MITSUBISHI UNIVERSITY

Mitsubishi Electric Powertrain Solutions

Flexible Assembly Control Systems (MEL-FACS)

Version 4.10

MITSUBISHI ELECTRIC

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MEL-FACS Training Manual

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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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

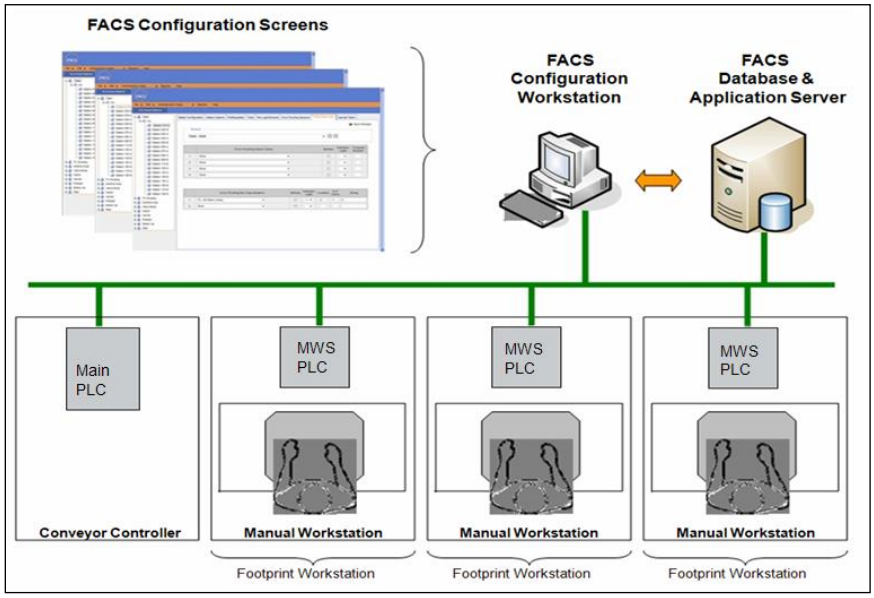


Figure 1.1 Flexible Assembly Configuration System

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

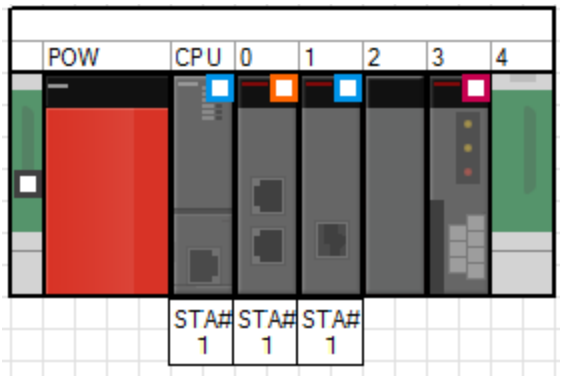


Figure 1.2 MEL-FACS Sample Rack Layout

Notes

1.4. MEL-FACS in Navigator

- Open MELSOFT Navigator

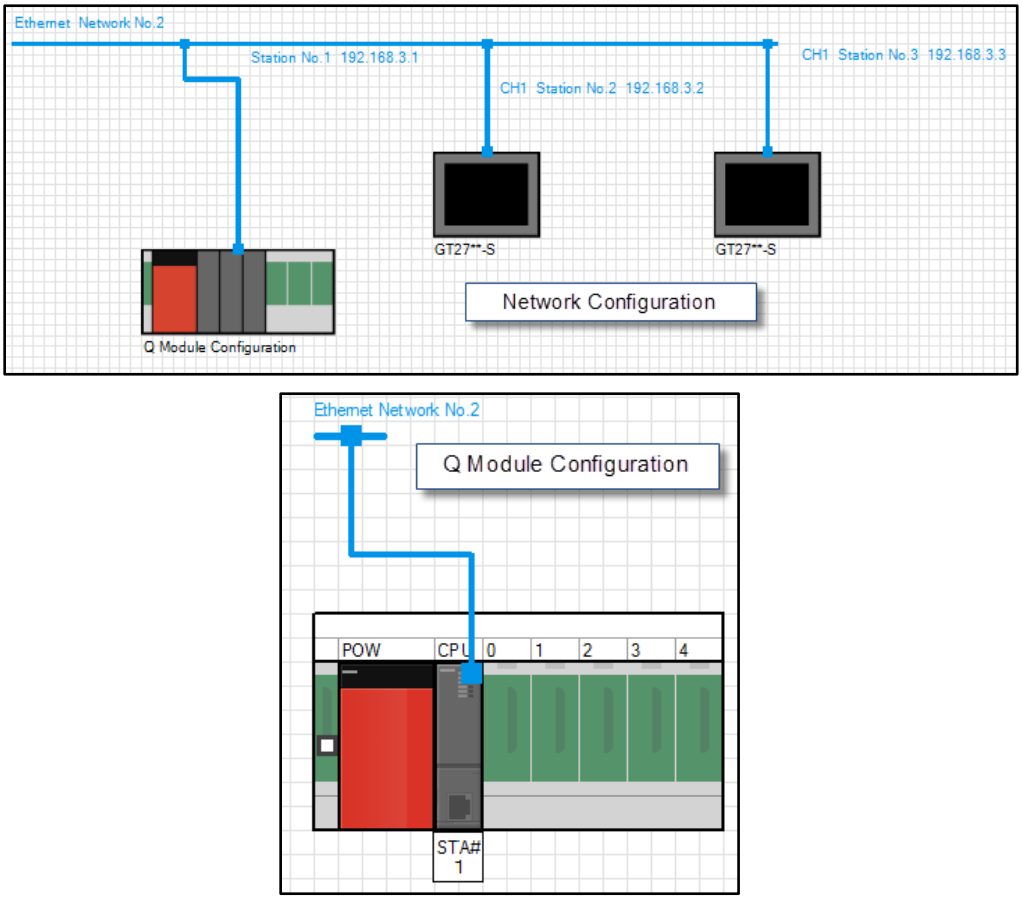


Figure 1.3 MEL-FACS in MELSOFT Navigator

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.'

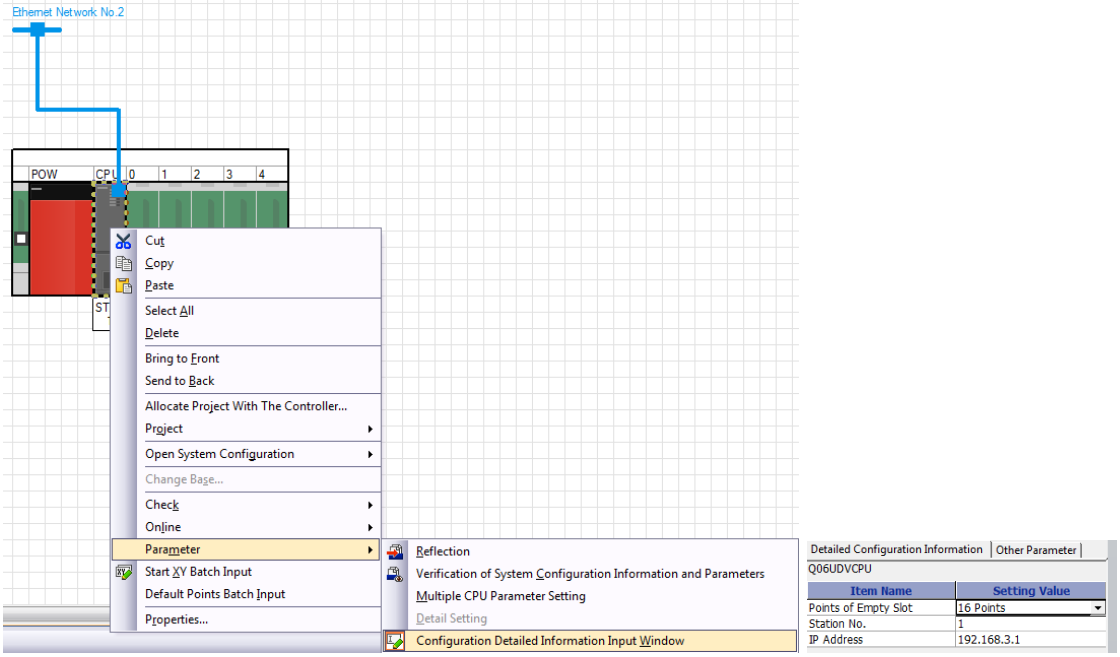
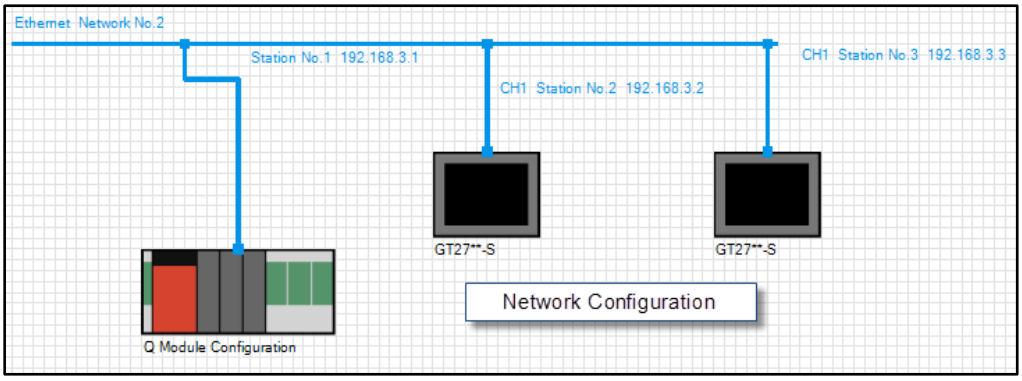


Figure 1.4 IP Address, Net and Station # for PLC

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.



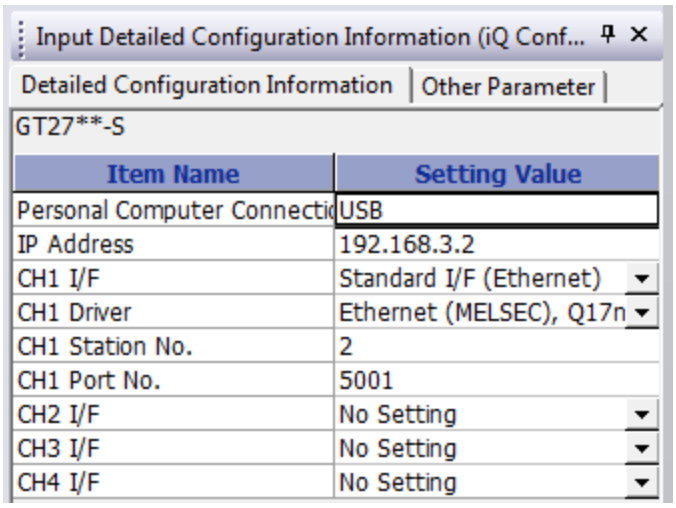
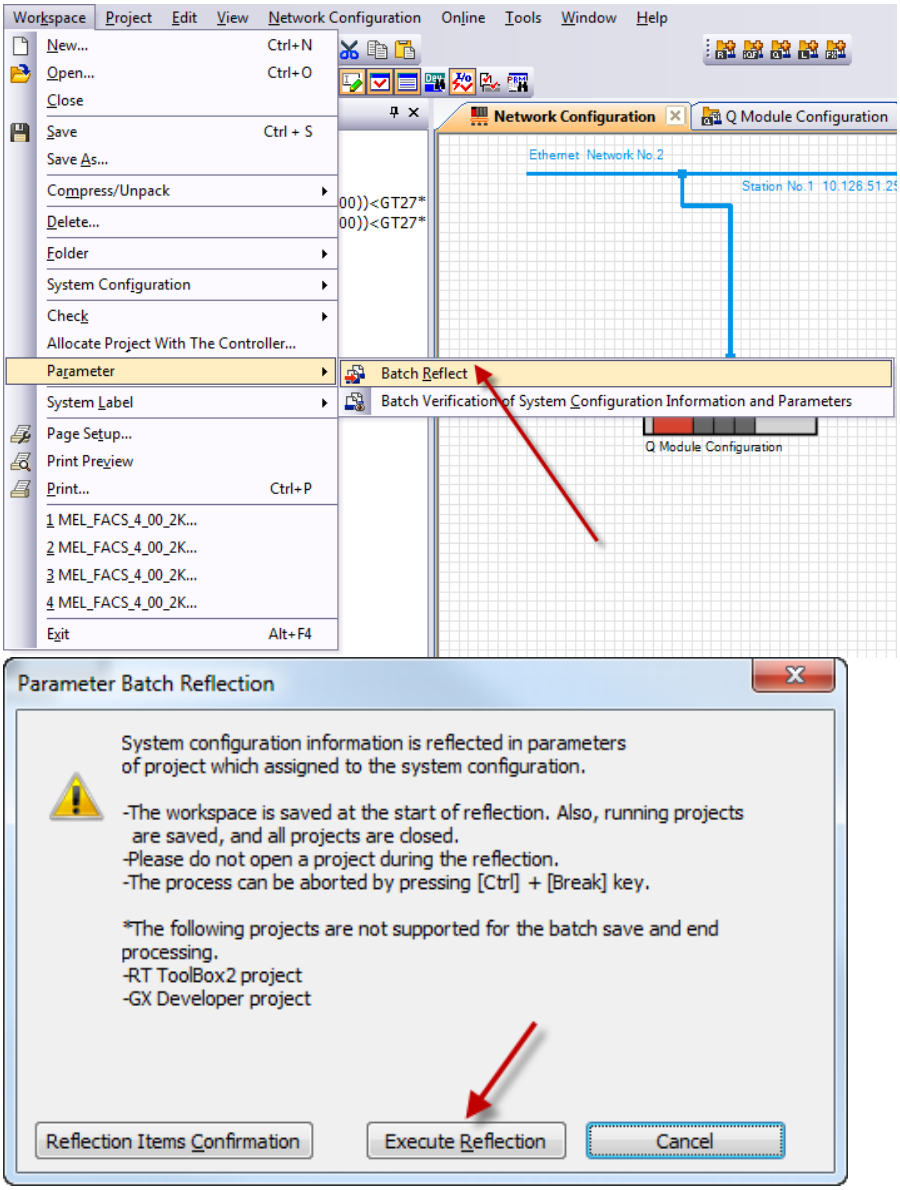


Figure 1.5 IP Address, Net and Station # for HMI

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

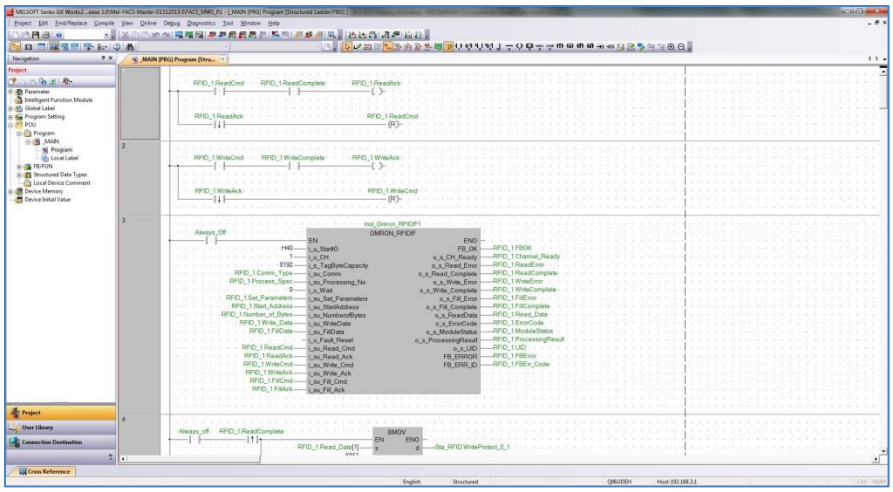


Figure 1.6 PLC Application

From MELSOFT Navigator, open the GOT (HMI) Application by double-clicking either on the GOT project in the left window or the GOT icon in the "Network Configuration" window.

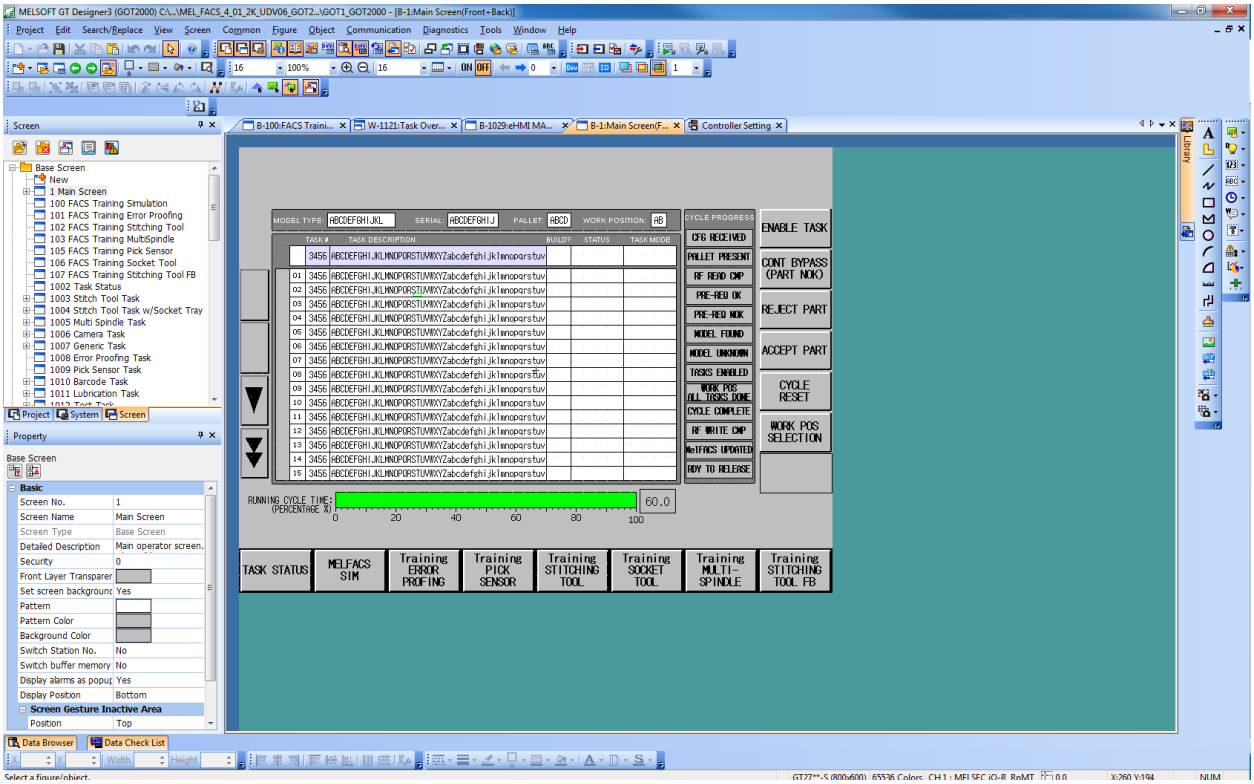


Figure 1.7 GOT Application

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)

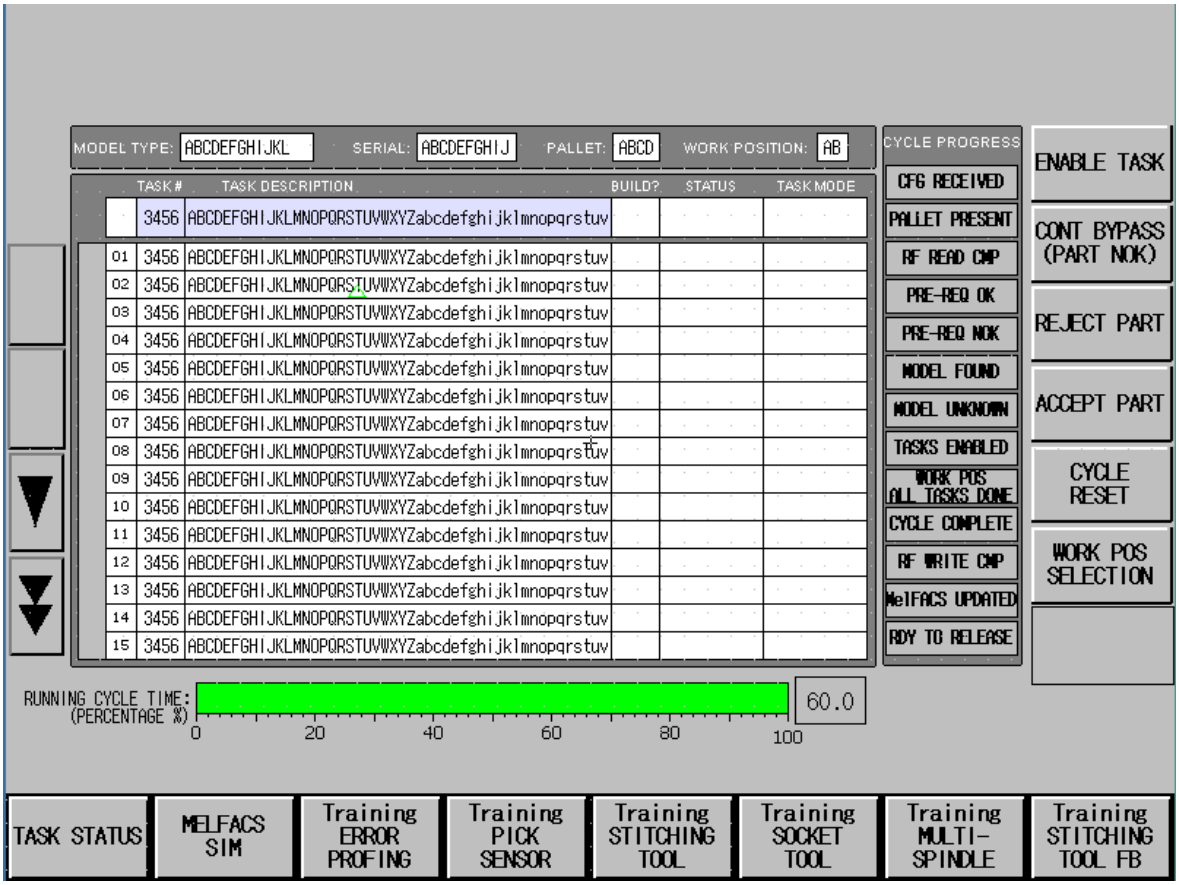


Figure 2.1 eHMI Application

Notes

The Tasks enabled Navigation screen is shown below.

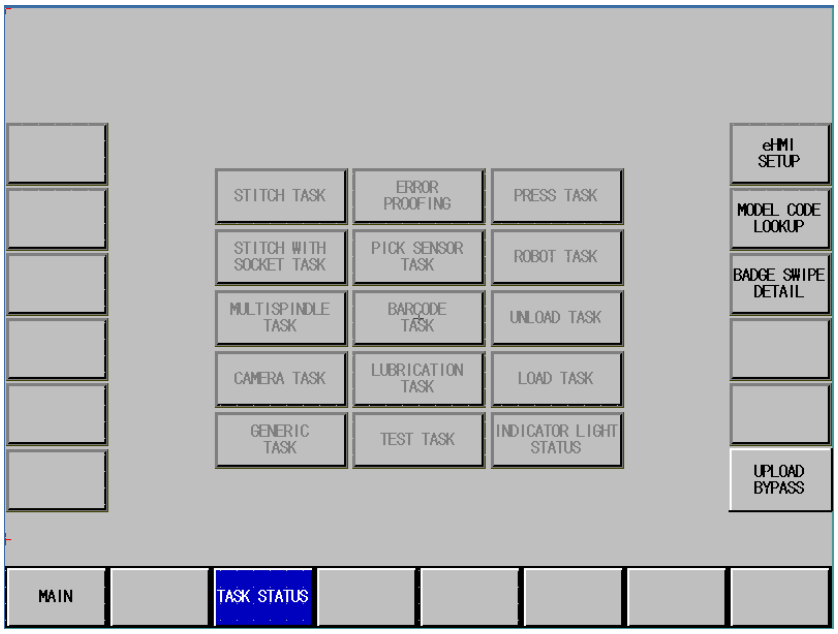


Figure 2.2 eHMI Sample Screen - Navigation

Sample task screen is shown below.

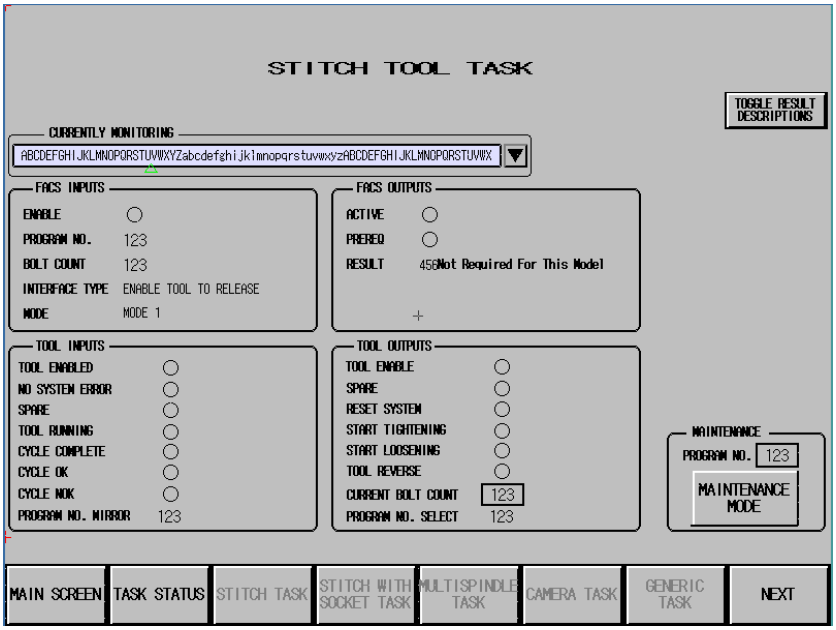


Figure 2.3 eHMI Sample Screen – Stitching Tool

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.

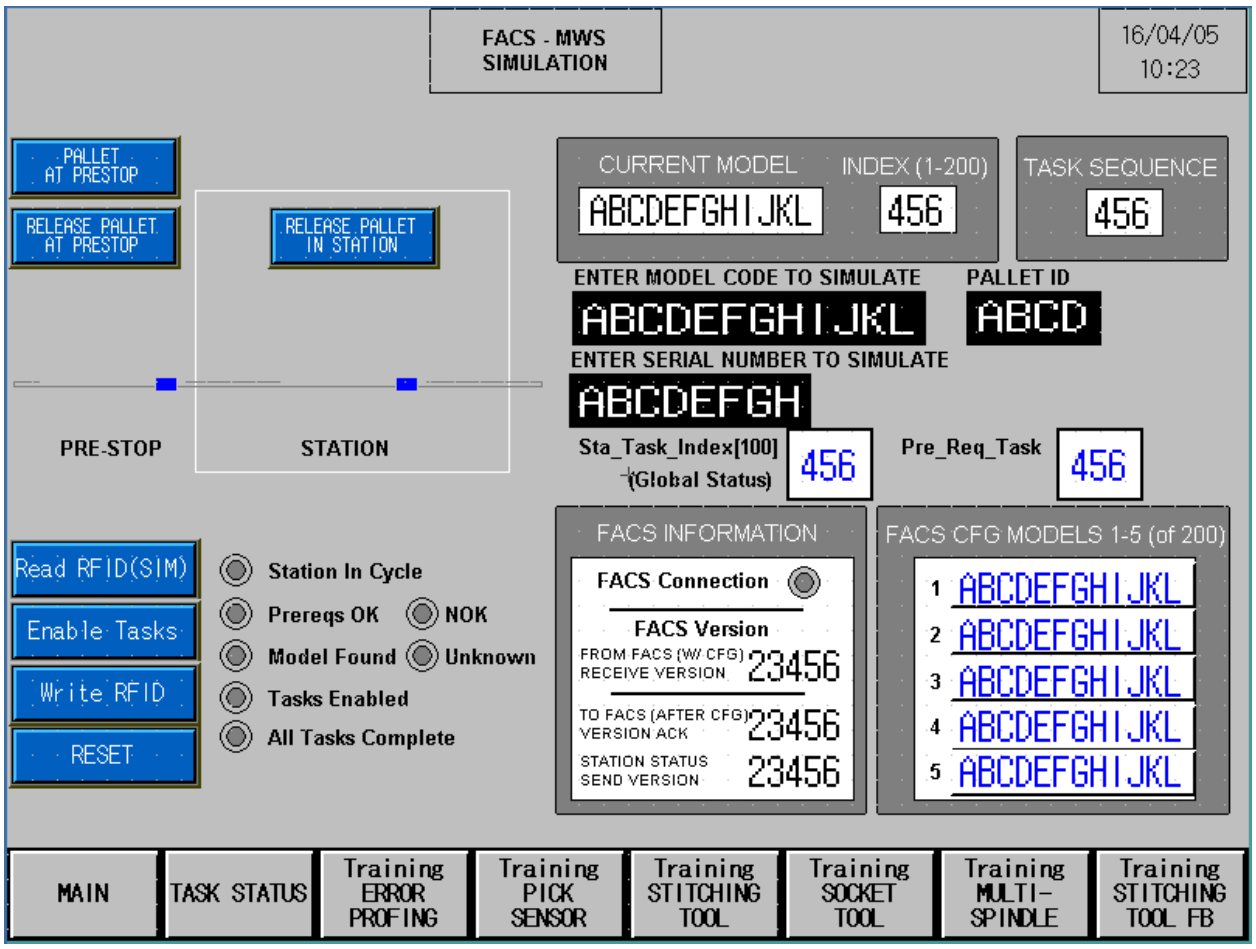


Figure 2.4 MEL-FACS Simulation

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.

Notes

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

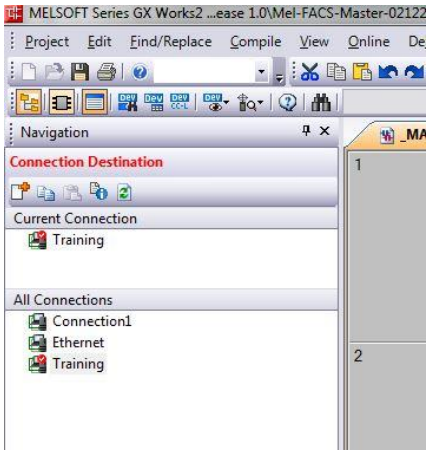
3.3. Download to PLC

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.'



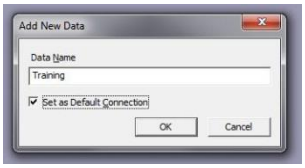


Figure 3.1 PLC Connection

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.

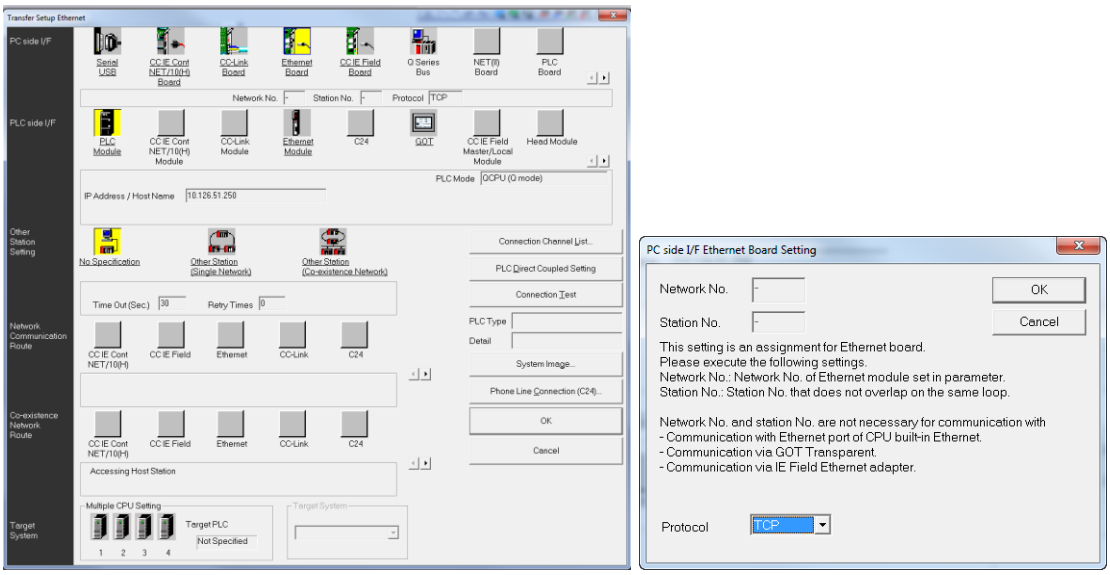


Figure 3.2 Setting for PLC Connection

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.

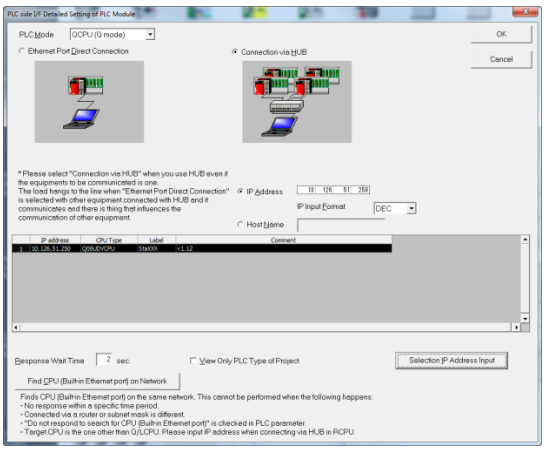


Figure 3.3 PLC Side Ethernet Setting

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.

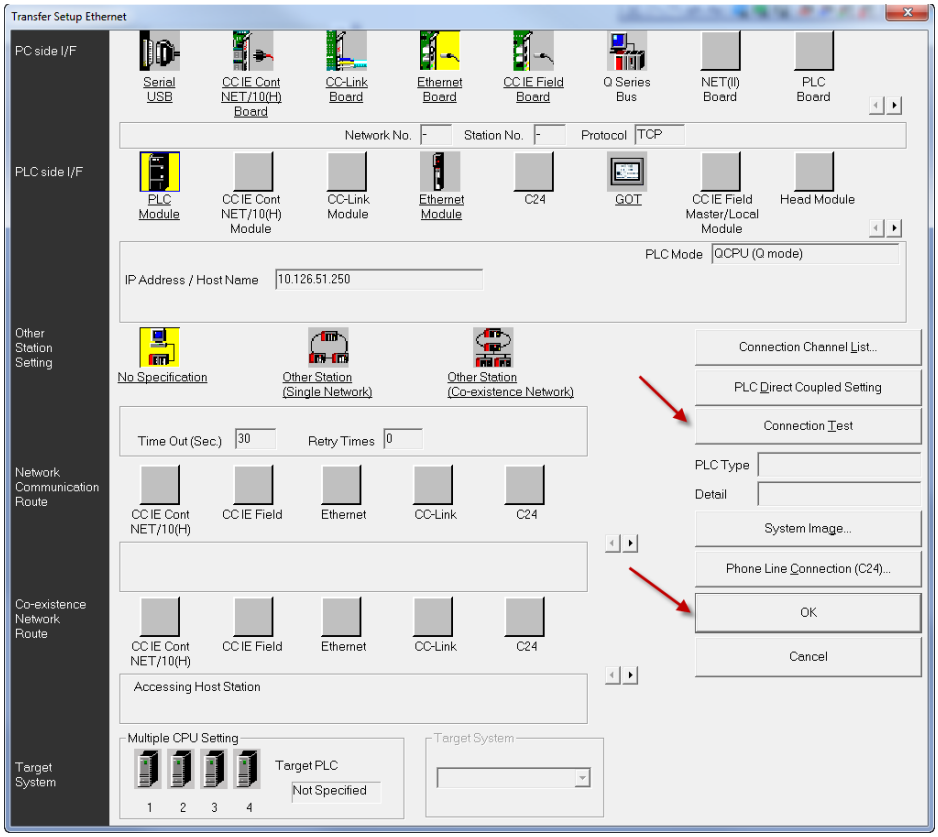


Figure 3.4 Other Settings for PLC Connection

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

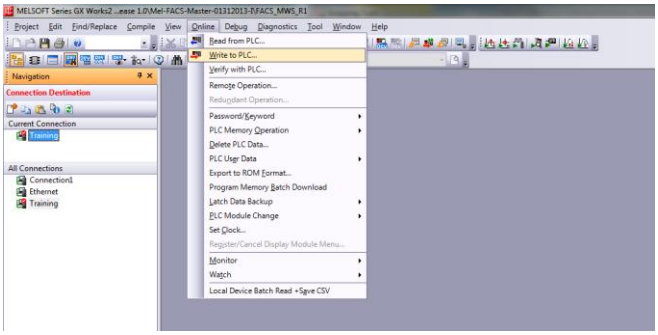


Figure 3.5 Write to PLC

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.)

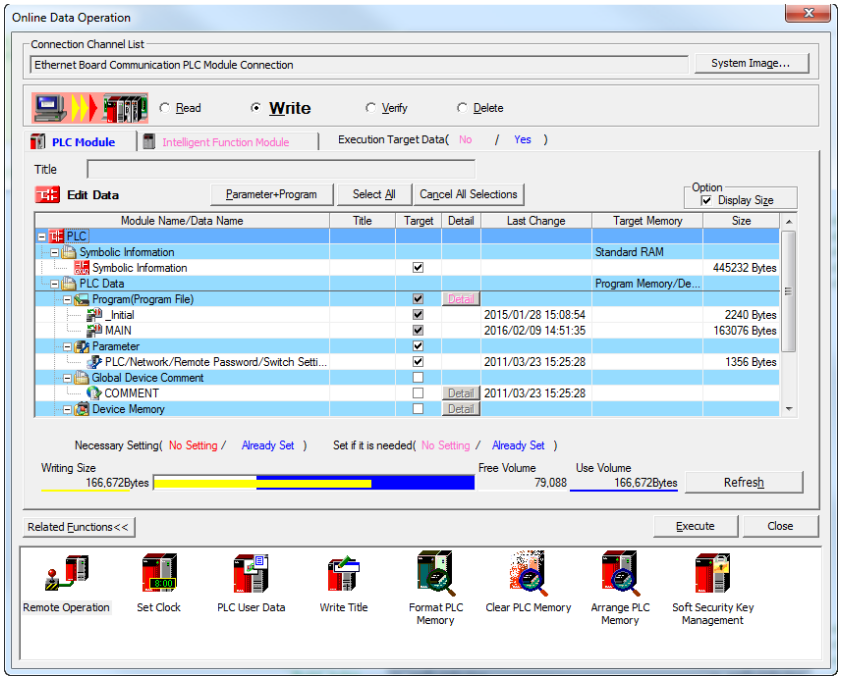


Figure 3.6 Write to PLC

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.

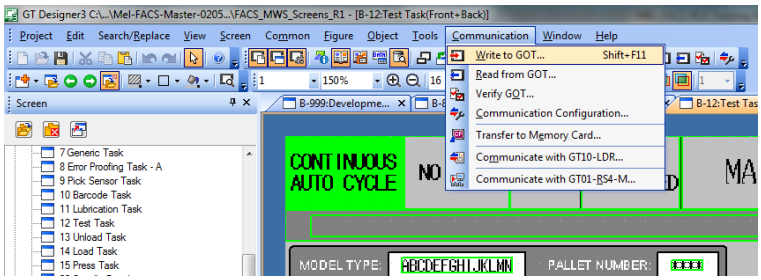


Figure 3.7 Download to GOT

Notes

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

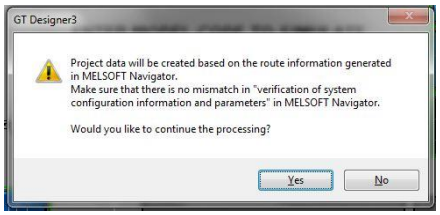


Figure 3.8 Download to GOT

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.'

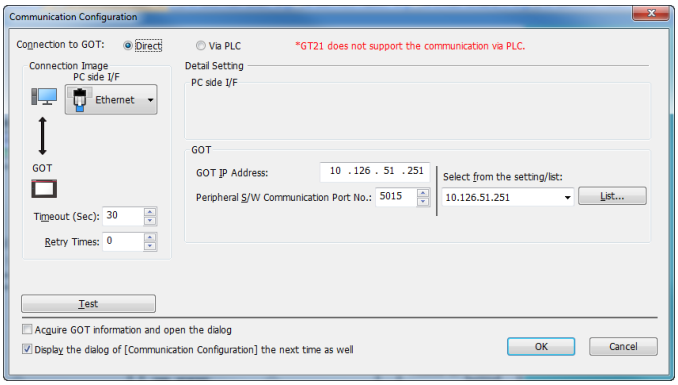


Figure 3.9 Download to GOT

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

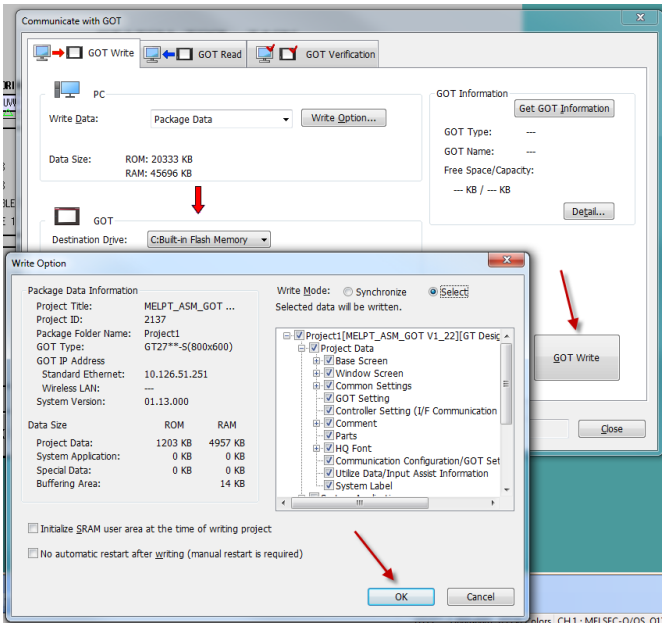


Figure 3.10 Download to GOT

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

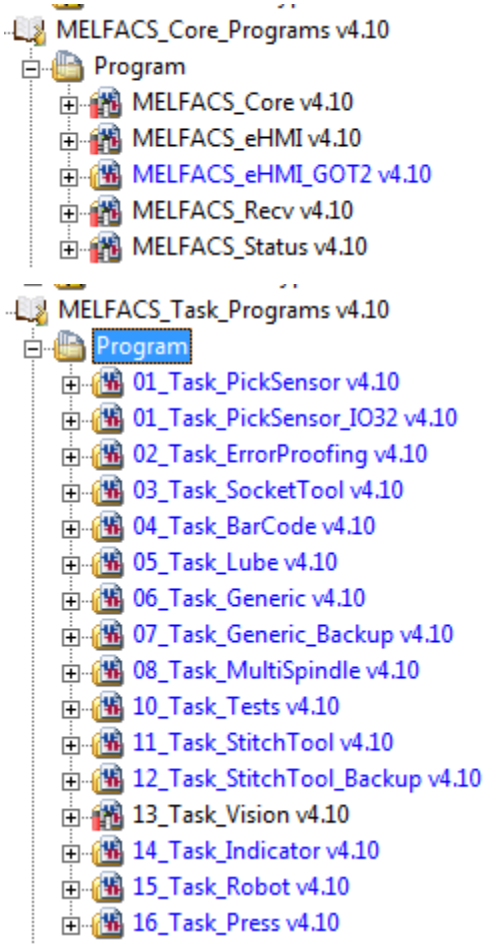


Figure 4.1 MEL-FACS MWS Program Structure – cont'd

Notes

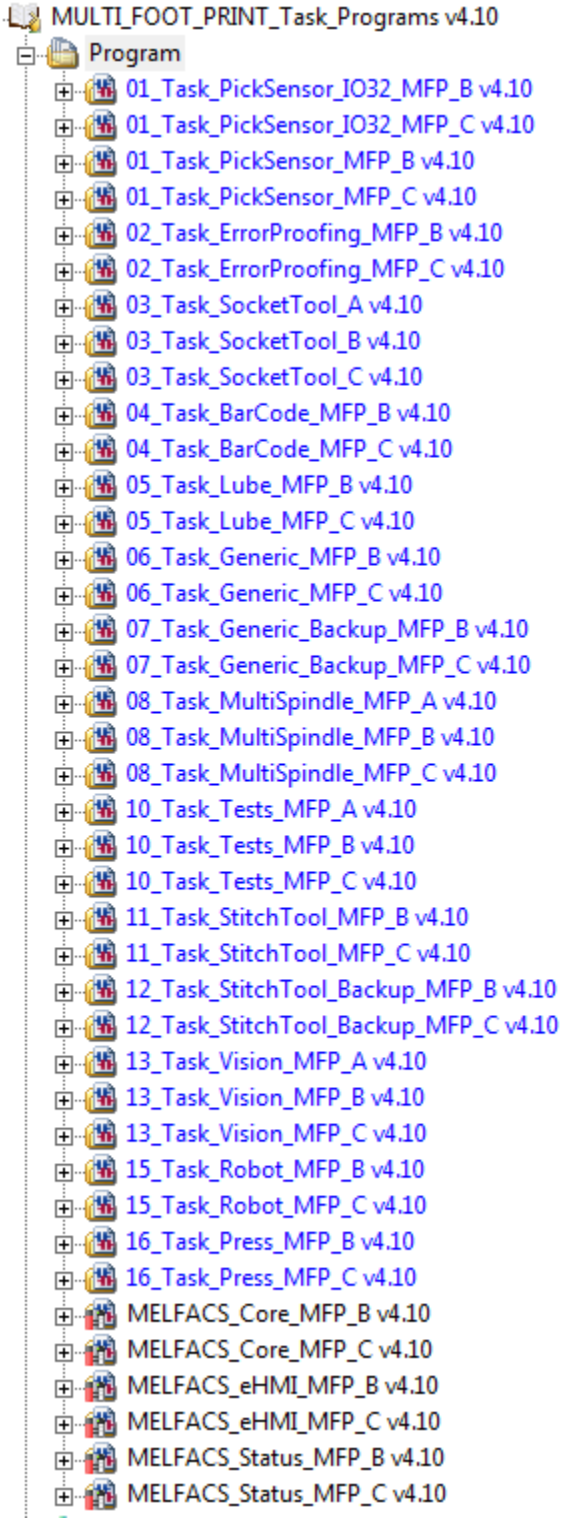
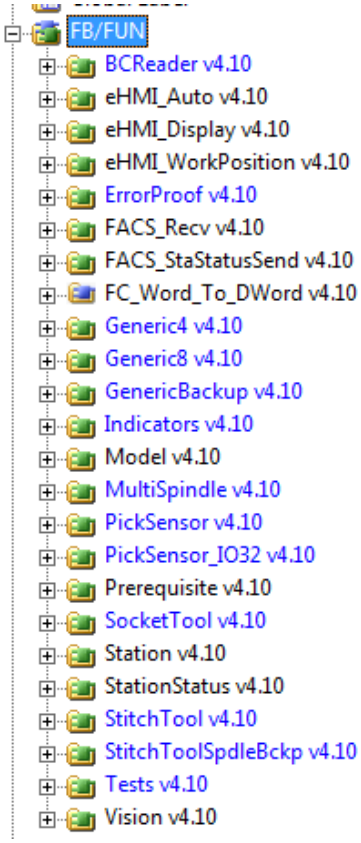


Figure 4.1 MEL-FACS MWS Program Structure

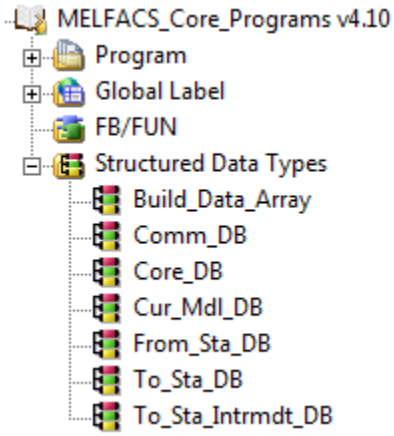
Notes

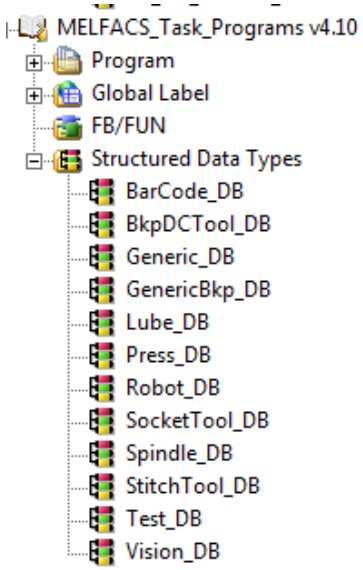
4.1.2. User Library FBs and FUNs

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



4.1.3. Structured Data Types





Notes

4.1.4. Global Labels

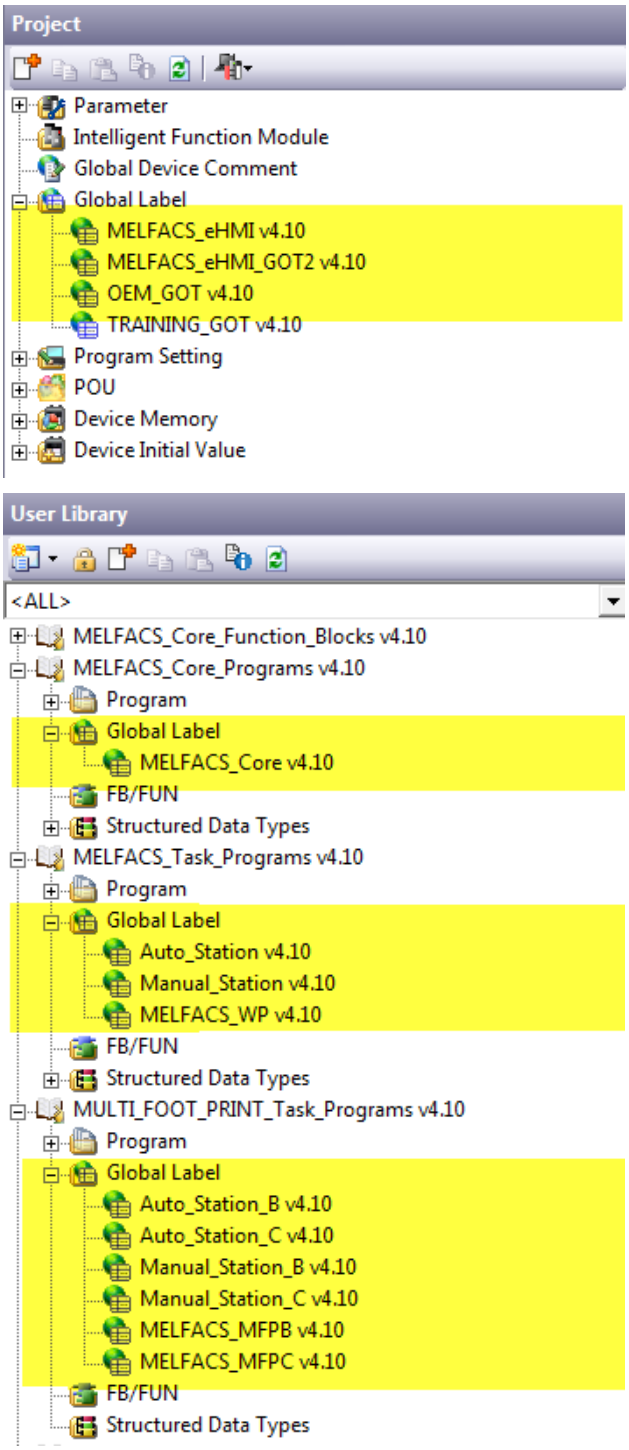


Figure 4.2 MEL-FACS MWS Project and User Library Global Labels

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 Figure4.3 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)

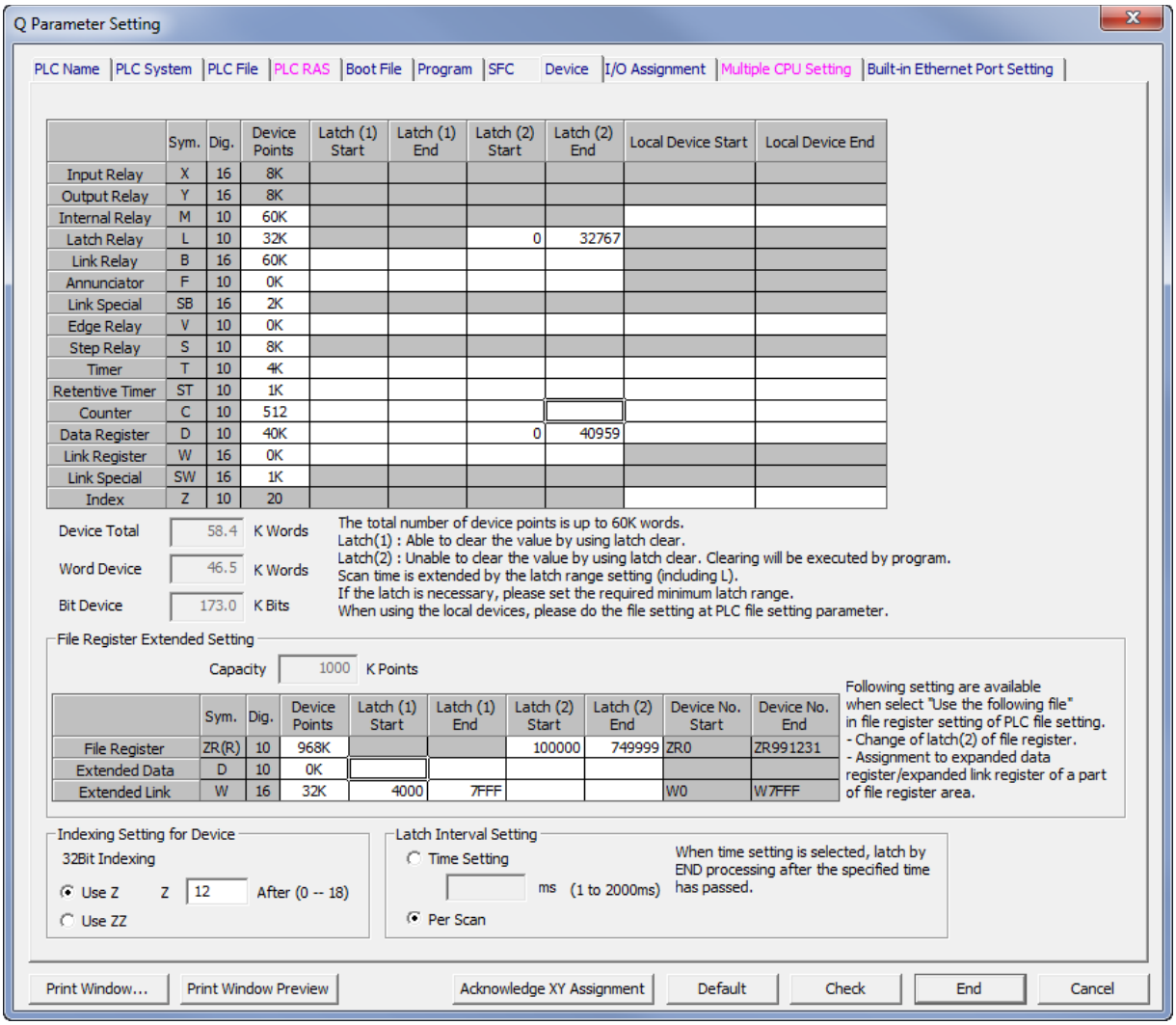
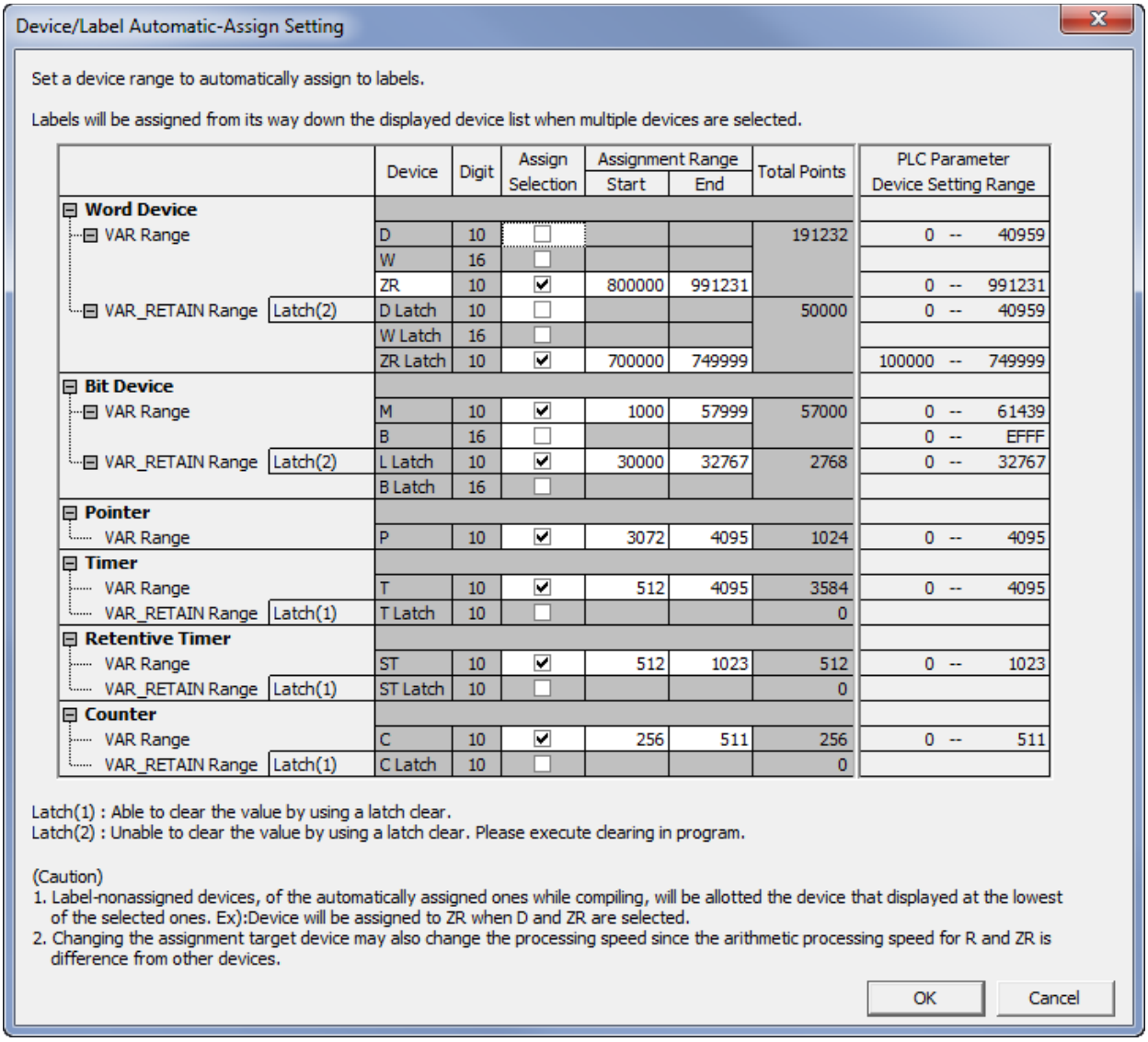


Figure 4.3 Device Configuration – Parameter->Devices

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

Figure 4.4 Device Configuration – Auto Assign Devices for Labels

Notes

4.2.3. PLC Memory Map

ZR - Total Device - 968K	991231
VAR Range	0 - 99999
VAR_RETAIN Range	100000 - 749999
VAR Range	750000 - 991231

Note: Auto Assign is used by both MEL-FACS and User (OEM)
Plese See Automatic Assignment Tab for actual usage by MEL-FACS

	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)
Plese 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.

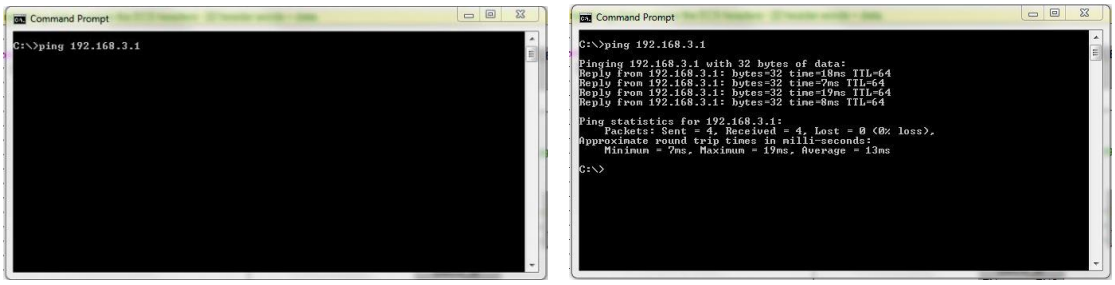


Figure 5.1 Ping PLC

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.

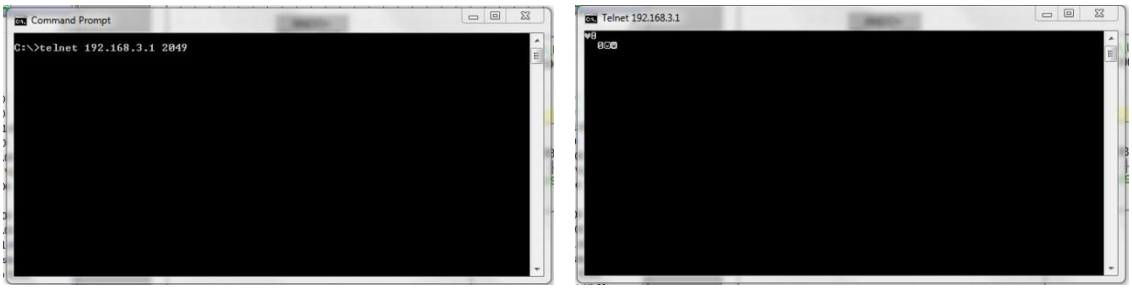


Figure 5.2 Telnet PLC

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.

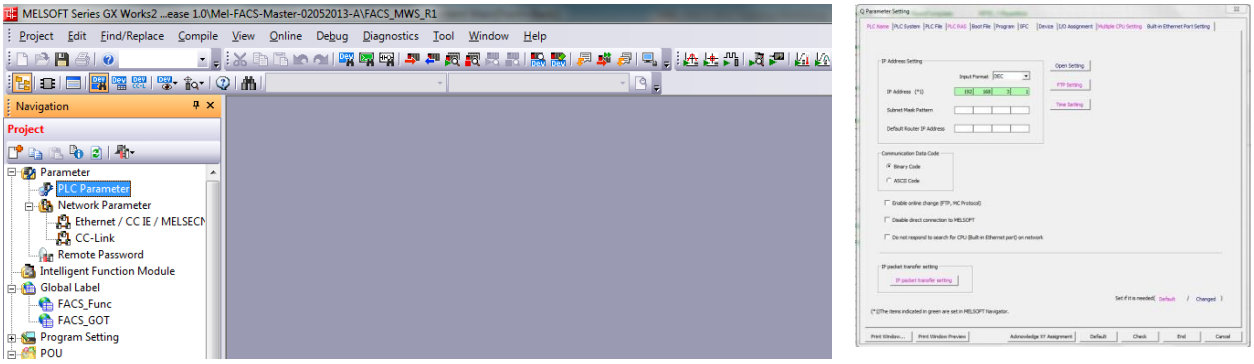


Figure 5.3 PLC Built-in Ethernet

Click the 'Open Settings' button.

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

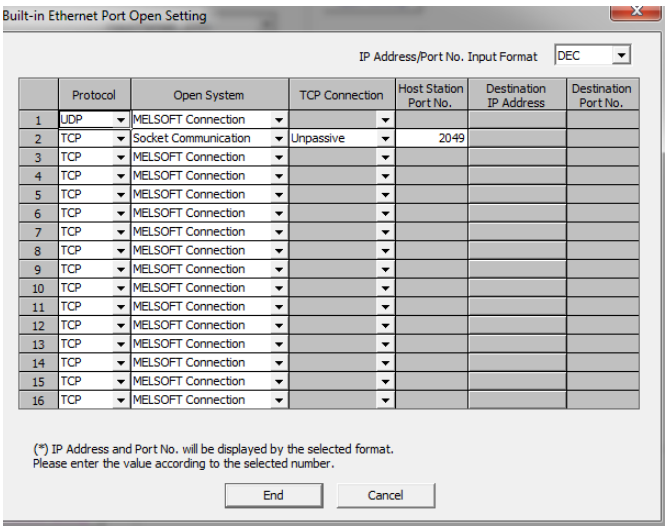


Figure 5.4 Open Setting of Built-in Ethernet Port

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

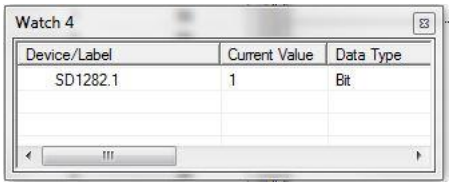


Figure 5.5 Channel Status

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.)

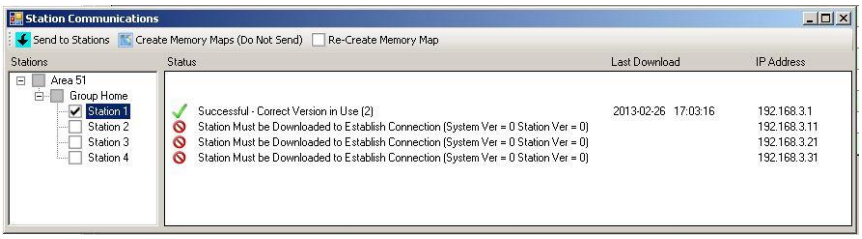


Figure 5.6 Download Configuration to PLC

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.

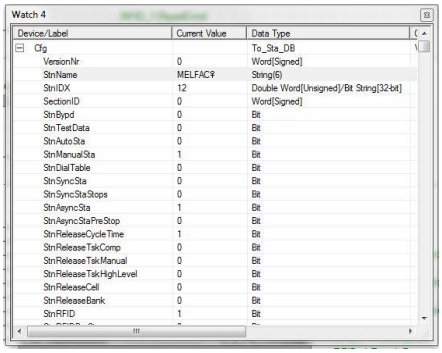


Figure 5.7 Watch Window for 'Cfg' SDT

Notes

LESSON 6 Prerequisites

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

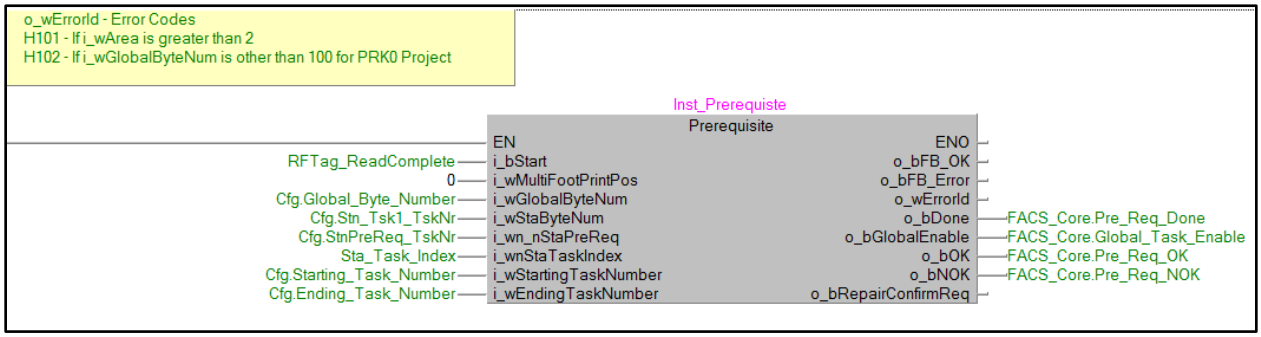
6.1. Lesson Objectives

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

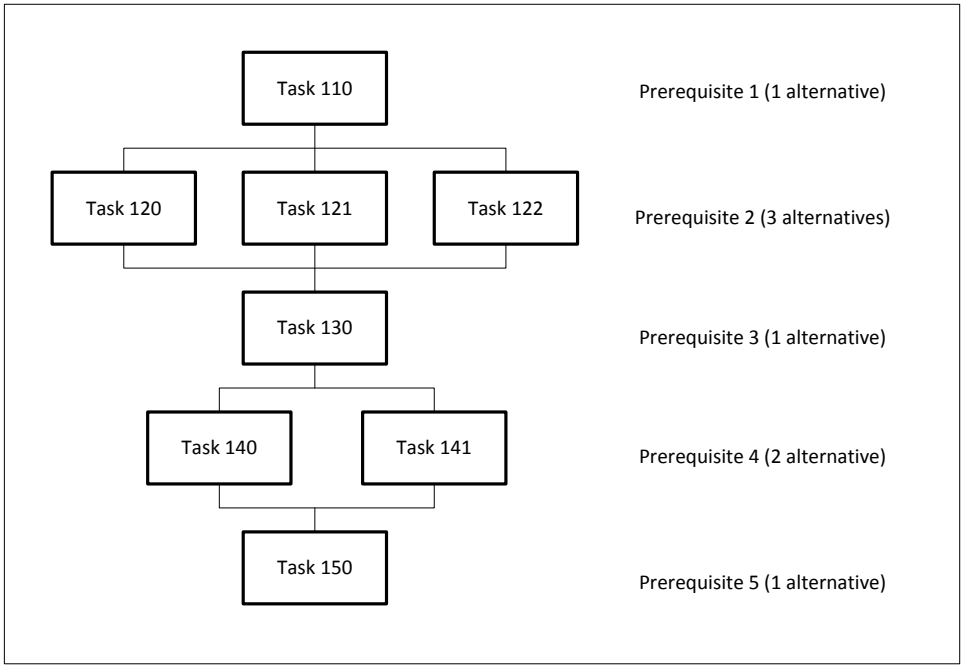


Figure 6.1 Sample of Prerequisite Configuration

- 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.

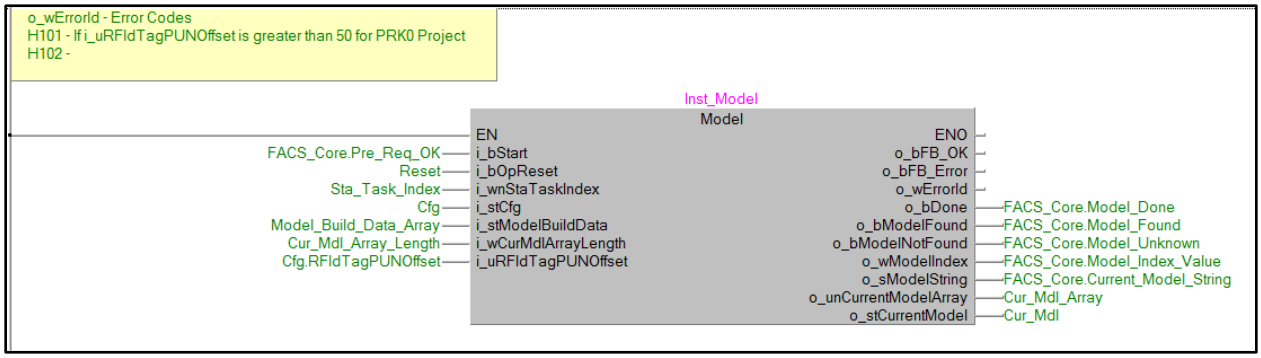
7.1. Lesson Objectives

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).

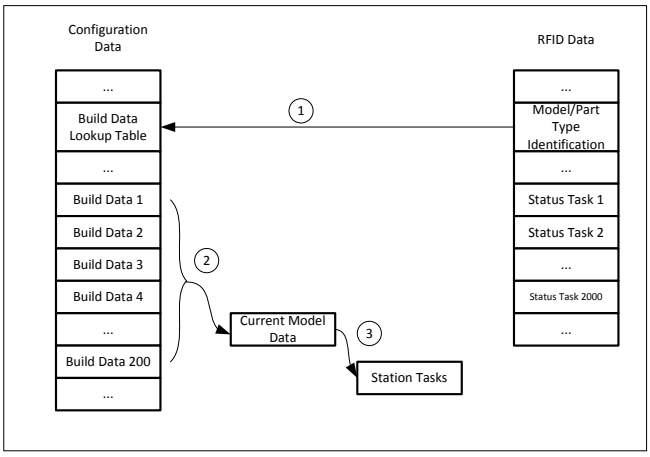


Figure 7.1 Data Flow of Model Management

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.

Notes

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

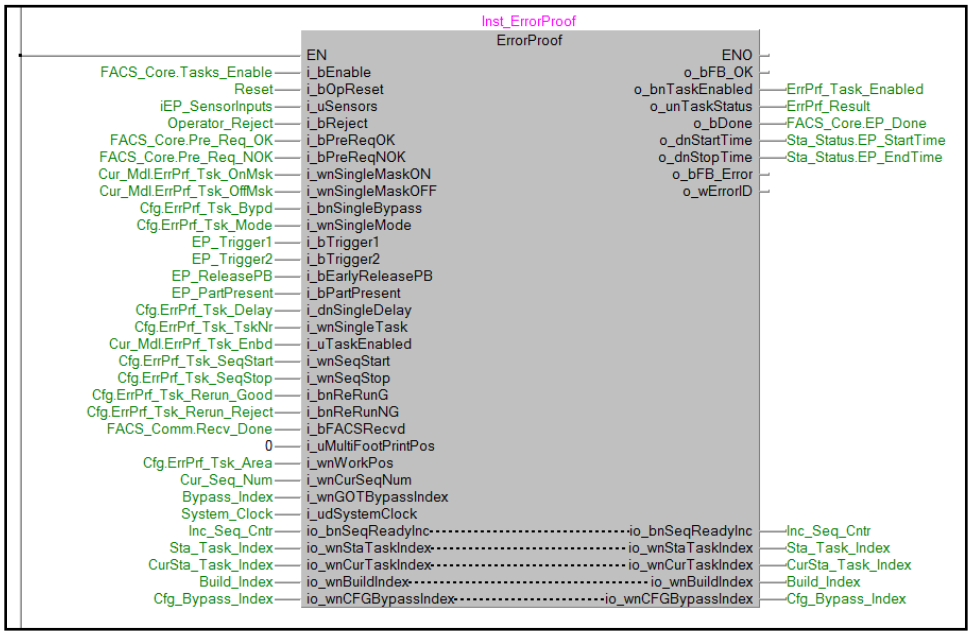
This lesson discusses how to complete "Error Proofing" task.

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.

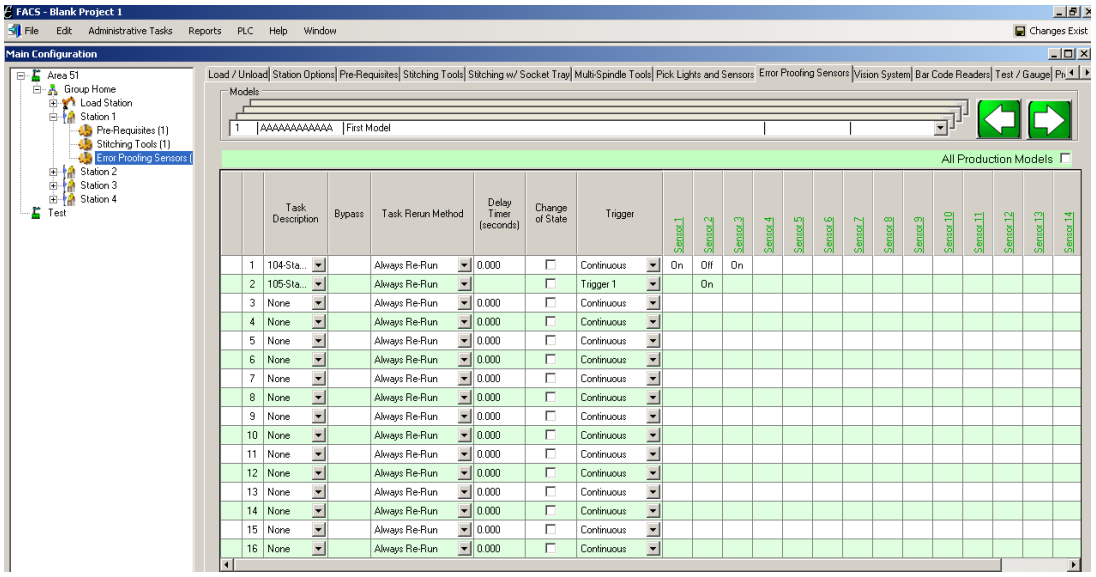


Figure 8.1 Example eFlex Screen – Error Proofing Tasks

Notes

The eHMI Error Proofing screen is shown below.

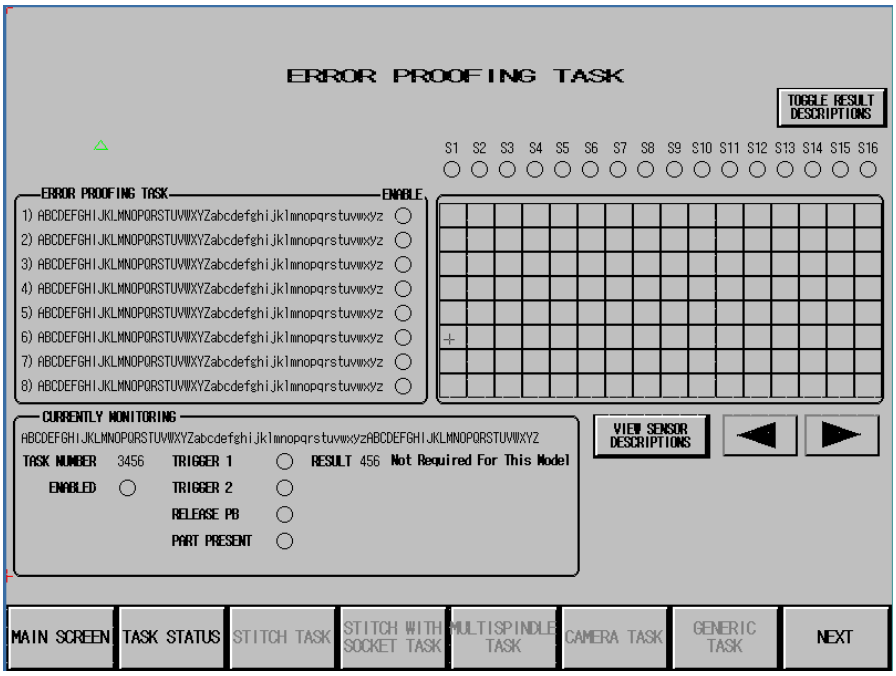
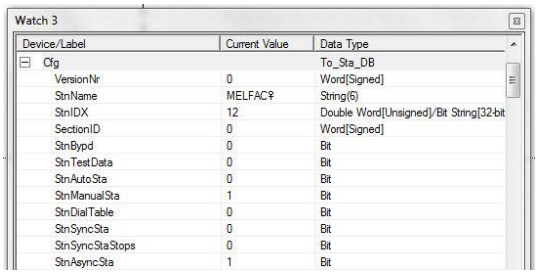


Figure 8.2 Example eHMI Screen

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)

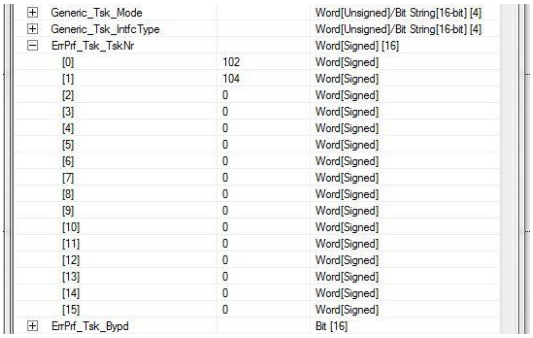


Figure 8.3 Example of Cfg

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.

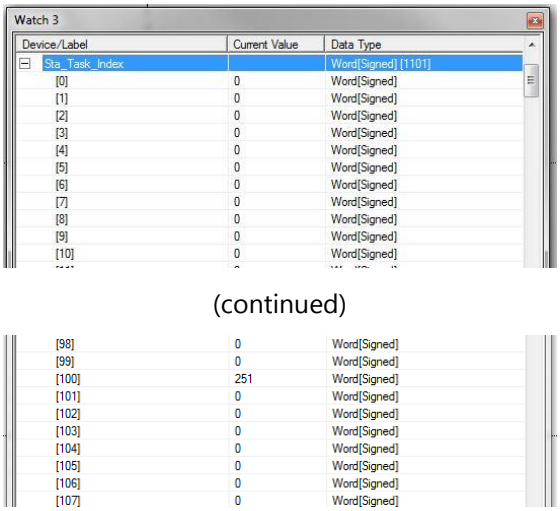


Figure 8.4 Example of Task Status

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.

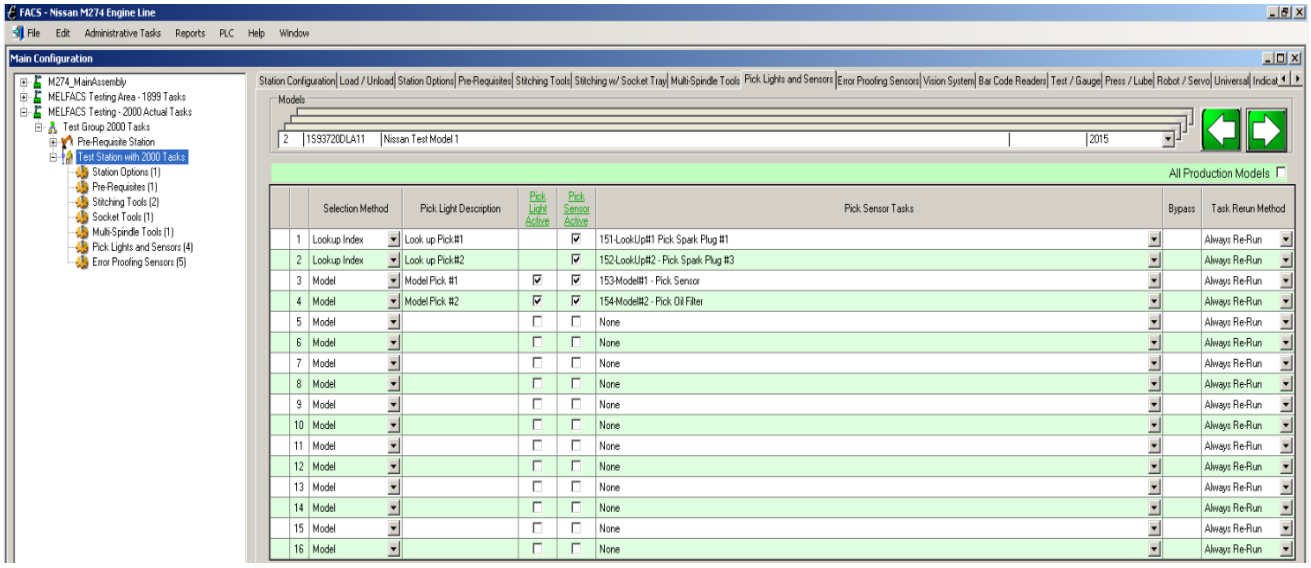


Figure 9.1 Example eFlex Screen – Pick Sensor Tasks

Notes

The eHMI Pick Sensor screen is shown below.

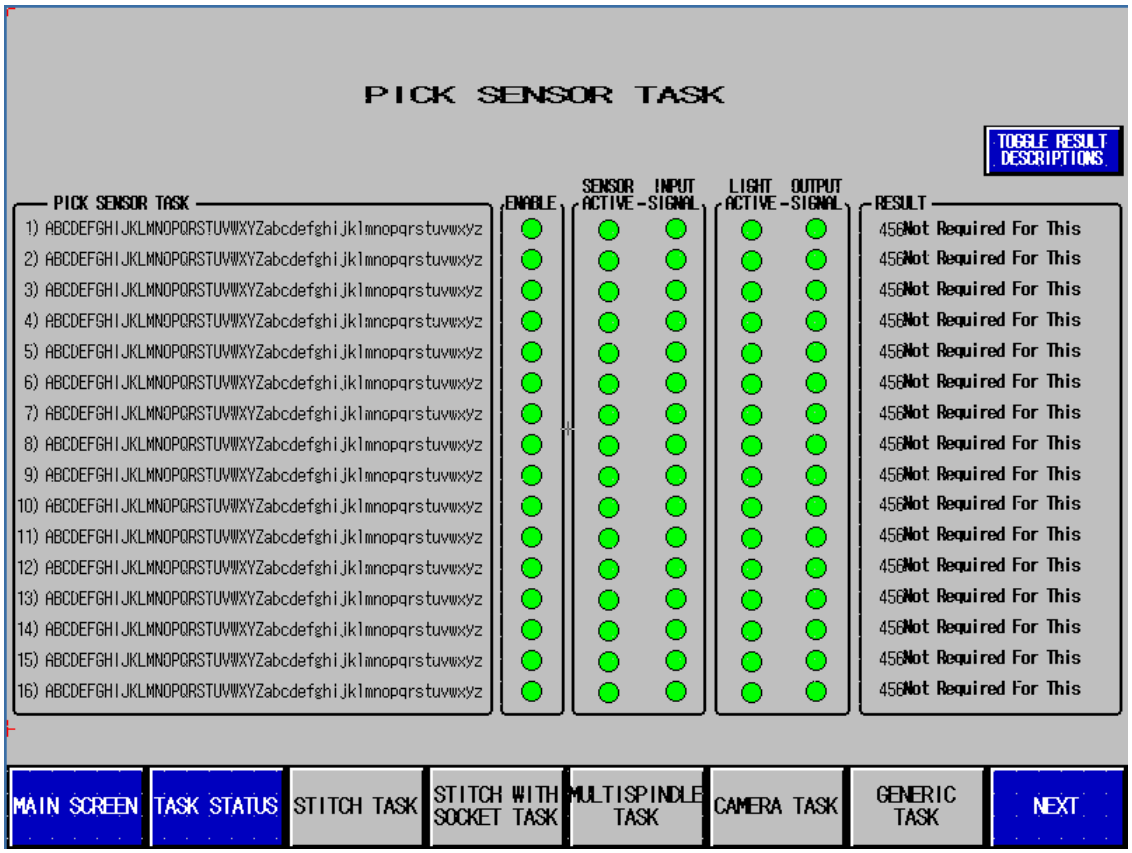
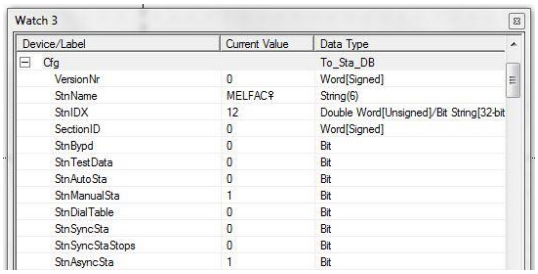


Figure 9.2 Example eHMI Screen

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

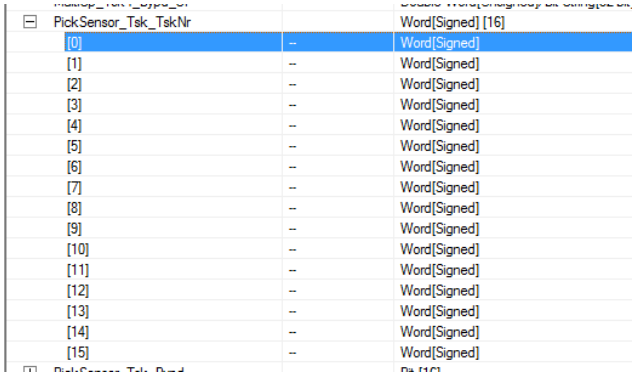
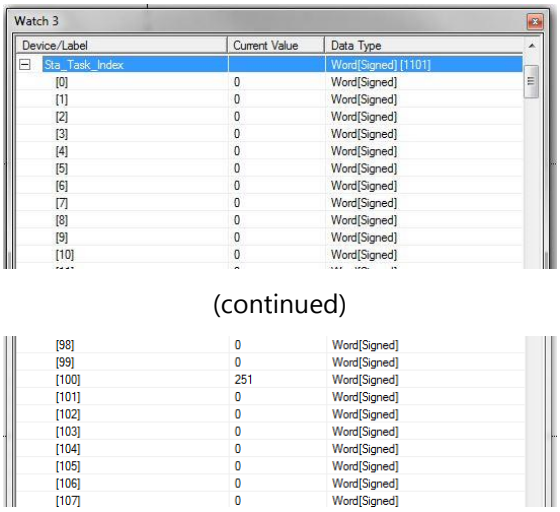


Figure 9.3 Example of Cfg

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.



(continued)

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		☑	151-LookUp#1 Pick Spark Plug #1
	2	Lookup Index	Look up Pick#2		☑	152-LookUp#2 - Pick Spark Plug #3
	3	Model	Model Pick #1	☑	☑	153-Model#1 - Pick Sensor
	4	Model	Model Pick #2	☑	☑	154-Model#2 - Pick Oil Filter
	5	Model		☐	☐	None
	6	Model		☐	☐	None
	7	Model		☐	☐	None
	8	Model		☐	☐	None
	9	Model		☐	☐	None
	10	Model		☐	☐	None
	11	Model		☐	☐	None
	12	Model		☐	☐	None
	13	Model		☐	☐	None
	14	Model		☐	☐	None
	15	Model		☐	☐	None
	16	Model		☐	☐	None

Notes

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

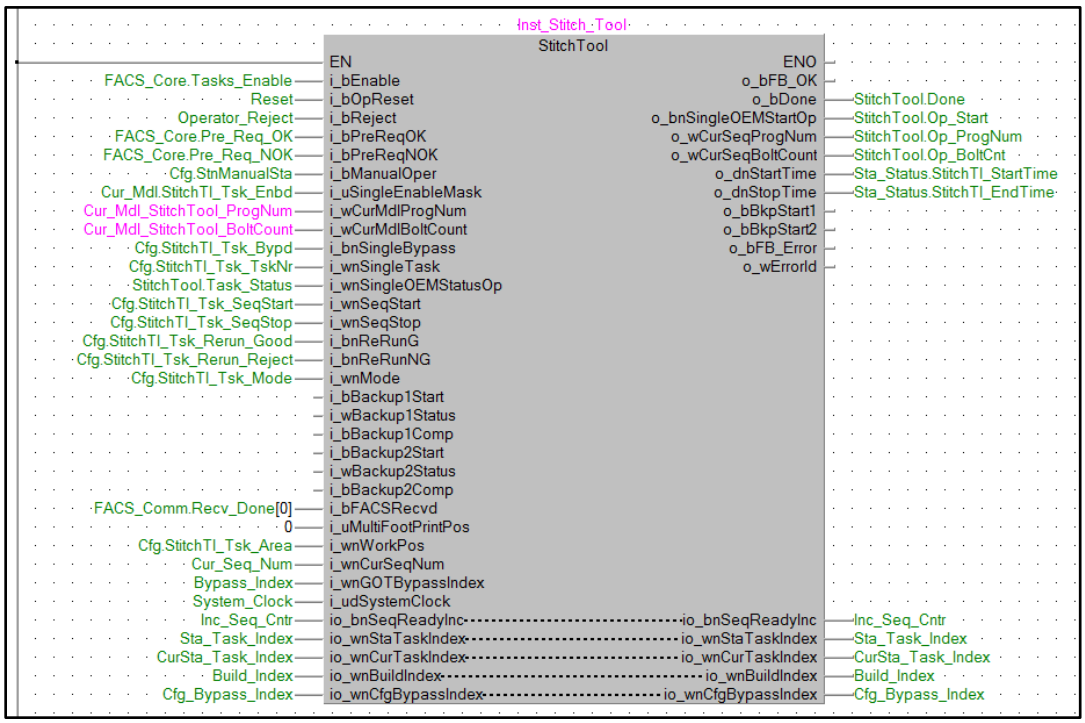
This lesson discusses how to complete “Stitching Tool” task.

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.

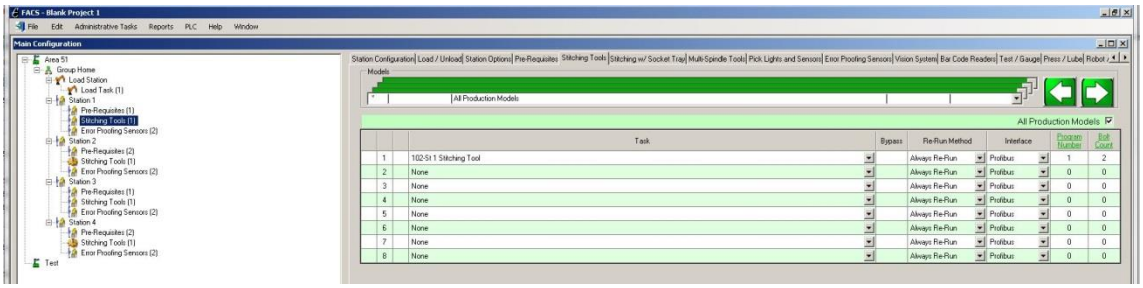


Figure 10.1 Example eFlex Screen

Notes

The eHMI Stitching Tool screen is shown below.

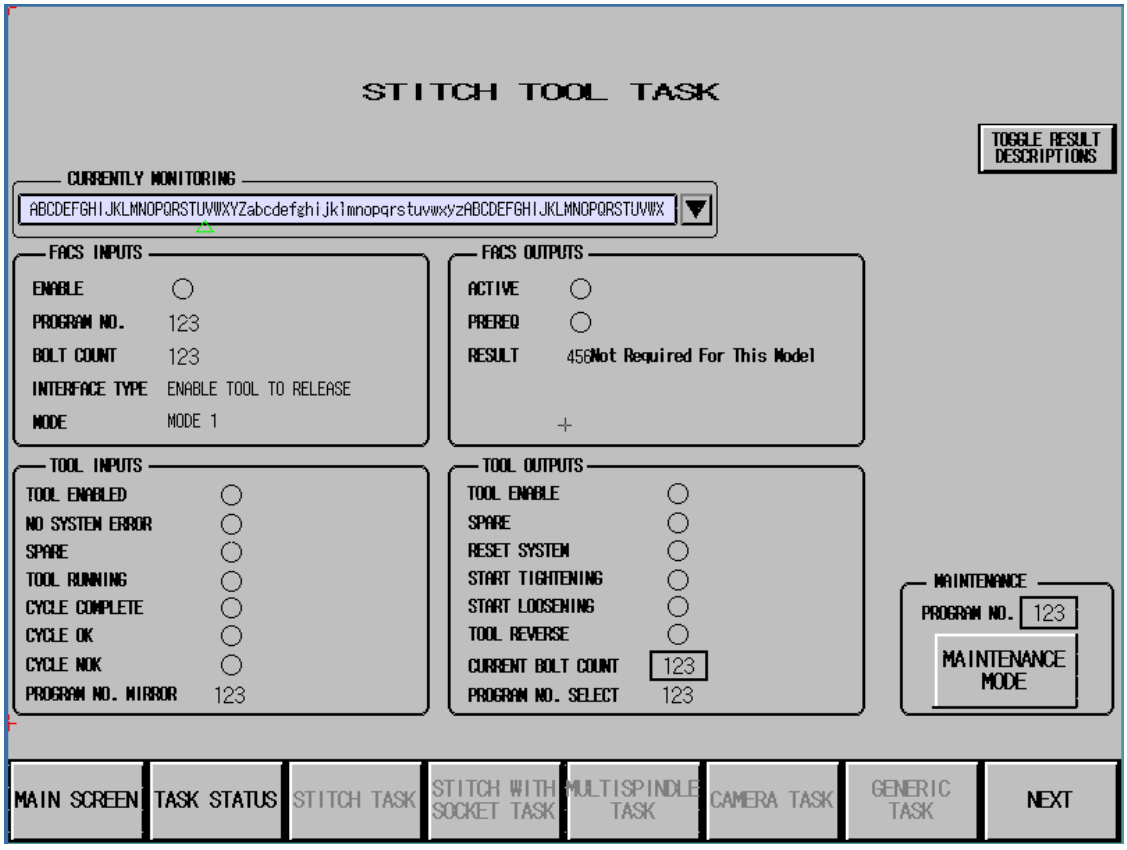
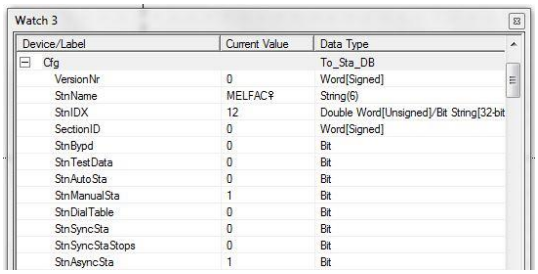


Figure 10.2 Example eHMI Screen

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

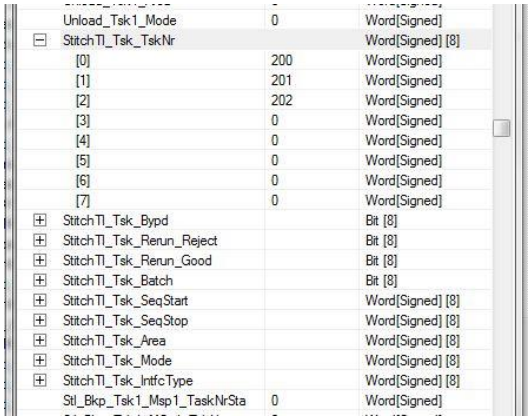
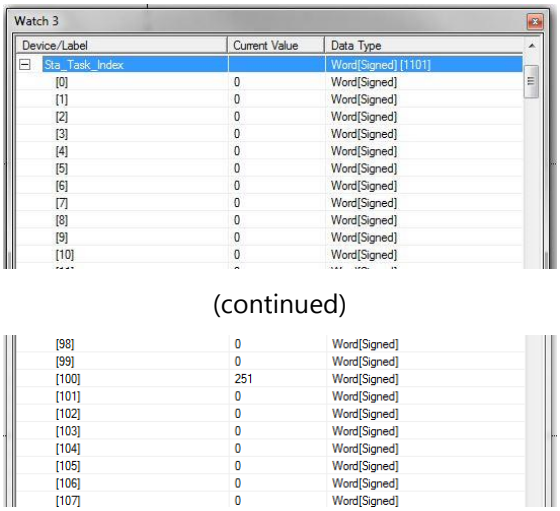


Figure 10.3 Example of Cfg

Scroll down to 'StitchTl_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.



(continued)

Figure 10.4 Example of Task Status

Notes

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.

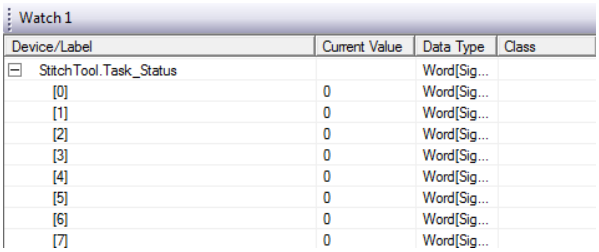


Figure 10.5 Task Status from OEM Logic

Notes

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

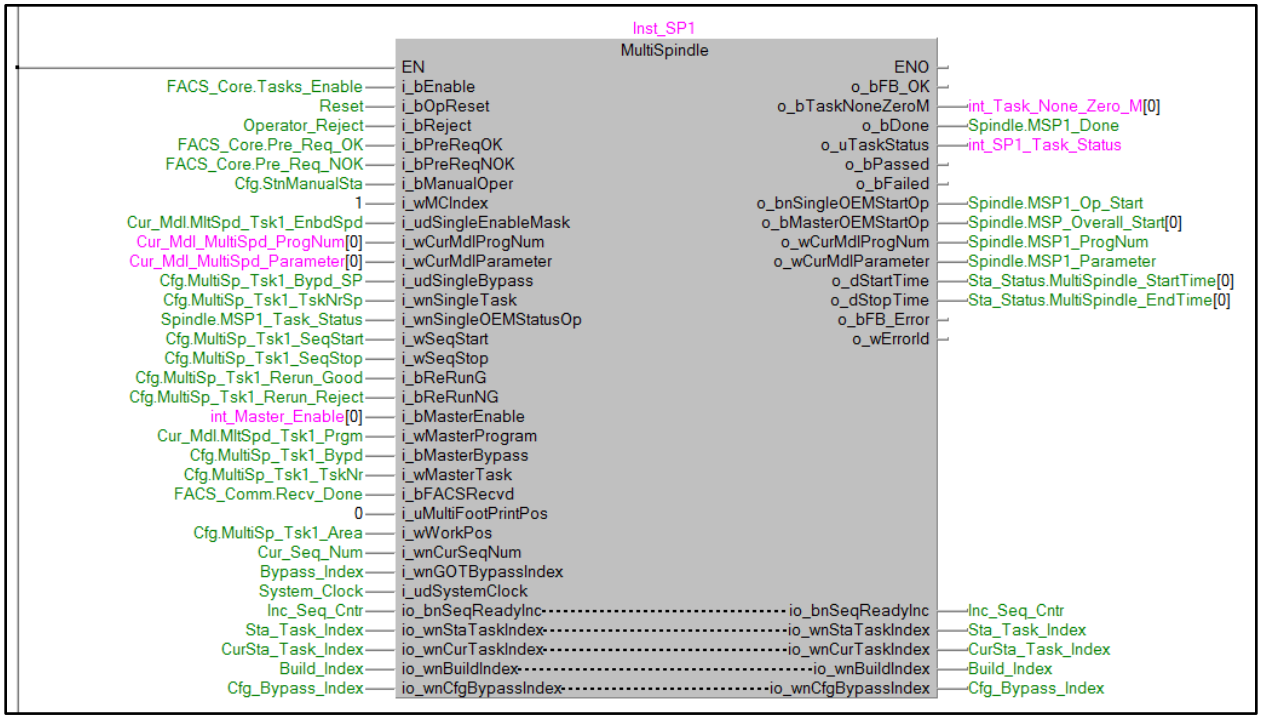
This lesson discusses how to complete Multi-Spindle Master and Sub tasks.

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.

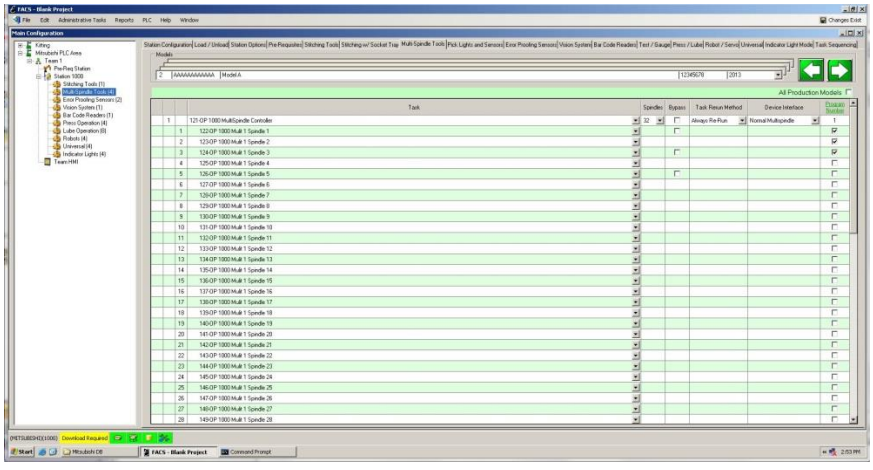


Figure 11.1 Example eFlex Screen

Notes

The eHMI Multi-Spindle screen is shown below.

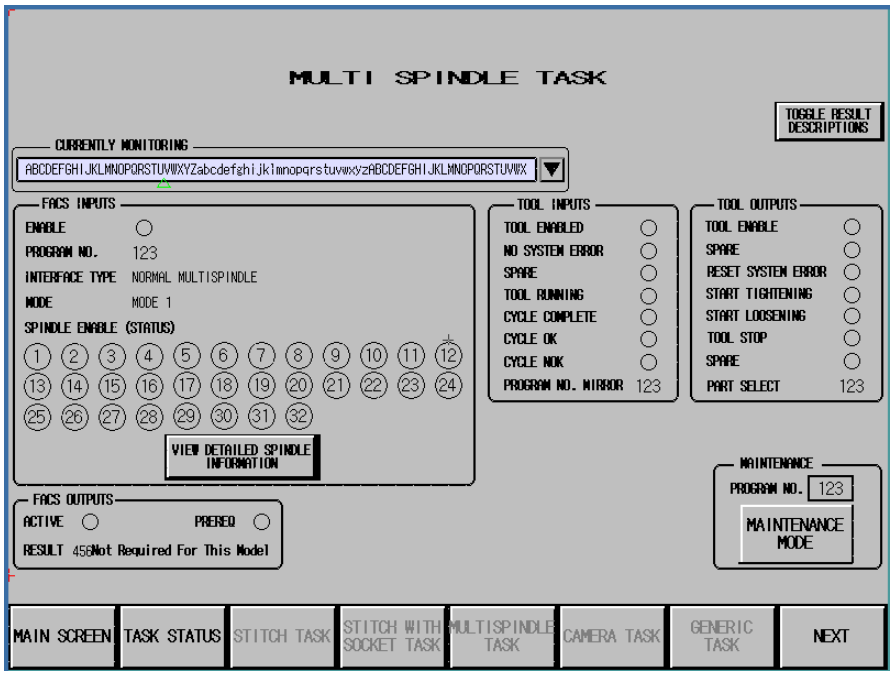


Figure 11.2 Example eHMI Screen -1

The following screen shows the spindle detail information.

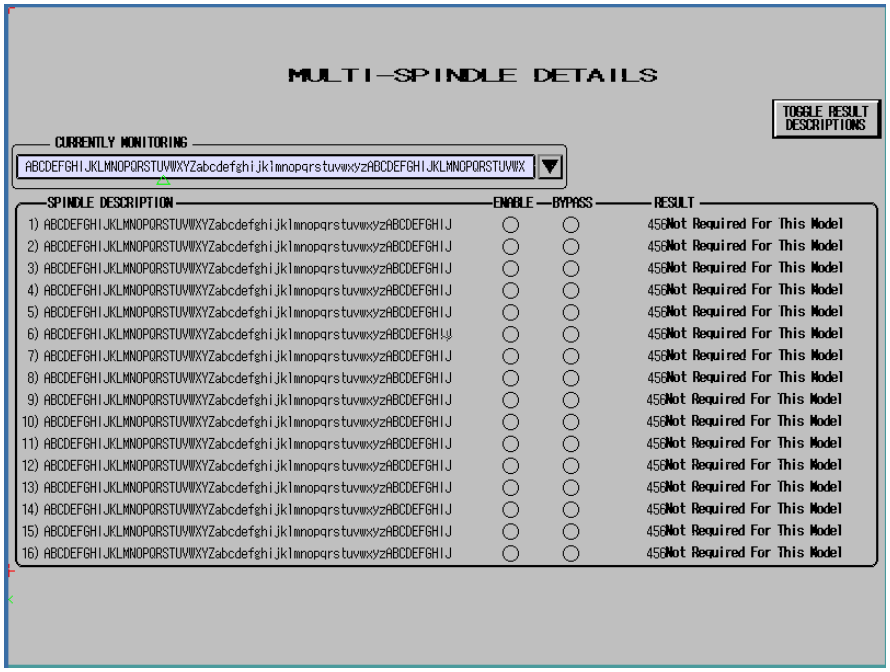


Figure 11.3 Example eHMI Screen -2

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.

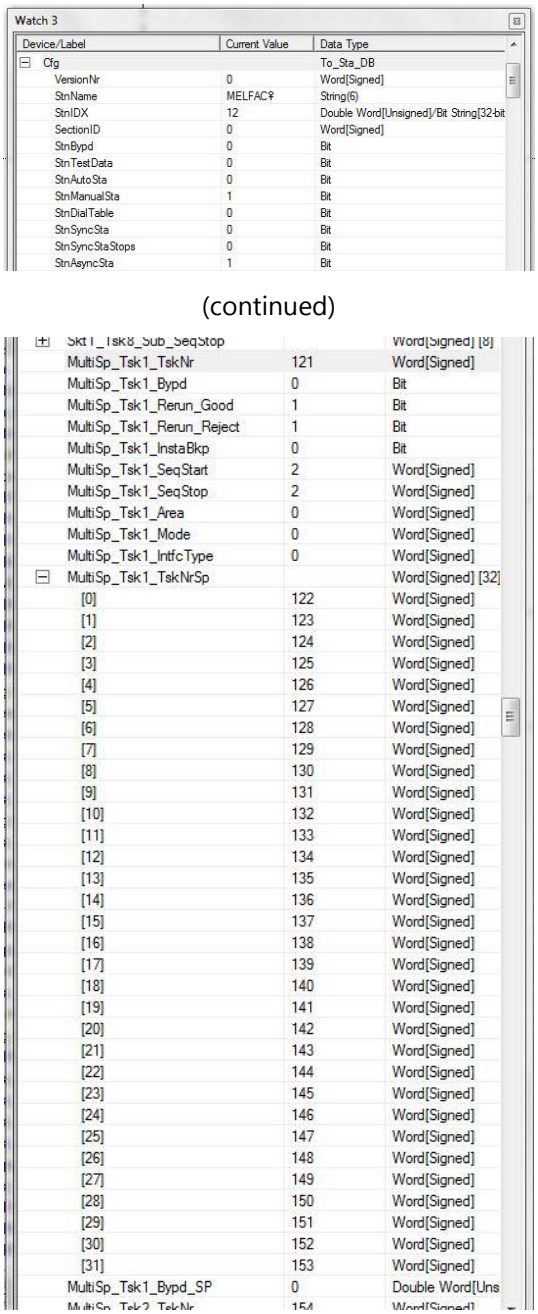


Figure 11.4 Example of Cfg

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.

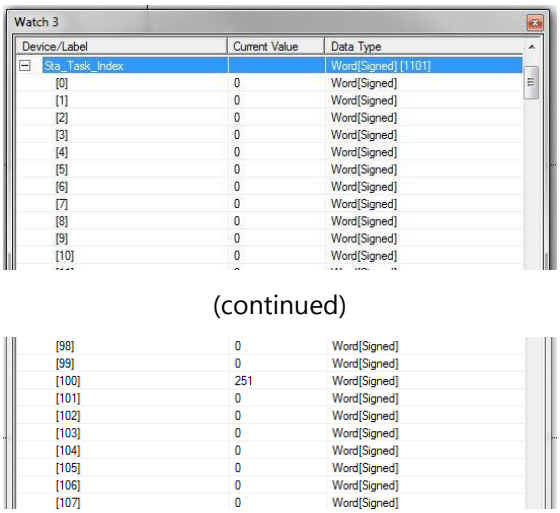


Figure 11.5 Example of Task Status

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.

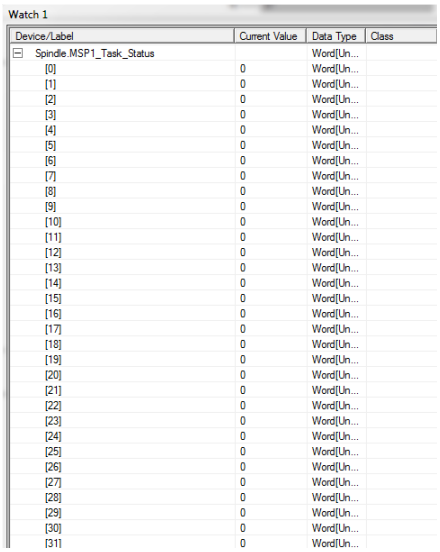


Figure 11.6 Task Status from OEM Logic

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 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. **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 1st 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.

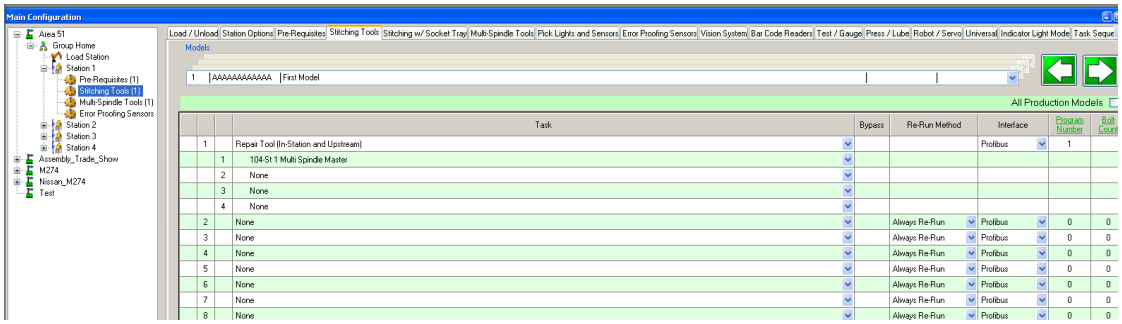


Figure 12.1 Example eFlex Screen

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

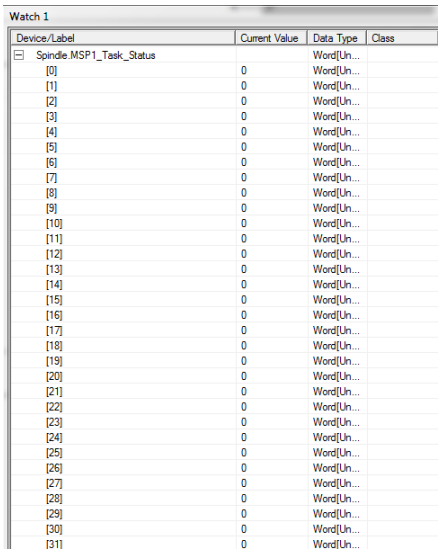


Figure 12.2 Task Status from OEM Logic

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.

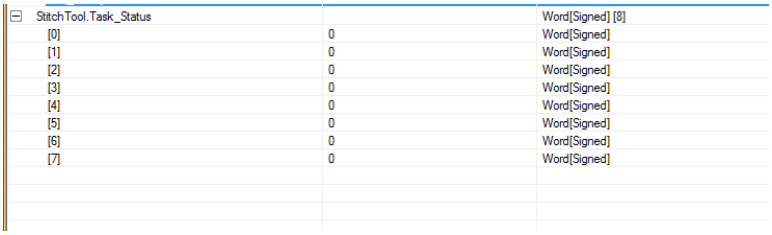
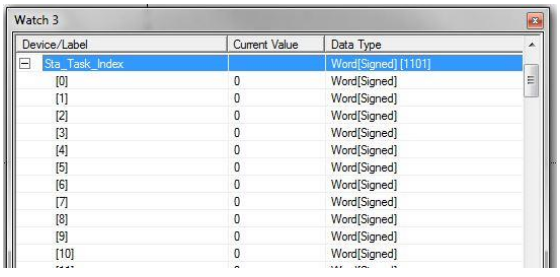


Figure 12.3 Task Status from OEM Logic

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".



(continued)

Notes

[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

Notes

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.

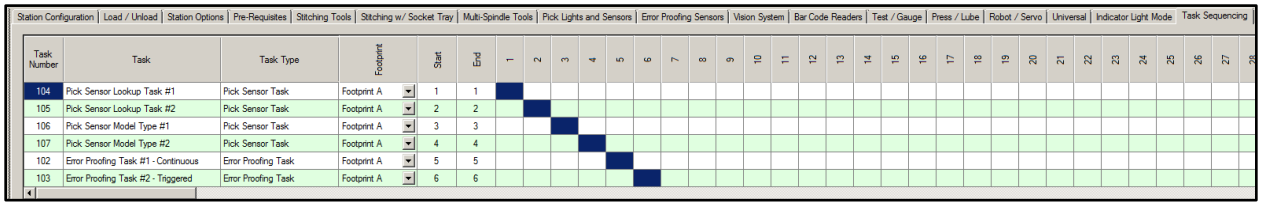
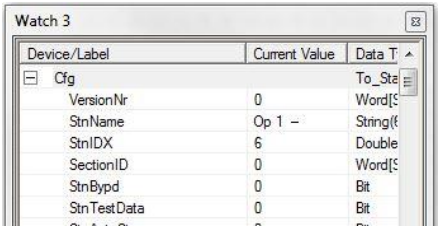
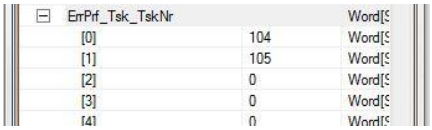


Figure 13.1 Example eFlex Screen

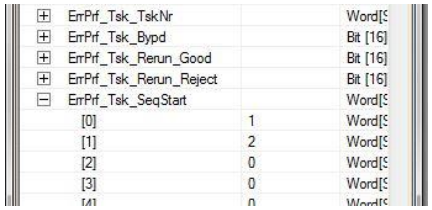
Monitor the tasks and their respective sequence start and stop numbers in a PLC watch window in the 'Cfg' data. The following PLC watch window screen shots show the various areas in the 'Cfg' table where the above configured tasks and their sequence information is stored.



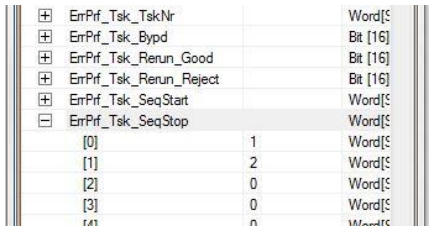
. . .



. . .



. . .



. . .

Notes

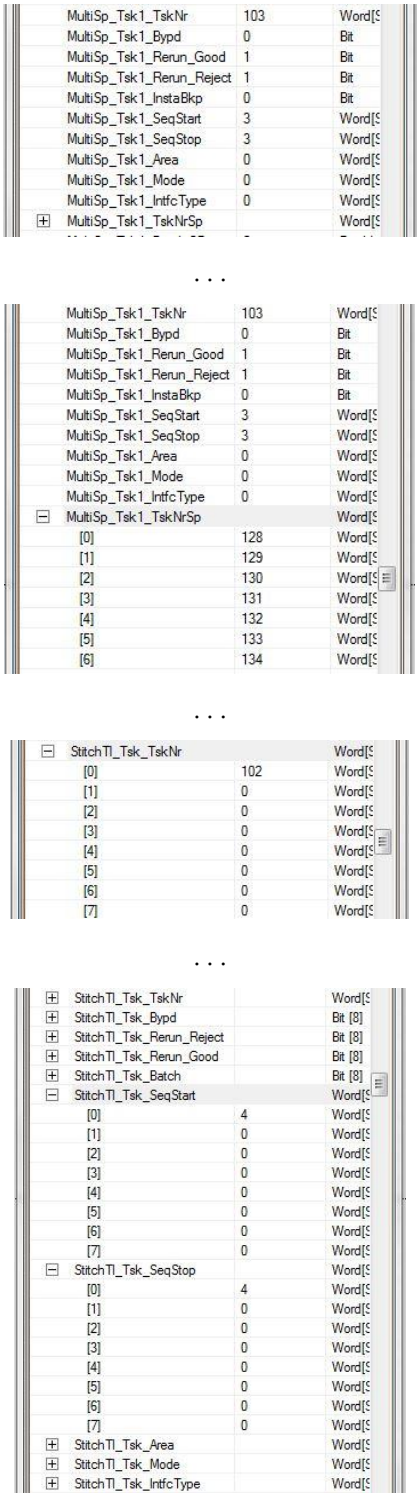


Figure 13.2 Example of Cfg

Notes

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

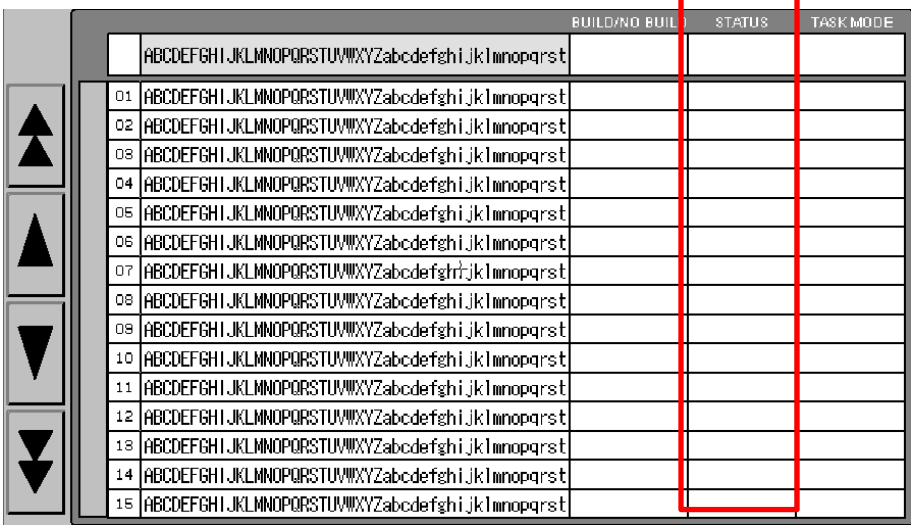


Figure 13.3 Sequence in eHMI Main Screen

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

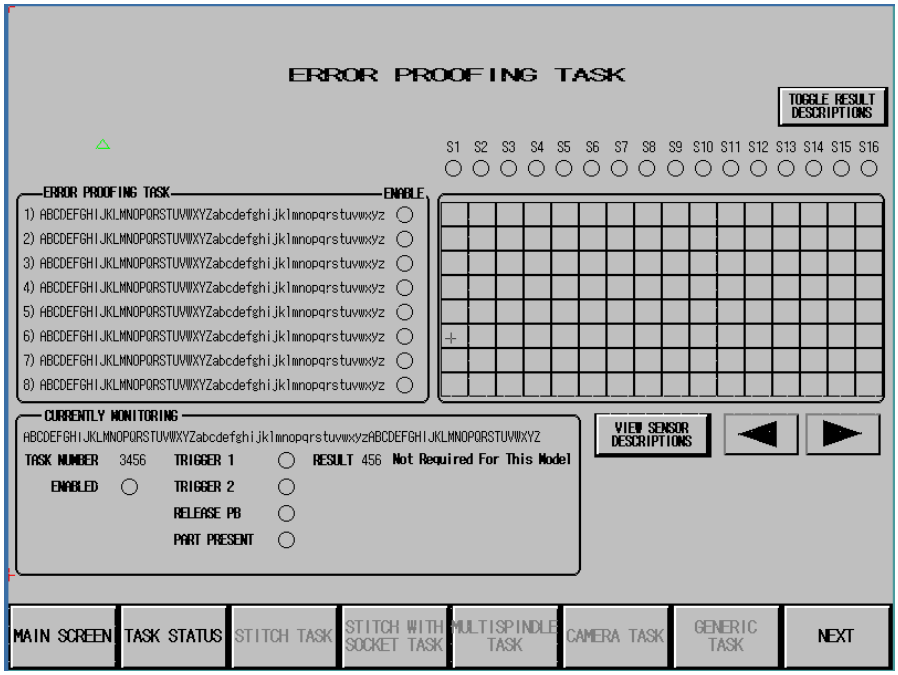


Figure 13.4 Sequence in eHMI Task Screen (Error Proofing)

Notes

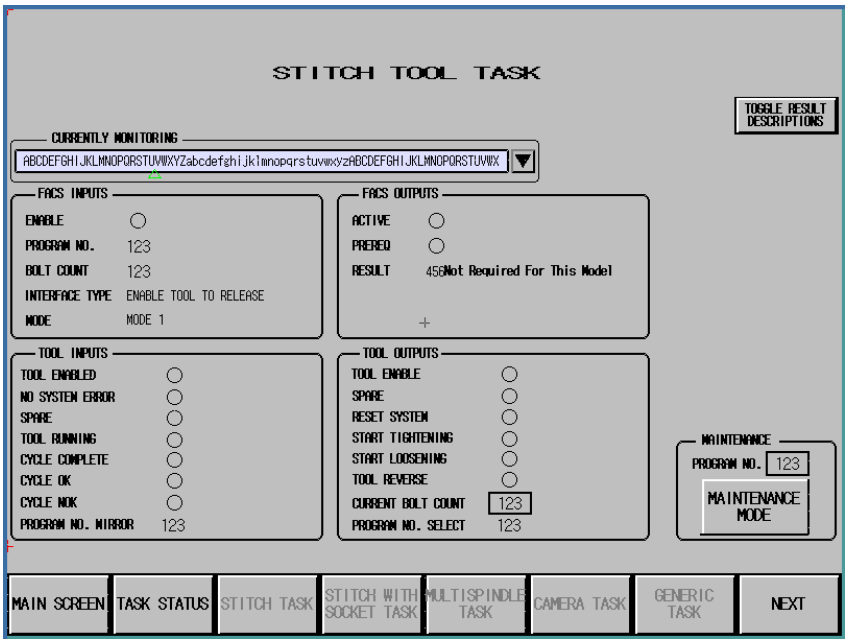


Figure 13.5 Sequence in eHMI Task Screen (Stitching Tool)

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

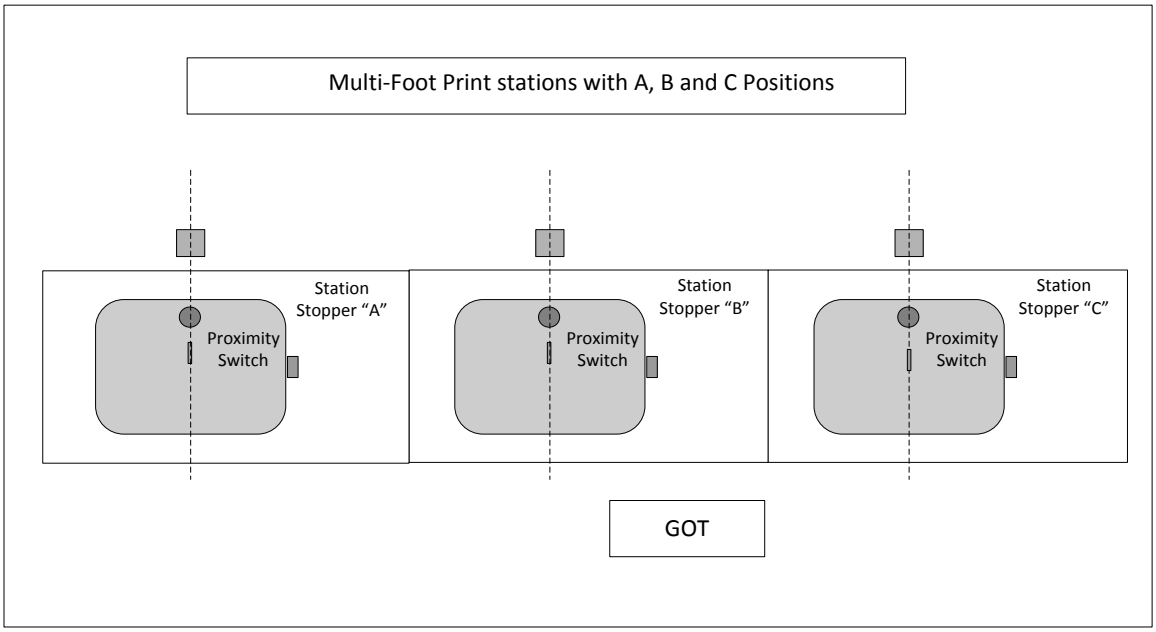
At the conclusion of this lesson, you will be able to…

- 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.

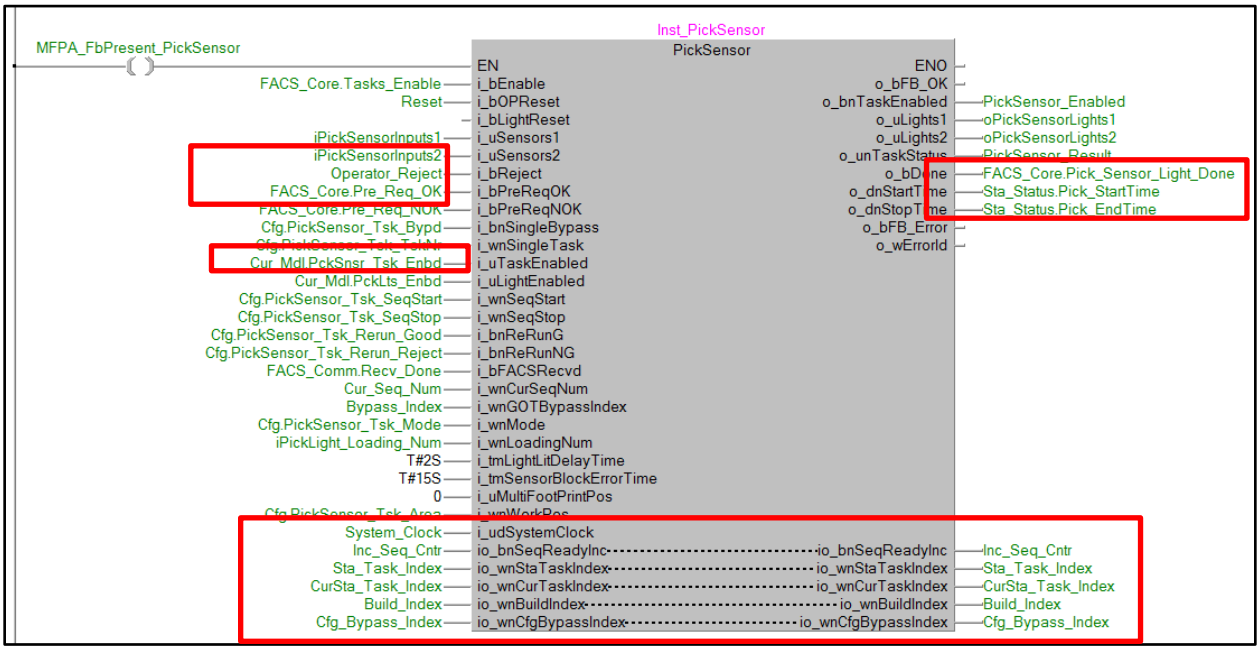
Multi-Foot Print stations are two/three independent stop-in-station cells share one PLC and one GOT based on station design. Each stop-in-station will have their own RFID. Tasks configured for the station are shared between two or three cells. Each cell will have their own task sequencing. After all 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. Statuses of tasks in each cell are written into the RFID tag in each cell.



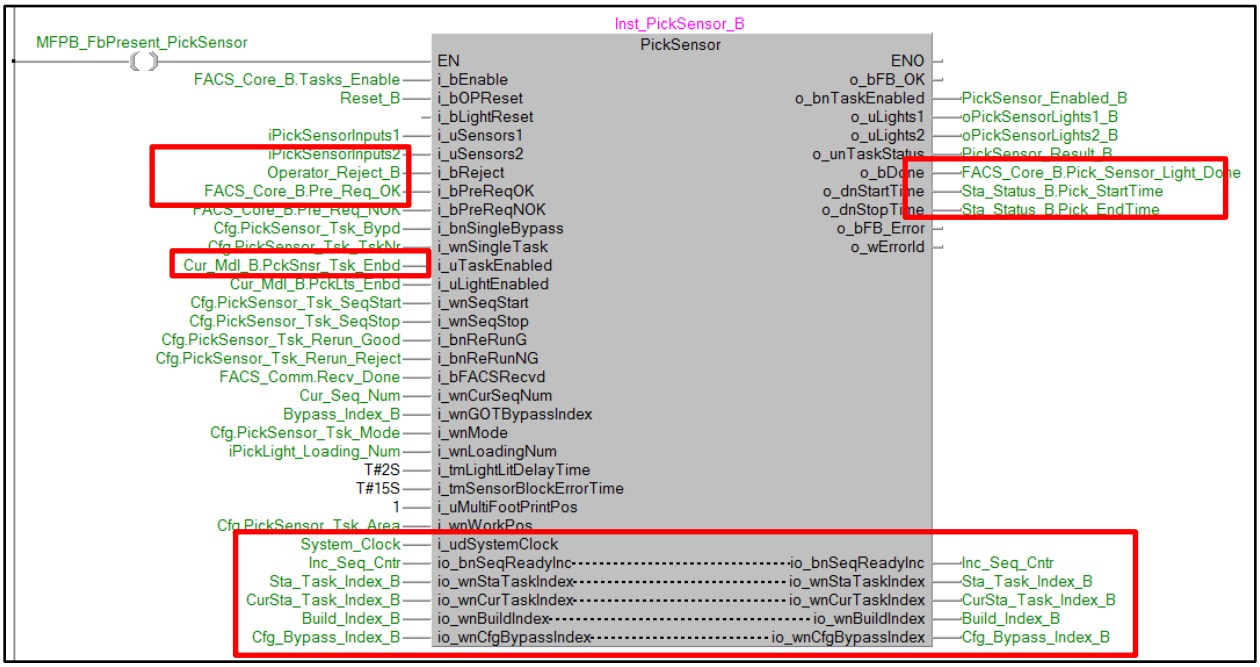
Notes

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

Position A

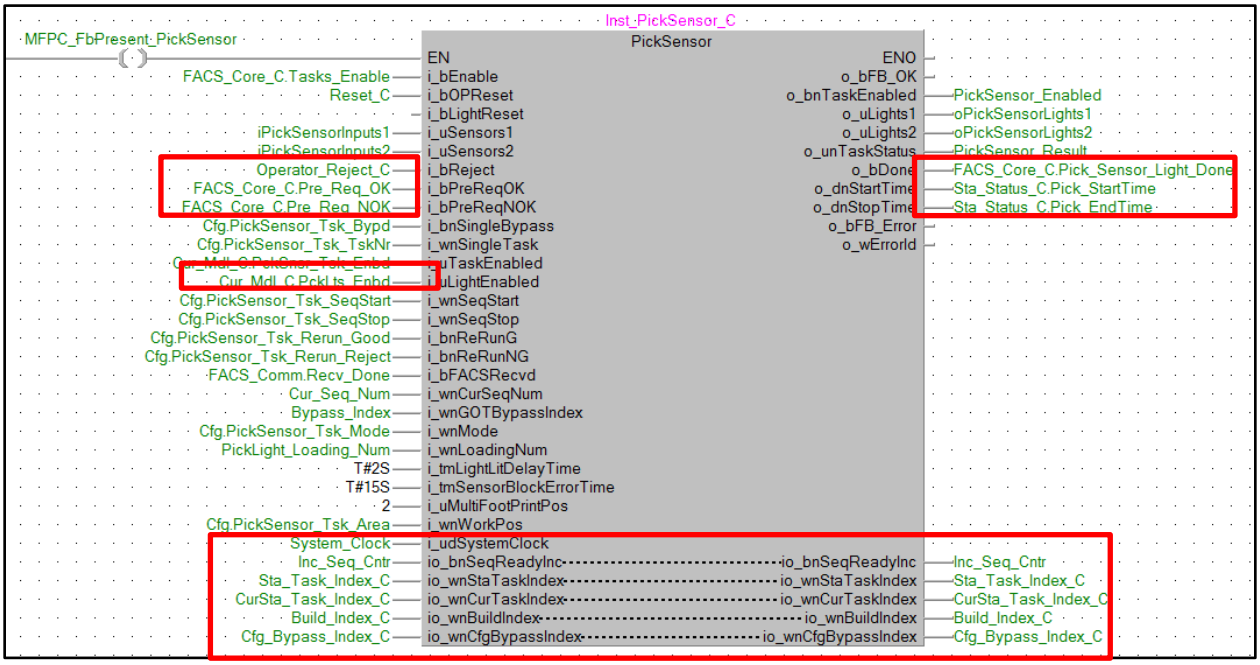


Position B



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*

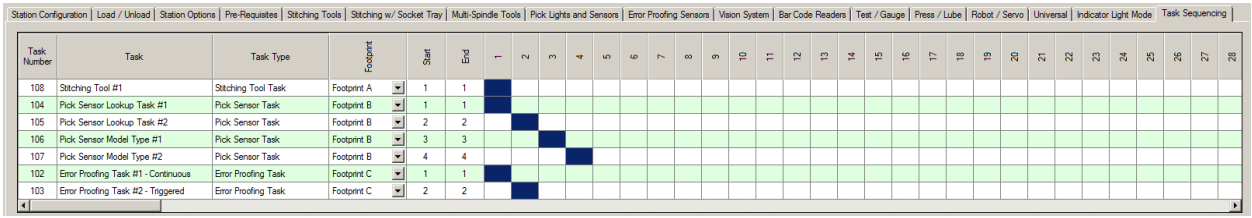
Position C

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

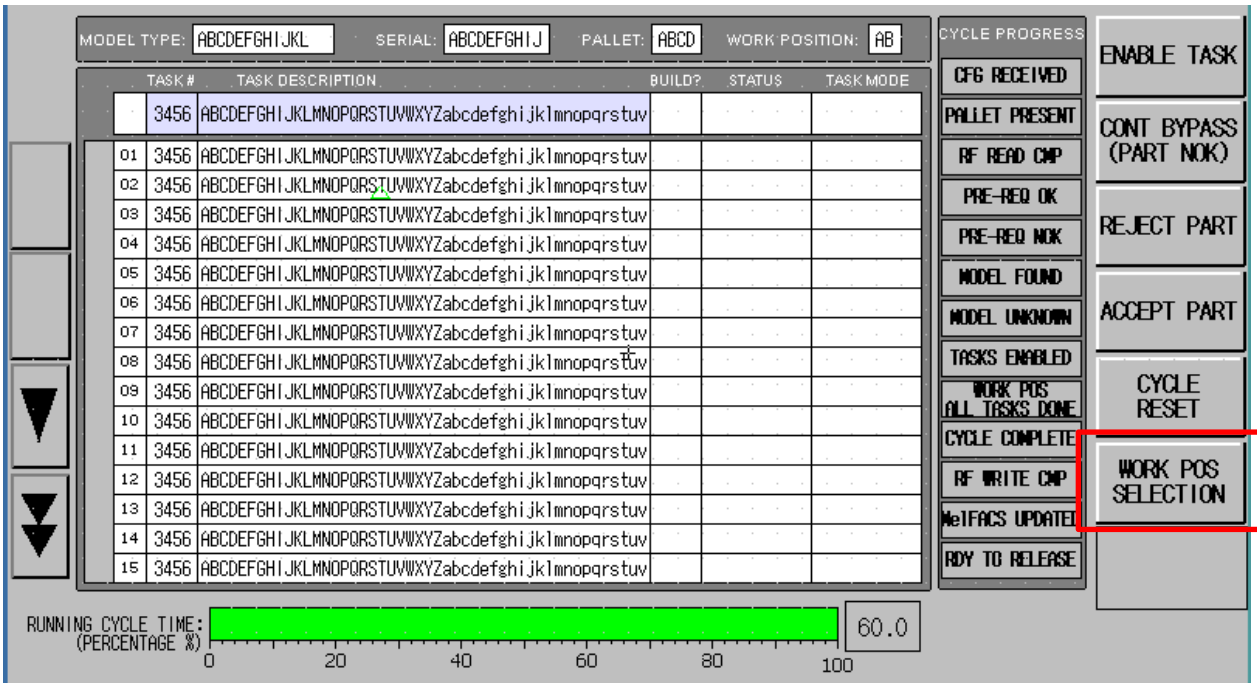
* Note: Task number will vary based on the training station.

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

The eFlex Multi-Foot Print station is shown below.



Notes


MODEL TYPE: ABCDEFGHIJKL
SERIAL: ABCDEFGHIJ
PALLET: ABCD
WORK POSITION: AB
TASK # TASK DESCRIPTION BUILD? STATUS TASK MODE
3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv
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
MelFACS UPDATE
RDY TO RELEASE
ENABLE TASK
CONT BYPASS (PART NOK)
REJECT PART
ACCEPT PART
CYCLE RESET
WORK POS SELECTION
RUNNING CYCLE TIME: (PERCENTAGE %)
0 20 40 60 80 100
60.0

Notes

LESSON 15 Dual GOTs

This lesson discusses the Dual GOTS for one station.

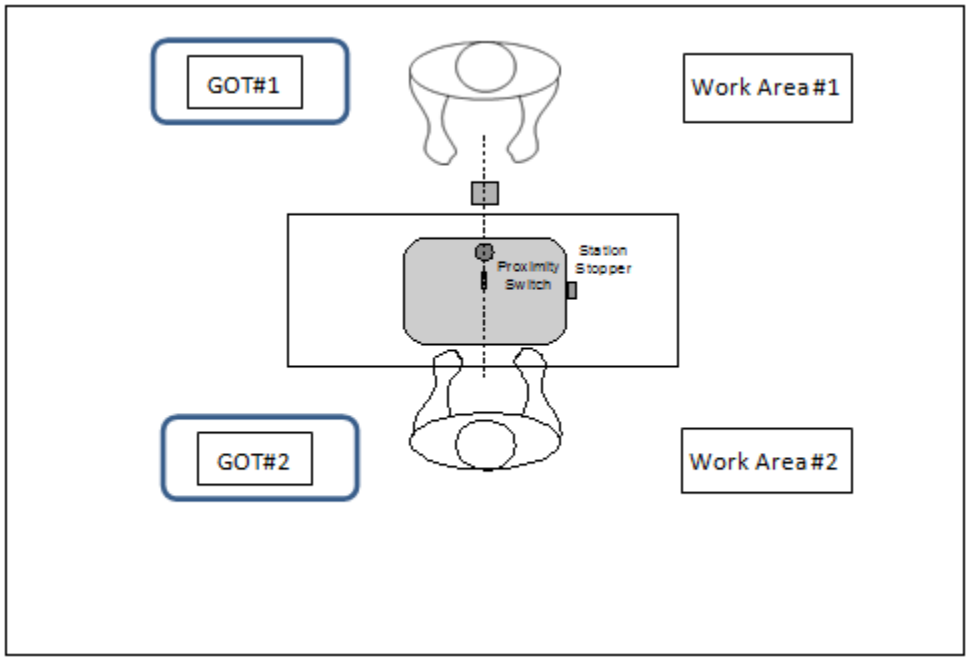
15.1. Lesson Objectives

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.

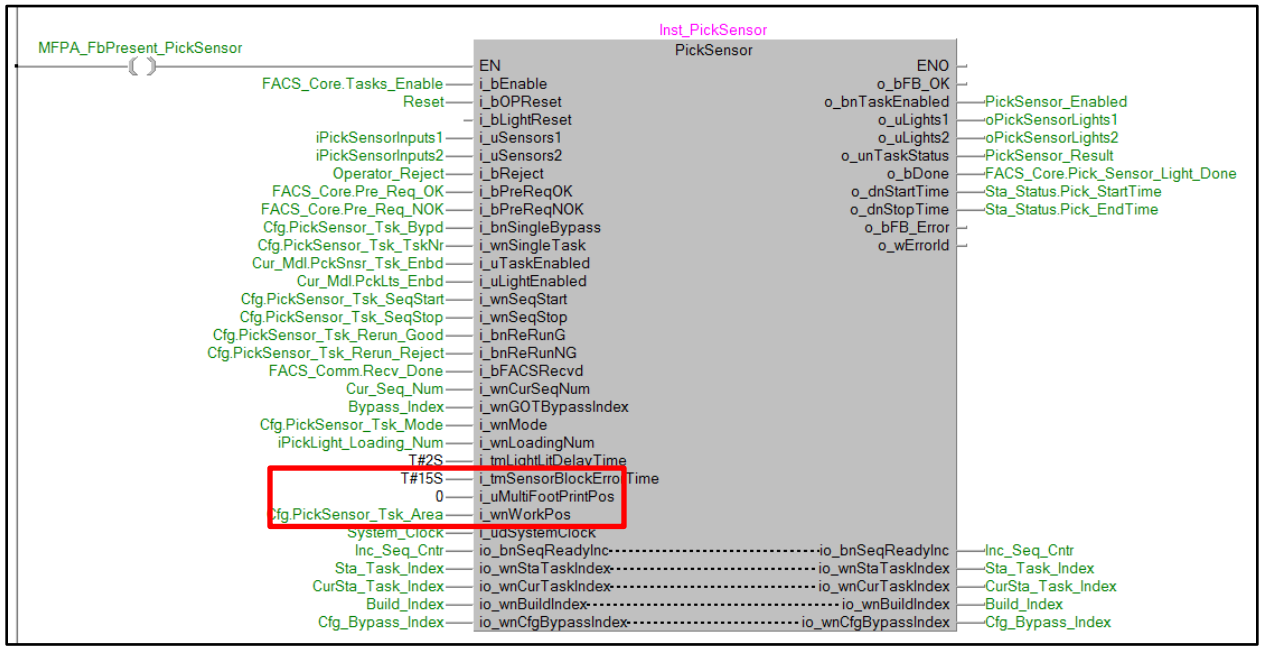


Notes

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*

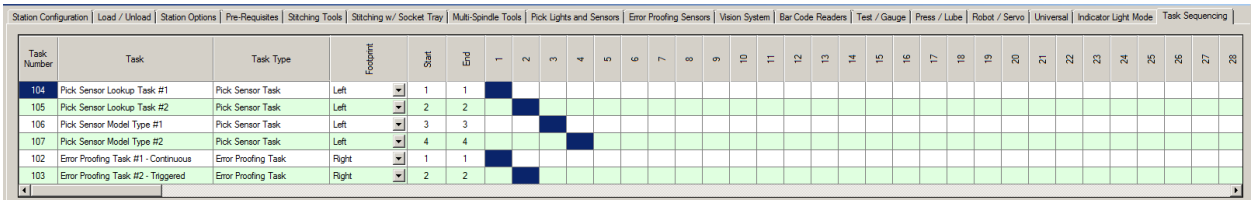
Side 2

	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.



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.

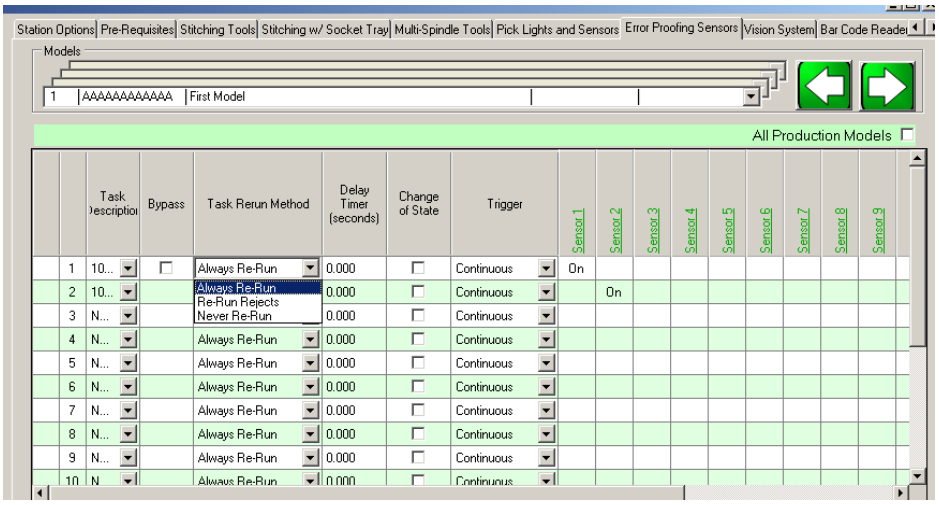


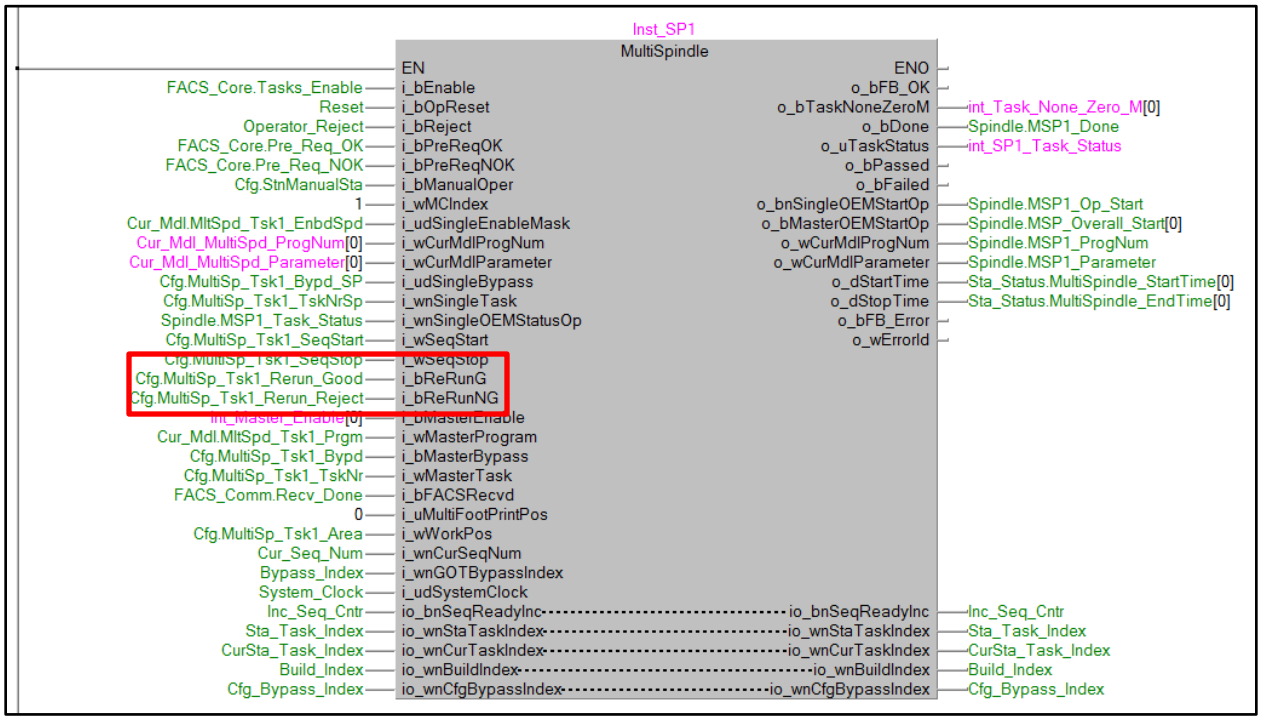
Figure 16.1 Re-Run options

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.

Notes

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 "BBBBBBBBBBB"

	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				
Sub Tasks	110-141	Required				

* 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)

Notes

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.

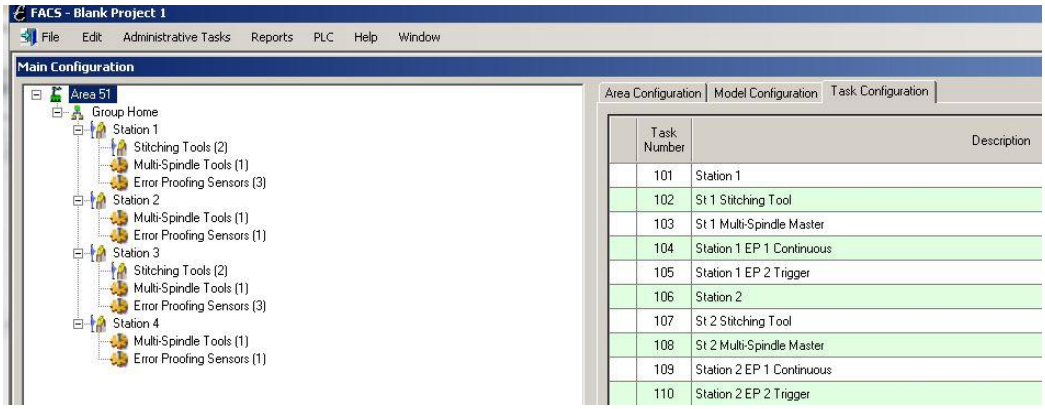


Figure 18.1 Example eFlex Task Configuration Screen -1

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.'

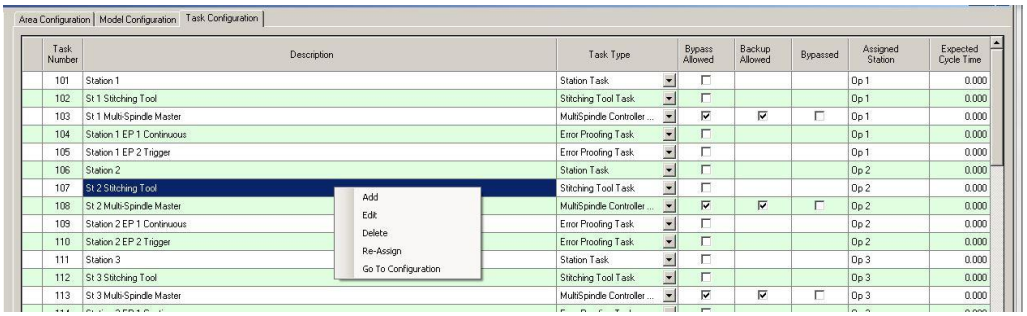


Figure 18.3 Example eFlex Task Configuration Screen -3

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

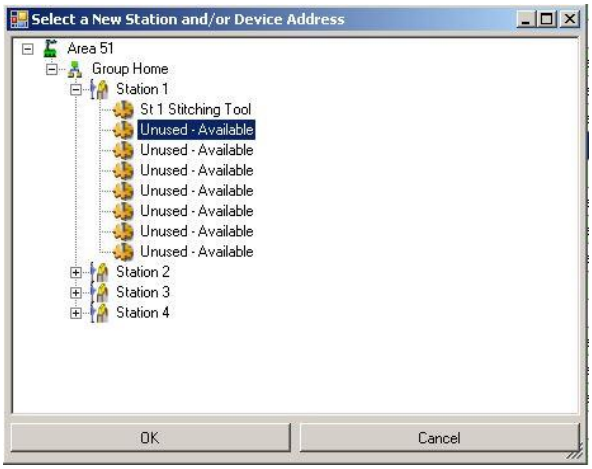


Figure 18.4 Example eFlex Task Configuration Screen -4

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.

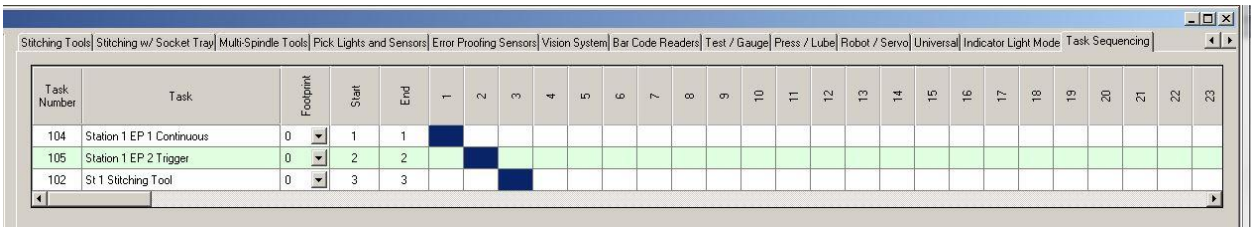


Figure 18.6 Station 1 – Original Sequence

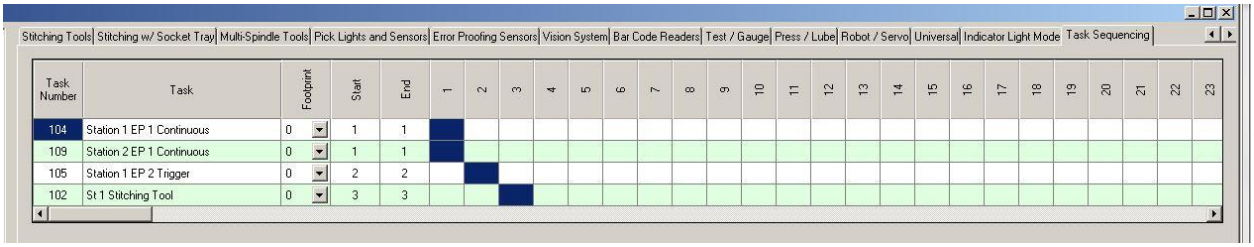


Figure 18.7 Station 1 – Sequence Immediately after Task Re-assignment

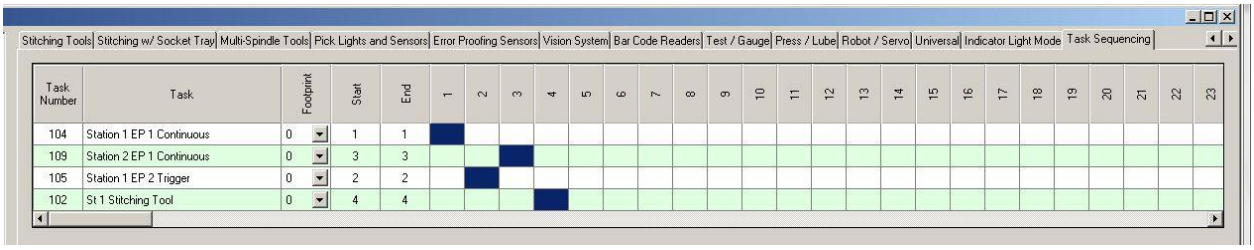


Figure 18.8 Station 1 – Re-sequenced after Task Re-assignment

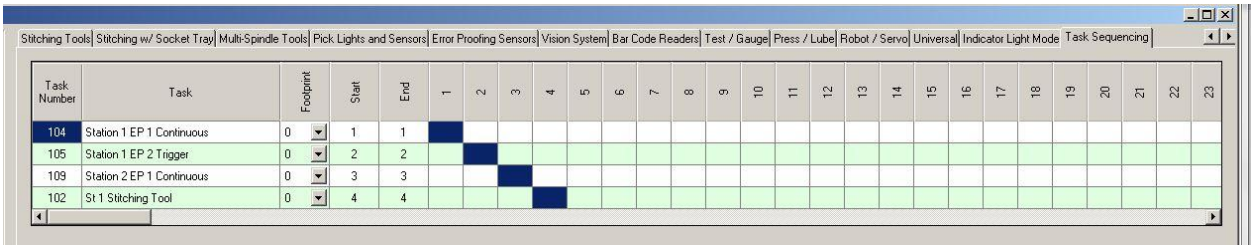


Figure 18.9 Station 1 – Re-sequence Updated after Saving Configuration

Notes

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

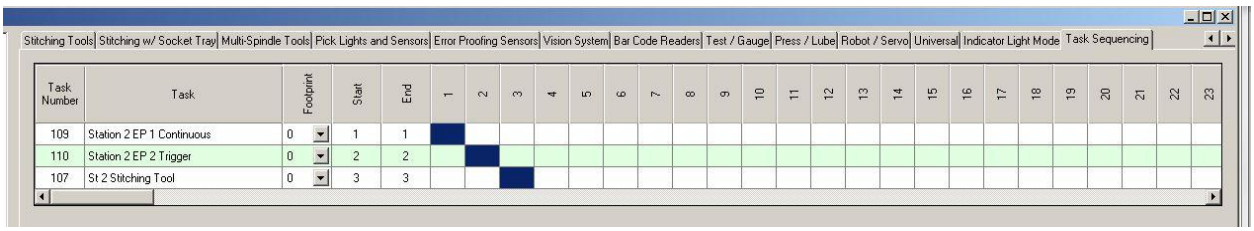


Figure 18.10 Station 2 – Original Sequence

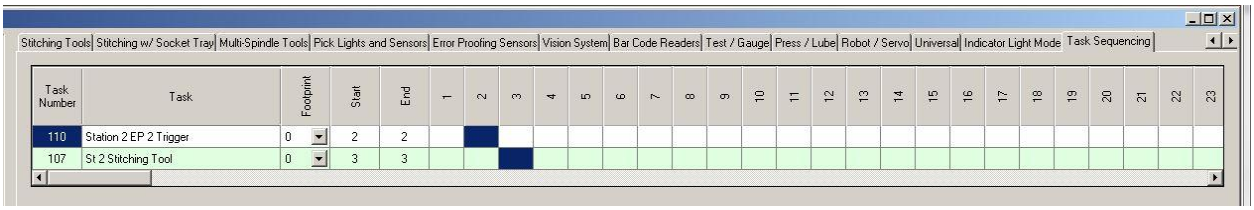


Figure 18.11 Station 2 – Re-sequenced and Updated after Saving Configuration

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.

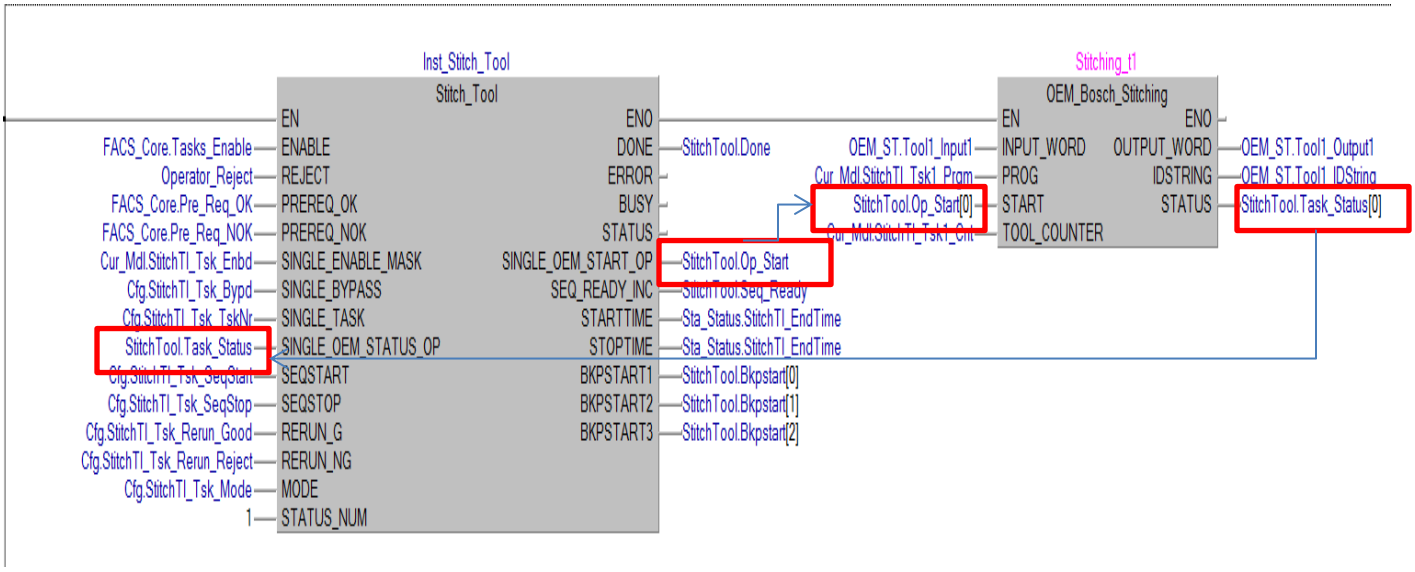


Figure 19.1 Example of OEM Logic

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.

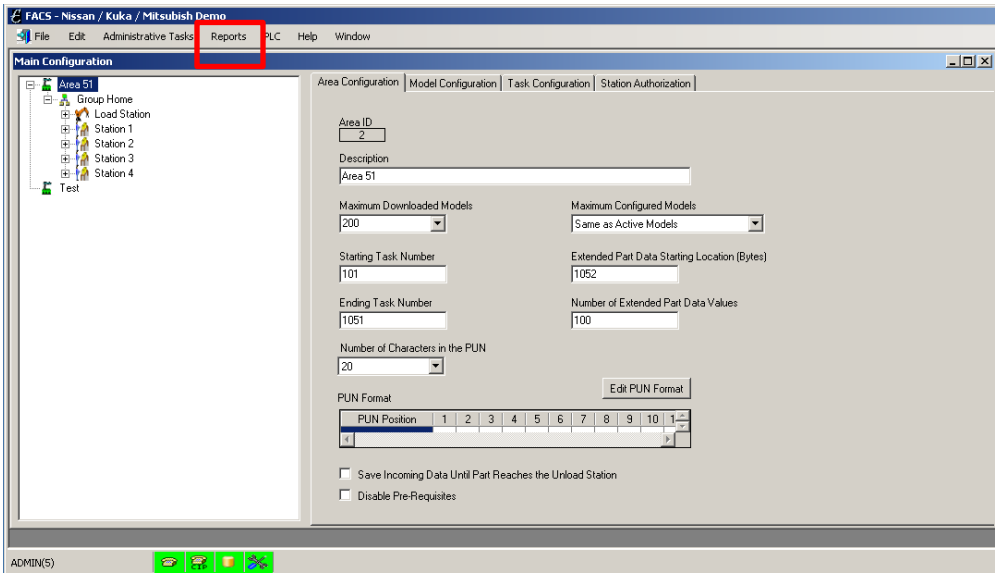


Figure 20.1 eFlex Reports

Notes

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

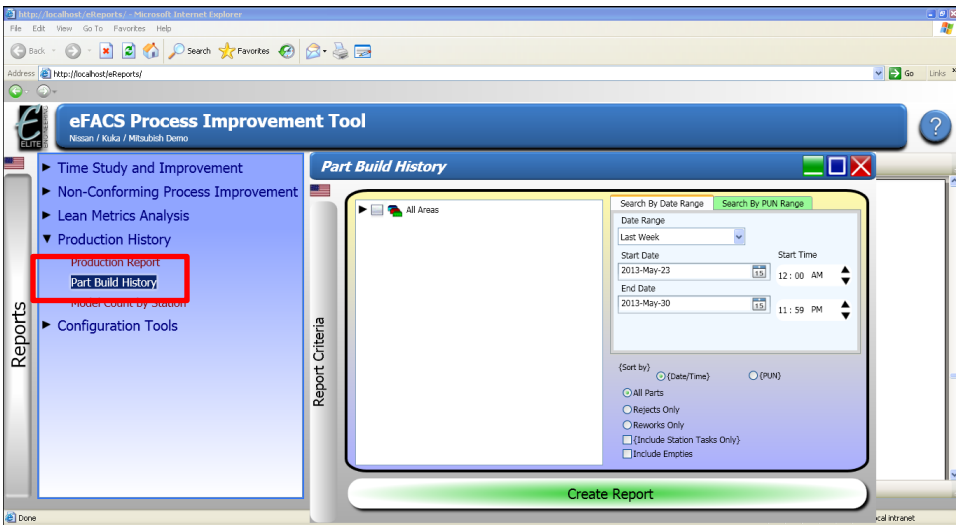


Figure 20.2 Example of eFlex Reports – Part Build History - 1

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

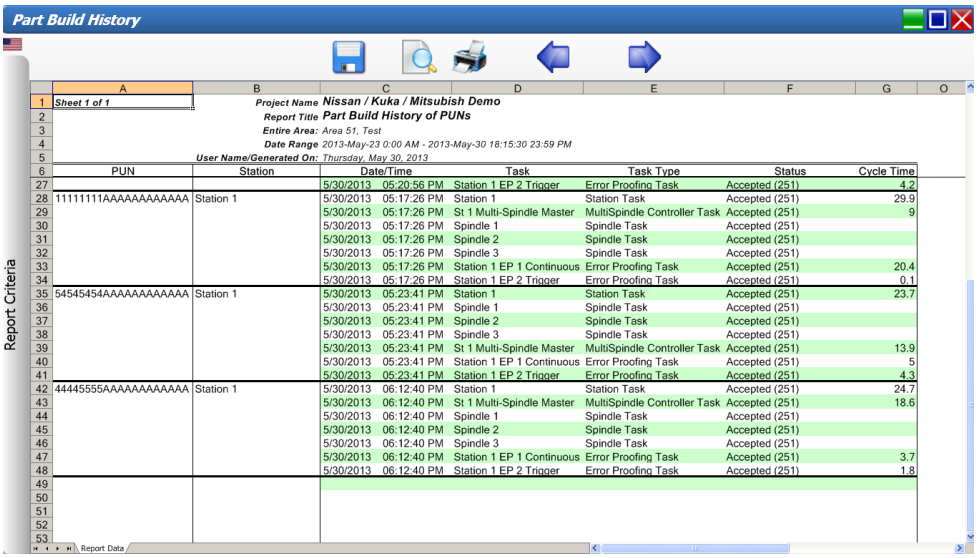


Figure 20.3 Example of eFlex Reports – Part Build History - 2

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".

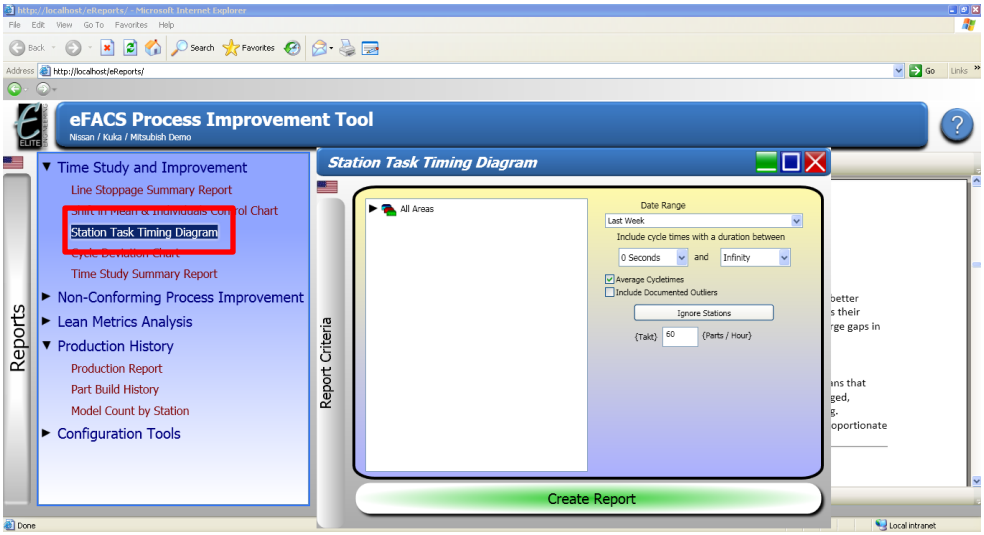


Figure 20.4 Example of eFlex Reports – Station Task Timing Diagram - 1

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

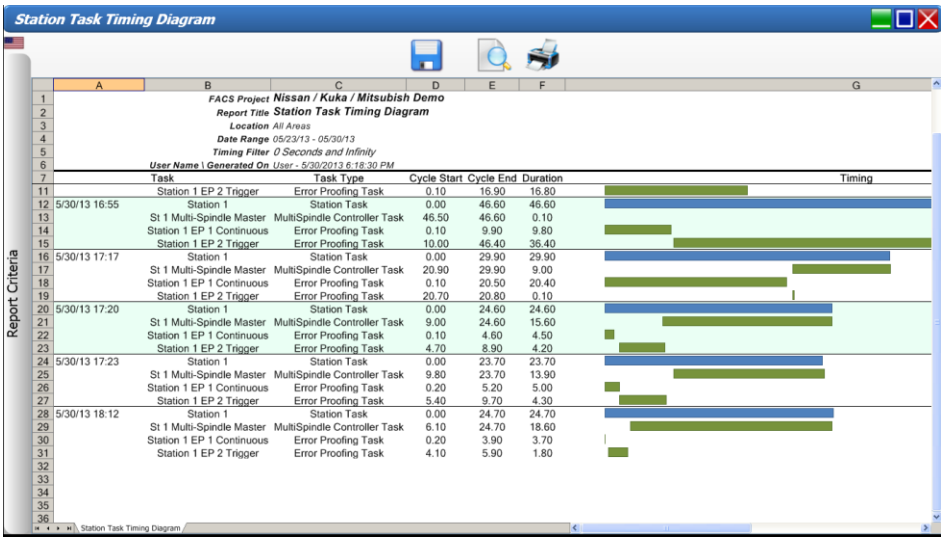


Figure 20.5 Example of eFlex Reports – Station Task Timing Diagram - 2

Notes

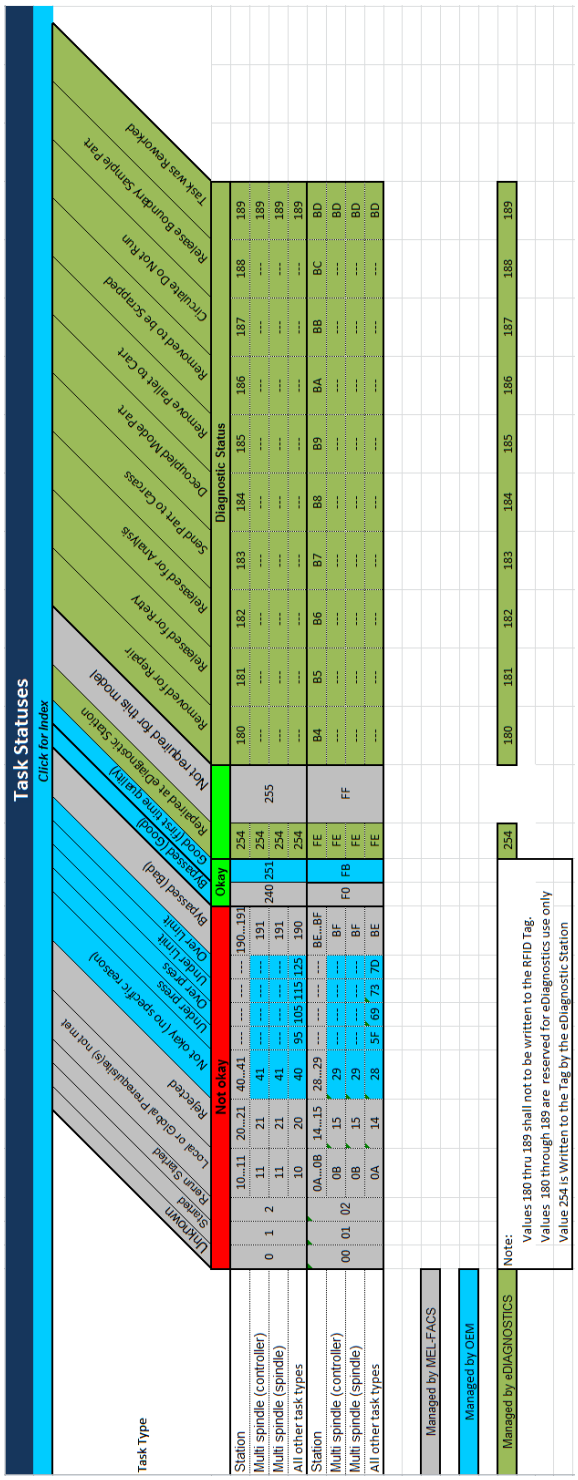
20.5. Exercise

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.

Notes

Appendix 1. Task Status Code



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				
	CC-Link Station 1 Inputs				
	INPUTS			INPUTS	
	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	*spare*
	X1005	Team Leader Call PB		X100D	*spare*
	X1006	Early Release Part Pushbutton		X100E	*spare*
	X1007	Part Present in Station		X100F	*spare*
	CC-Link Station 2 Outputs				
	OUTPUTS (Non-Motion)			OUTPUTS (Non-Motion)	
	Y1020	Station Beacon		Y1028	*spare*
	Y1021	In foot print Beacon		Y1029	*spare*
	Y1022	*spare*		Y102A	*spare*
	Y1023	*spare*		Y102B	*spare*
	Y1024	Reject Light		Y102C	*spare*
	Y1025	Team Leader Call Light		Y102D	*spare*
	Y1026	Foot Print Indicator		Y102E	*spare*
	Y1027	*spare*		Y102F	*spare*
	CC-Link Station 3 Outputs				
	OUTPUTS (Non-Motion)			OUTPUTS (Non-Motion)	
	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
	CC-Link Station 4 Inputs				
	INPUTS			INPUTS	
	X1060	Error Proofing Sensor 1		X1068	Error Proofing Sensor 9
	X1061	Error Proofing Sensor 2		X1069	Error Proofing Sensor 10

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	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
	CC-Link Station 5 INPUTS and OUTPUTS				
	INPUTS			OUTPUTS (Non-Motion)	
	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

	CC-Link NODE 6 INPUTS and OUTPUTS				
	INPUTS			OUTPUTS (Non-Motion)	
	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

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

	CC-Link NODE 17 Fasten Tool Desoutter - 1 *
	CC-Link NODE 18 Fasten Tool Desoutter - 2 *
	CC-Link NODE 19 Fasten Tool Desoutter - 3 *
	CC-Link NODE 20 Fasten Tool Desoutter - 4 *
	CC-Link NODE 2 1Fasten Tool Desoutter - 5 *
	CC-Link NODE 22 Fasten Tool Desoutter - 6 *

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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.

Notes

Appendix 3. RFID Memory Map

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

		(Byte) (Word)							
	ID address Hexadecimal	ID address Decimal	PLC address	Name	Content	Remarks	Type	Protection	Data equipment
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	ASCII	○Protect write-in	
	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