MITSUBISHI ELECTRIC

Mitsubishi Electric MEL-FACS

Part 2: User's Manual

Release 4.10

MEAU – Engineering Group

Content

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May 27, 2016	4.10	MEL-FACS Manual	Project and User Library structure, Generic Backup FB and Updated Application Notes	MEAU Engineering Group

1 Introduction

This document describes the hardware and software architectures of the Mitsubishi MEL-FACS Work Station control system (MEL-FACS) implementation.

The MEL-FACS is designed to work with both a server-based FACS Configuration system such as the eFACS system from eFLEX Systems as well as an operator interface based configuration system such as the Mitsubishi MEL-FACS GOT Configuration system without requiring any modifications to the MEL-FACS hardware or software.

1.1 MEL-FACS Hardware Architecture Overview

The Mitsubishi MEL-FACS hardware architecture is based on the MELSEC iQ series PLC/Modules (5 slots rack) with distributed I/O modules and GOT2000.

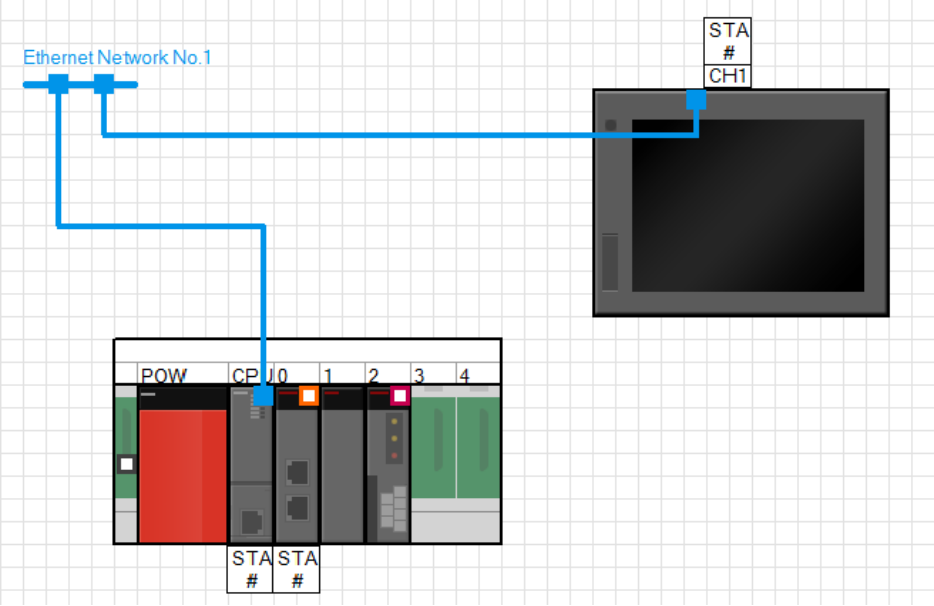


Figure 1 Five slots rack with iQ series PLC and Modules and GOT1000 GT16

1.2 MEL-FACS Software Overview

The Mitsubishi MEL-FACS contains a software library which provides a complete framework for a typical assembly line manual workstation.

The features of the software library include:

- Support for “continuous moving” and “stop in station” assembly line concepts,
- Support of pre stop areas for “stop in station assembly” lines,
- Support of “Dual-GOT” – two GOT’s on either side of the Assembly Line station
- Support of Multi-Foot Print stations – Multiple Work Stations share single PLC and GOT
- Handling of part reject,
- Handling of station and task bypass configuration,
- Model specific build data (up to 200 build configuration),
- Direct control of all sensors and actuators connected via physical I/O channels,
- Managing of RFID systems in different configurations,
- Support for typical assembly tools (e.g. error proofing sensors, stitching and multi spindle controller, vision systems and barcode reader),

- Support of indicator lights in different configurations,
- Standard sequencing of a typical assembly station operations (e.g. read RFID, determine prerequisites, lookup model build data, enable tools and operations, write RFID).

1.2.1. Device Integration and Adding Functionality

The Mitsubishi MEL-FACS software library also controls all devices which are connected via physical I/O channels to the MEL-FACS control system.

All other devices (e.g. vision systems, multi spindle controller) have to be integrated by means of additional user application. The software library provides standard data interfaces for these devices with predefined parameter input and output areas.

The software library function blocks are sequenced by means of function block input and output parameters. The standard sequence of function block is capable to control a typical manual workstation. It is possible to integrate additional functionality in order to control “special purpose” assembly stations (e.g. pallet load or unload station) or manual workstations with additional assembly devices. The interlocking (sequencing) of the operations is open to the user application.

2 Hardware Architecture

The following diagram shows the typical manual control system with MEL-FACS enclosure.

- The Hardware configuration like Fieldbus, RFID controller and the enclosure style may vary based on the Project/Customer

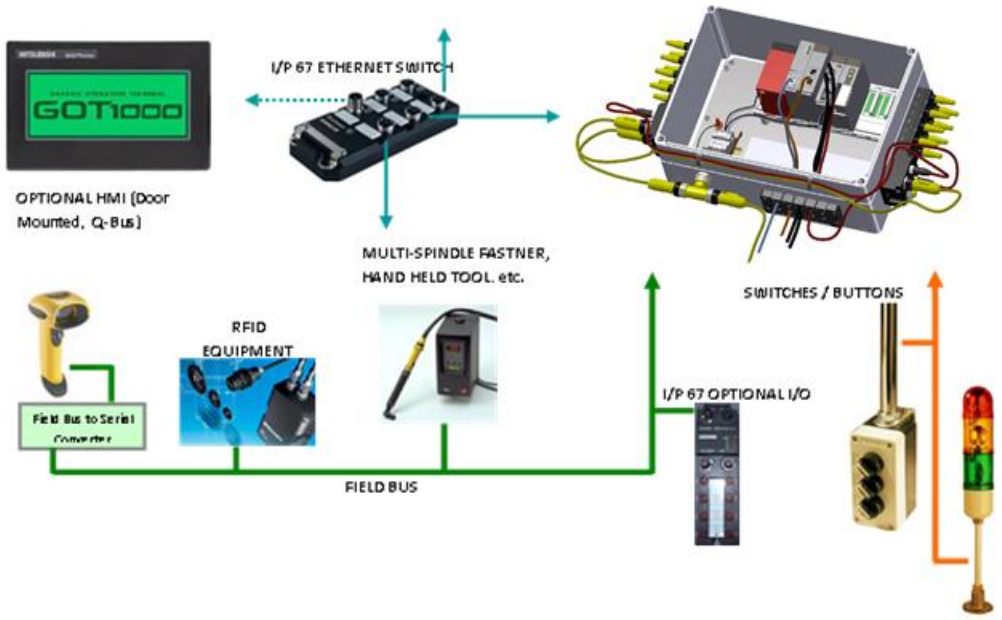


Figure 2 Typical Manual Control System

The MEL-FACS enclosure control system main components

- iQ Series PLC system, includes base rack, power supply, PLC with Built-in Ethernet port, CC-Link IE Field module, CC-Link Device Level module, Omron RFID module an optional Ethernet module.
- Hoffmann enclosure with pre-built connectors for 24VDC power, Ethernet and CC-Link network.

The typical MEL-FACS IP 67 enclosure is shown as below

2.1 PLC and Modules

The hardware configuration of PLC is listed in the following table.

Slot Number	Module Type	PLC Address
0	PLC CPU – Q06UDV CPU with 4M SRAM Cassette	-
1	CC-Link IE Field - QJ71GF11-T2	00-1F
2	QJ71E71 -100	20-3F
3	Omron RFID - EQ-V680D2	40-5F
4	CC-Link QJ61BT11N	60-7F
5	Spare	-

Notice

The address assignment shall not be changed by the user

** The Fieldbus an/or I/O configuration may vary based on the Project/Customer*

2.2 CC-Link Network

SLOT	Q Series				
0	PLC CPU - Q06UDV CPU				
1	CC-Link IE Module 00				
2	Ethernet Module 20				
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
	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 Fasten Tool Desoutter - 1 *
	CC-Link NODE 12 Fasten Tool Desoutter - 2 *
	CC-Link NODE 13 Fasten Tool Desoutter - 3 *

	CC-Link NODE 14 Fasten Tool Desoutter - 4 *
	CC-Link NODE 15 Fasten Tool Desoutter - 5 *
	CC-Link NODE 16 Fasten Tool Desoutter - 6 *
	CC-Link NODE 17 Fasten Tool Desoutter - 7 *
	CC-Link NODE 18 Fasten Tool Desoutter - 8 *

	CC-Link NODE 19-64 Spare

The standard CC-Link Network is configured by using IQ Navigator. All the stations are pre-configured as the defined devices in the above table. The following diagram shows the standard pre-configured CC-Link network.

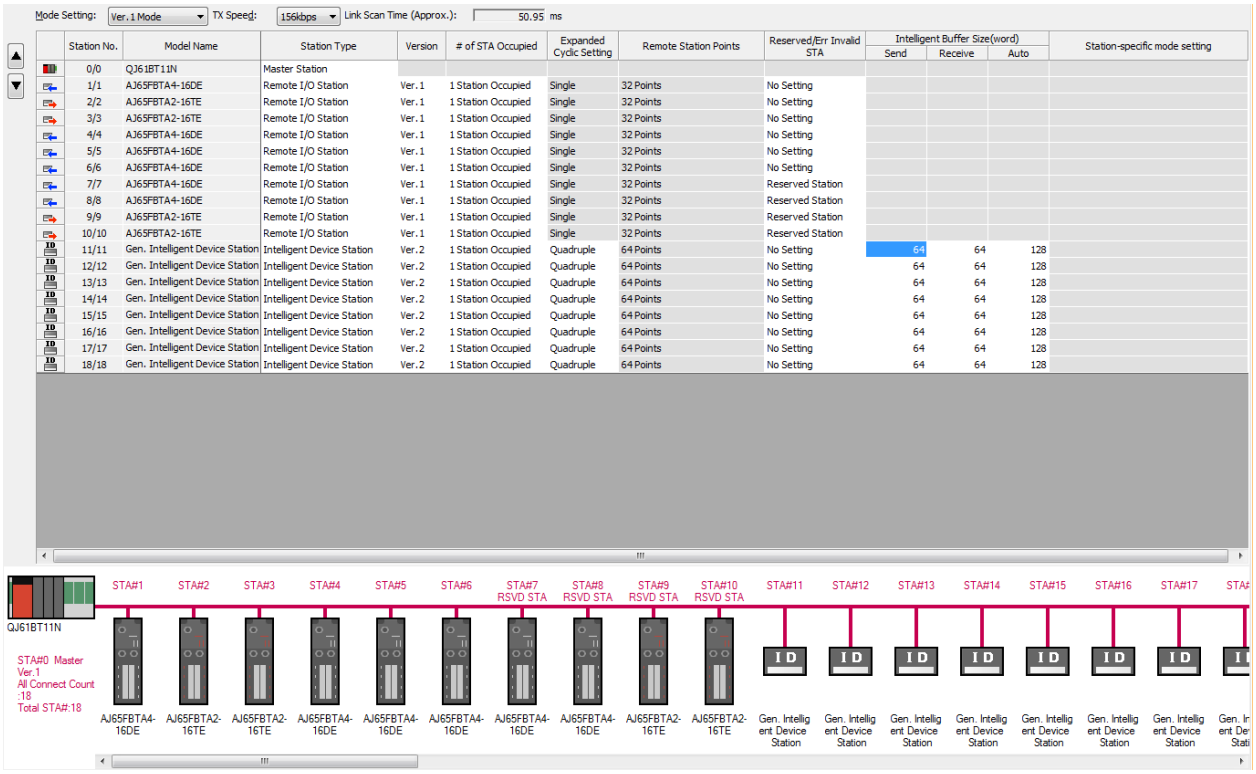


Figure 3 MEL-FACS CC-Link Configurations

3 Software Architecture

3.1 MEL-FACS Software Overview

The MEL-FACS MWS functions blocks are grouped into three categories: Core Function Blocks, OEM Function Blocks and OEM Logic. The functions of each category are listed below:

Core Function Block

- Perform foundation tasks such as communication and configuration memory map handling
- Interact with conveyors and RFID to identify part locations and part types
- Provide status feedback to FACS Configuration System
- Handle eHMI screens

OEM Function Block

- Perform interface functions with OEM Logic such as:
  - Providing Tasks Start, Program # to OEM Logic
  - Receiving Task Status from OEM Logic
  - Updating RFID database

OEM Logic

- Perform specific tasks
- Interface with OEM Function Blocks by
  - Receiving Task Start and Program # from OEM FBs
  - Sending Task Status to OEM FBs after Task completed

The following diagram shows the relationship between these three categories in MEL-FACS software.

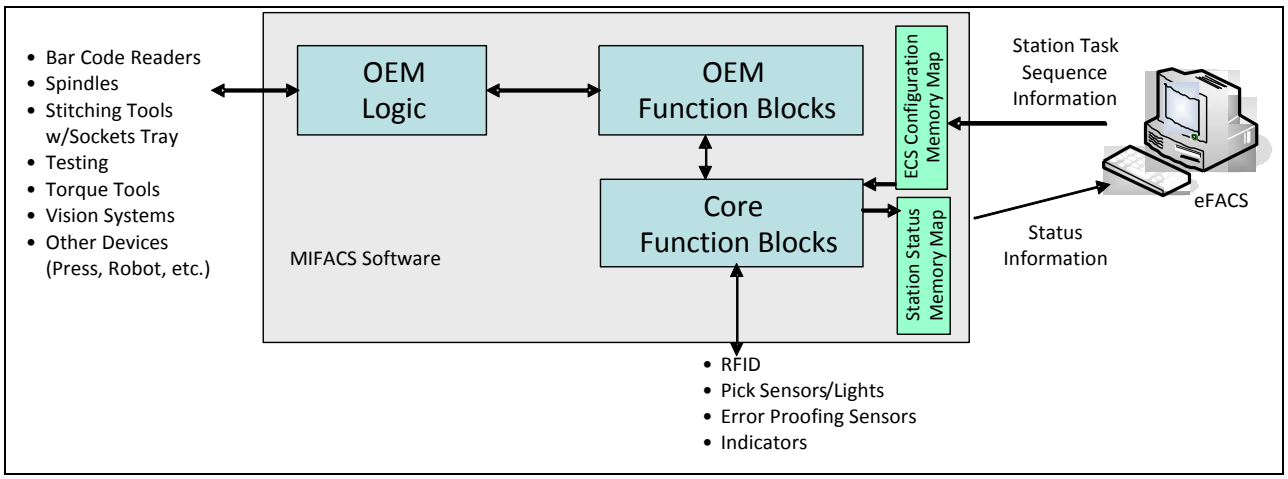


Figure 4 Software System Architecture

3.2 MEL-FACS FBs

The following list shows the defined Function Blocks of MEL-FACS MWS. For details please refer to Chapter 4.

Core Function Blocks:

- Administration
  - *FACS_Send_Recv* – Handling TCP/IP communication between Configuration server and PLC
  - *Prerequisite* – Determining whether or not station prerequisites are fulfilled
  - *Model* – Looking up model names
  - *Station and StationStatus* – Summarizes all Task Status and hanle OEM/Config inputs to generate outputs to all other Task FBs
- Interfaces
  - *eHMI* – Displaying tasks configuration
- Tasks
  - *Pick Sensor* – Handling all the tasks of Pick Sensors and lights
  - *ErrorProof* – Handling all the tasks of Error Proofing sensors
  - *Indicators* – Handling all the indicators with assigned tasks

OEM Function Blocks

- Tasks
  - *StitchingTool* – Handling all the tasks of Stitching Tools
  - *StitchToolSpdleBckp* – Handling the tasks of Stitching Tool to backup “Failed” or “Bypassed” spindles in previous or current station
  - *SocketTool* – Handling the sub tasks of Stitching Tool with Socket Trays
  - *MultiSpindle* – Handling the sub tasks Multi-Spindle Tools
  - *Tests* – Handling the sub tasks of Testing system
  - *Vision* – Handling the sub tasks of Vision system
  - *BCReader* – Handling the sub tasks of Bar Code Reader system
  - *Generic4* – Handling all systems with 4 pre-assigned tasks, such as Robot/Servo and Universal
  - *Generic8* – Handling all systems with 8 pre-assigned tasks, such as Press and Lube
  - *Station* – Handling overall station tasks
  - *GenericBackup* – Handling Generic Backup tasks repaired by operator at Backup station or Repair station without Tools

OEM Logic

OEM Logic Function Blocks are developed by OEMs to operate specific tools and/or tasks when implementing an assembly line application. Please contact Mitsubishi for available OEM Logics Function Blocks that can be integrated with the MEL-FACS Library.

3.3 Data Area and Data Flow

3.3.1. RFID Station with only "Main Work Area"

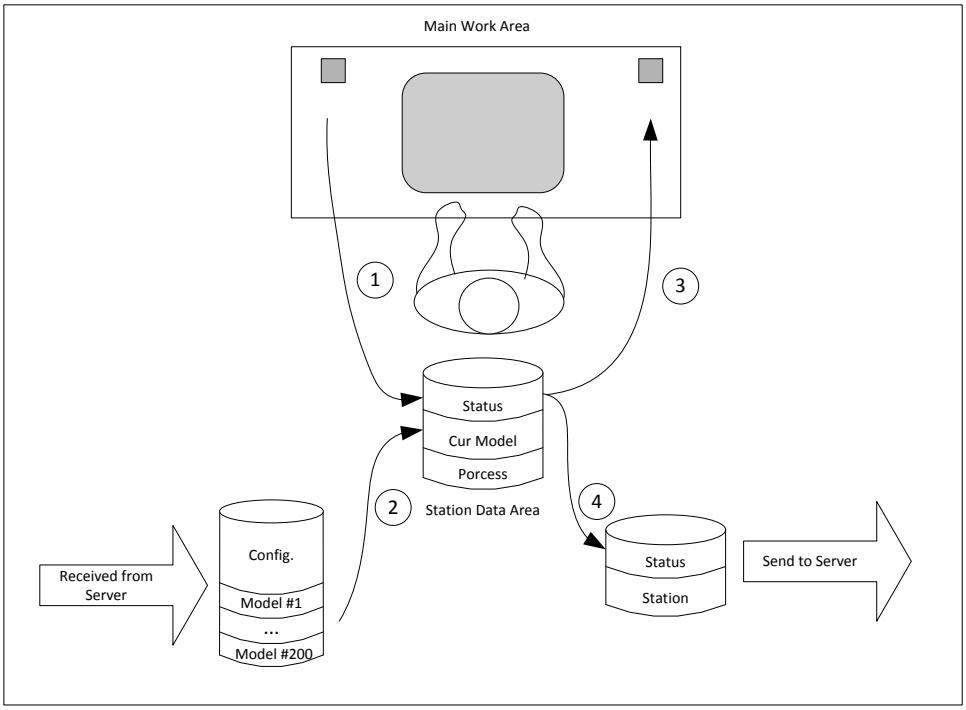


Figure 5 Station Data Flow with only a "Main Work Area"

1. Station reads the RFID tag data and transfer into SDT -RFID_Data_DB (Sta_RFID) as soon as new part enters the station.
2. Based on the model type read from tag, the model specific build data is determined and transferred into SDT - Cur_Mdl_DB (Cur_Mdl).
3. The tasks status information is transferred into RFID tag SDT -RFID_Data_DB (Sta_RFID) after tasks completed and before the part leaves the station.
4. The tasks status and station status information is transferred to SDT - From_Sta_DB (Sta_Status) and send together back to FACS sever.

3.3.2. RFID Station with "Pre-Stop Area"

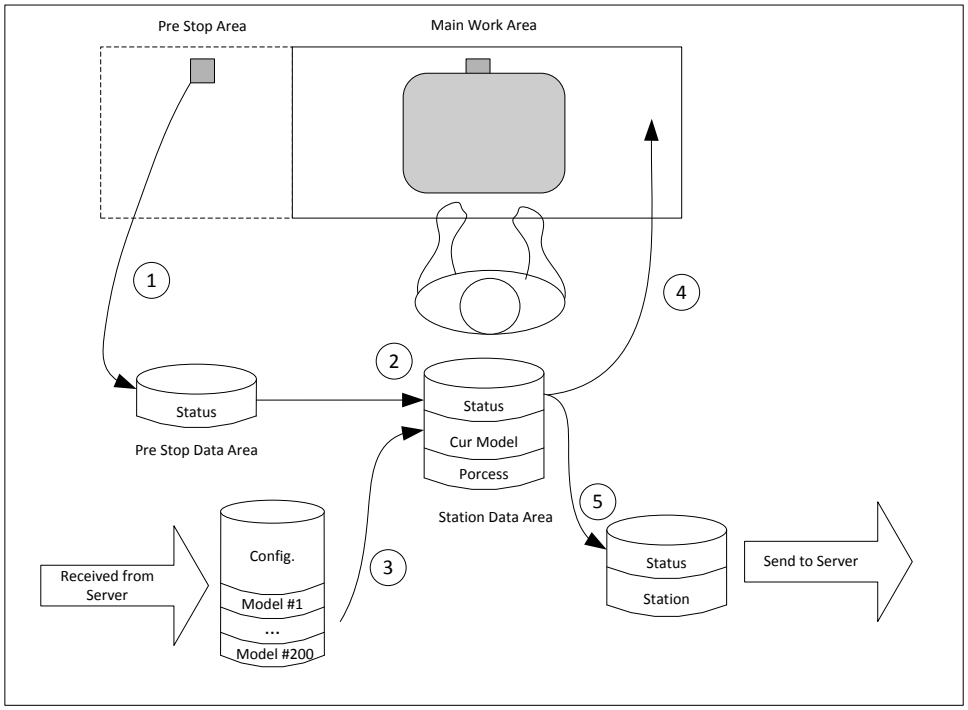


Figure 6 Station Data Flow with a "Pre-Stop Area"

1. Station reads the RFID tag data and transfers into SDT -RFID_Data_DB (PreSta_RFID) as soon as new part arrives at pre-stop.
2. Tag data will transfer into SDT -RFID_Data_DB (Sta_RFID) as soon as part arrives at station stop.
3. Based on the model type read from tag, the model specific build data is determined and transferred into DUT - Cur_Mdl_DB (Cur_Mdl).
4. The tasks status information is transferred into RFID tag SDT -RFID_Data_DB (Sta_RFID) after tasks completed and before the part leaves the station.
5. The tasks status and station status information is transferred to SDT - From_Sta_DB (Sta_Status) and send together back to FACS sever.

4 Software Implementation and PLC Configurations

4.1 Project 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. Base Project Structure

All MEL-FACS FBs are called from respective programs

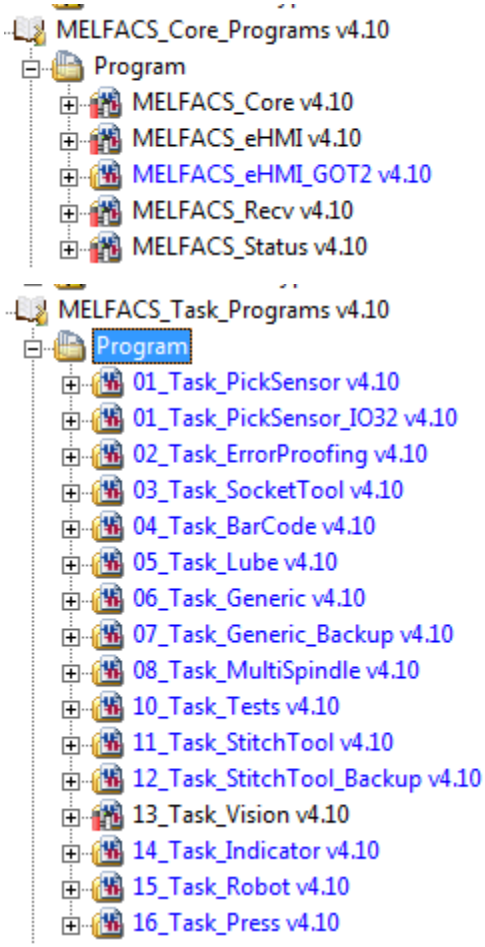


Figure 7 MEL-FACS MWS Program Structure – cont'd

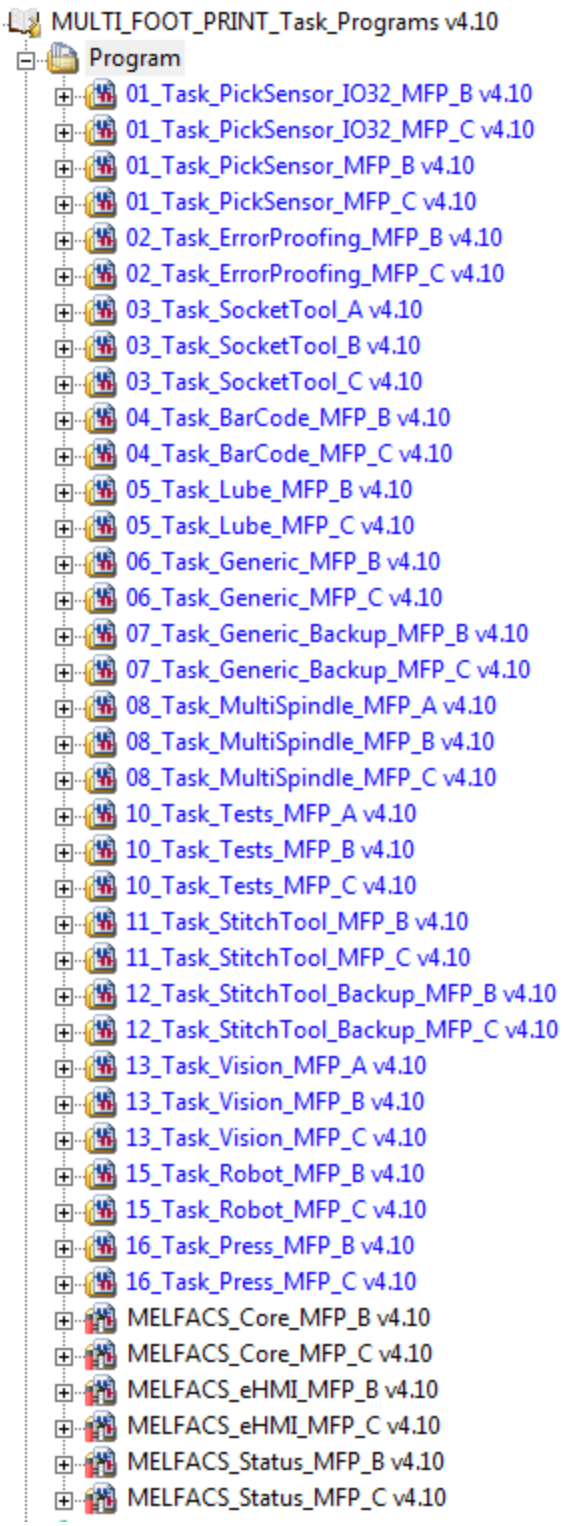
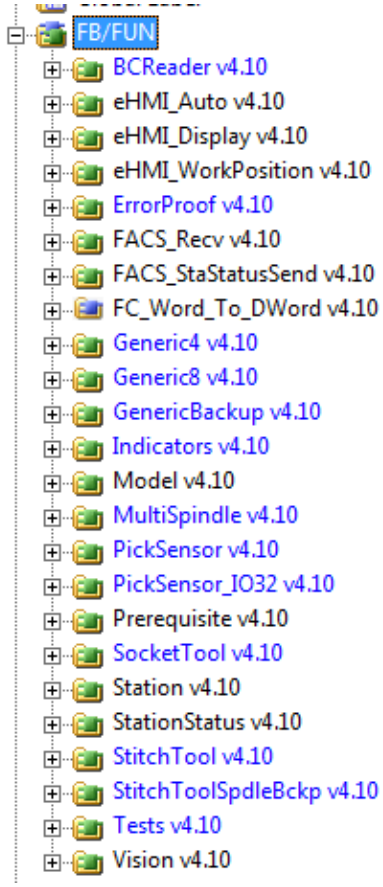


Figure 7 MEL-FACS MWS Program Structure

4.1.2. User Library

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



4.1.3. Structured Data Types

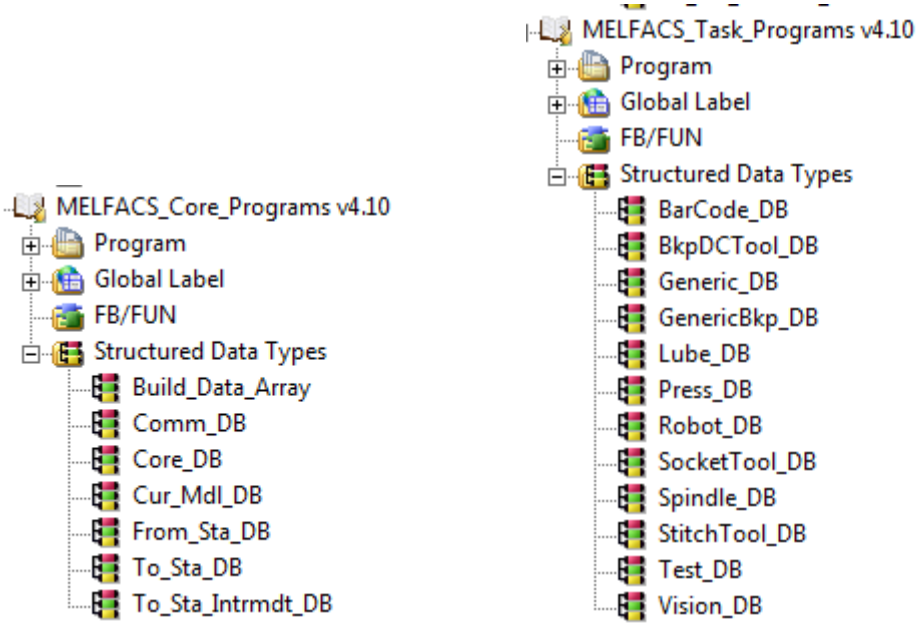


Figure 8 MEL-FACS MWS User Library FBs and SDTs

4.1.4. Global Labels

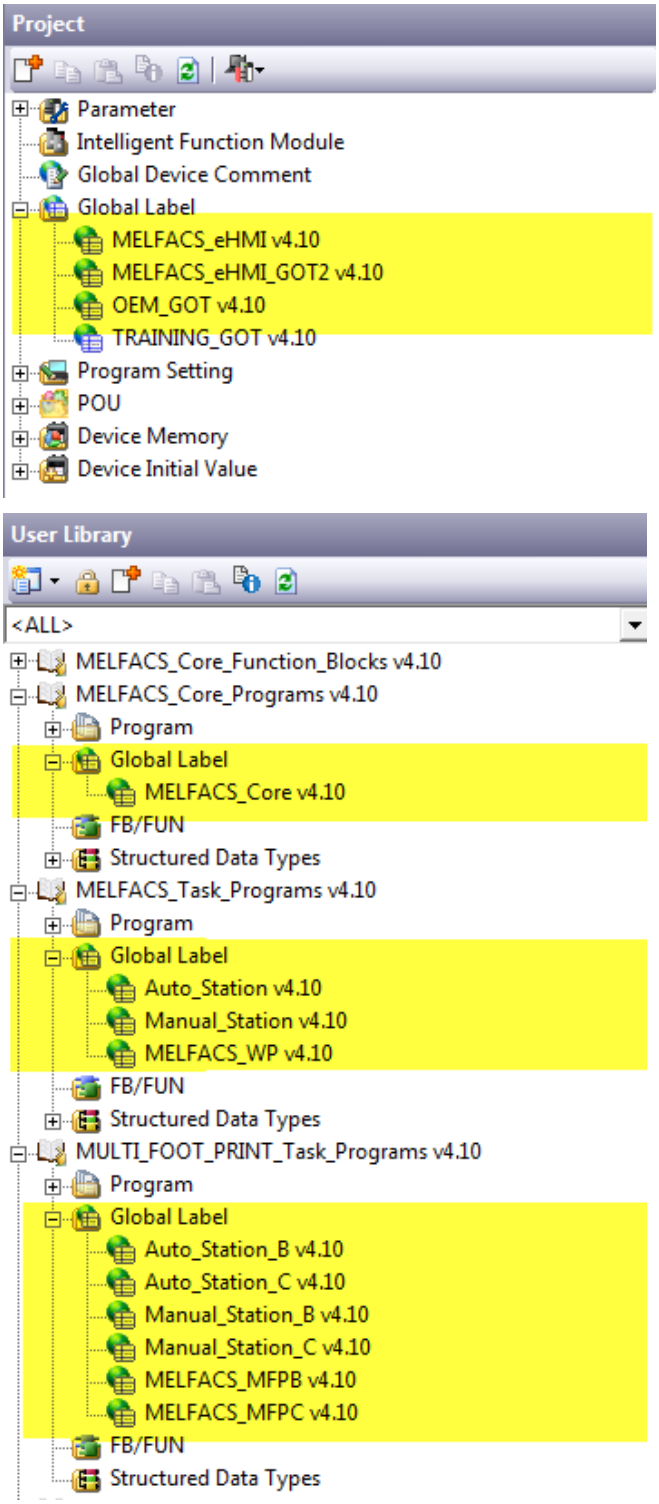


Figure 9 MEL-FACS MWS Project and User Library Global Labels

4.2 Parameters

This section describes several key PLC parameters that need to be configured properly.

4.2.1. PLC System

The default Timer Limit Settings should remain shown in below.

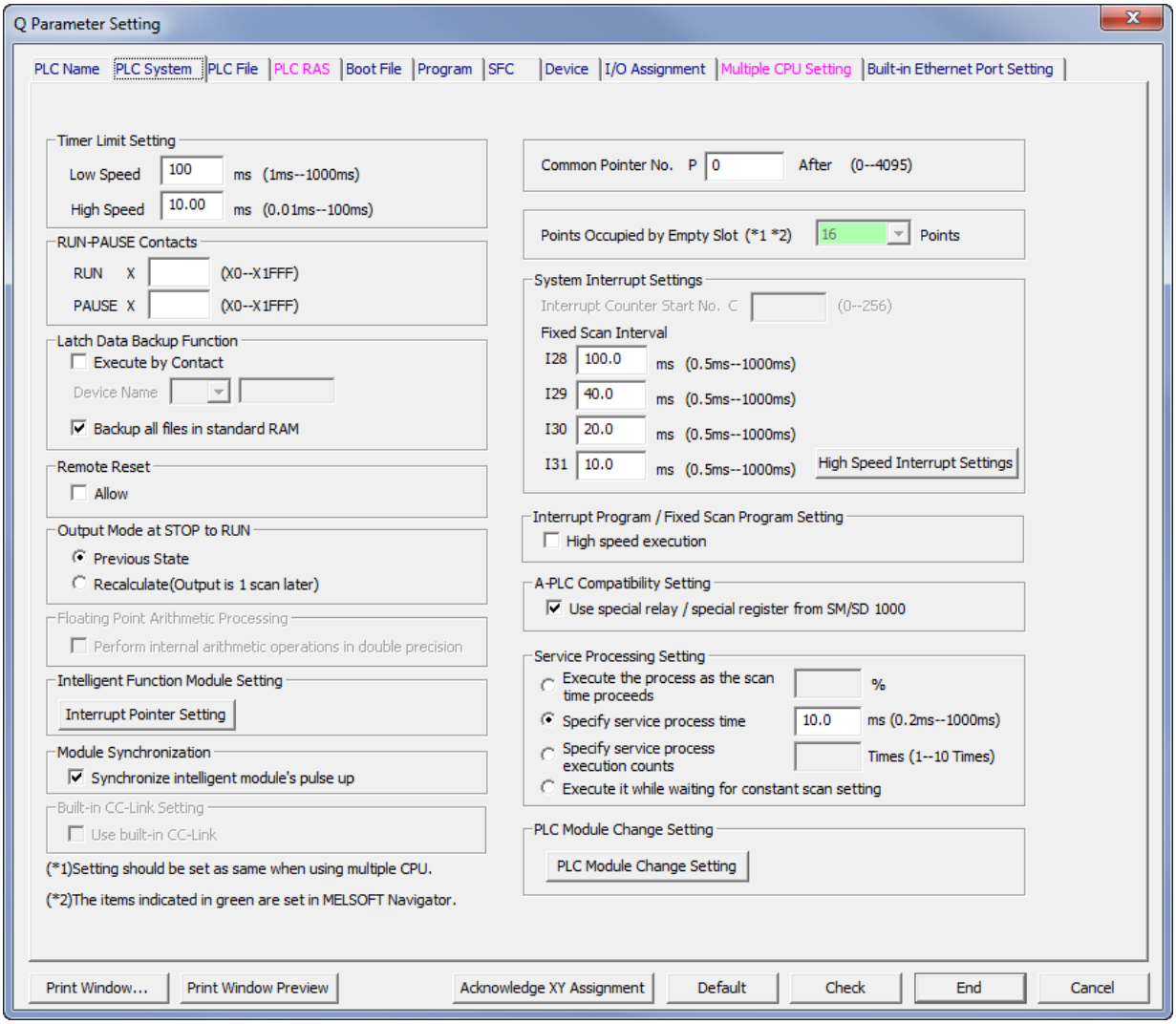


Figure 3 MEL-FACS System Configuration

4.2.2. PLC File

A PLC File is configured to support File Registers, Extended Data Registers, and Extended Link Registers as shown in below.

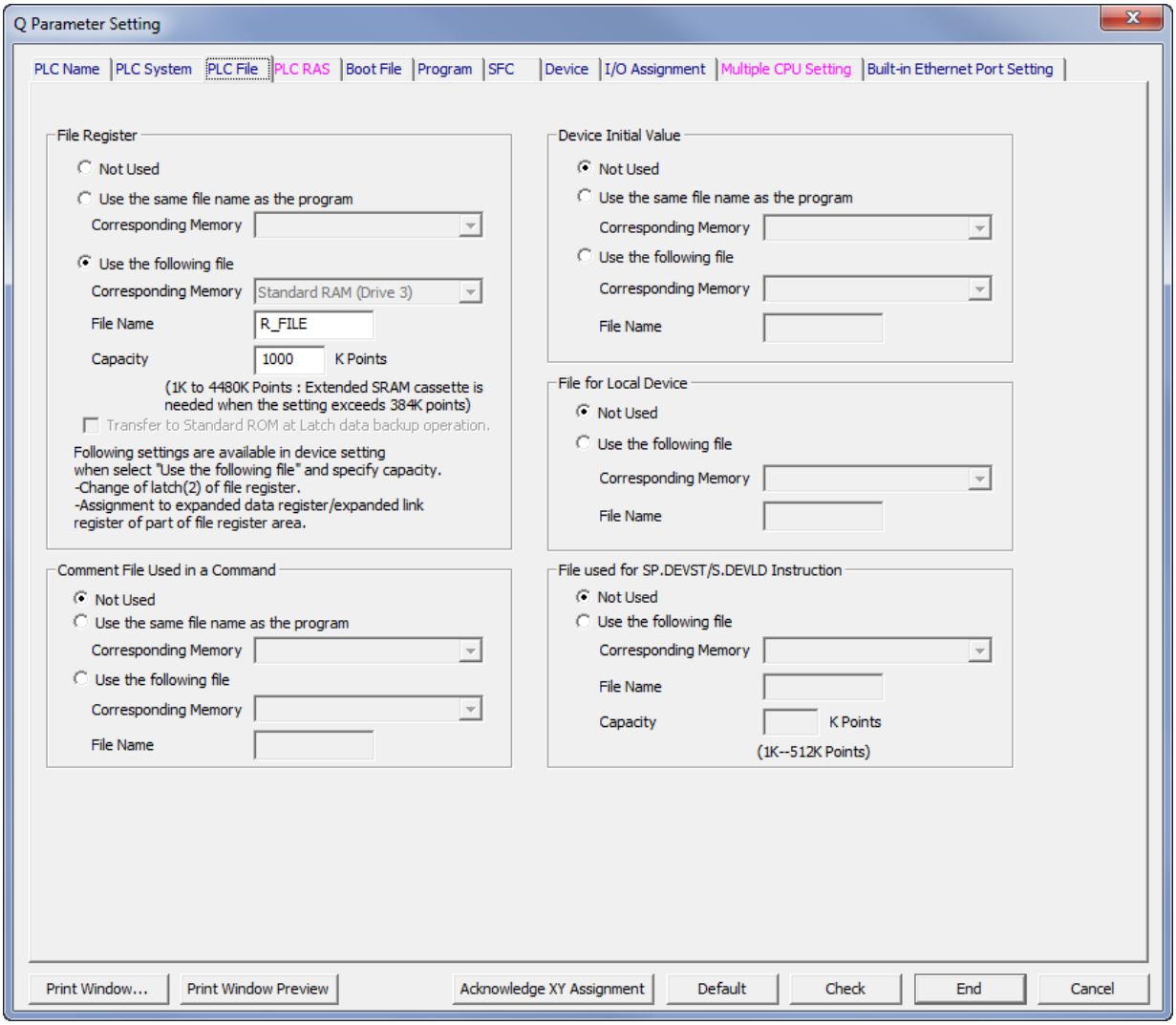


Figure 4 PLC File Configurations

4.2.3. Device

It is also critical to configure the latches for L Relay bits, W Registers, and ZR registers as shown in Figure 5 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)

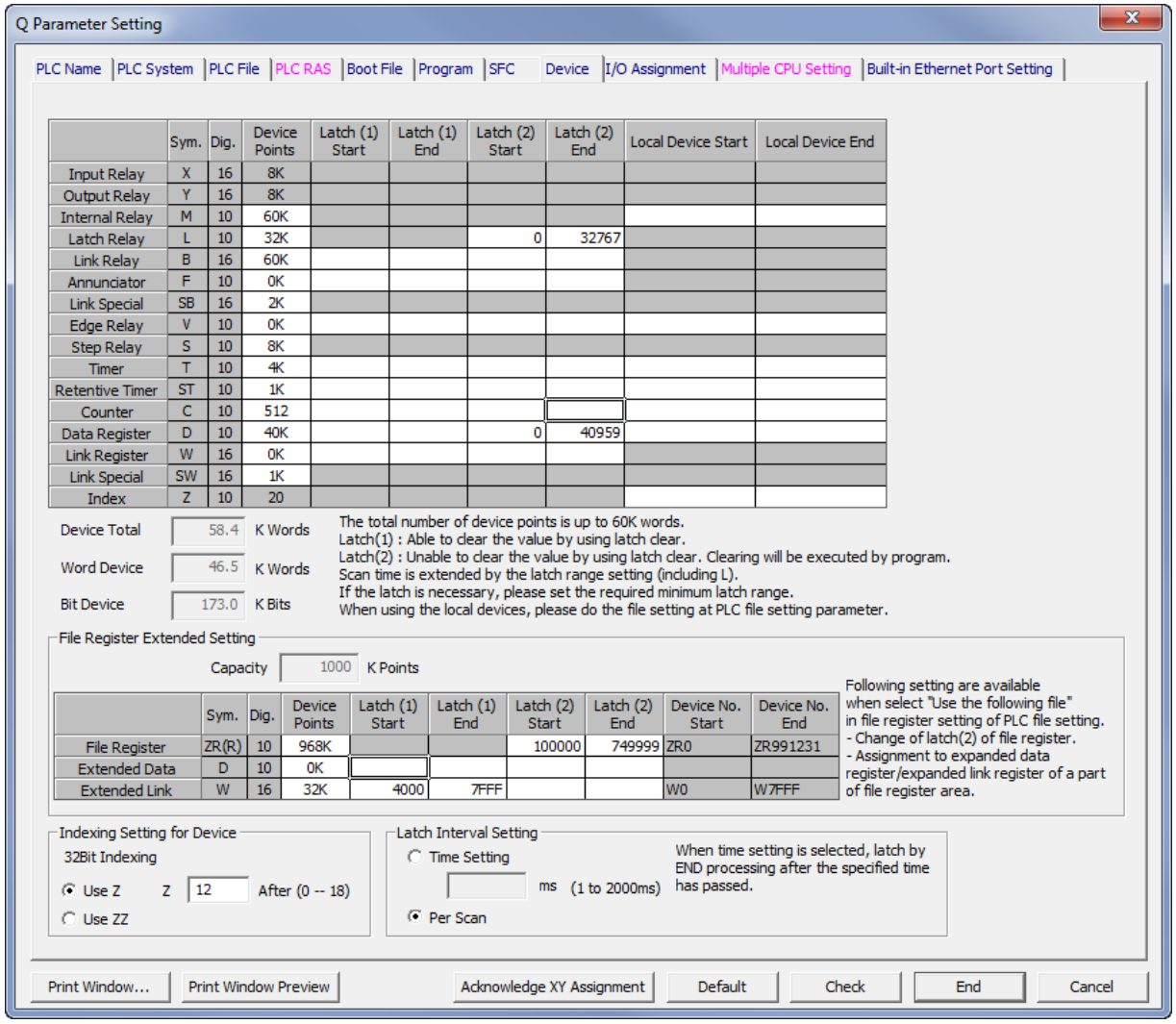
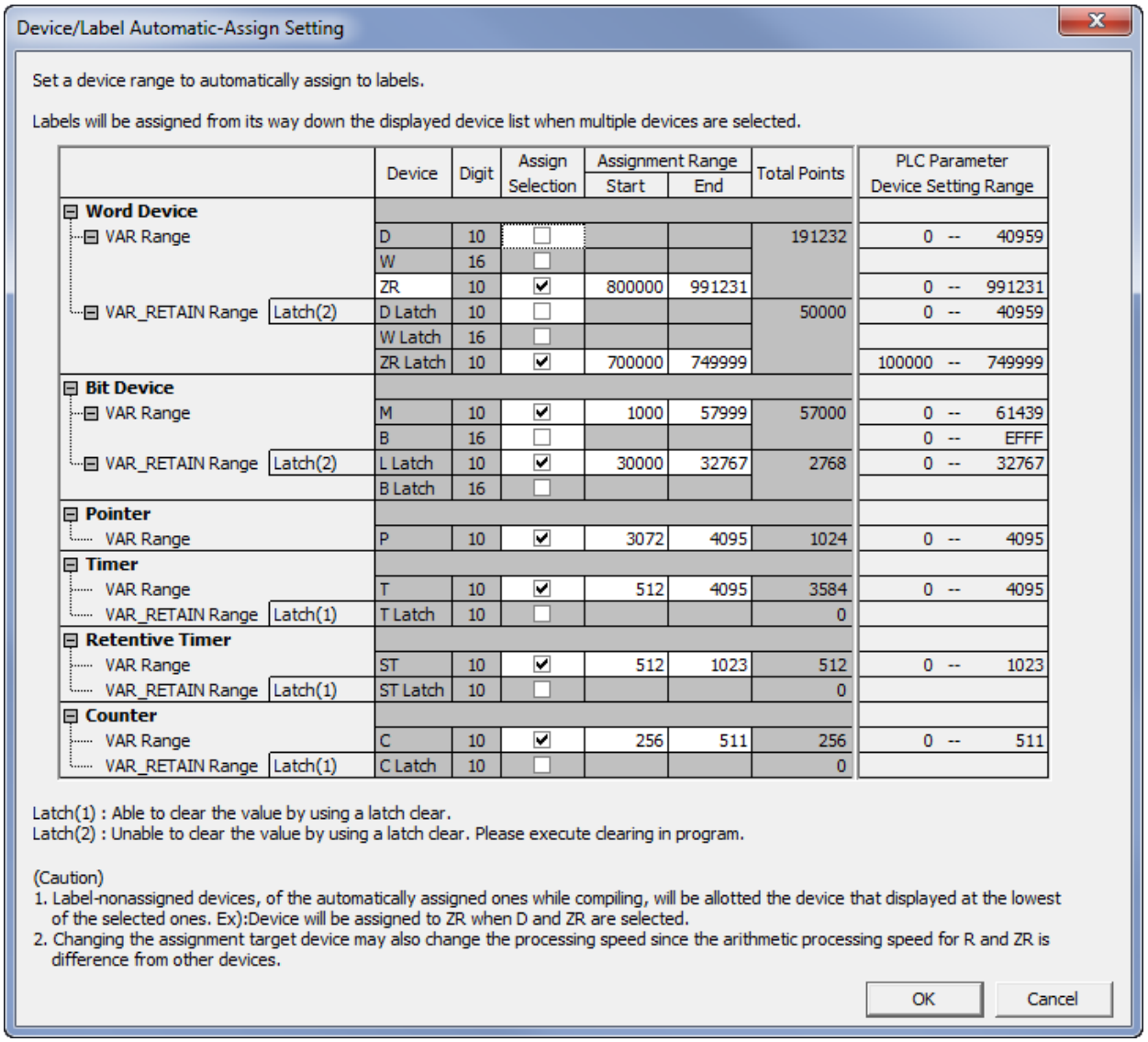


Figure 5 Device Configuration – Parameter->Devices Cont'd

4.2.4. 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 -> Options -> 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	

Figure 6 Device Configuration – Auto Assign Devices for Labels

4.2.5. Built-in Ethernet Port

The front port of the PLC is used to communicate with the Configuration System thus it has to be configured properly to receive the station configuration information and provide status information to the Configuration System. Figure 7 illustrates the parameters that need to be configured for proper communication. In the MEL-FACS, Channel 2 is used to receive/send data from/to the sever-based configuration system such as eFlex from Elite Engineering

The channel are configured to be “Unpassive” meaning that the Configuration System has to establish TCP connections with the PLC front port before data exchanges can take place. Port 2049 is used for receiving/sending the data from/to eFlex.

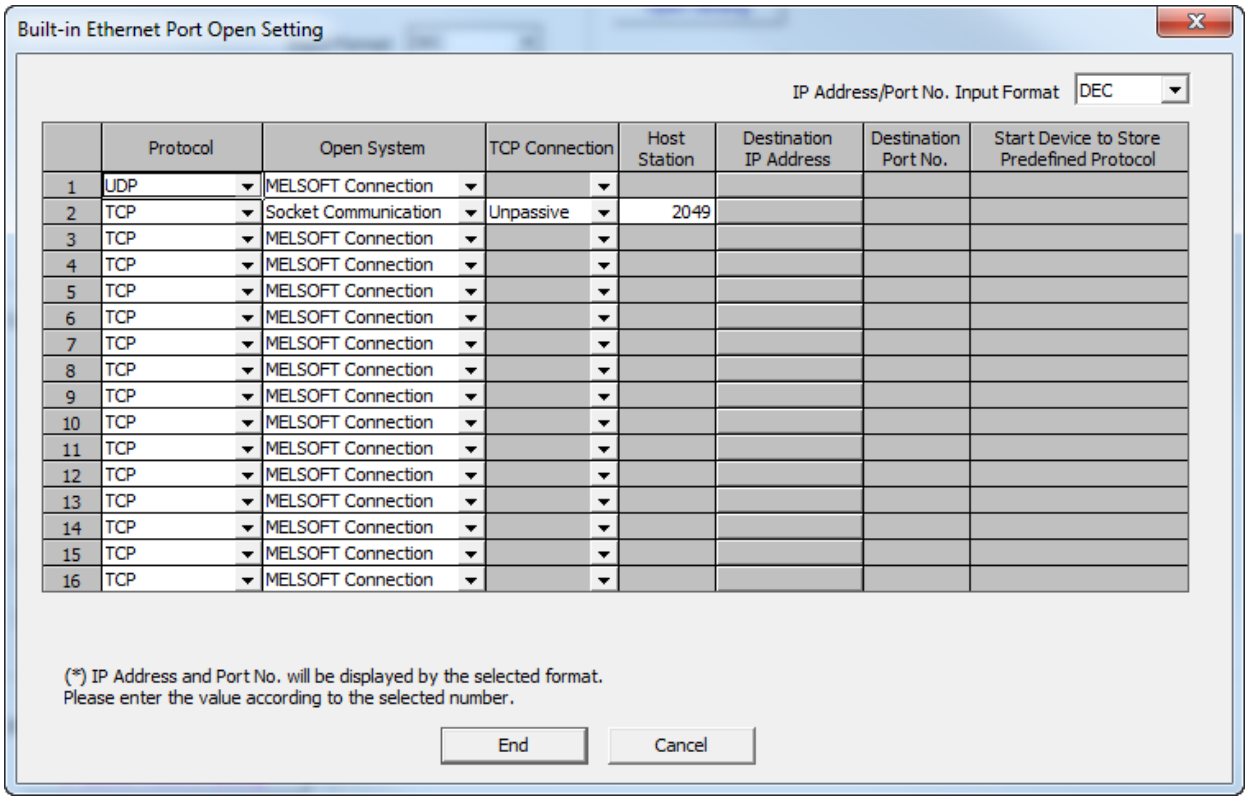


Figure 7 Built-In Ethernet Port Configurations

4.3 POU - Program Layout

The following diagram shows the calling structure of all the function blocks in Main program.

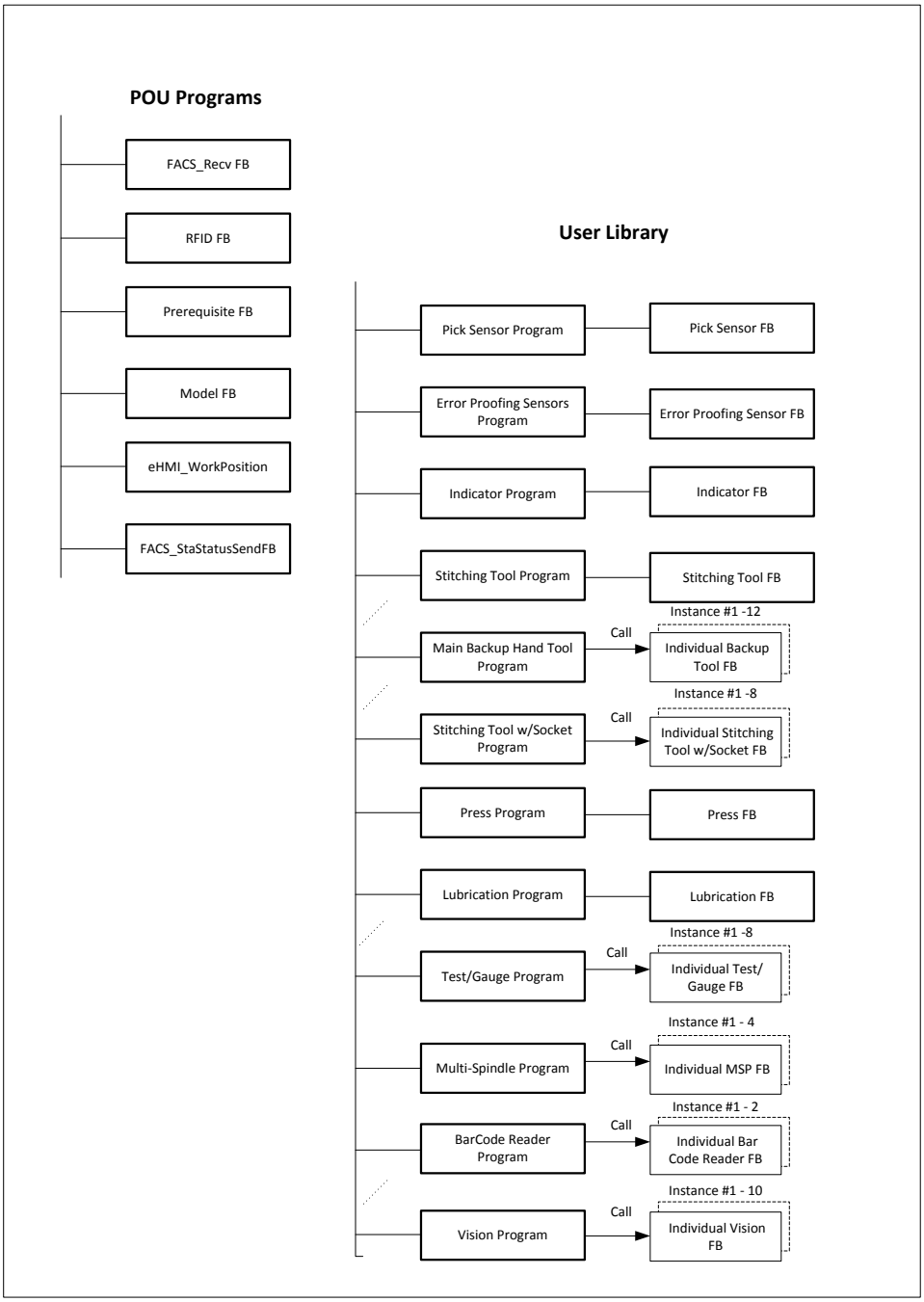


Figure 8 Program Structure

The User Library Task programs are put in PLC scan as required per station configuration. The multiple task FBs are called inside programs as per station configuration

4.4 POU – Structure Data Types

4.4.1. SDTs for MEL-FACS – Management Data

The following table shows the defined SDT for MEL-FACS MWS Project.

Data Type	Label Name	Description
Build_Data_Array	Model_Build_Data_Array	Configuration data – 200 Models Build Data received from FACS in Word Array Format
Comm_DB	FACS_Comm	Communication headers/data between ECS and PLC
Core_DB	FACS_Core	Prerequisites/build model lookup/others
Cur_Mdl_DB	Cur_Mdl	Current model data
From_Sta_DB	Sta_Status	Data to send to FACS after each machine cycle
To_Sta_DB	Cfg	Configuration data received from FACS
To_Sta_Intmdt_DB	Cfg_Recv_Buffer/Cfg_Recv_Blocks	Configuration data received from FACS in Word Array Format

4.4.2. SDTs for Tasks – Process Data

The following table shows the defined SDT for tasks (Process Data) Library. Please refer Chapter 5 for detailed information of individual SDT.

Data Type	Label Name	Description
BarCode_DB	BarCode	Tasks enable bits and status code for Barcode Readers
BkpDCTool_DB	Bkp_StitchTool	Tasks enable bits and status code for Backup Stitching Tools
Generic_DB	Generic	Tasks enable bits and status code for Generic operations
GenericBkp_DB	Bkp_Generic	Tasks enable bits and status code for Generic Backup by Operator without Tools
Lube_DB	Lube	Tasks enable bits and status code for Lubrication operations
Press_DB	Press	Tasks enable bits and status code for Press operations
Robot_DB	Robot	Tasks enable bits and status code for Robots
SocketTool_DB	SocketTool	Tasks enable bits and status code for Stitching Tools w/Socket
Spindle_DB	Spindle	Tasks enable bits and status code for Multi Spindles
StitchTool_DB	StitchTool	Tasks enable bits and status code for Stitching Tools
Test_DB	Testing	Tasks enable bits and status code for Test operations
Vision_DB	Vision	Tasks enable bits and status code for Vision Operations

5 Function Block Library

Below is a current list of MEL-FACS Function Blocks and Functions in User Library.

Function Block Name	Version	Programming Language	Description	
FACS_Recv	v4.10	Structured Ladder	receive the FACS configuration data for the station from FACS server	Core FBs
Prerequisite	v4.10	Structured Ladder	determine whether or not station prerequisites are fulfilled	
Model	v4.10	Structured Ladder	look up the model names and configuration for the current model after pallet enters the station and reads RFID tag	
StationStatus	v4.10	Structured Ladder	handle the summary of the station status	
Station	v4.10	Structured Ladder	Handles OEM inputs and eFlex Config	
FACS_StaStatusSend	v4.10	Structured Ladder	send Task Status, Task time and RFID data to FACS server	
FC_Word_To_DWord	v4.10	Structured Ladder	Function - Converts word array to DWord	
ErrorProof	v4.10	Structured Ladder	handle all the tasks of Error Proofing sensors	Core Tasks FBs
PickSensor	v4.10	Structured Ladder	handle all the tasks of pick sensors and pick lights	
Indicators	v4.10	Structured Ladder	handle the light indicator with assigned tasks	
Generic8	v4.10	Structured Ladder	Generic8 FB is called by certain programs such as Lubrication and Press. The purpose of this function block is to handle the system with 8 pre-assigned tasks	OEM Tasks FBs
Generic4	v4.10	Structured Ladder	Generic4 FB is called by certain programs, such as Robot and Universal. The purpose of Generic4 function block is to handle the system with 4 pre-assigned tasks	
GenericBackup	v4.10	Structured Ladder	Handle Generic Backup tasks repaired by operator at Backup/Repair station without Tools	
Tests	v4.10	Structured Ladder	handle the tasks of test system	
Stitch_Tool	v4.10	Structured Ladder	the tasks of stitching tool	
BCReader	v4.10	Structured Ladder	handle the tasks of barcode reader system	
Vision	v4.10	Structured Ladder	handle the tasks of vision and camera system	
MultiSpindle	v4.10	Structured Ladder	handle the tasks of multiple spindles system	
StitchToolSpdleBckp	v4.10	Structured Ladder	handle the tasks of backup stitching tool	
SocketTool	v4.10	Structured Ladder	handle the tasks of stitching tool with socket tray	
eHMI_Display	v4.10	Structured Ladder	handle all the status display on eHMI screen	eHMI FBs
eHMI_WorkPosition	v4.10	Structured Ladder	handle all the tasks status screens for MWS	

Function Block Name	Version	Programming Language	Description	
eHMI_Auto	v4.10	Structured Ladder	handle all the tasks status screens for Auto	

Below is a current list of MEL-FACS Global Labels and associated Structured Data Types in User Library.

Global Labels Name	Structured Data Type Name	Description	
FACS_Comm	Comm_DB	Comm structure to handle Header data to and from FACS Server	Core Global Labels & SDTs
FACS_Core	Core_DB	List of labels to handle passing of data from FB to another FB	
Cfg	To_Sta_DB	receive the FACS configuration data for the station and all Model configuration from FACS server	
Cfg_Recv_xxxxx	To_Sta_Intrmdt_DB	receive the FACS configuration data for the station and all Model configuration from FACS server in Word Array format	
Cur_Mdl	Cur_Mdl_DB	configuration for the current model after pallet enters the station and reads RFID tag	
Model_Build_Data	Cur_Mdl_DB(1..200)	Array of all models configuration from FACS Server	
Sta_Status	From_Sta_DB	send Task Status, Task time and RFID data to FACS Server	
Lube	Lube_DB	Generic8 FB is called by certain programs such as Lubrication and Press. The purpose of this Label and SDT is to handle the system with 8 pre-assigned tasks	OEM Tasks Global Labels & SDTs
Press	Press_DB		
Generic	Generic_DB	Generic4 FB is called by certain programs, such as Robot and Universal. The purpose of this Label and SDT is to handle the system with 4 pre-assigned tasks	
Robot	Robot_DB		
Testing	Test_DB	handle the tasks of test system	
StitchTool	StitchTool_DB	the tasks of stitching tool	
BarCode	BarCode_DB	handle the tasks of barcode reader system	
Vision	Vision_DB	handle the tasks of vision and camera system	
Spindle	Spindle_DB	handle the tasks of multiple spindles system	
Bkp_StitchTool	BkpDCTool_DB	handle the tasks of backup stitching tool	
Bkp_Generic	GenericBkp_DB	handle the tasks of Generic Backup by Operator without Tools	
SocketTool	SocketTool_DB	handle the tasks of stitching tool with socket tray	
eHMI_Select	eHMI_Sel_PB	Handle Selection PBs from Main and Task Status screens	System Label related SDTs
eHMI_Display	eHMI_Disp	Handle all the Status display of Tasks on Main screen and Task Status screens	
eHMI_General	GOTGeneral	Handles all GOT related System Parameters	
GOT1_CycleData	CycleData	Handles display of Cycle related Data like Model, Serial Number	

Following diagram shows the Data Flow among all FACS FBs in the Library

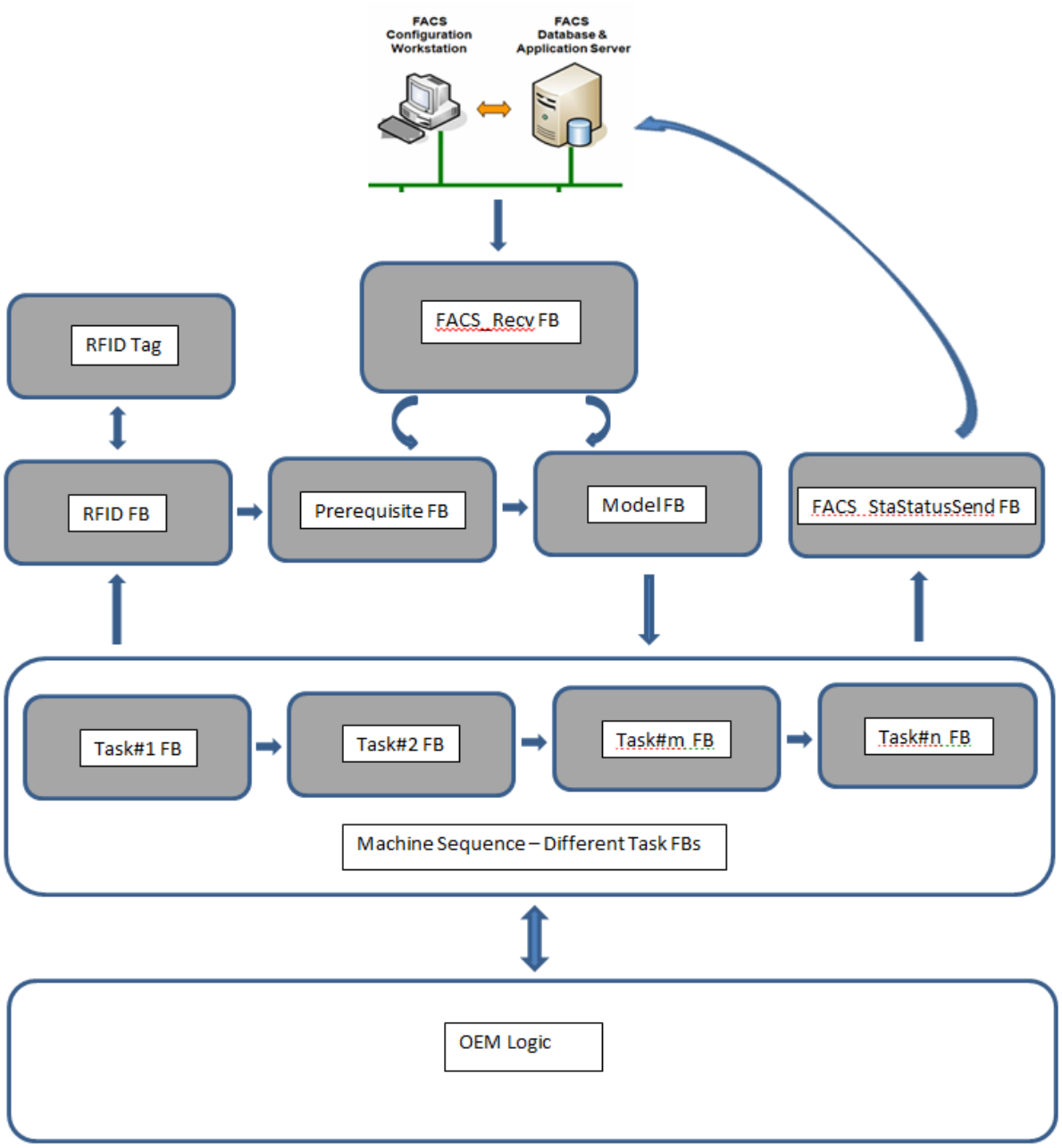


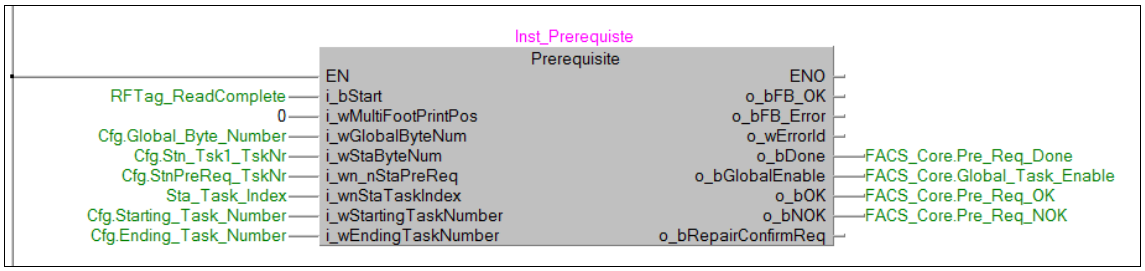
Figure 15 eFACS, MEL-FACS and OEM Logic Communication structure

5.1 Prerequisite Management

The purpose of this function block is to determine whether or not station prerequisites are fulfilled.

5.1.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Prerequisite	Inst_Prerequisite	V4.10	V4.02



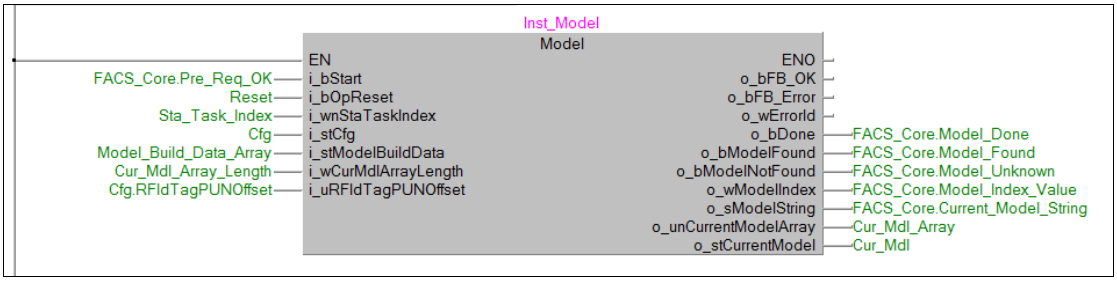
Identifier	Class	Type	Description	User/System
i_bStart	Input	Bit	Start prerequisite determination	User
i_wMultiFootPrintPos	Input	Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wGlobalByteNum	Input	Word	Byte # in RFID for the Global Status	System
i_wStaByteNum	Input	Word	Station Task Number in RFID	System
i_wn_nStaPreReq	Input	Word – (1..10, 1..10)	PreRequisite two dimensional array	System
i_wnStaTaskIndex	Input	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
i_wStartingTaskNumber	Input	Word	Starting Task Number	System
i_wEndingTaskNumber	Input	Word	Ending Task Number	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bDone	Output	Bit	Prerequisite determination complete	System
o_bGlobalEnable	Output	Bit	Global Status is OK	System
o_bOK	Output	Bit	All prerequisite conditions are met	System
o_bNOK	Output	Bit	Any or all Prerequisite conditions are not met	System
o_bRepairConfirmReq	Output	Bit	If any of the PreRequisites Tasks are Repaired	User
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code H101 - If i_wArea is greater than 2, H102 - If i_wGlobalByteNum is other than 100	User

5.2 Model Management

The purpose of this function block is to look up the model names and configuration for the current model after pallet enters the station and reads RFID tag.

5.2.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Model	Inst_Model	V4.10	V4.02



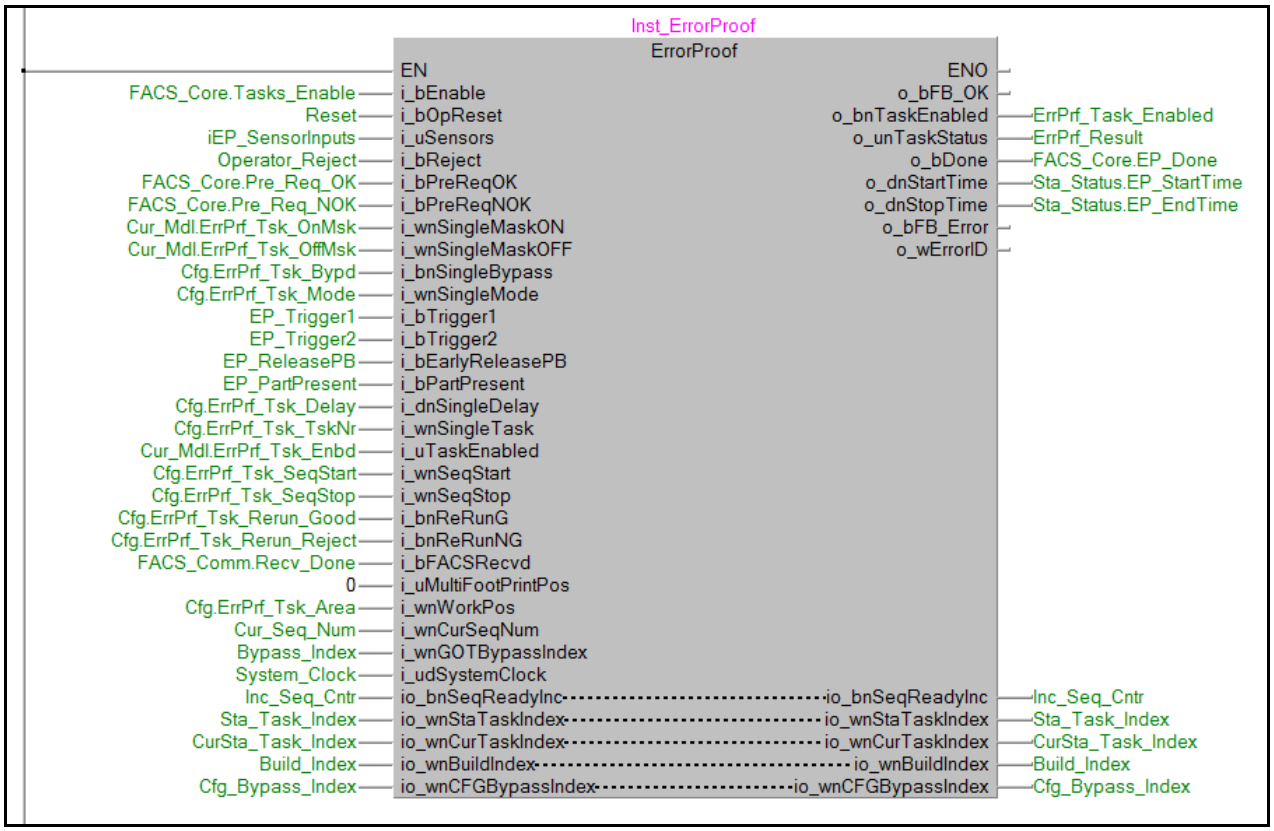
Identifier	Class	Type	Description	User/Sys
i_bStart	Input	Bit	Start build model lookup	System
i_bOpReset	Input	Bit	Reset the operation	System
i_wnStaTaskIndex	Input	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
i_stCfg	Input	SDT - To_Sta_DB	Configuration Data downloaded from eFACS Server	System
i_stModelBuildData	Input	SDT – Build_Data_Array	Model Build Data downloaded from eFACS Server	System
i_wCurMdlArrayLength	Input	Word[Signed]	Current Model Array Length in Words	System
i_uRFIdTagPUNOffset	Input	Unsigned Word	PUN offset in Model Information	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bDone	Output	Bit	Model lookup build complete	System
o_bModelFound	Output	Bit	Model Found in lookup	System
o_bModelNotFound	Output	Bit	Model Not Found in lookup	System
o_wModelIndex	Output	Word	Current model (Suffix code) index number (1-200)	System
o_sModelString	Output	String(12)	Current model – suffix code	System
o_unCurrentModelArray	Output	Unsigned Word (0..757)	Current Model Data extracted from Model Build Data in Array format	System
o_stCurrentModel	Output	SDT – Cur_Mdl_DB	Current Model Data extracted from Model Build Data in SDT format	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 - If i_uRFIdTagPUNOffset is greater than 50 for PRK0 Project	User

5.3 Error Proofing Sensors Tasks

The purpose of this function block is to handle all the tasks of Error Proofing sensors.

5.3.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
ErrorProof	Inst_ErrorProof	V4.10	V4.02

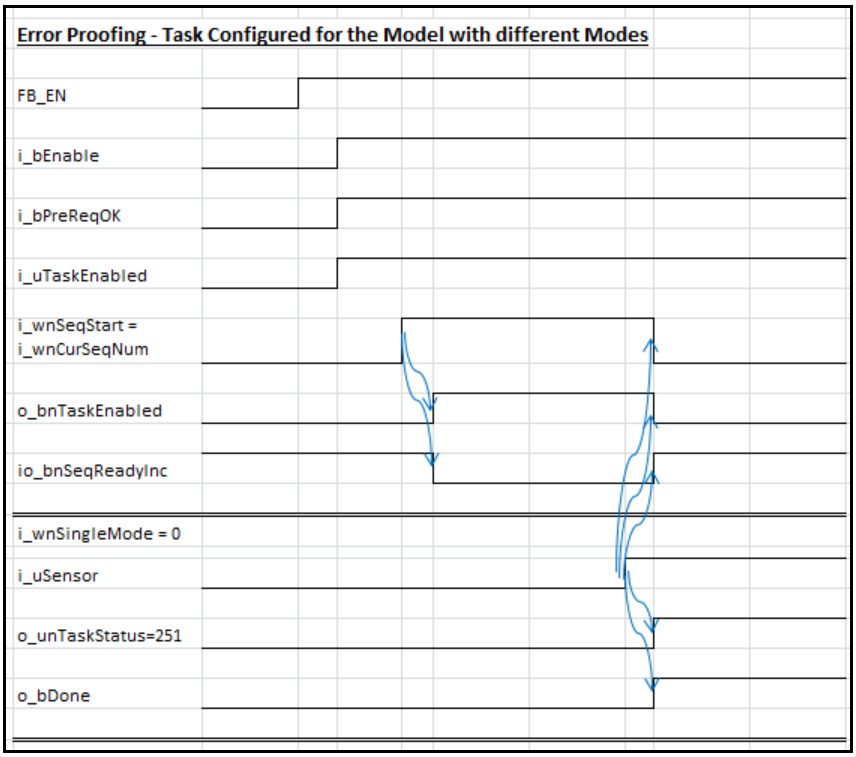


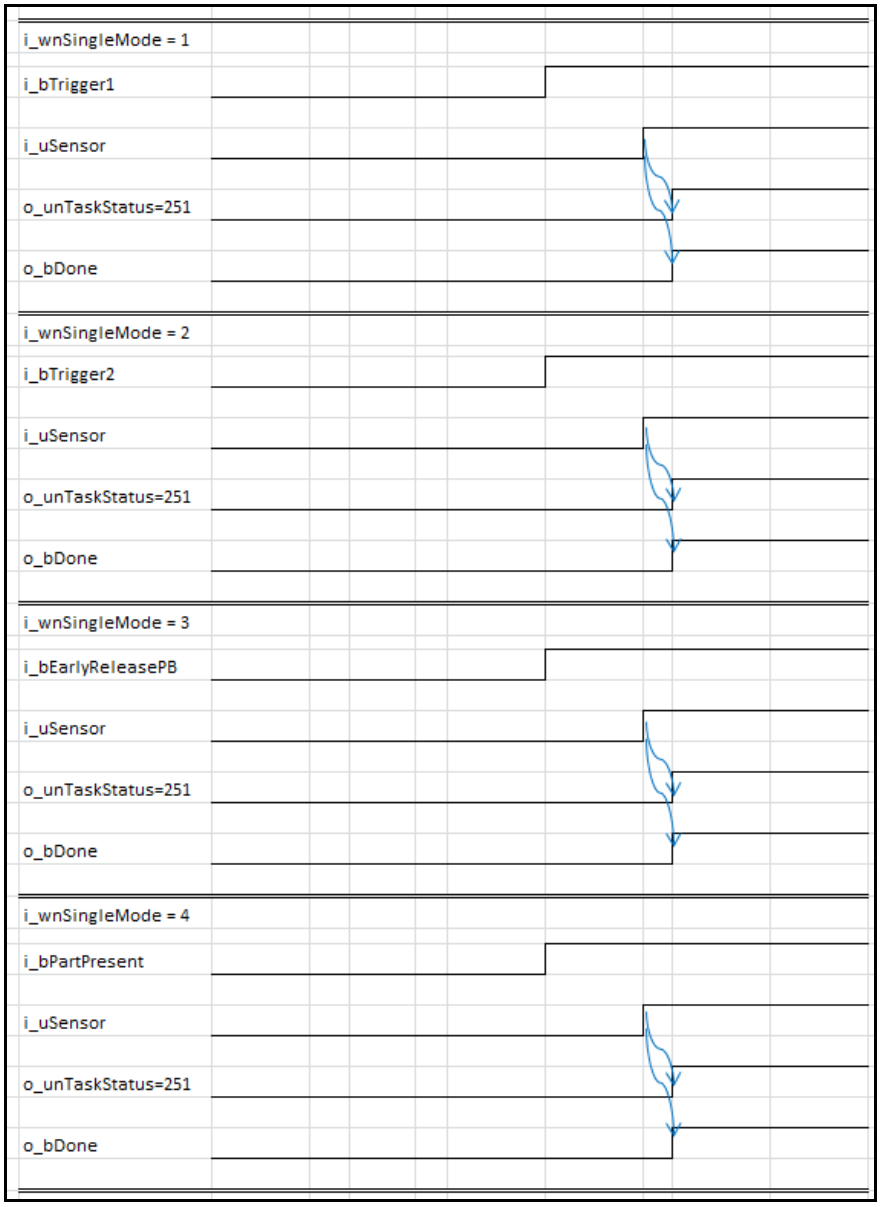
Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start Error Proofing tasks	System
i_bOpReset	Input	Bit	Resets the Operation	System
i_uSensors	Input	Unsigned Word	Error Proofing sensors input address	System
i_bReject	Input	Bit	Reject current work piece signal	System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_wnSingleMaskON	Input	Word (0..15)	1-16 task mask ON configuration from current model	System

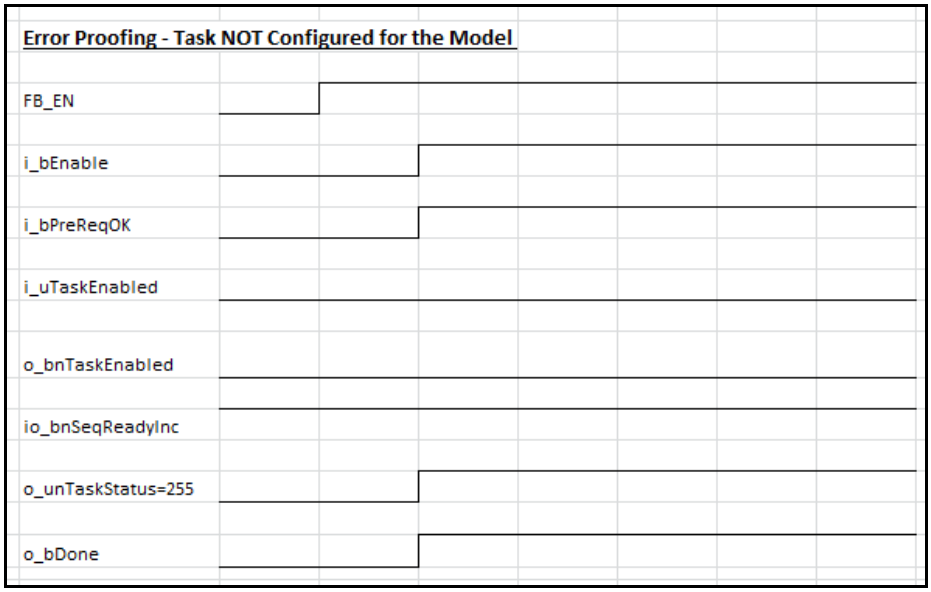
Identifier	Class	Type	Description	User/System
i_wnSingleMaskOFF	Input	Word (0..15)	1-16 task mask OFF configuration from current model	System
i_bnSingleBypass	Input	Bit (0..15)	1-16 task bypass configuration	System
i_wnSingleMode	Input	Word (0..15)	1-16 task mode configuration =0 – Continuous =1 – Trigger 1 =2 – Trigger 2 =3 – Trigger with Release PB =4 – Trigger with Part Present	System
i_b Trigger1	Input	Bit	Trigger 1 address	System
i_bTrigger2	Input	Bit	Trigger 2 address	System
i_bEarlyReleasePB	Input	Bit	Early Release PB address	System
i_bPartPresent	Input	Bit	Part Present address	System
i_dnSingleDelay	Input	Unsigned DWord (0..15)	1-16 task delay time configuration	System
i_wnSingleTask	Input	Word (0..15)	1-16 task numbers	System
i_uTaskEnabled	Input	Unsigned Word	1-16 tasks enabled for the current model	System
i_wnSeqStart	Input	Word (0..15)	1-16 task sequence start numbers	System
i_wnSeqStop	Input	Word (0..15)	1-16 task sequence stop numbers	System
i_bnReRunG	Input	Bit (0..15)	1-16 task rerun for good part configuration	System
i_bnReRunNG	Input	Bit (0..15)	1-16 task rerun for no good part configuration	System
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wnWorkPos	Input	Word (0..15)	Multi-Foot Print data for the Task from Configuration	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System

Identifier	Class	Type	Description	User/System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bnTaskEnabled	Output	Bit (0..15)	1-16 Tasks enabled as per sequence for the current part	User
o_unTaskStatus	Output	Unsigned Word (0..15)	1-16 Task Status for the current part	User/System
o_bDone	Output	Bit	All Tasks are completed	User/System
o_dnStartTime	Output	DWord (0..15)	1-16 task start time	System
o_dnStopTime	Output	DWord (0..15)	1-16 task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.3.2. Timing Chart




i_wnSingleMode = 1
i_bTrigger1
i_uSensor
o_unTaskStatus=251
o_bDone
i_wnSingleMode = 2
i_bTrigger2
i_uSensor
o_unTaskStatus=251
o_bDone
i_wnSingleMode = 3
i_bEarlyReleasePB
i_uSensor
o_unTaskStatus=251
o_bDone
i_wnSingleMode = 4
i_bPartPresent
i_uSensor
o_unTaskStatus=251
o_bDone

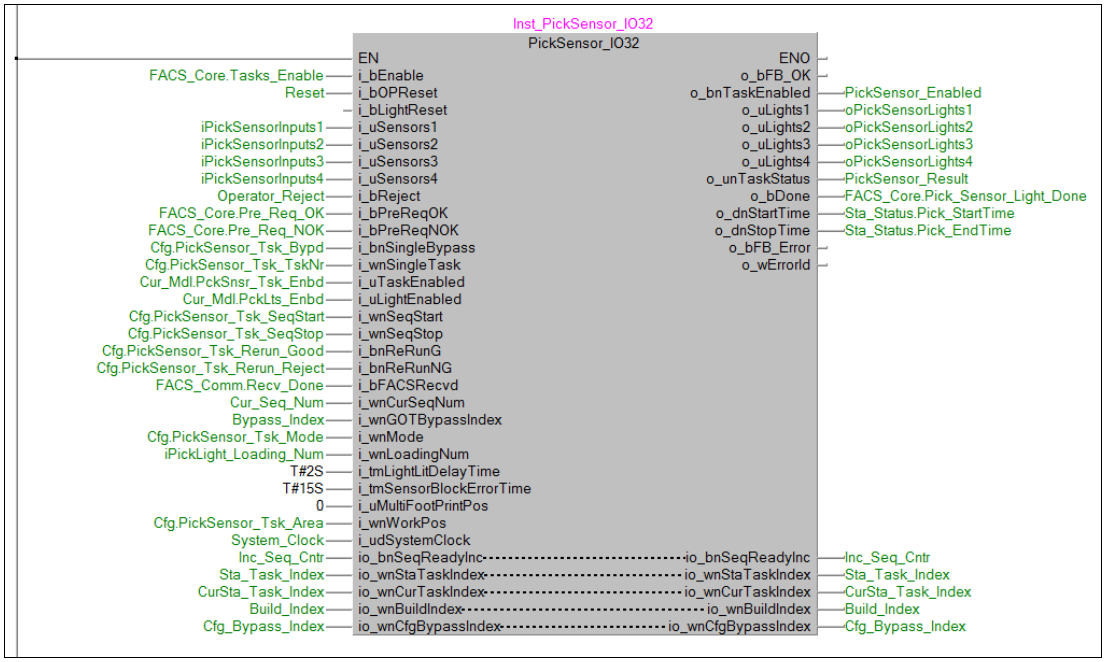

Error Proofing - Task NOT Configured for the Model
FB_EN
i_bEnable
i_bPreReqOK
i_uTaskEnabled
o_bnTaskEnabled
io_bnSeqReadyInc
o_unTaskStatus=255
o_bDone

5.4 Pick Sensors/Lights Tasks

The purpose of the function block is to handle all the tasks of pick sensors and pick lights.

5.4.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
PickSensor	Inst_PickSensor	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start Pick Sensor tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bLightReset	Input	Bit	Reset Pick Sensor lights	User
i_uSensors1	Input	Unsigned Word	Pick sensors 1 address (Inputs and Outputs mixed block)	User
i_uSensors2	Input	Unsigned Word	Pick sensors 2 address (Inputs and Outputs mixed block)	User
i_uSensors3	Input	Unsigned Word	Pick sensors 3 address (Inputs and Outputs mixed block)	User
i_uSensors4	Input	Unsigned Word	Pick sensors 4 address (Inputs and Outputs mixed block)	User
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System

Identifier	Class	Type	Description	User/System
i_bnSingleBypass	Input	Bit (0..15)	1-16 task bypass configuration	System
i_wnSingleTask	Input	Word (0..15)	1-16 task numbers	System
i_uTaskEnabled	Input	Unsigned Word	1-16 tasks enabled for the current model	System
i_uLightEnabled	Input	Unsigned Word	1-16 tasks lights enabled for the current model	System
i_wnSeqStart	Input	Word (0..15)	1-16 task sequence start numbers	System
i_wnSeqStop	Input	Word (0..15)	1-16 task sequence stop numbers	System
i_bnReRunG	Input	Bit (0..15)	1-16 task rerun for good part configuration	System
i_bnReRunNG	Input	Bit (0..15)	1-16 task rerun for no good part configuration	System
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_wnMode	Input	Word (0..15)	1-16 task mode configuration =0 – Model Pick – Pick Bin based on Model =1 – Look Up – Pick Bin based on i_wnLoadingNum	System
i_wnLoadingNum	Input	Word (0..15)	For i_wnMode = 1 - Look Up Mode, Bin selection	User
i_tmLightLitDelayTime	Input	Time	Time Delay to lit lights between two selection for Lookup	User
i_tmSensorBlockErrorTime	Input	Time	Error Time if Pick sensor(s) are blocked for more than input time	User
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wnWorkPos	Input	Word (0..15)	Multi-Foot Print data for the Task from Configuration	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User

Identifier	Class	Type	Description	User/System
o_bnTaskEnabled	Output	Bit (0..15)	1-16 Tasks enabled as per sequence for the current part	User
o_uLights1	Output	Unsigned Word	Pick lights 1 address	User
o_uLights2	Output	Unsigned Word	Pick lights 2 address	User
o_uLights3	Output	Unsigned Word	Pick lights 3 address	User
o_uLights4	Output	Unsigned Word	Pick lights 4 address	User
o_unTaskStatus	Output	Unsigned Word (0..15)	1-16 Task Status for the current part	User/System
o_bDone	Output	Bit	All Tasks are completed	User/system
o_dnStartTime	Output	DWord (0..15)	1-16 task start time	System
o_dnStopTime	Output	DWord (0..15)	1-16 task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2 = H102 – if i_tmLightLitDelayTime > 5 Sec = H103 – if i_tmSensorBlockErrorTime > 30 sec = K1 – if Sensors are blocked for i_tmSensorBlockErrorTime = K2 – if two or more Pick Sensors are blocked at the same time	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.4.2. 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

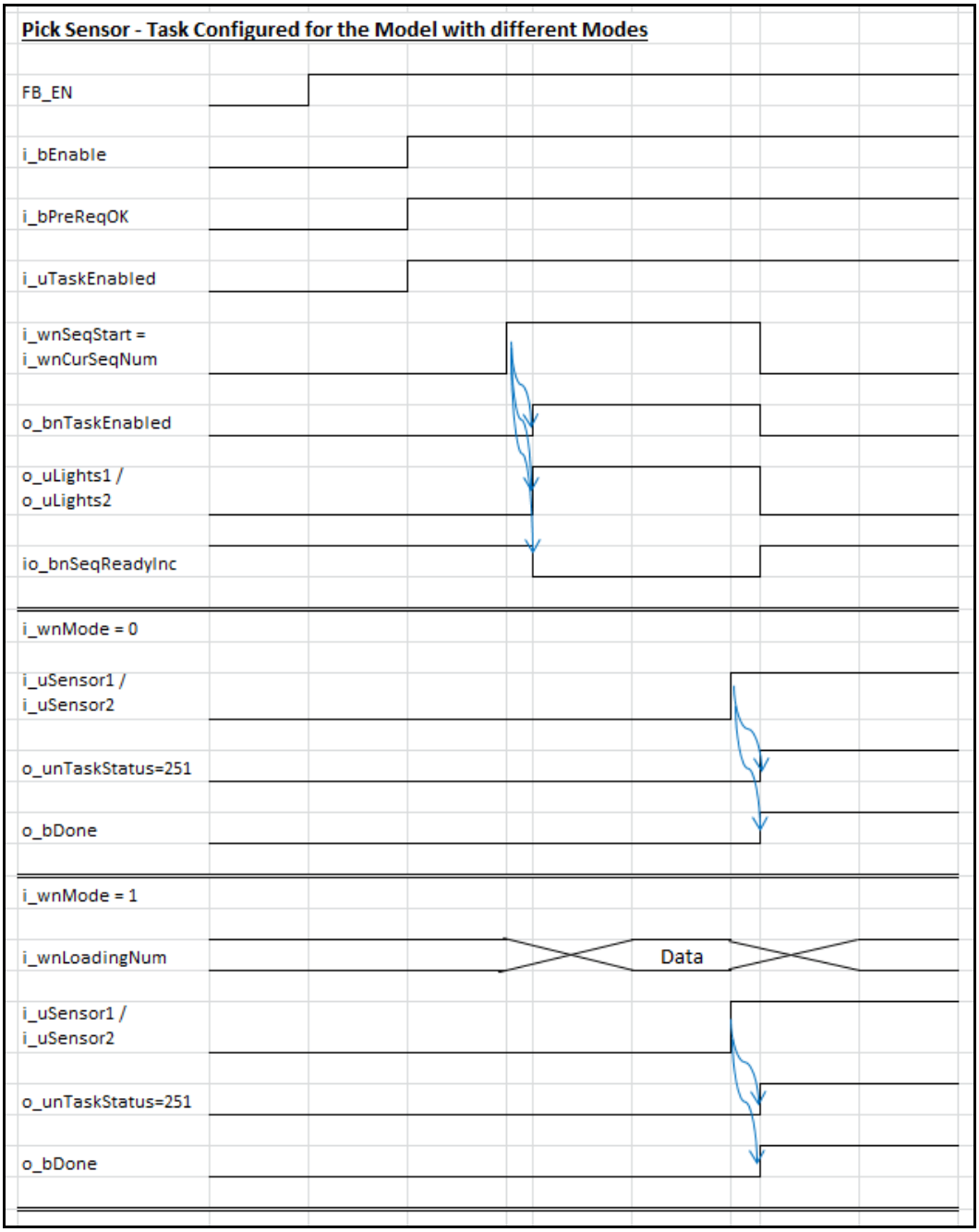
Model Pick: This is applied when one component is picked from a bin only once during the part cycle. Good example for the Model Pick is different types of Oil Filters are picked from different bins for different models of engine. Only one type of Oil Filter is picked from its bin for each model of the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

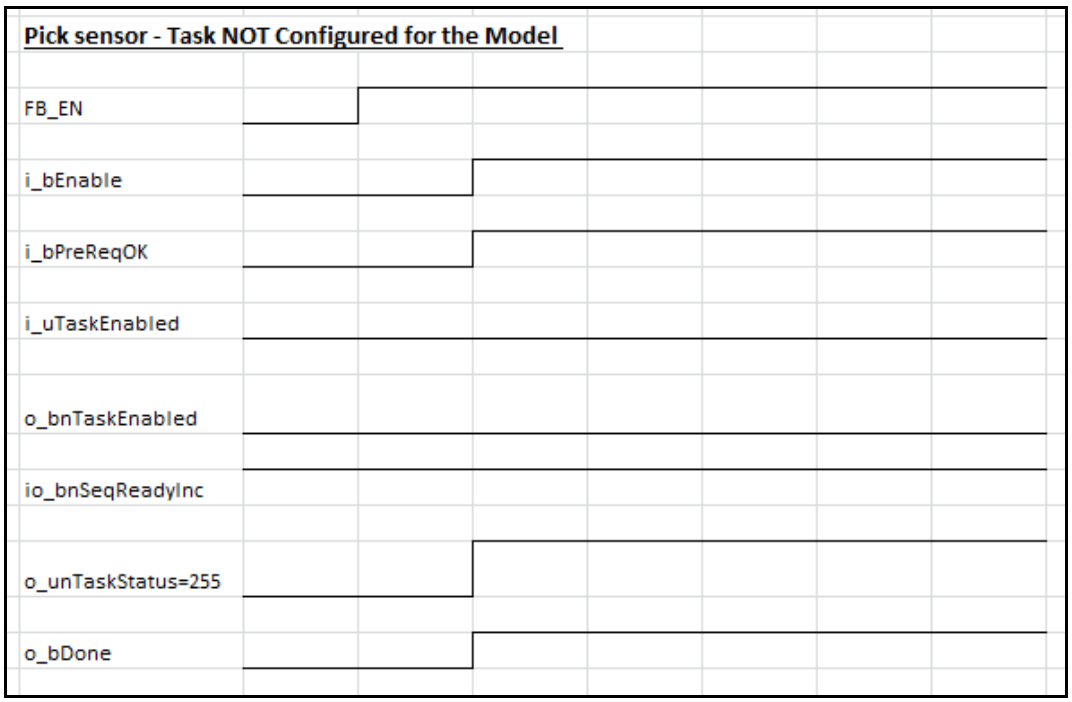
Look Up Pick: This is applied when components are picked from the same bin more than once during the part cycle. Good example for Look Up Pick is picking the Main Bearing shells from the bin where there are chances of picking same Bearing type more than once for the engine. The data to know from which 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

5.4.3. Timing Chart



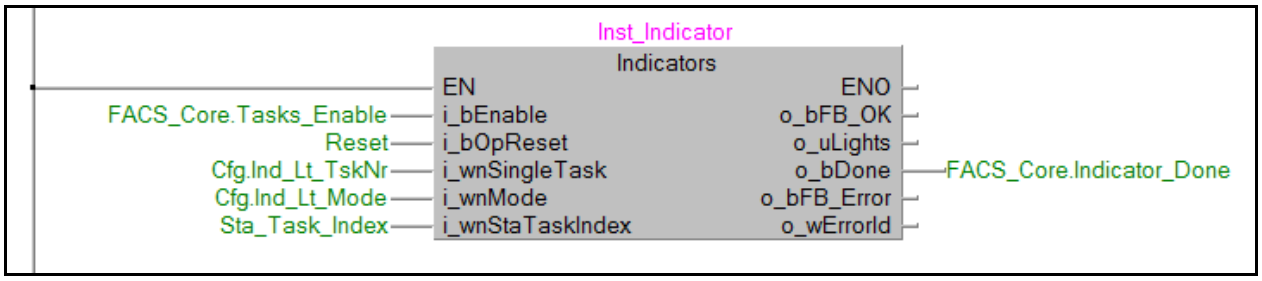

Pick sensor - Task NOT Configured for the Model
FB_EN
i_bEnable
i_bPreReqOK
i_uTaskEnabled
o_bnTaskEnabled
io_bnSeqReadyInc
o_unTaskStatus=255
o_bDone

5.5 Indicator Management

The purpose of the function block is to handle the light indicator with assigned tasks.

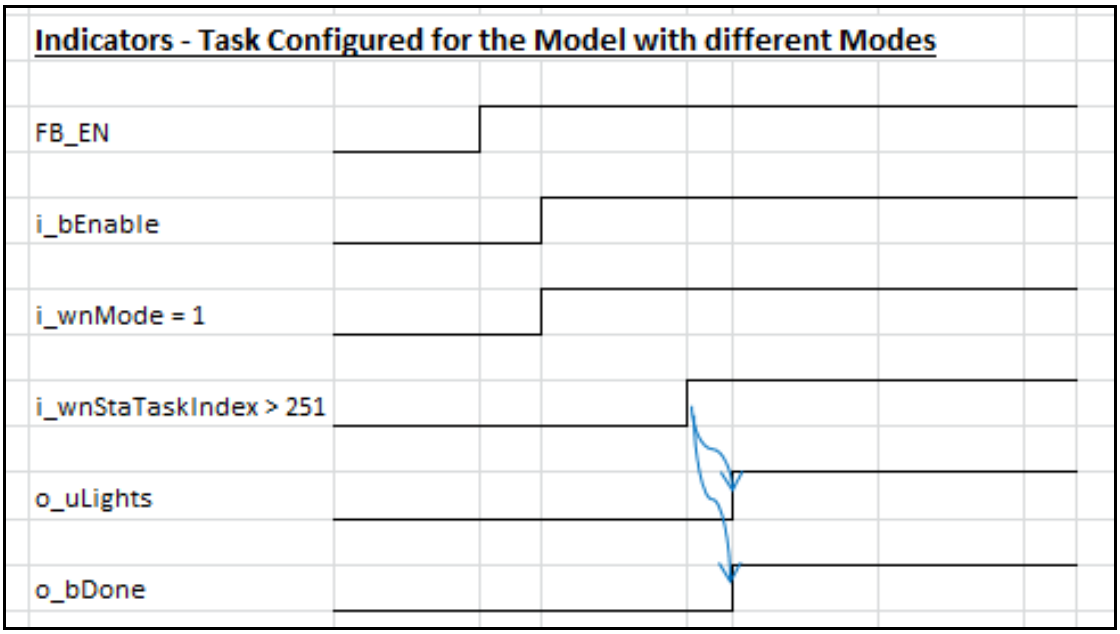
5.5.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Indicators	Inst_Indicator	V4.10	V4.02



Identifier	Class	Type	Description	User/system
i_bEnable	Input	Bit	Conditions to start indicator tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_wnSingleTask	Input	Word (0..15)	1-16 task numbers	System
i_wnMode	Input	Word (0..15)	1-16 task mode configuration	System
i_wnStaTaskIndex	Input	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_uLights	Output	Unsigned Word	Indicators output address	User
o_bDone	Output	Bit	All Tasks are completed	User/System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code	User

5.5.2. Timing Chart

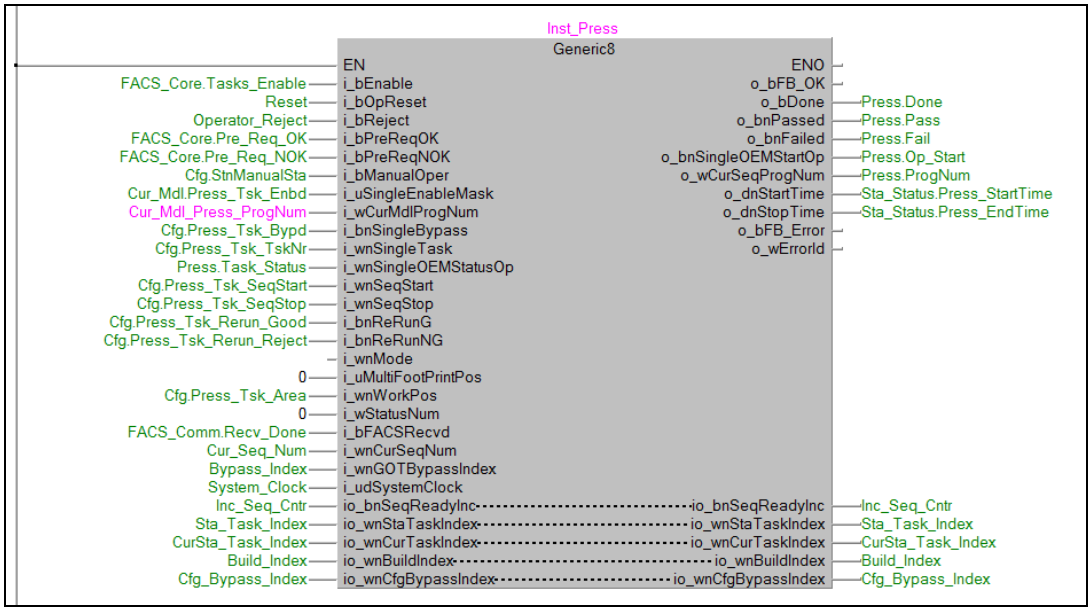


5.6 Lubrication/Press Operation Tasks

Generic8 FB is called by certain programs such as Lubrication and Press. The purpose of this function block is to handle the system with 8 pre-assigned tasks.

5.6.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Generic8	Inst_Lube	V4.10	V4.02
Generic8	Inst_Press	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start tasks	System
i_bOpReset	Input	Bit	Reset the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	BIT	Manual operation option. Manual operation allows retry and operator reject.	System
i_uSingleEnableMask	Input	Unsigned Word	1-8 task enable configuration in word format	System
i_wCurMdlProgNum	Input	Word (0..7)	1-8 Current Model Program Number	System
i_bnSingleBypass	Input	Bit (0..7)	1-8 task bypass configuration	System
i_wnSingleTask	Input	Word (0..7)	1-8 task numbers	System
i_wnSingleOEMStatusOp	Input	Word (0..7)	1-8 task status from OEM Logic	User
i_wnSeqStart	Input	Word (0..7)	1-8 task sequence start number	System
i_wnSeqStop	Input	Word (0..7)	1-8 task sequence stop number	System
i_bnReRunG	Input	Bit (0..7)	1-8 task rerun for good part configuration	System
i_bnReRunNG	Input	Bit (0..7)	1-8 task rerun for no good part configuration	System
i_wnMode	Input	Word (0..7)	1-8 task mode configuration	System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User

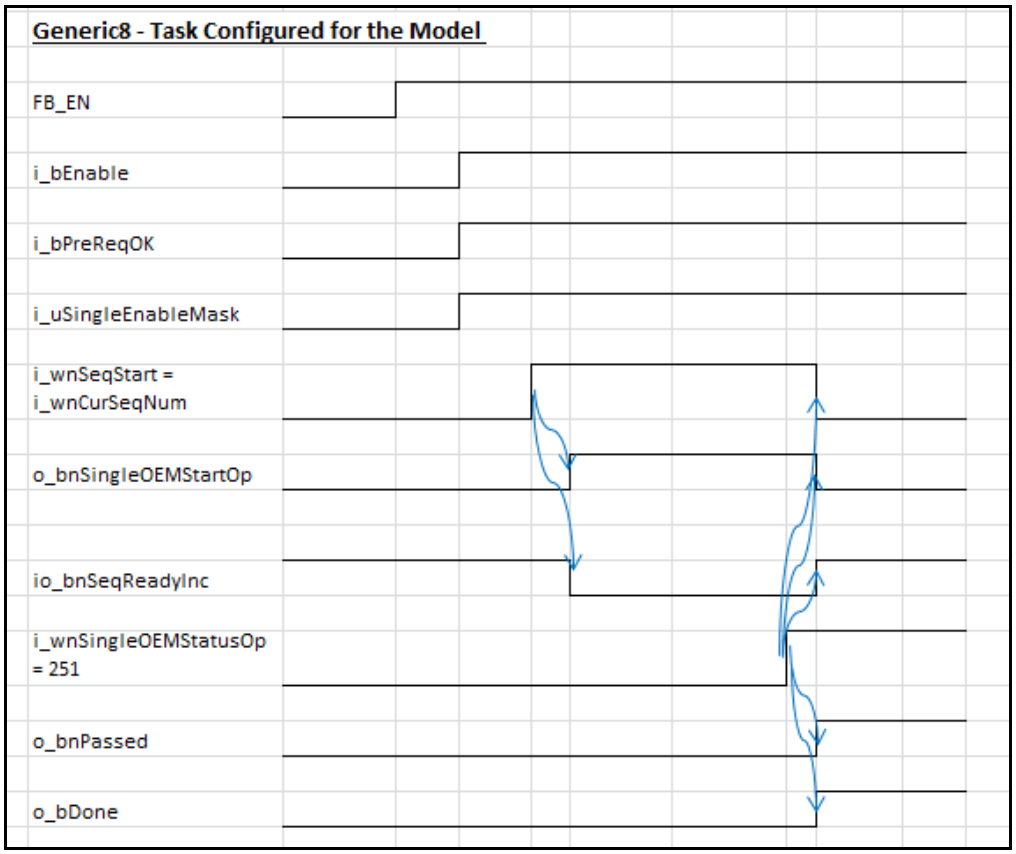
Identifier	Class	Type	Description	User/System
i_wnWorkPos	Input	Word (0..7)	Multi-Foot Print data for the Task from Configuration	System
i_wStatusNum	Input	Word	Specific status value assigned by General Motors	User
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bDone	Output	Bit	All Tasks are completed	User/System
o_bnPassed	Output	Bit (0..7)	1-8 tasks passed	User
o_bnFailed	Output	Bit (0..7)	1-8 tasks failed	User
o_bnSingleOEMStartOp	Output	Bit (0..7)	1-8 task start bit to OEM Logic	User
o_wCurSeqProgNum	Output	Word	Current Model Program Number for the current Sequence	User
o_dnStartTime	Output	DWord (0..7)	1-8 task start time	System
o_dnStopTime	Output	DWord (0..7)	1-8 task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2, H102 – if i_wStatusNum > 0	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.6.2. SDT data

Identifier	Data Type	Description
Lube.Op_Start	BIT(0..7)	To OEM Logic, OK to start Lubrication operation
Lube.Op_ProgNr	WORD(0..7)	To OEM Logic, Lubrication program number for operation
Lube.Task_Status	WORD(0..7)	Operation completion status code from OEM Logic
Lube.Done	Bit	To OEM Logic, all tasks complete
Lube.Pass	Bit(0..7)	To OEM Logic, each task Pass status
Lube.Fail	Bit(0..7)	To OEM Logic, each task
Lube.Op_ProgNum	WORD	To OEM Logic, Lubrication program number for operation

Identifier	Data Type	Description
Press.Op_Start	BIT(0..7)	To OEM Logic, OK to start Lubrication operation
Press.Op_ProgNr	WORD(0..7)	To OEM Logic, Lubrication program number for operation
Press.Task_Status	WORD(0..7)	Operation completion status code from OEM Logic
Press.Done	Bit	To OEM Logic, all tasks complete
Press.Pass	Bit(0..7)	To OEM Logic, each task Pass status
Press.Fail	Bit(0..7)	To OEM Logic, each task
Press.Op_ProgNum	WORD	To OEM Logic, Lubrication program number for operation

5.6.3. Timing Chart

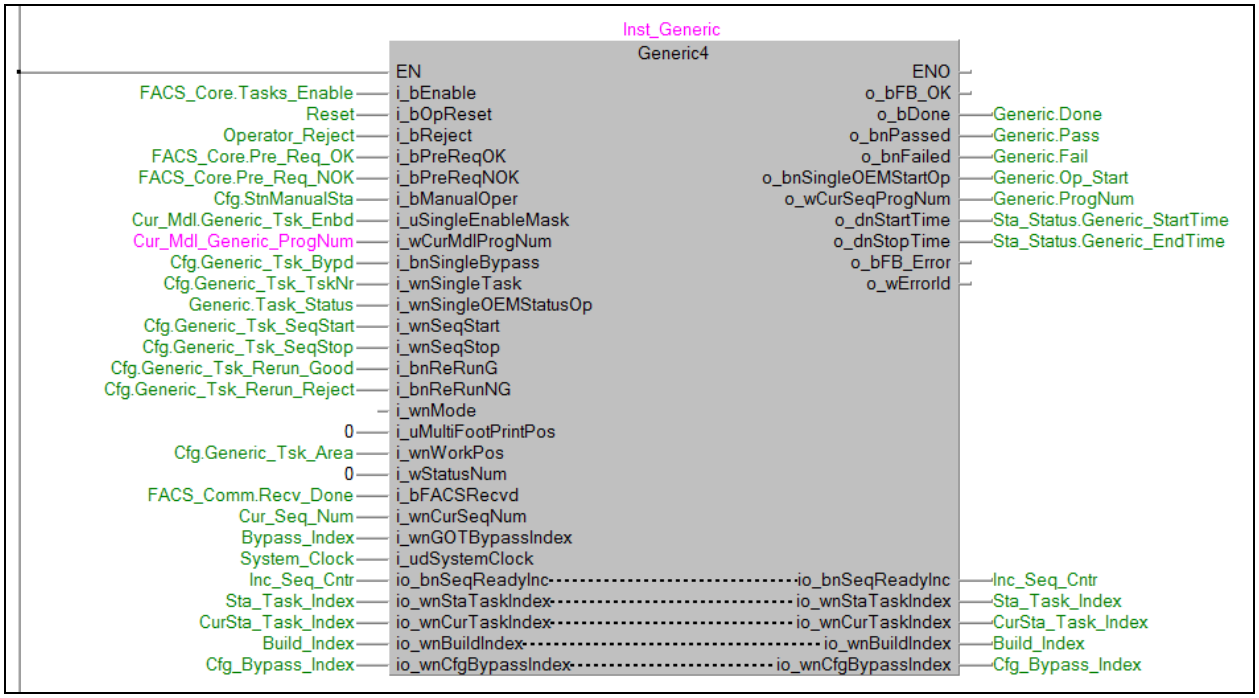


5.7 Robot/Generic Operation Tasks

Generic4 FB is called by certain programs, such as Robot and Universal. The purpose of Generic4 function block is to handle the system with 4 pre-assigned tasks.

5.7.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Generic4	Inst_Robot	V4.10	V4.02
Generic4	Inst_Generic	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	BIT	Manual operation option. Manual operation allows retry and operator reject.	System
i_uSingleEnableMask	Input	Unsigned Word	1-4 task enable configuration in word format	System
i_wCurMdlProgNum	Input	Word (0..3)	1-4 Current Model Program Numbers	System
i_bnSingleBypass	Input	Bit (0..3)	1-4 task bypass configuration	System
i_wnSingleTask	Input	Word (0..3)	1-4 task number	System
i_wnSingleOEMStatusOp	Input	Word (0..3)	1-4 task status from OEM Logic	User
i_wnSeqStart	Input	Word (0..3)	1-4 task sequence start number	System
i_wnSeqStop	Input	Word (0..3)	1-4 task sequence stop number	System
i_bnReRunG	Input	Bit (0..3)	1-4 task rerun for good part configuration	System
i_bnReRunNG	Input	Bit (0..3)	1-4 task rerun for no good part configuration	System
i_wnMode	Input	Word (0..3)	1-4 task mode configuration	System

Identifier	Class	Type	Description	User/System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wnWorkPos	Input	Word (0..3)	Multi-Foot Print data for the Task from Configuration	System
i_wStatusNum	Input	Word	Specific status value assigned by General Motors	User
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bDone	Output	Bit	Task is completed	User/System
o_bnPassed	Output	Bit (0..3)	All Tasks are completed	User
o_bnFailed	Output	Bit (0..3)	1-4 tasks passed	User
o_bnSingleOEMStartOp	Output	Bit (0..3)	1-4 tasks failed	User
o_wCurSeqProgNum	Output	Word	Current Model Program Number for current Sequence	User
o_dnStartTime	Output	DWord (0..3)	1-4 task start time	System
o_dnStopTime	Output	DWord (0..3)	1-4 task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2, H102 – if i_wStatusNum > 0	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System

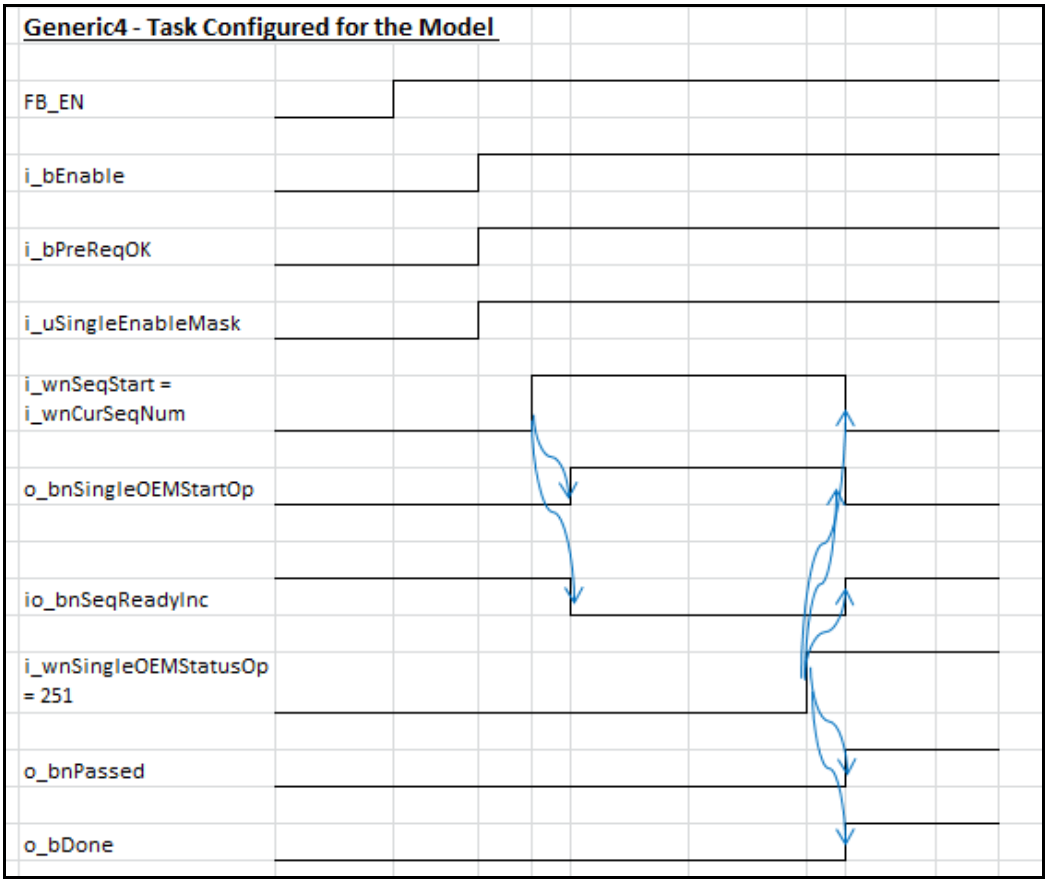
Identifier	Class	Type	Description	User/System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT "STATUS" – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT "BUILD" – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT "ENABLED" – Enabled, Single Bypass, Cont. Bypass	System

5.7.2. SDT data

Identifier	Data Type	Description
Robot.Op_Start	BIT(0..3)	To OEM Logic, OK to start Lubrication operation
Robot.Op_ProgNr	WORD(0..3)	To OEM Logic, Lubrication program number for operation
Robot.Task_Status	WORD(0..3)	Operation completion status code from OEM Logic
Robot.Done	Bit	To OEM Logic, all tasks complete
Robot.Pass	Bit(0..3)	To OEM Logic, each task Pass status
Robot.Fail	Bit(0..3)	To OEM Logic, each task
Robot.Op_ProgNum	WORD	To OEM Logic, Lubrication program number for operation

Identifier	Data Type	Description
Generic.Op_Start	BIT(0..3)	To OEM Logic, OK to start Lubrication operation
Generic.Op_ProgNr	WORD(0..3)	To OEM Logic, Lubrication program number for operation
Generic.Task_Status	WORD(0..3)	Operation completion status code from OEM Logic
Generic.Done	Bit	To OEM Logic, all tasks complete
Generic.Pass	Bit(0..3)	To OEM Logic, each task Pass status
Generic.Fail	Bit(0..3)	To OEM Logic, each task
Generic.Op_ProgNum	WORD	To OEM Logic, Lubrication program number for operation

5.7.3. Timing Chart

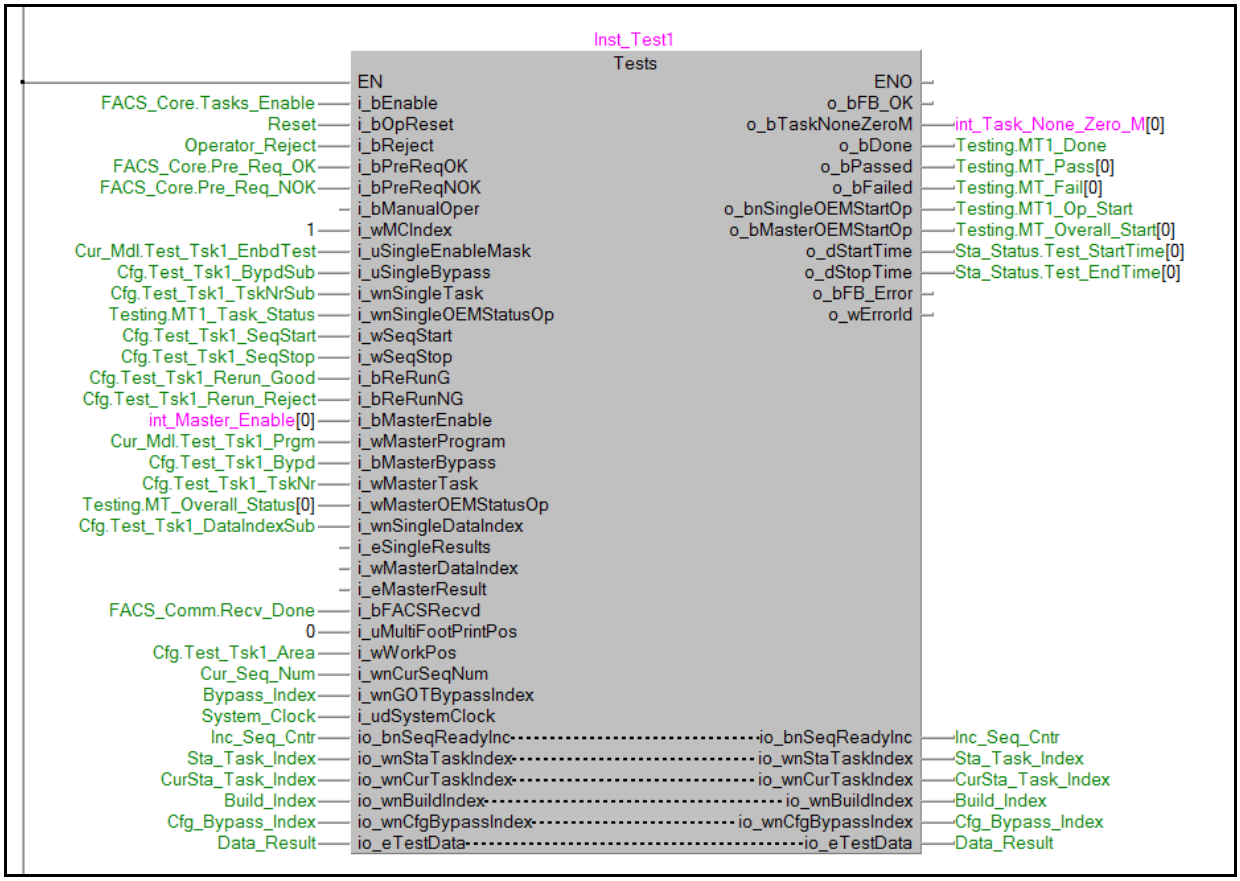


5.8 Test Operation Tasks

The purpose of this function blocks is to handle the tasks of test system.

5.8.1. Main Test Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Tests	Inst_Test1…Inst_Test4	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start Test tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	Bit	Manual operation option. Manual operation allows retry and operator reject.	System
i_wMCIndex	Input	Word	Internal index register reference number	User

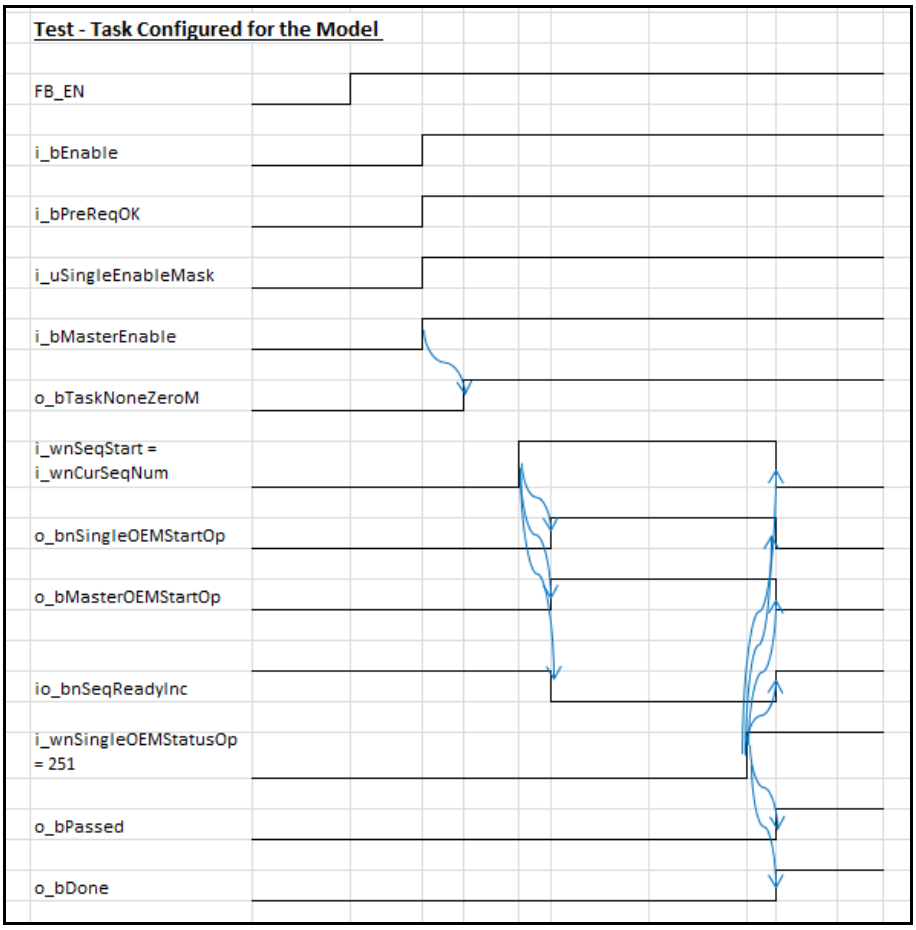
Identifier	Class	Type	Description	User/System
i_uSingleEnableMask	Input	Unsigned Word	1-8 sub task enable configuration in word format	System
i_uSingleBypass	Input	Unsigned Word	1-8 sub task bypass configuration in word format	System
i_wnSingleTask	Input	Word (0..7)	1-8 sub task numbers	System
i_wnSingleOEMStatusOp	Input	Word (0..7)	1-8 sub task status from OEM Logic	User
i_wnSeqStart	Input	Word	Task sequence start number	System
i_wnSeqStop	Input	Word	Task sequence stop number	System
i_bReRunG	Input	Bit	Task rerun for good part configuration	System
i_bReRunNG	Input	Bit	Task rerun for no good part configuration	System
i_bMasterEnable	Input	Bit	Master task enable configuration	System
i_wMasterProgram	Input	Word	Master task program configuration	System
i_bMasterBypass	Input	Bit	Master task bypass configuration	System
i_wMasterTask	Input	Word	Master task number	System
i_wMasterOEMStatusOp	Input	Word	Master task status from OEM Logic	User/System
i_wnSingleDataIndex	Input	Word (0..7)	io_eTestData address offset of sub task testing result	User/System
i_eSingleResults	Input	Float (0..7)	1-8 sub task testing result	User
i_wMasterDataIndex	Input	Word	io_eTestData address offset for master task testing result	User
i_eMasterResult	Input	Float	Master task testing result	User
i_bFACSRecvd	Input	Bit	FACS configuration received	
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wWorkPos	Input	Word	Multi-Foot Print data for the Task from Configuration	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System

Identifier	Class	Type	Description	User/System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bTaskNoneZeroM	Output	Bit	Master Task Configured	System
o_bDone	Output	Bit	Master Task is completed	User/System
o_bPassed	Output	Bit	Master Task passed – used for next auto task	User
o_bFailed	Output	Bit	Master Task failed – used for next auto task	User
o_bnSingleOEMStartOp	Output	Bit (0..7)	1-8 sub task start bit to OEM Logic	User
o_bMasterOEMStartOp	Output	Bit	Master task start bit to OEM Logic	User
o_dStartTime	Output	DWord	Task start time	System
o_dStopTime	Output	DWord	Task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2, = H102 - If i_wMCIndex input > 8 for Manual Operation, If i_wMCIndex input > 4 for Auto Operation	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System
io_eTestData	In/Out	Float (0..49)	Test Data storage for the work piece	User

5.8.2. SDT Data

Identifier	Data Type	Description
Testing.MT_Overall_Start	BIT(0..7)	To OEM Logic, OK to start testing master task operation
Testing.MT1_Op_Start	BIT(0..7)	To OEM Logic, OK to start testing 1 sub tasks operation
Testing.MT2_Op_Start	BIT(0..7)	To OEM Logic, OK to start testing 2 sub tasks operation
Testing.MT3_Op_Start	BIT(0..7)	To OEM Logic, OK to start testing 3 sub tasks operation
Testing.MT4_Op_Start	BIT(0..7)	To OEM Logic, OK to start testing 4 sub tasks operation
Testing.MT_Overall_ProgNr	WORD(0..7)	To OEM Logic, testing master task program number
Testing.MT1_Op_ProgNr	WORD(0..7)	To OEM Logic, testing 1 sub tasks program number
Testing.MT2_Op_ProgNr	WORD(0..7)	To OEM Logic, testing 2 sub tasks program number
Testing.MT3_Op_ProgNr	WORD(0..7)	To OEM Logic, testing 3 sub tasks program number
Testing.MT4_Op_ProgNr	WORD(0..7)	To OEM Logic, testing 4 sub tasks program number
Testing.MT_Overall_LowLimit	FLOAT(0..7)	To OEM Logic, low limit of testing master task
Testing.MT_Overall_HiLimit	FLOAT(0..7)	To OEM Logic, high limit of testing master task
Testing.MT1_LowLimit	FLOAT(0..7)	To OEM Logic, low limit of testing 1 sub tasks
Testing.MT2_LowLimit	FLOAT(0..7)	To OEM Logic, low limit of testing 2 sub tasks
Testing.MT3_LowLimit	FLOAT(0..7)	To OEM Logic, low limit of testing 3 sub tasks
Testing.MT4_LowLimit	FLOAT(0..7)	To OEM Logic, low limit of testing 4 sub tasks
Testing.MT1_HiLimit	FLOAT(0..7)	To OEM Logic, high limit of testing 1 sub tasks
Testing.MT2_HiLimit	FLOAT(0..7)	To OEM Logic, high limit of testing 2 sub tasks
Testing.MT3_HiLimit	FLOAT(0..7)	To OEM Logic, high limit of testing 3 sub tasks
Testing.MT4_HiLimit	FLOAT(0..7)	To OEM Logic, high limit of testing 4 sub tasks
Testing.MT_Overall_Status	WORD(0..7)	Testing master task operation completion status code
Testing.MT1_Task_Status	WORD(0..7)	Testing 1 sub tasks operation completion status code
Testing.MT2_Task_Status	WORD(0..7)	Testing 2 sub tasks operation completion status code
Testing.MT3_Task_Status	WORD(0..7)	Testing 3 sub tasks operation completion status code
Testing.MT4_Task_Status	WORD(0..7)	Testing 4 sub tasks operation completion status code

5.8.3. Timing Chart



5.9 Stitching Tool Tasks

The purpose of the function block is to handle the tasks of stitching tool.

5.9.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Stitch_Tool	Inst_Stitch_Tool	V4.10	V4.02

Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start Stitching Tool tasks	System
i_bOpReset	Input	Bit	Reset Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	Bit	Manual operation option. Manual operation allows retry and operator reject.	System
i_uSingleEnableMask	Input	Unsigned Word	1-8 task enable configuration in word format	System
i_wCurMdlProgNum	Input	Word (0..7)	1-8 Current Model Program Number	System

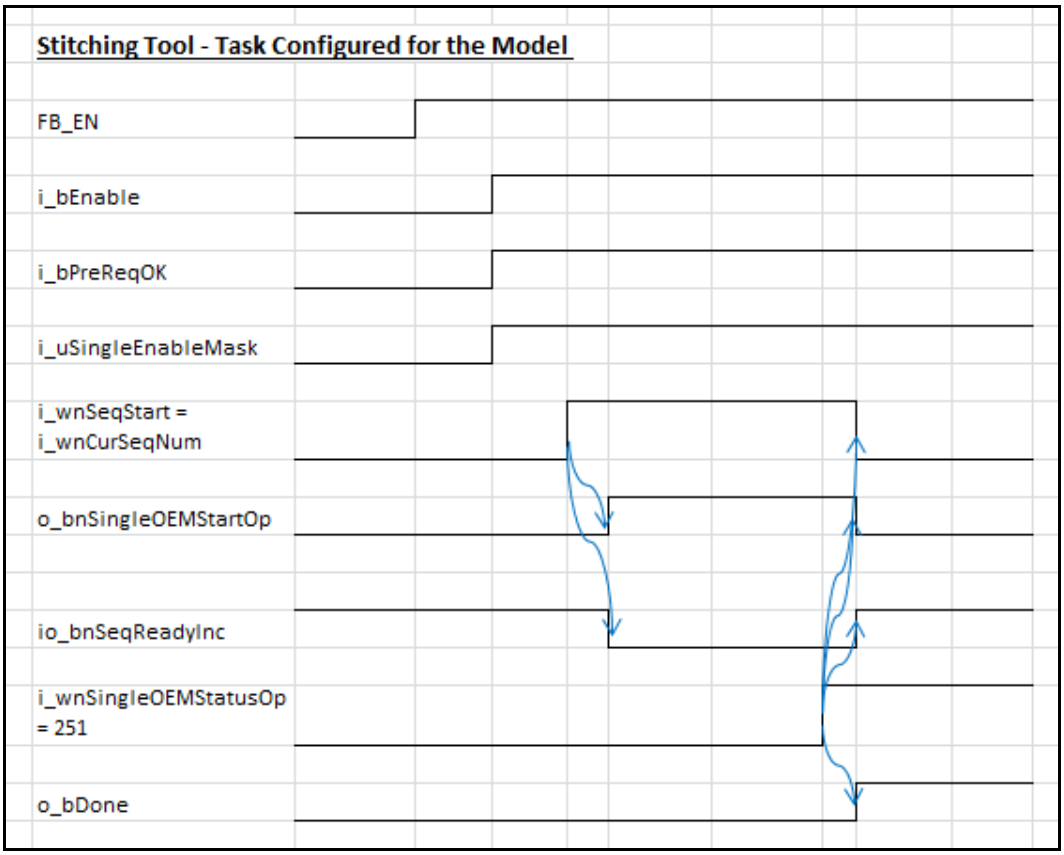
Identifier	Class	Type	Description	User/System
i_wCurMdlBoltCount	Input	Word (0..7)	1-8 Current Model Bolt Counts	System
i_bnSingleBypass	Input	Bit (0..7)	1-8 task bypass configuration	System
i_wnSingleTask	Input	Word (0..7)	1-8 task number	System
i_wnSingleOEMStatusOp	Input	Word (0..7)	1-8 task status from OEM Logic	User
i_wnSeqStart	Input	Word (0..7)	1-8 task sequence start number	System
i_wnSeqStop	Input	Word (0..7)	1-8 task sequence stop number	System
i_bnReRunG	Input	Bit (0..7)	1-8 task rerun for good part configuration	System
i_bnReRunNG	Input	Bit (0..7)	1-8 task rerun for no good part configuration	System
i_wnMode	Input	Word (0..7)	1-8 task mode configuration	System
i_bBackup1Start	Input	Bit	1st backup tool start	User/System
i_wBackup1Status	Input	Word	Status of 1st backup tool	User/System
i_bBackup1Comp	Input	Bit	1st backup tool completion	User/System
i_bBackup2Start	Input	Bit	2nd backup tool start	User/System
i_wBackup2Status	Input	Word	Status of 2nd backup tool	User/System
i_bBackup2Comp	Input	Bit	2nd backup tool completion	User/System
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wnWorkPos	Input	Word (0..7)	Multi-Foot Print data for the Task from Configuration	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	1-8 task start bit to OEM Logic	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bDone	Output	Bit	All Tasks are completed	User/System
o_bnSingleOEMStartOp	Output	Bit (0..7)	1-8 task start bit to OEM Logic	User
o_dnStartTime	Output	DWord (0..7)	1-8 task start time	System

Identifier	Class	Type	Description	User/System
o_dnStopTime	Output	DWord (0..7)	1-8 task stop time	System
o_bBkpStart1	Output	Bit	Stitching Tool 1 is a backup tool	User/System
o_bBkpStart2	Output	Bit	Stitching Tool 2 is a backup tool	User/System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.9.2. SDT data

Identifier	Data Type	Description
StitchTool.Op_Start	BIT(0..7)	To OEM Logic, OK to start Stitching Tool operation
StitchTool.Op_ProgNr	WORD	To OEM Logic, Stitch Tool program number for operation
StitchTool.Op_BoltCnt	WORD	To OEM Logic, bolt count of operation
StitchTool.Task_Active	Bit(0..7)	Task active status to eHMI Task screen
StitchTool.Task_Status	WORD(0..7)	Operation completion status code from OEM
StitchTool.Done	Bit	To OEM Logic, All tasks completion status
StitchTool.Bkpstart	Bit(0..2)	To Stitch Tool Backup Task enable bit
StitchTool.Op_ProgNUm	WORD	To OEM Logic, Stitch Tool program number for operation
StitchTool.Op_BoltCnt	WORD	To OEM Logic, bolt count of operation

5.9.3. Timing Chart

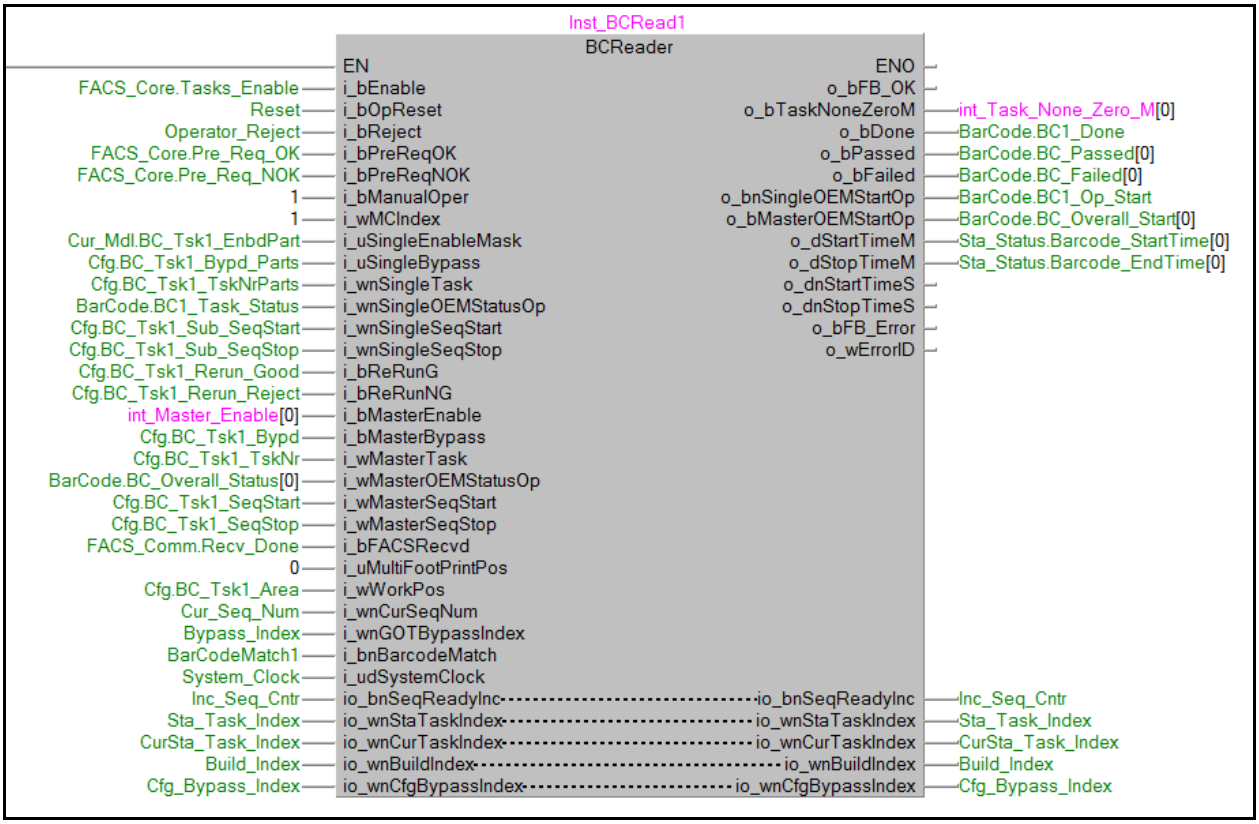


5.10 Error Proofing Barcode Tasks

The purpose of this function blocks is to handle the tasks of barcode reader system.

5.10.1. Main EP Barcode Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
BCReader	Inst_BCRead1	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start BCReader tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	Bit	Manual operation option. Manual operation allows retry and operator reject.	System
i_wMCIndex	Input	Word	Internal index register reference number	User
i_uSingleEnableMask	Input	Unsigned Word	1-10 sub task enable configuration in word format	System

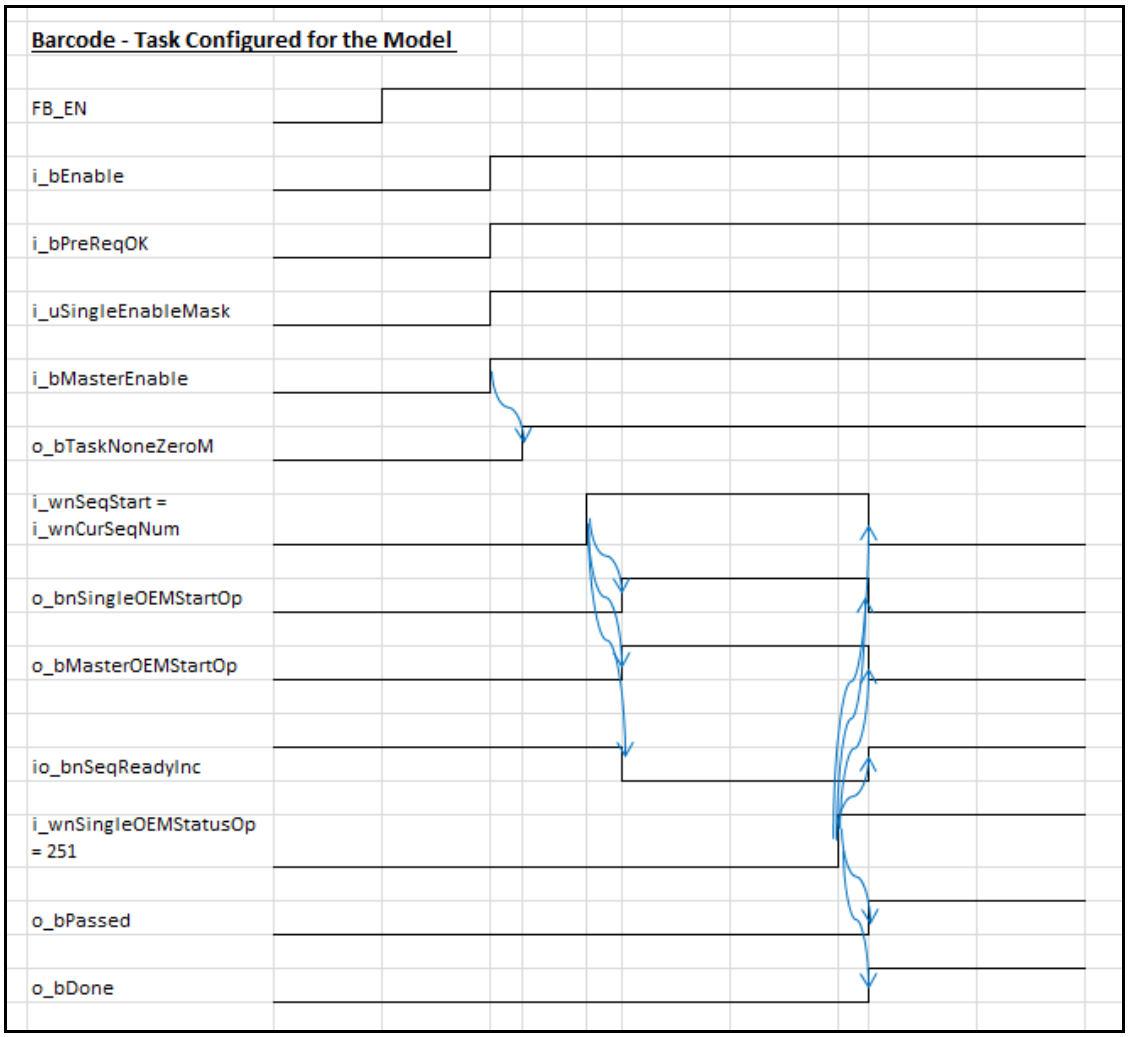
Identifier	Class	Type	Description	User/System
i_uSingleBypass	Input	Unsigned Word	1-10 sub task bypass configuration in word format	System
i_wnSingleTask	Input	Word (0..9)	1-10 sub task number	System
i_wnSingleOEMStatusOp	Input	Word (0..9)	1-10 sub task status from OEM Logic	User
i_wnSingleSeqStart	Input	Word (0..9)	Sub task sequence start number	System
i_wnSingleSeqStop	Input	Word (0..9)	Sub task sequence stop number	System
i_bReRunG	Input	Bit	Task rerun for good part configuration	System
i_bnReRunNG	Input	Bit	Task rerun for no good part configuration	System
i_bMasterEnable	Input	Bit	Master task enable configuration	System
i_bMasterBypass	Input	Bit	Master task bypass configuration	System
i_wMasterTask	Input	Word	Master task number	System
i_wMasterOEMStatusOp	Input	Word	Master task status from OEM Logic	User/System
i_wMasterSeqStart	Input	Word	Master task sequence start number	System
i_wMasterSeqStop	Input	Word	Master task sequence stop number	System
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wWorkPos	Input	Word	Multi-Foot Print data for the Task from Configuration	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_bnBarcodeMatch	Input	Bit (0..9)	Barcode scan Match with configured string	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bTaskNoneZeroM	Output	Bit	Master Task Configured	System
o_bDone	Output	Bit	All Tasks are completed	User/System

Identifier	Class	Type	Description	User/System
o_bPassed	Output	Bit	Master Task passed – used for next auto task	User
o_bFailed	Output	Bit	Master Task failed – used for next auto task	User
o_bnSingleOEMStartOp	Output	Bit (0..9)	1-10 sub task start bit to OEM Logic	User
o_bMasterOEMStartOp	Output	Bit	Master task start bit to OEM Logic	User
o_dStartTimeM	Output	DWord	Master task start time	System
o_dStopTimeM	Output	DWord	Master task stop time	System
o_dStartTimeS	Output	DWord (0..9)	1-10 task start time	System
o_dStopTimeS	Output	DWord (0..9)	1-10 task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code H101 – If i_uMultiFootPrintPos input > 2, H102 - i_wMCIndex input > 2	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.10.2. SDT Data

Identifier	Data Type	Description
BarCode.BC_Overall_Start	BIT(0..1)	To OEM Logic, OK to start Barcode master task operation
BarCode.BC1_Op_Start	BIT(0..9)	To OEM Logic, OK to start Barcode 1 sub tasks operation
BarCode.BC2_Op_Start	BIT(0..9)	To OEM Logic, OK to start Barcode 2 sub tasks operation
BarCode.BC1_String_Start	WORD(0..9)	To OEM Logic, Barcode 1 string start location
BarCode.BC1_String_Len	WORD(0..9)	To OEM Logic, Barcode 1 string start length
BarCode.BC2_String_Start	WORD(0..9)	To OEM Logic, Barcode 2 string start location
BarCode.BC2_String_Len	WORD(0..9)	To OEM Logic, Barcode 2 string start length
BarCode.BC_Overall_Status	WORD(0..1)	Barcode master task operation completion status code
BarCode.BC1_Task_Status	WORD(0..9)	Barcode 1 sub tasks operation completion status code
BarCode.BC2_Task_Status	WORD(0..9)	Barcode 2 sub tasks operation completion status code

5.10.3. Timing Chart

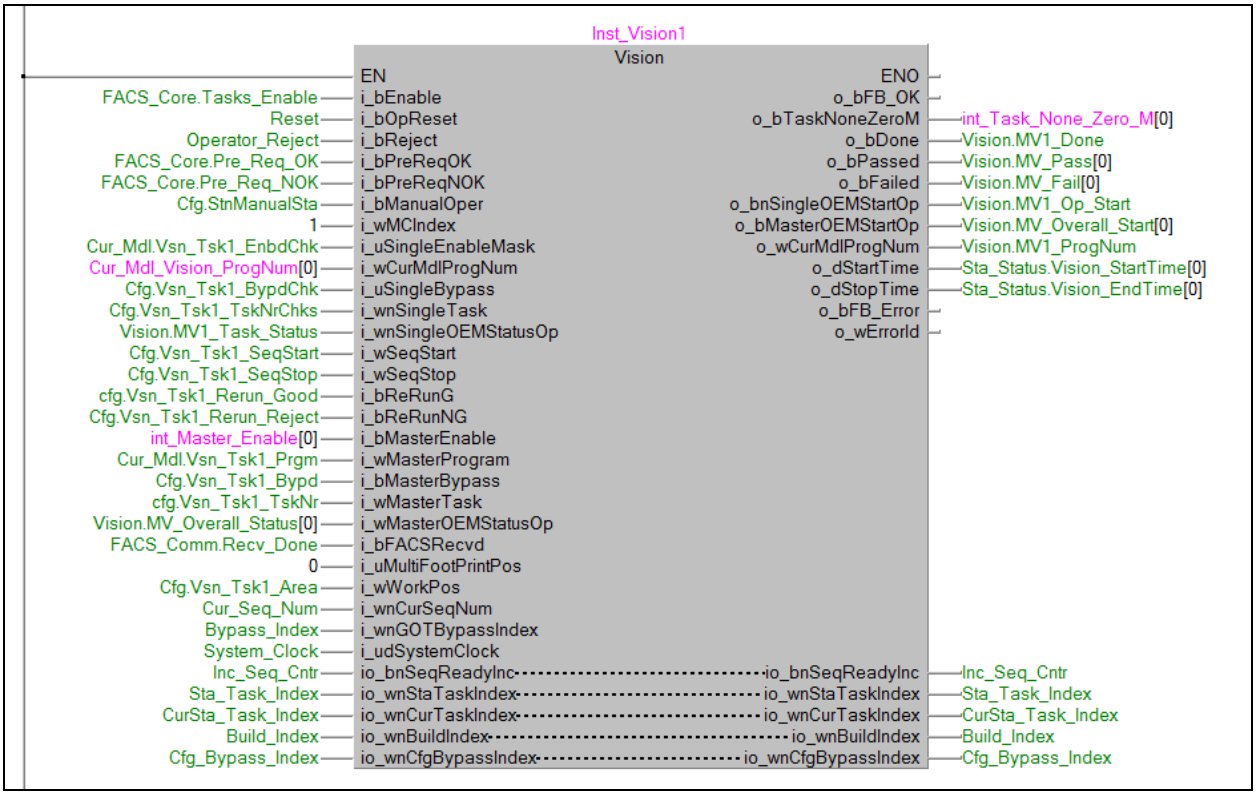


5.11 Error Proofing Vision Tasks

The purpose of this function block is to handle the tasks of vision and camera system.

5.11.1. Vision Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
Vision	Inst_Vision1…. Inst_Vision4	V4.10	V4.02



Identifier	Class	Type	Description	
i_bEnable	Input	Bit	Conditions to start Vision tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	Bit	Manual operation option. Manual operation allows retry and operator reject.	System
i_wMCIndex	Input	Word	Internal index register reference number	User
i_uSingleEnableMask	Input	Unsigned Word	1-16 sub task enable configuration in word format	System

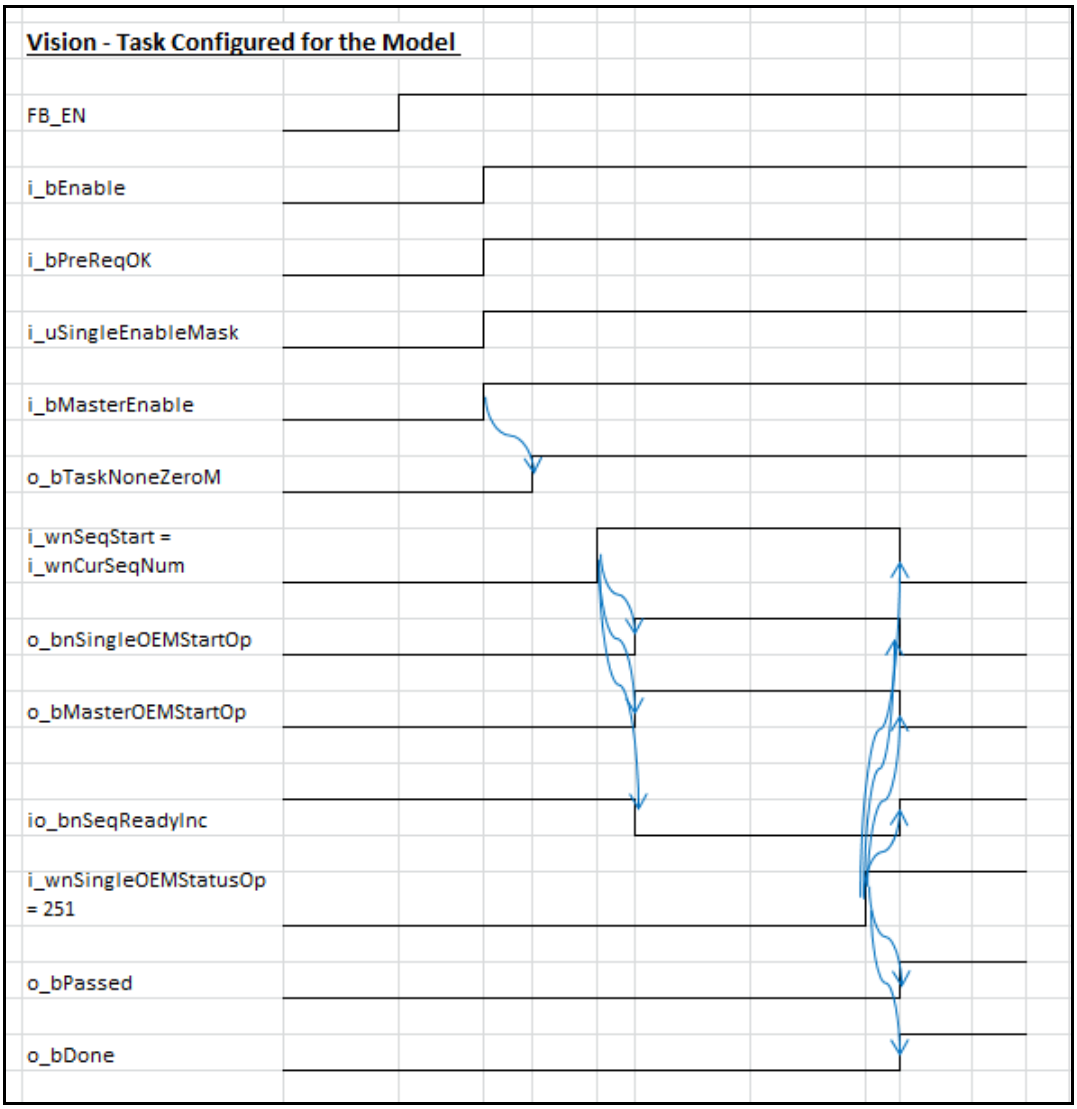
Identifier	Class	Type	Description	
i_wCurMdlProgNum	Input	Word	Current Model Program Number	System
i_uSingleBypass	Input	Unsigned Word	1-16 sub task bypass configuration in word format	System
i_wnSingleTask	Input	Word (0..15)	1-16 sub task numbers	System
i_wnSingleOEMStatusOp	Input	Word (0..15)	1-16 sub task status from OEM Logic	User
i_wnSeqStart	Input	Word	Sub task sequence start number	System
i_wnSeqStop	Input	Word	Sub task sequence stop number	System
i_bnReRunG	Input	Bit	Task rerun for good part configuration	System
i_bnReRunNG	Input	Bit	Task rerun for no good part configuration	System
i_bMasterEnable	Input	Bit	Master task enable configuration	System
i_wMasterProgram	Input	Word	Master task program configuration	System
i_bMasterBypass	Input	Bit	Master task bypass configuration	System
i_wMasterTask	Input	Word	Master task number	System
i_wMasterOEMStatusOp	Input	Word	Master task status from OEM Logic	User/System
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wWorkPos	Input	Word (0..7)	Multi-Foot Print data for the Task from Configuration	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bTaskNoneZeroM	Output	Bit	Master Task Configured	System
o_bDone	Output	Bit	Master Task is completed	User/System
o_bPassed	Output	Bit	Master Task passed – used for next auto task	User
o_bFailed	Output	Bit	Master Task failed – used for next auto task	User

Identifier	Class	Type	Description	
o_bnSingleOEMStartOp	Output	Bit (0..15)	1-16 sub task start bit to OEM Logic	User
o_bMasterOEMStartOp	Output	Bit	Master task start bit to OEM Logic	User
o_dStartTime	Output	DWord	Master task start time	System
o_dStopTime	Output	DWord	Master task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2, = H102 - If i_wMCIndex input > 10 for Manual Operation, If i_wMCIndex input > 4 for Auto Operation	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.11.2. SDT Data

Identifier	Data Type	Description
Vision.MV_Overall_Start	BIT(0..9)	To OEM Logic, OK to start Vision master task operation
Vision.MV1_Op_Start	BIT(0..15)	To OEM Logic, OK to start Vision 1 sub tasks operation
Vision.MV2_Op_Start	BIT(0..15)	To OEM Logic, OK to start Vision 2 sub tasks operation
Vision.MV3_Op_Start	BIT(0..15)	To OEM Logic, OK to start Vision 3 sub tasks operation
Vision.MV4_Op_Start	BIT(0..15)	To OEM Logic, OK to start Vision 4 sub tasks operation
Vision.MV_Overall_ProgNr	WORD(0..9)	To OEM Logic, Vision master task program number
Vision.MV1_Op_ProgNr	WORD(0..15)	To OEM Logic, Vision 1 sub tasks program number
Vision.MV2_Op_ProgNr	WORD(0..15)	To OEM Logic, Vision 2 sub tasks program number
Vision.MV3_Op_ProgNr	WORD(0..15)	To OEM Logic, Vision 3 sub tasks program number
Vision.MV4_Op_ProgNr	WORD(0..15)	To OEM Logic, Vision 4 sub tasks program number
Vision.MV_Overall_Status	WORD(0..9)	Vision master task operation completion status code
Vision.MV1_Task_Status	WORD(0..15)	Vision 1 sub tasks operation completion status code
Vision.MV2_Task_Status	WORD(0..15)	Vision 2 sub tasks operation completion status code
Vision.MV3_Task_Status	WORD(0..15)	Vision 3 sub tasks operation completion status code
Vision.MV4_Task_Status	WORD(0..15)	Vision 4 sub tasks operation completion status code

5.11.3. Timing Chart

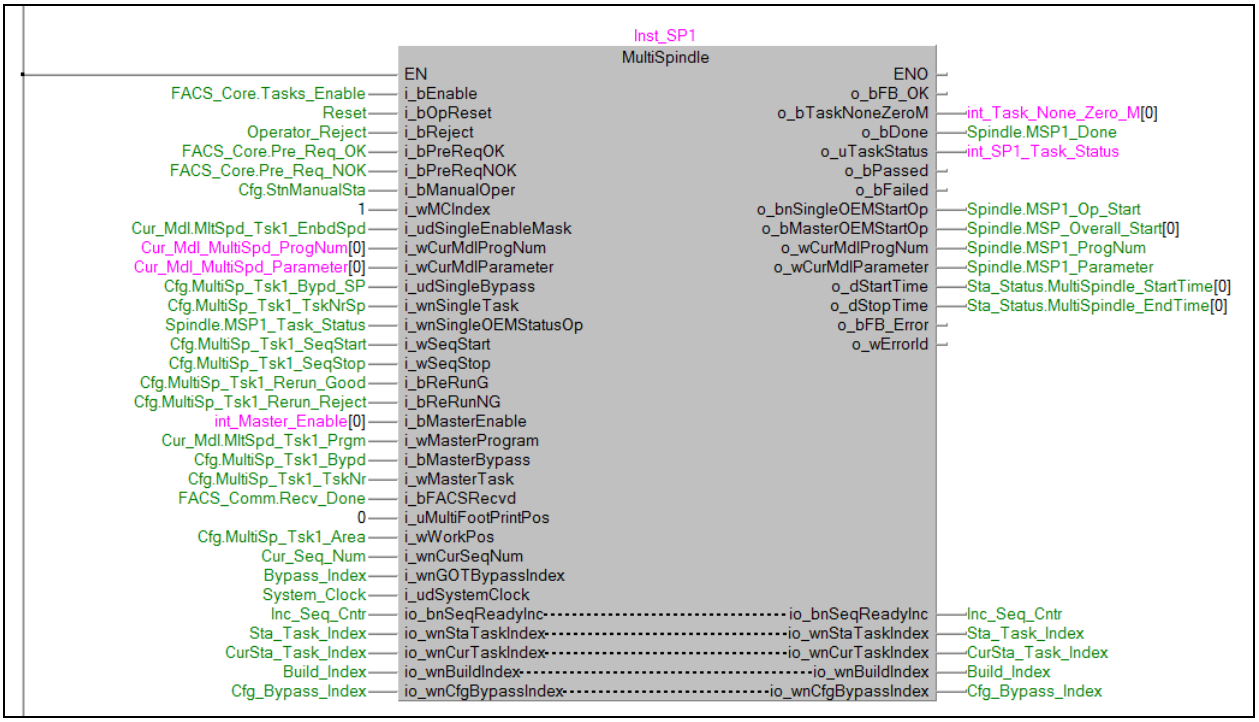


5.12 Multi-Spindle Tasks

The purpose of this function block is to handle the tasks of multiple spindles system.

5.12.1. MultiSpindle Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
MultiSpindle	Inst_SP1… Inst_SP2	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start multi-spindle tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	Bit	Manual operation option. Manual operation allows retry and operator reject.	System
i_wMCIndex	Input	Word	Internal index register reference number	User
i_udSingleEnableMask	Input	Unsigned DWord	1-32 sub task enable configuration in word format	System
i_wCurMdlProgNum	Input	Word	Current Model Program Number	System
i_wCurMdlParameter	Input	Word	Current Model Parameter Number	System

Identifier	Class	Type	Description	User/System
i_udSingleBypass	Input	Unsigned DWord	1-32 sub task bypass configuration in word format	System
i_wnSingleTask	Input	Word (0..31)	1-32 sub task numbers	System
i_wnSingleOEMStatusOp	Input	Word (0..31)	1-32 sub task status from OEM Logic	User
i_wnSeqStart	Input	Word	Master task sequence start number	System
i_wnSeqStop	Input	Word	Master task sequence stop number	System
i_bnReRunG	Input	Bit	Task rerun for good part configuration	System
i_bnReRunNG	Input	Bit	Task rerun for no good part configuration	System
i_bMasterEnable	Input	Bit	Master task enable configuration	System
i_wMasterProgram	Input	Word	Master task program configuration	System
i_bMasterBypass	Input	Bit	Master task bypass configuration	System
i_wMasterTask	Input	Word	Master task number	System
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wWorkPos	Input	Word	Multi-Foot Print data for the Task from Configuration	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bTaskNoneZeroM	Output	Bit	Master Task Configured	System
o_bDone	Output	Bit	Master Task is completed	User/System
o_uTaskStatus	Output	Unsigned Word (0..31)	1-32 Task Status	System
o_bPassed	Output	Bit	Master Task passed – used for next auto task	User

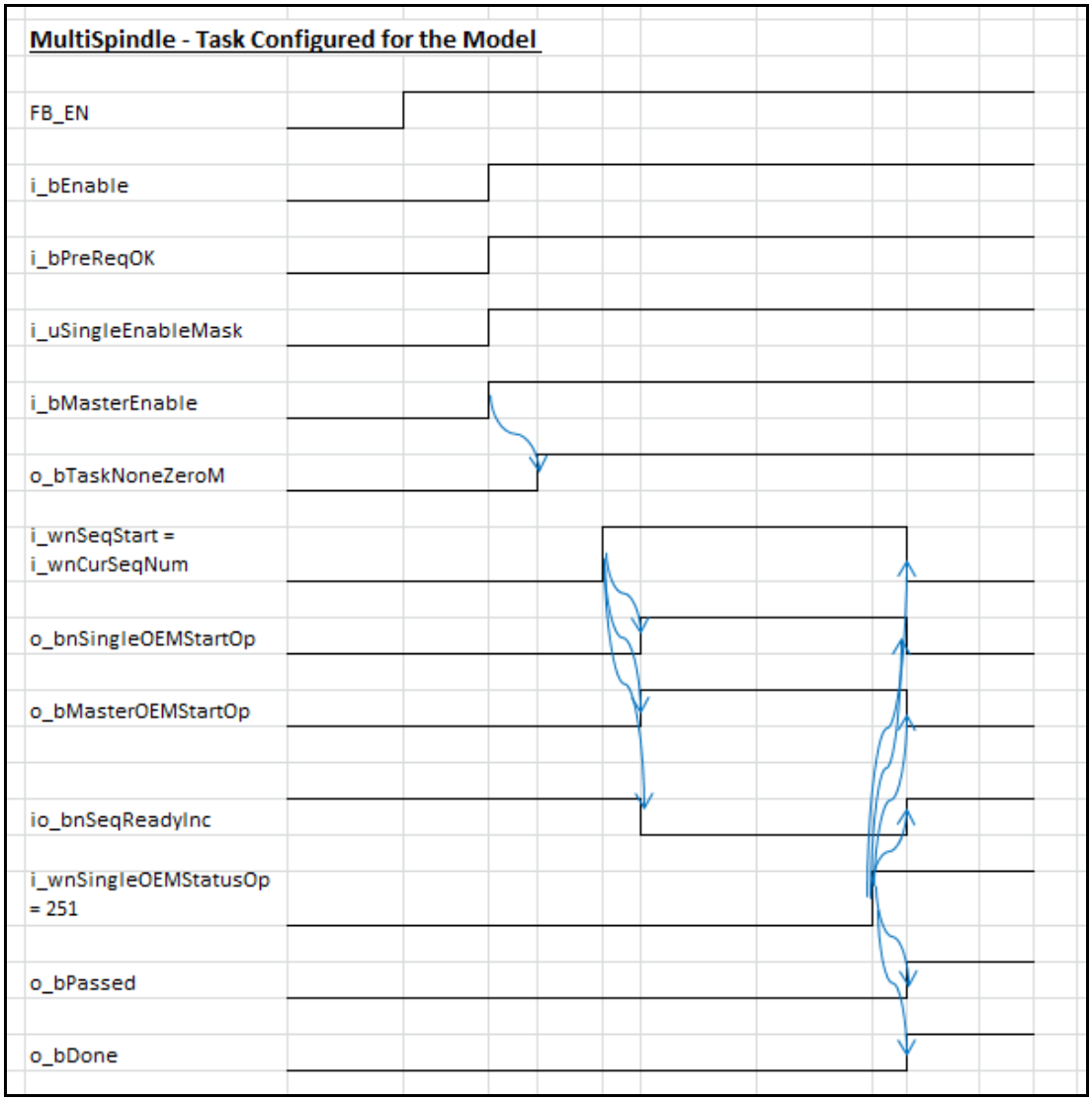
Identifier	Class	Type	Description	User/System
o_bFailed	Output	Bit	Master Task failed – used for next auto task	User
o_bnSingleOEMStartOp	Output	Bit (0..31)	1-32 sub task start bit to OEM Logic	User
o_bMasterOEMStartOp	Output	Bit	Master task start bit to OEM Logic	User
o_wCurMdlProgNum	Output	Word	Current Model Program Number	User
o_wCurMdlParameter	Output	Word	Current Model Parameter Number	User
o_dStartTime	Output	DWord	Master Task start time	System
o_dStopTime	Output	DWord	Master Task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2, H102 - If i_wMCIndex input > 4	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT "STATUS" – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT "BUILD" – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT "ENABLED" – Enabled, Single Bypass, Cont. Bypass	System

5.12.2. SDT Data

Identifier	Data Type	Description
Spindle.MSP1_Overall_Start	BIT(0..3)	To OEM Logic, OK to start Spindle master task operation
Spindle.MSP1_Op_Start	BIT(0..31)	To OEM Logic, OK to start Spindle 1 sub tasks operation
Spindle.MSP2_Op_Start	BIT(0..31)	To OEM Logic, OK to start Spindle 2 sub tasks operation
Spindle.MSP3_Op_Start	BIT(0..31)	To OEM Logic, OK to start Spindle 3 sub tasks operation
Spindle.MSP4_Op_Start	BIT(0..31)	To OEM Logic, OK to start Spindle 4 sub tasks operation
Spindle.MSP_Overall_ProgNr	WORD (0..3)	To OEM Logic, Spindle master task program number
Spindle.MSP1_Op_ProgNr	WORD(0..31)	To OEM Logic, Spindle 1 sub tasks program number
Spindle.MSP2_Op_ProgNr	WORD(0..31)	To OEM Logic, Spindle 2 sub tasks program number
Spindle.MSP3_Op_ProgNr	WORD(0..31)	To OEM Logic, Spindle 3 sub tasks program number
Spindle.MSP4_Op_ProgNr	WORD(0..31)	To OEM Logic, Spindle 4 sub tasks program number
Spindle.MSP_Overall_Status	WORD(0..3)	Spindle master task operation completion status code

Identifier	Data Type	Description
Spindle.MSP1_Task_Status	WORD(0..31)	Spindle 1 sub tasks operation completion status code
Spindle.MSP2_Task_Status	WORD(0..31)	Spindle 2 sub tasks operation completion status code
Spindle.MSP3_Task_Status	WORD(0..31)	Spindle 3 sub tasks operation completion status code
Spindle.MSP4_Task_Status	WORD(0..31)	Spindle 4 sub tasks operation completion status code

5.12.3. Timing Chart

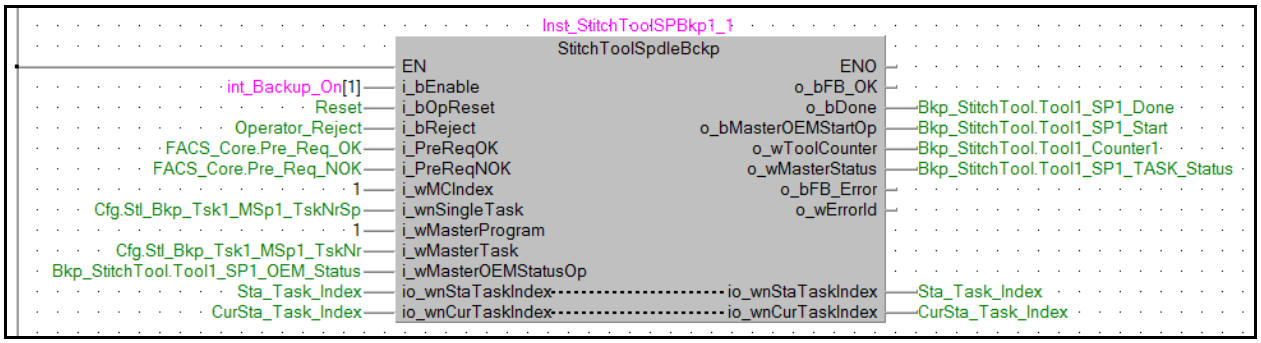


5.13 Backup Hand Tool Tasks

The purpose of this function block is to handle the tasks of backup stitching tool.

5.13.1. Individual Backup Hand Tool Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
StitchToolSpdleBckp	Inst_StitchToolSPBkp1_1	V4.10	V4.02
StitchToolSpdleBckp	Inst_StitchToolSPBkp1_2	V4.10	V4.02
StitchToolSpdleBckp	Inst_StitchToolSPBkp2_1	V4.10	V4.02
StitchToolSpdleBckp	Inst_StitchToolSPBkp2_2	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start Backup Hand Tool tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_wMCIndex	Input	Word	Internal index register reference number	User
i_wnSingleTask	Input	Word (0..31)	1-32 sub task numbers	System
i_wMasterProgram	Input	Word	Master task program configuration	User
i_wMasterTask	Input	Word	Master task number	System
i_wMasterOEMStatusOp	Input	Word	Master task status from OEM Logic	User
o_bFB_OK	Output	Bit	Function Block OK	User
o_bDone	Output	Bit	Task is completed	User/System
o_bMasterOEMStartOp	Output	Bit	Master task start bit to OEM Logic	User/System
o_wToolCounter	Output	Word	Number of bolts to be fixed for backup	User
o_wMasterStatus	Output	Word	Tool Status that needs to be feedback to Stitching Tool FB.	User

Identifier	Class	Type	Description	User/System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – If i_wMCIndex input > 3	User
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT "STATUS" – Started, Accept, Reject, Rerun	System

5.13.2. SDT Data

Identifier	Data Type	Description
Bkp_StitchTool.Tool1_Start	BIT(0..3)	To OEM Logic, OK to start Backup_Tool 1 master task operation
Bkp_StitchTool.Tool2_Start	BIT(0..3)	To OEM Logic, OK to start Backup_Tool 2 master task operation
Bkp_StitchTool.Tool1_Counter	WORD(0..3)	To OEM Logic, count of Tool 1 for sub tasks operation
Bkp_StitchTool.Tool2_Counter	WORD(0..3)	To OEM Logic, count of Tool 2 for sub tasks operation
Bkp_StitchTool.Tool1_Status	WORD(0..3)	Backup_Tool 1 master task operation completion status code
Bkp_StitchTool.Tool2_Status	WORD(0..3)	Backup_Tool 2 master task operation completion status code

5.14 Generic Backup Tasks

The purpose of this function block is to handle the tasks of backup tasks by operator without Tools.

5.14.1. Individual Backup Hand Tool Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
StitchToolSpdleBckp	Inst_Generic_Backup1	V4.10	
StitchToolSpdleBckp	Inst_Generic_Backup2	V4.10	

Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_bManualOper	Input	BIT	Manual operation option. Manual operation allows retry and operator reject.	System
I_wMCIndex	Input	Word	Internal index register reference number	User
i_uSingleEnableMask	Input	Unsigned Word	1-2 task enable configuration in word format	System
i_wnCurMdlProgNum	Input	Word (0..1)	1-2 Current Model Program Numbers	System
I_wnCurMdlParam	Input	Float(0..1)	1-2 Current Model Parameters	
i_bnSingleBypass	Input	Bit (0..15)	1-2 task bypass configuration	System
i_wnSingleTask	Input	Word (0..1)	1-2 task number	System

Identifier	Class	Type	Description	User/System
i_wnSeqStart	Input	Word (0..1)	1-2 task sequence start number	System
i_wnSeqStop	Input	Word (0..1)	1-2 task sequence stop number	System
i_bnReRunG	Input	Bit (0..15)	1-2 task rerun for good part configuration	System
i_bnReRunNG	Input	Bit (0..15)	1-2 task rerun for no good part configuration	System
i_wnMode	Input	Word (0..1)	1-2 task mode configuration	System
i_wnBkpMasterTask	Input	Word(0..7)	1-8 Master Task Number to be Back Up	System
i_wn_nBkpSubTask	Input	Word(0..7,0..15)	1-16 Sub Tasks for 1-8 Master Tasks to be Back Up	System
i_wSelectedTask	Input	Word	Selected Task Number from eHMI	System
i_bBackupAllowed	Input	Bit	Config setting for Task is Allowed for Backup	System
i_bAccept	Input	Bit	Accept PB	User
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wnWorkPos	Input	Word (0..1)	Multi-Foot Print data for the Task from Configuration	System
i_wStatusNum	Input	Word	Specific status value assigned by General Motors	User
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bDone	Output	Bit	Task is completed	User/System
o_bnPassed	Output	Bit	All Tasks are completed	User
o_bnFailed	Output	Bit	1-4 tasks passed	User
o_bnSingleOEMStartOp	Output	Bit	1-4 tasks failed	User
o_wRepairCounter	Output	Word(0..7)	Overall Tasks to be Repaired for all Master Task and SubTasks	User

Identifier	Class	Type	Description	User/System
o_wAcceptCounter	Output	Word(0..7)	Overall Tasks Accepted for all Master Task and SubTasks	User
o_wCurSeqProgNum	Output	Word	Current Model Program Number for current Sequence	User
o_wCurSeqParam	Output	Float	Current Model and Current Seq Start Robot Tool Parameter	User
o_dnStartTime	Output	DWord	1-4 task start time	System
o_dnStopTime	Output	DWord	1-4 task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 – if i_uMultiFootPrintPos input > 2, H102 – if i_wStatusNum > 0	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.14.2. SDT Data

Identifier	Data Type	Description
Bkp_Generic.Op_Start	BIT(0..1)	To OEM Logic, OK to start Generic task operation
Bkp_Generic.Task_Status	WORD(0..1)	Generic task operation completion status code
Bkp_Generic.Done	BIT(0..1)	Generic Task operation Completion
Bkp_Generic.Pass	BIT(0..1)	Generic Task operation Completion - Passed
Bkp_Generic.Fail	BIT(0..1)	Generic Task operation Completion - Fail
Bkp_Generic. ProgNum	WORD(0..1)	Generic Task current Program Number
Bkp_Generic. Parameter	FLOAT0..1)	Generic Task current Parameter

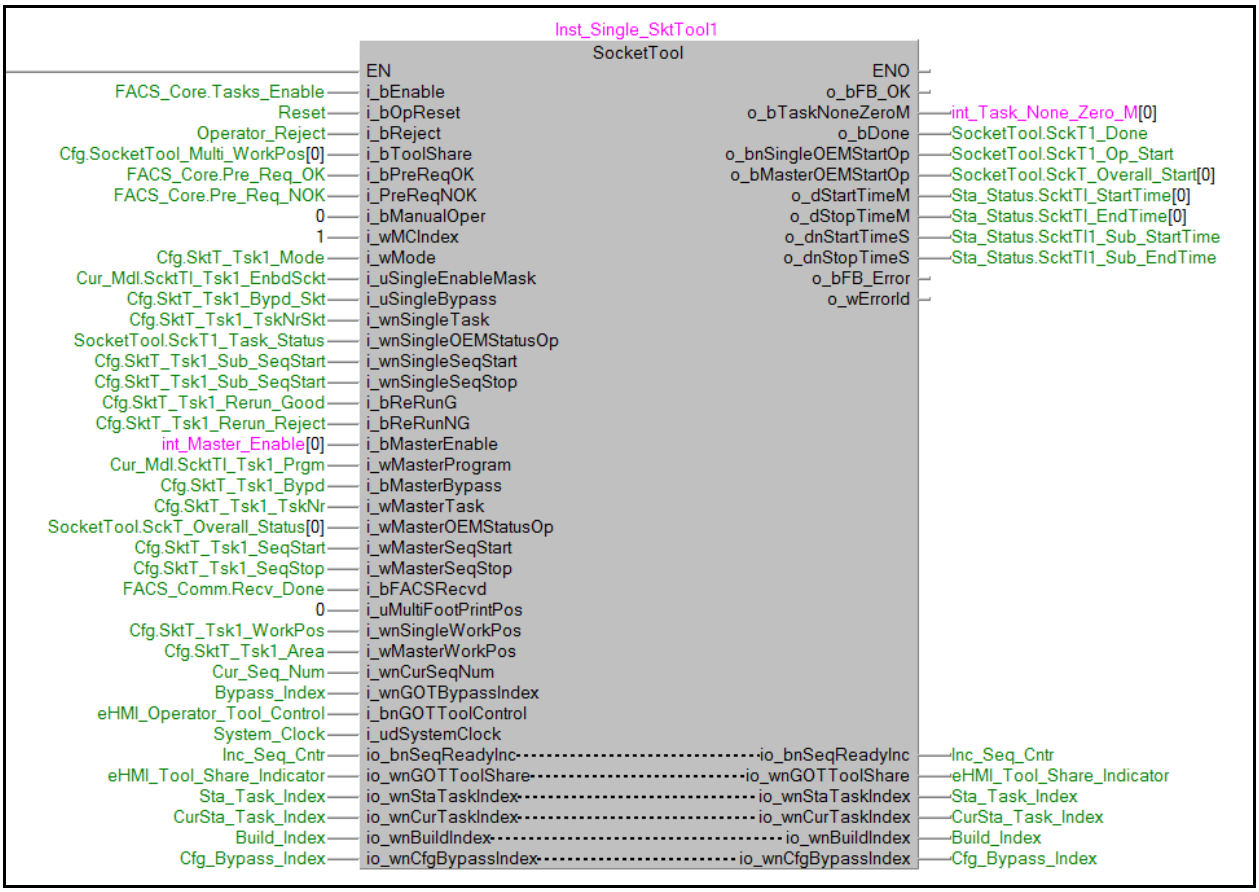
Identifier	Data Type	Description
Bkp_Generic. TotalBkpTask1RepairCounter	WORD(0..7)	To OEM Logic, count of Task 1 for Repair Counter
Bkp_Generic. TotalBkpTask2RepairCounter	WORD(0..7)	To OEM Logic, count of Task 2 for Repair Counter
Bkp_Generic. TotalBkpTask1AcceptCounter	WORD(0..7)	To OEM Logic, count of Task 1 for Accept Counter
Bkp_Generic. TotalBkpTask2AcceptCounter	WORD(0..7)	To OEM Logic, count of Task 2 for Accept Counter

5.15 Stitching Tool with Socket Tray Tasks

The purpose of this function blocks is to handle the tasks of stitching tool with socket tray.

5.15.1. Main Stitching Tool with Sockets Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
SocketTool	Inst_Single_SktTool1…Inst_Single_SktTool8	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start Stitching Tool with Sockets (Individual) tasks	System
i_bOpReset	Input	Bit	Resets the Operation	User/System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bToolShare	Input	Bit	Tool is shared between Left and Right Work Areas	System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System

Identifier	Class	Type	Description	User/System
i_bManualOper	Input	Bit	Manual operation option. Manual operation allows retry and operator reject.	System
i_wMCIndex	Input	Word	Internal index register reference number	User
i_wMode	Input	Word	= 0 means regular Stitching Tool, <>0 means with sockets	System
i_uSingleEnableMask	Input	Unsigned Word	1-8 sub task enable configuration in word format	System
i_uSingleBypass	Input	Unsigned Word	1-8 sub task bypass configuration in word format	System
i_wnSingleTask	Input	Word (0..7)	1-8 sub task numbers	System
i_wnSingleOEMStatusOp	Input	Word (0..7)	1-8 sub task status from OEM Logic	User
i_wnSingleSeqStart	Input	Word (0..7)	Sub task sequence start number	System
i_wnSingleSeqStop	Input	Word (0..7)	Sub task sequence stop number	System
i_bnReRunG	Input	Bit	Task rerun for good part configuration	System
i_bnReRunNG	Input	Bit	Task rerun for no good part configuration	System
i_bMasterEnable	Input	Bit	Master task enable configuration	System
i_wMasterProgram	Input	Word	Master task program configuration	System
i_bMasterBypass	Input	Bit	Master task bypass configuration	System
i_wMasterTask	Input	Word	Master task number	System
i_wMasterOEMStatusOp	Input	Word	Master task status from OEM Logic	User/System
i_wMasterSeqStart	Input	Word	Master task sequence start number	System
i_wMasterSeqStop	Input	Word	Master task sequence stop number	System
i_bFACSRecvd	Input	Bit	FACS configuration received	System
i_uMultiFootPrintPos	Input	Unsigned Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_wnSingleWorkPos	Input	Word (0..7)	Dual Work Area data for the Task from Configuration	System
i_wMasterWorkPos	Input	Word	Multi-Foot Print data for the Task from Configuration	System
i_wnCurSeqNum	Input	Word (0..5)	Current Task Sequence Number executing in the station	System

Identifier	Class	Type	Description	User/System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_bnGOTToolControl	Input	Bit (0..1)	Control of the Tool by each Dual Work Area as per current sequence	System
i_udSystemClock	Input	Unsigned DWord	System Clock calculated from PLC scan time SD520	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bTaskNoneZeroM	Output	Bit	Master Task Configured	System
o_bDone	Output	Bit	Master Task is completed	User/System
o_bnSingleOEMStartOp	Output	Bit (0..7)	1-8 sub task start bit to OEM Logic	User
o_bMasterOEMStartOp	Output	Bit	Master task start bit to OEM Logic	User
o_dStartTimeM	Output	DWord	Master task start time	System
o_dStopTimeM	Output	DWord	Master task stop time	System
o_dStartTimeS	Output	DWord (0..7)	1-8 sub task start time	System
o_dStopTimeS	Output	DWord (0..7)	1-8 sub task stop time	System
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code H101 – If i_uMultiFootPrintPos input > 2, H102 - i_wMCIndex input > 8	User
io_bnSeqReadyInc	In/Out	Bit (0..5)	Current Task is complete, increment Task Sequence Number	System
io_wnGOTToolShare	In/Out	Word (0..1)	Control of the tool indicator to the GOT	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System

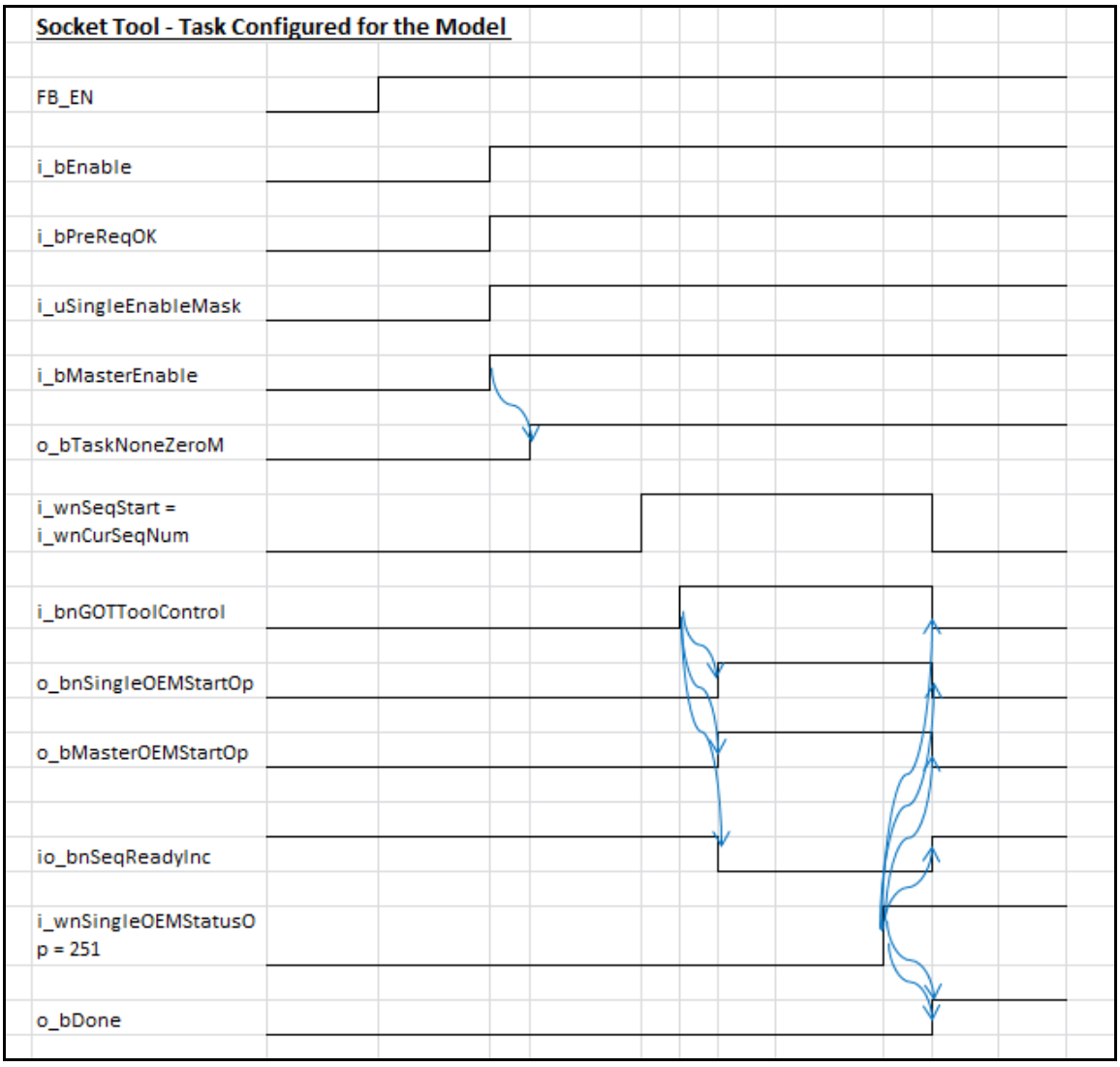
Identifier	Class	Type	Description	User/System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.15.2. SDT Data

Identifier	Data Type	Description
SocketTool.SCKT_Overall_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool master task operation
SocketTool.SCKT1_Op_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool 1 sub tasks operation
SocketTool.SCKT2_Op_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool 2 sub tasks operation
SocketTool.SCKT3_Op_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool 3 sub tasks operation
SocketTool.SCKT4_Op_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool 4 sub tasks operation
SocketTool.SCKT5_Op_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool 5 sub tasks operation
SocketTool.SCKT6_Op_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool 6 sub tasks operation
SocketTool.SCKT7_Op_Start	BIT(0..7)	To OEM Logic, OK to start SocketTool 7 sub tasks operation
SocketTool.SCKT8_Op_Start	BIT(0..7)	To OEM Logic, OK to startSocketTool 8 sub tasks operation
SocketTool.SCKT_Overall_ProgNr	WORD(0..7)	To OEM Logic, SocketTool master task program number
SocketTool.SCKT1_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 1 sub tasks program number
SocketTool.SCKT2_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 2 sub tasks program number
SocketTool.SCKT3_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 3 sub tasks program number
SocketTool.SCKT4_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 4 sub tasks program number
SocketTool.SCKT5_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 5 sub tasks program number
SocketTool.SCKT6_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 6 sub tasks program number
SocketTool.SCKT7_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 7 sub tasks program number
SocketTool.SCKT8_Op_ProgNr	WORD(0..7)	To OEM Logic, SocketTool 8 sub tasks program number
SocketTool.SCKT_Overall_Cnt	WORD(0..7)	To OEM Logic, SocketTool master task bolts counter
SocketTool.SCKT1_Cnt	WORD(0..7)	To OEM Logic, SocketTool 1 sub tasks bolts counter
SocketTool.SCKT2_Cnt	WORD(0..7)	To OEM Logic, SocketTool 2 sub tasks bolts counter
SocketTool.SCKT3_Cnt	WORD(0..7)	To OEM Logic, SocketTool 3 sub tasks bolts counter
SocketTool.SCKT4_Cnt	WORD(0..7)	To OEM Logic, SocketTool 4 sub tasks bolts counter
SocketTool.SCKT5_Cnt	WORD(0..7)	To OEM Logic, SocketTool 5 sub tasks bolts counter
SocketTool.SCKT6_Cnt	WORD(0..7)	To OEM Logic, SocketTool 6 sub tasks bolts counter
SocketTool.SCKT7_Cnt	WORD(0..7)	To OEM Logic, SocketTool 7 sub tasks bolts counter
SocketTool.SCKT8_Cnt	WORD(0..7)	To OEM Logic, SocketTool 8 sub tasks bolts counter
SocketTool.SCKT_Overall_Status	WORD(0..7)	SocketTool master task operation completion status code
SocketTool.SCKT1_Task_Status	WORD(0..7)	SocketTool 1 sub tasks operation completion status code
SocketTool.SCKT2_Task_Status	WORD(0..7)	SocketTool 2 sub tasks operation completion status code
SocketTool.SCKT3_Task_Status	WORD(0..7)	SocketTool 3 sub tasks operation completion status code

Identifier	Data Type	Description
SocketTool.SCKT4_Task_Status	WORD(0..7)	SocketTool 4 sub tasks operation completion status code
SocketTool.SCKT5_Task_Status	WORD(0..7)	SocketTool 5 sub tasks operation completion status code
SocketTool.SCKT6_Task_Status	WORD(0..7)	SocketTool 6 sub tasks operation completion status code
SocketTool.SCKT7_Task_Status	WORD(0..7)	SocketTool 7 sub tasks operation completion status code
SocketTool.SCKT8_Task_Status	WORD(0..7)	SocketTool 8 sub tasks operation completion status code

5.15.3. Timing Chart

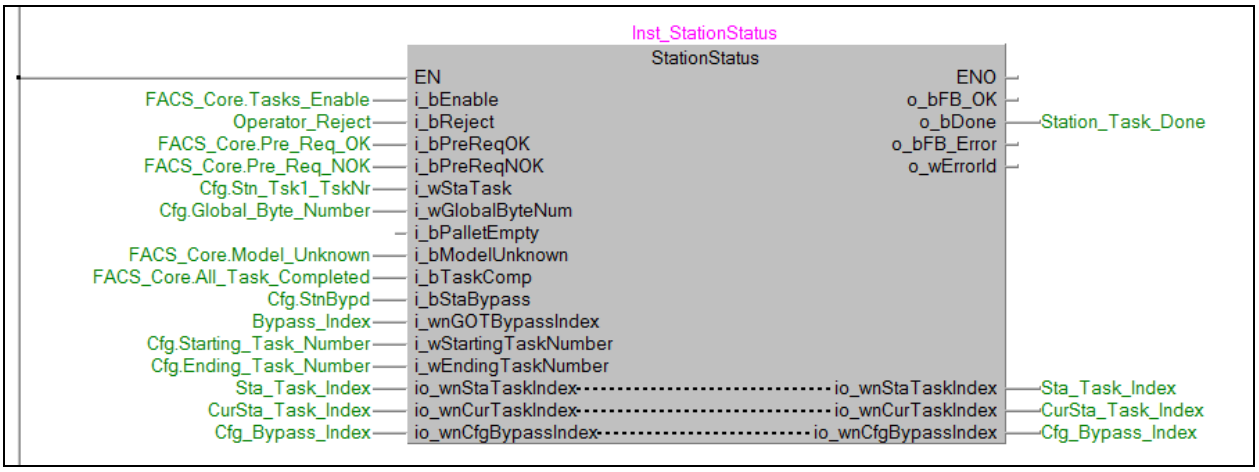


5.16 Station Status

The purpose of this function block is to handle the summary of the station status.

5.16.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
StationStatus	Inst_StationStatus	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bEnable	Input	Bit	Conditions to start the block	System
i_bReject	Input	Bit	Reject workpiece signal	User/System
i_bPreReqOK	Input	Bit	Prerequisite condition is OK	System
i_bPreReqNOK	Input	Bit	Prerequisite condition is not OK	System
i_wStaTask	Input	Word	Station task number	System
i_wGlobalByteNum	Input	Word	Global byte number	System
i_bPalletEmpty	Input	Bit	Pallet empty	User
i_bModelUnknown	Input	Bit	Model not found	System
i_bTaskComp	Input	Bit	All Station Tasks are completed	System
i_bStaBypass	Input	Bit	Station Bypass bit	System
i_wnGOTBypassIndex	Input	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled =2 – Task Bypassed for the current part – Single Bypass =3 – Task Bypassed continuously until Enabled	System
i_wStartingTaskNumber	Input	Word	Starting Task Number for the line	System
i_wEndingTaskNumber	Input	Word	Ending Task Number for the line	System

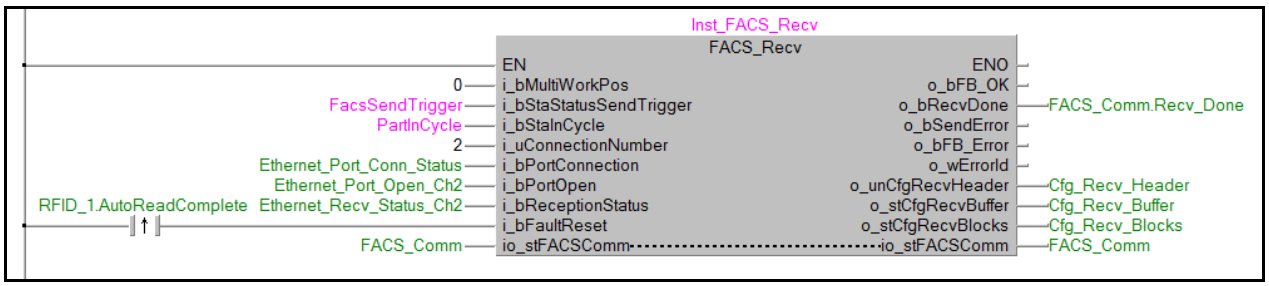
o_bFB_OK	Output	Bit	FB is OK	User
o_bDone	Output	Bit	FB is completed	User
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 - If i_wGlobalByteNum is other than 100 for PRK0 Project	User
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System

5.17 FACS_Recv

The purpose of this function block is to receive the FACS configuration data for the station from FACS server.

5.17.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
FACS_Recv	Inst_FACS_Recv	V4.10	V4.02



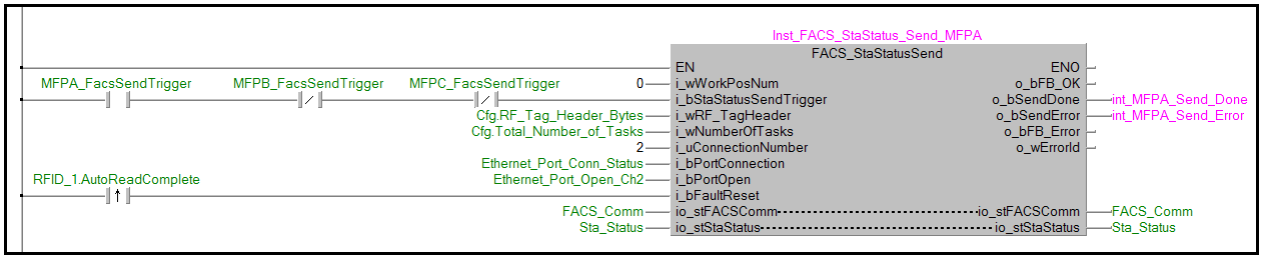
Identifier	Class	Type	Description	User/System
i_bMultiWorkPos	Input	Bit	Is this Station a Multi-Foot Print station?	User
i_bStaStatusSendTrigger	Input	Bit	All tasks complete, send status to FACS server	User/System
i_bStaInCycle	Input	Bit	Is Station in the middle of cycle?	User/System
i_uConnectionNumber	Input	Unsigned Word	PLC built-in Ethernet Parameter – connection number	User
i_bPortConnection	Input	Bit	PLC built-in Ethernet port connected to hub	User
i_bPortOpen	Input	Bit	PLC built-in Ethernet port successfully open	User
i_bReceptionStatus	Input	Bit	PLC built-in Ethernet port successfully received configuration data from FACS server	User
i_bFaultReset	Input	Bit	Reset to clear Heartbeat / Version Send Error	User
o_bFB_OK	Output	Bit	FB is OK no errors	User
o_bRecvDone	Output	Bit	configuration data received from FACS server	User/System
o_bSendError	Output	Bit	Heartbeat / Version Send Error to FACS server	User
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 - If i_uConnectionNumber is greater than 16,	User
o_unCfgRecvHeader	Output	Unsigned Word (0..1023)	FACS Comm Receive Header Data	System
o_stCfgRecvBuffer	Output	SDT – To_Sta_Intrmdt_DB	Intermediate storage/buffer area to receive configuration data	System
o_stCfgRecvBlocks	Output	SDT – To_Sta_Intrmdt_DB	storage/buffer area to receive configuration data in array format	System
io_stFACSComm	In/Out	SDT – Comm_DB	FACS Comm Send Header Data	System

5.18 FACS_StaStatusSend

The purpose of this function block is to send Task Status, Task time and RFID data to FACS server.

5.18.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
FACS_StaStatusSend	Inst_FACS_StaStatusSend_MFPA	V4.10	V4.02



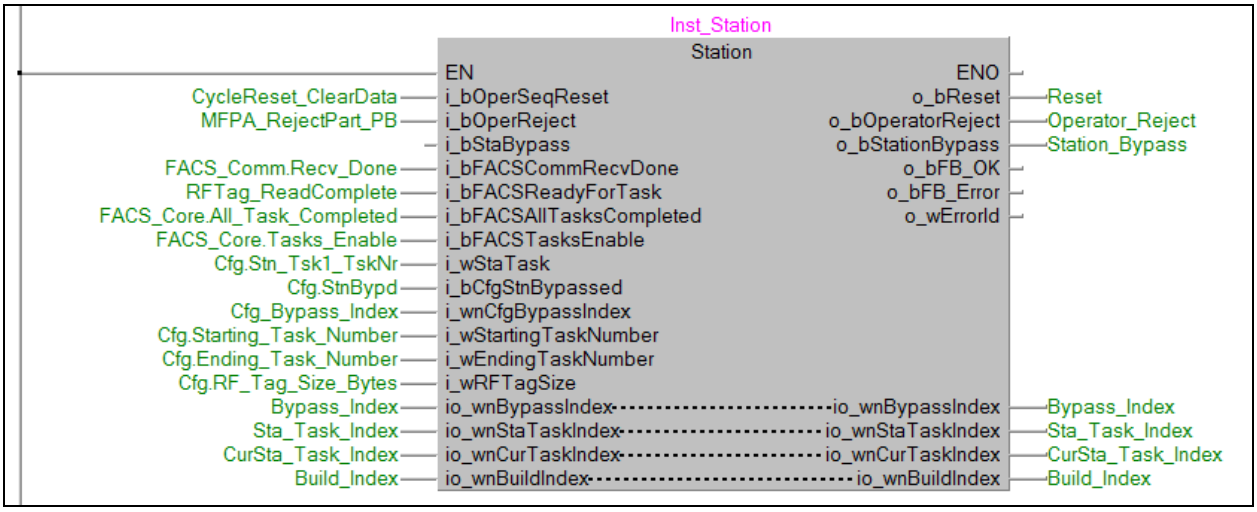
Identifier	Class	Type	Description	User/System
i_wWorkPosNum	Input	Word	=0 for Multi-Foot Print Position A =1 for Multi-Foot Print Position B =2 for Multi-Foot Print Position C	User
i_bStaStatusSendTrigger	Input	Bit	All tasks complete, send status to FACS server	User
i_wRF_TagHeader	Input	Word	Number of RF Tag Header bytes	User
i_wNumberOfTasks	Input	Word	Total number of tasks for the line	User
i_uConnectionNumber	Input	Unsigned Word	PLC built-in Ethernet Parameter – connection number	User
i_bPortConnection	Input	Bit	PLC built-in Ethernet port connected to hub	User
i_bPortOpen	Input	Bit	PLC built-in Ethernet port successfully open	User
i_bFaultReset	Input	Bit	Reset to clear Send Error	User
o_bFB_OK	Output	Bit	FB is OK no error	User
o_bSendDone	Output	Bit	Status send complete	User/System
o_bSendError	Output	Bit	Status send error	User
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101 - If i_uConnectionNumber is greater than 16, = H102 - If i_wArea is greater than 2	User
io_stFACSComm	In/Out	SDT – Comm DB	FACS Comm Send Header Data	System
io_stStaStatus	In/Out	SDT – From_Sta_DB	Task time data and RF Tag data sent to FACS server	System

5.19 Station

The purpose of this function block is to handle the inputs from User/OEM and Configuration Software

5.19.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
StationStatus	Inst_Station	V4.10	V4.02



Identifier	Class	Type	Description	User/System
i_bOperSeqReset	Input	Bit	Cycle Data Clear and Reset	User
i_bOperReject	Input	Bit	Cycle and Part Reject	User
i_bStaBypass	Input	Bit	Station Bypass	User
i_bFACSCommRecvDone	Input	Bit	FACS Configuration Received from Server	System
i_bFACSReadyForTask	Input	Bit	Ready for Cycle new part	User
i_bFACSAllTasksCompleted	Input	Bit	FACS Tasks Completed	System
i_bFACSTasksEnable	Input	Bit	FACS Tasks Enabled	System
i_wStaTask	Input	Word	Station Task number	System
i_bCfgStnBypassed	Input	Bit	Station Task Bypass from Server	System
i_wnCfgBypassIndex	Input	Word (0..2100)	Tasks Bypass from Server	System
i_wStartingTaskNumber	Input	Word	Starting Task Number	User
i_wEndingTaskNumber	Input	Word	Ending Task Bypass Number	User
i_wRFTagSize	Input	Word	RF Tag Size including Header	User
o_bReset	Output	Bit	Reset Output	User/System
o_bOperatorReject	Output	Bit	Reject Output	User/System
o_bStationBypass	Output	Bit	Station Bypass output	User/System

o_bFB_OK	Output	Bit	Function Block OK	User
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	In/Out	Word	FB Error Code = H101 –	User
io_wnBypassIndex	In/Out	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled, =2 – Task Bypassed for the current part – Single Bypass, =3 – Task Bypassed continuously until Enabled	System
io_wnStaTaskIndex	In/Out	Word (0..2100)	RFID Data including Header and Task Status info from Previous Stations and update from current station	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System

5.20 eHMI_Display

The purpose of this function block is to populate the Status of all Tasks on eHMI Main screen

5.20.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
eHMI_Display	Inst_eHMI_MFPA_Display, Inst_eHMI_MFPA_Display_GOT2, Inst_eHMI_MFPB_Display, Inst_eHMI_MFPC_Display	V4.10	

Identifier	Class	Type	Description	User/System
i_bWorkPositionSelected	Input	Bit	In Multi-Foot Print Station, Position A, B or C Selected	User
i_wFootPrintNumber	Input	Word	In Multi-Foot Print Position Selection 0, 2 or 4	System
i_bFacsCorePreReqDone	Input	Bit	Pre-Req FB Execution is Complete	System
i_bFacsCorePreReqOK	Input	Bit	Pre-Req set for the Station is OK	System
i_bFacsCorePreReqNOK	Input	Bit	Pre-Req set for the Station is NOK	System
i_bFacsCoreModelFound	Input	Bit	Model info read from the RF Tag is Found in the Cfg	System
i_bFacsCoreModelUnknown	Input	Bit	Model info read from the RF Tag is NOT Found in the Cfg	System
i_bFacsCoreTasksEnable	Input	Bit	FACS Tasks Enabled	System
i_bnWorkPosDone	Input	Bit	In Dual GOT Mode, All Tasks Complete in the Work Pos (Area)	System
i_bFacsCoreAllTasksCompleted	Input	Bit	FACS Tasks Completed in the Station (Incl. Dual GOT)	System

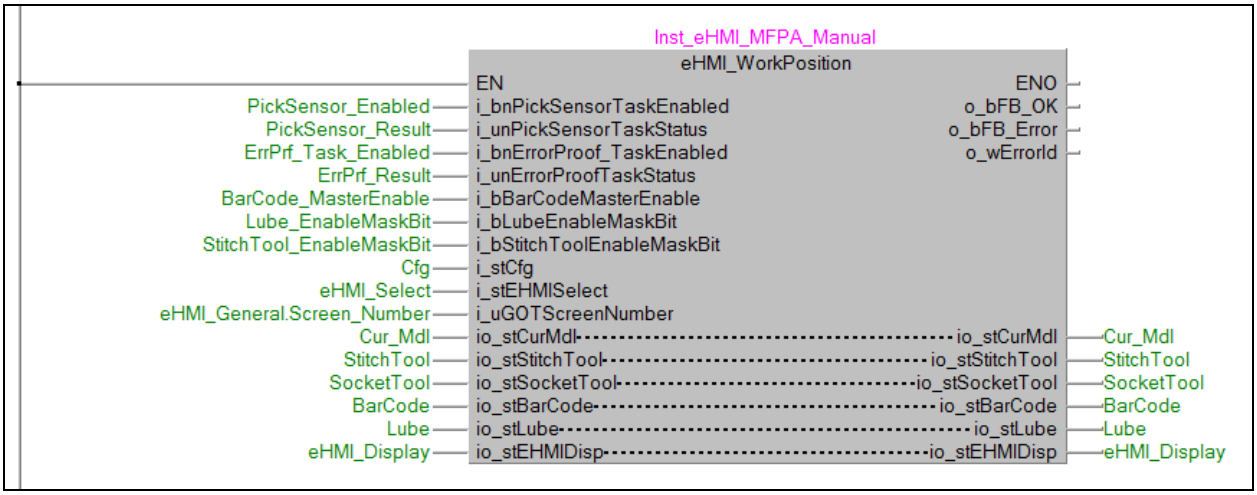
i_bFacsCommSendDone	Input	Bit	FACS Sta_Status is sent to Server after All Tasks Complete	System
i_bFacsCommRecvDone	Input	Bit	New Configuration Parameters received from the Server	System
i_bRfidReadComplete	Input	Bit	RF Tag Read Complete after Pallet in Station	User
i_bRfidWriteComplete	Input	Bit	RF Tag Write Complete after All Tasks Complete	User
i_bReadyToRelease	Input	Bit	Ready to Release Pallet after RF Tag Write and Status update to Server is Complete	User/System
i_wFacsCoreCycleTime	Input	Bit	Cycle Time Elapsed for Display on Main eHMI	User/System
i_bStation_Bypass	Input	Bit	Station Bypass input from Cfg	System
i_stCfg	Input	To_Sta_DB SDT	Cfg – Configuration Received from the Server	System
i_wnEHMITaskSeq	Input	Word (0..255)	Task Sequence – Task Numbers Received from the eHMI script	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101-	User
io_wnEHMITaskBuildList	In/Out	Word (0..255)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnEHMITaskStatusList	In/Out	Word (0..255)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnEHMITaskModeList	In/Out	Word (0..255)	Build Status for current station tasks displayed on GOT “Task Mode” – Enabled, Cont. Bypass from Config	System
io_stEHMIDisp	In/Out	eHMI_Disp SDT	eHMI Status update for eHMI Main screen and all Task Status screen for Maintenance	System
io_wnCurTaskIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “STATUS” – Started, Accept, Reject, Rerun	System
io_wnBuildIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “BUILD” – Y – Yes, N – No from Configuration	System
io_wnCfgBypassIndex	In/Out	Word (0..2100)	Build Status for current station tasks displayed on GOT “ENABLED” – Enabled, Single Bypass, Cont. Bypass	System
io_wnBypassIndex	In/Out	Word (0..2100)	Bypass set up of Tasks thru GOT =1 – Task Enabled, =2 – Task Bypassed for the current part – Single Bypass, =3 – Task Bypassed continuously until Enabled	System

5.21 eHMI_WorkPosition

The purpose of this function block is to populate the Status of all Tasks on Manual Task Status screens

5.21.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
eHMI_WorkPosition	Inst_eHMI_MFPA_Manual, Inst_eHMI_MFPA_Manual_GOT2, Inst_eHMI_MFPB_Manual, Inst_eHMI_MFPC_Manual	V4.10	



Identifier	Class	Type	Description	User/System
i_bnPickSensorTaskEnabled	Input	Bit(0..15)	Pick Sensor Tasks Enabled for the Current Model	User/System
i_unPickSensorTaskStatus	Input	Unsigned Word (0..15)	Pick Sensor Tasks Status for the Current Model	User/System
i_bnErrorProof_TaskEnabled	Input	Bit(0..15)	Error Proof Tasks Enabled for the Current Model	User/System
i_unErrorProofTaskStatus	Input	Unsigned Word (0..15)	Error Proof Tasks Status for the Current Model	User/System
i_bBarCodeMasterEnable	Input	Bit	Barcode Task Enabled for the Current Model	User/System
i_bLubeEnableMaskBit	Input	Bit	Lube Task Enabled for the Current Model	User/System
i_bStitchToolEnableMaskBit	Input	Bit	Stitch Tool Task Enabled for the Current Model	User/System
i_stCfg	Input	To_Sta_DB - SDT	Cfg – Parameter Configuration from the Server	System
i_stEHMISelect	Input	eHMI_Sel_PB - SDT	Task Selection PB from different Task Status screens incl. Main screen	System
i_uGOTScreenNumber	Input	Unsigned Word	Current Screen Number on Display	System
o_bFB_OK	Output	Bit	Function Block OK	User

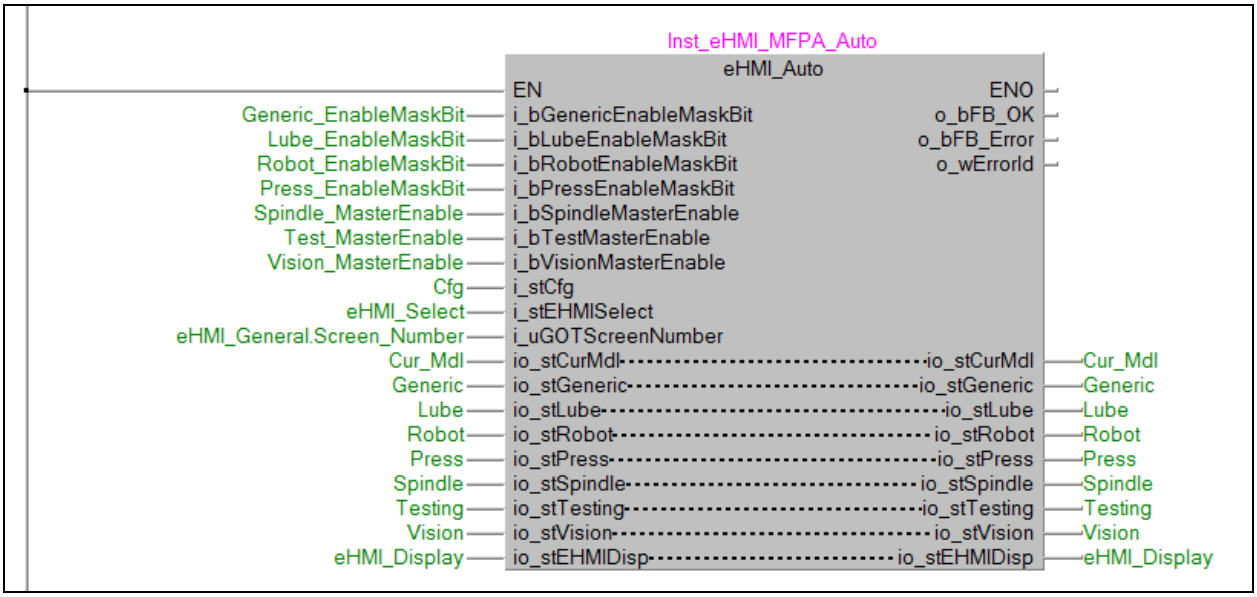
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101-	User
io_stCurMdl	In/Out	Cur_Mdl_DB - SDT	See corresponding SDT for more info	System
io_stStitchTool	In/Out	StitchTool_DB - SDT	See corresponding SDT for more info	System
io_stSocketTool	In/Out	SocketTool_DB - SDT	See corresponding SDT for more info	System
io_stBarCode	In/Out	BarCode_DB - SDT	See corresponding SDT for more info	System
io_stLube	In/Out	Lube_DB - SDT	See corresponding SDT for more info	System
io_stEHMIDisp	In/Out	eHMI_Disp SDT	eHMI Status update for eHMI Main screen and all Task Status screen for Maintenance	System

5.22 eHMI_Auto

The purpose of this function block is to populate the Status of all Tasks on Auto Task Status screens

5.22.1. Function Block and Parameters

Function Block Name	Instance Data Block	Revision	History
eHMI_Auto	Inst_eHMI_MFPA_Auto, Inst_eHMI_MFPA_Auto_GOT2, Inst_eHMI_MFPB_Auto, Inst_eHMI_MFPC_Auto	V4.10	



Identifier	Class	Type	Description	User/System
i_bGenericEnableMaskBit	Input	Bit	Generic Tasks Enabled for the Current Model	User/System
i_bLubeEnableMaskBit	Input	Bit	Lube Task Enabled for the Current Model	User/System
i_bRobotEnableMaskBit	Input	Bit	Robot Task Enabled for the Current Model	User/System
i_bPressEnableMaskBit	Input	Bit	Press Task Enabled for the Current Model	User/System
i_bSpindleMasterEnable	Input	Bit	Multi-Spindle Task Enabled for the Current Model	User/System
i_bTestMasterEnable	Input	Bit	Test Task Enabled for the Current Model	User/System
i_bVisionMasterEnable	Input	Bit	Vision Tool Task Enabled for the Current Model	User/System
i_stCfg	Input	To_Sta_DB - SDT	Cfg – Parameter Configuration from the Server	System
i_stEHMISelect	Input	eHMI_Sel_PB - SDT	Task Selection PB from different Task Status screens incl. Main screen	System

i_uGOTScreenNumber	Input	Unsigned Word	Current Screen Number on Display	System
o_bFB_OK	Output	Bit	Function Block OK	User
o_bFB_Error	Output	Bit	FB in Error	User
o_wErrorId	Output	Word	FB Error Code = H101-	User
io_stCurMdl	In/Out	Cur_Mdl_DB - SDT	See corresponding SDT for more info	System
io_stGeneric	In/Out	Generic_DB - SDT	See corresponding SDT for more info	System
io_stLube	In/Out	Lube_DB - SDT	See corresponding SDT for more info	System
io_stRobot	In/Out	Robot_DB - SDT	See corresponding SDT for more info	System
io_stPress	In/Out	Press_DB - SDT	See corresponding SDT for more info	System
io_stSpindle	In/Out	Spindle_DB - SDT	See corresponding SDT for more info	System
io_stTesting	In/Out	Test_DB - SDT	See corresponding SDT for more info	System
io_stVision	In/Out	Vision_DB - SDT	See corresponding SDT for more info	System
io_stEHMIDisp	In/Out	eHMI_Disp SDT	eHMI Status update for eHMI Main screen and all Task Status screen for Maintenance	System

6 Application Notes

There are two special cases of Stop-In-Station type. Both Multi-Foot Print Station and Dual GOT Stations are explained here with examples. Single Position Manual/Auto station and GOT Main screen PB Controls are explained also.

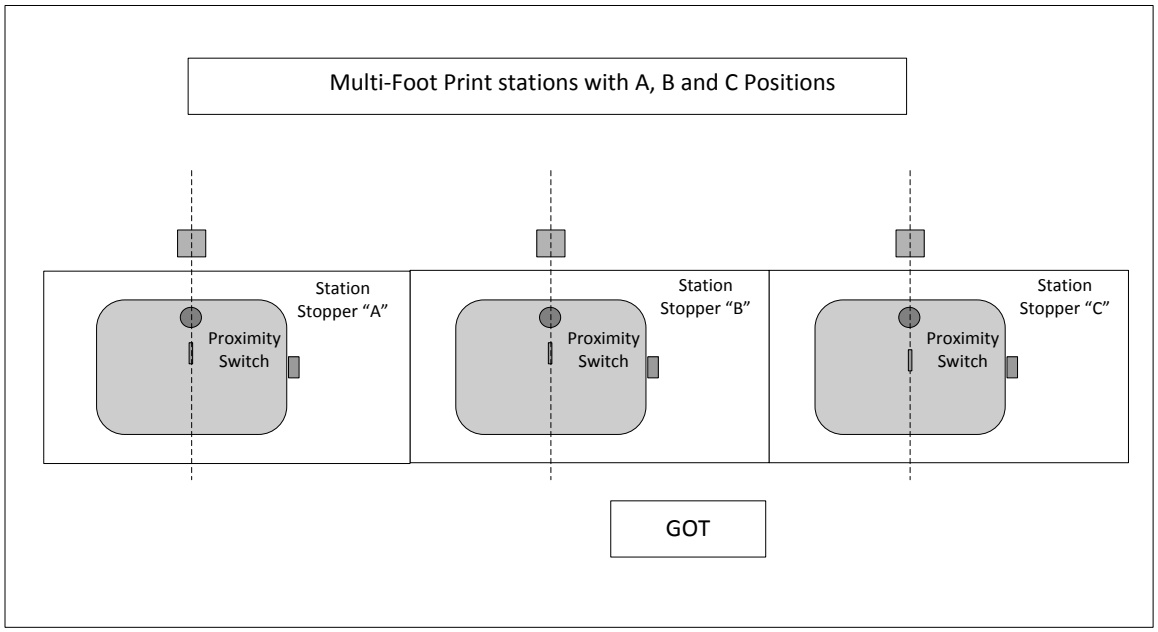
There are two types of Backup tasks. Both Stitch Tool Backup task and Generic Backup task completed by operator without using tools (visual inspection), are explained here with examples.

Other useful information like OEM/User defined RFID Start Addresses & Length and RFID Tag Data to Read and Write are explained.

6.1 Multi-Foot Print Station

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.



Labels for each Input and Output pins will be different based on the Position where FB is called. The example programs are shown below. The Single Station (Single Foot Print) and Multi-Foot Print Programs still call same FBs, but Labels for Inputs and Outputs are different as show below.

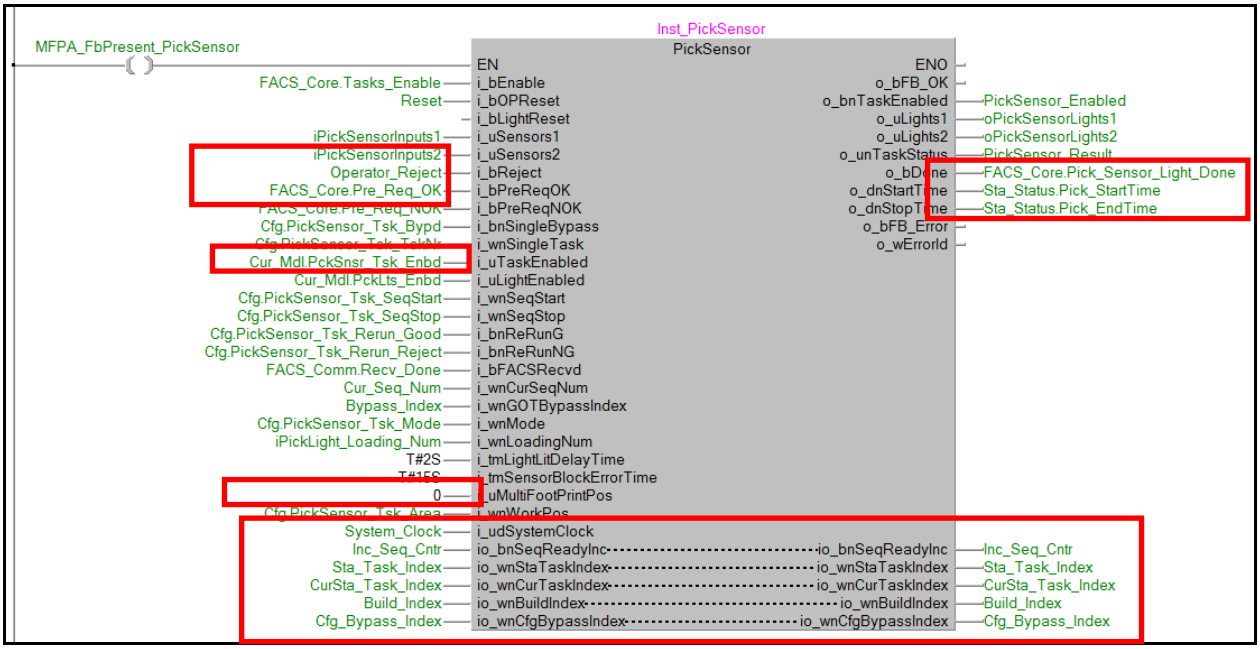
Set "i_uMultiFootPrintPos" = 0 for Position A

"i_uMultiFootPrintPos" = 1 for Position B

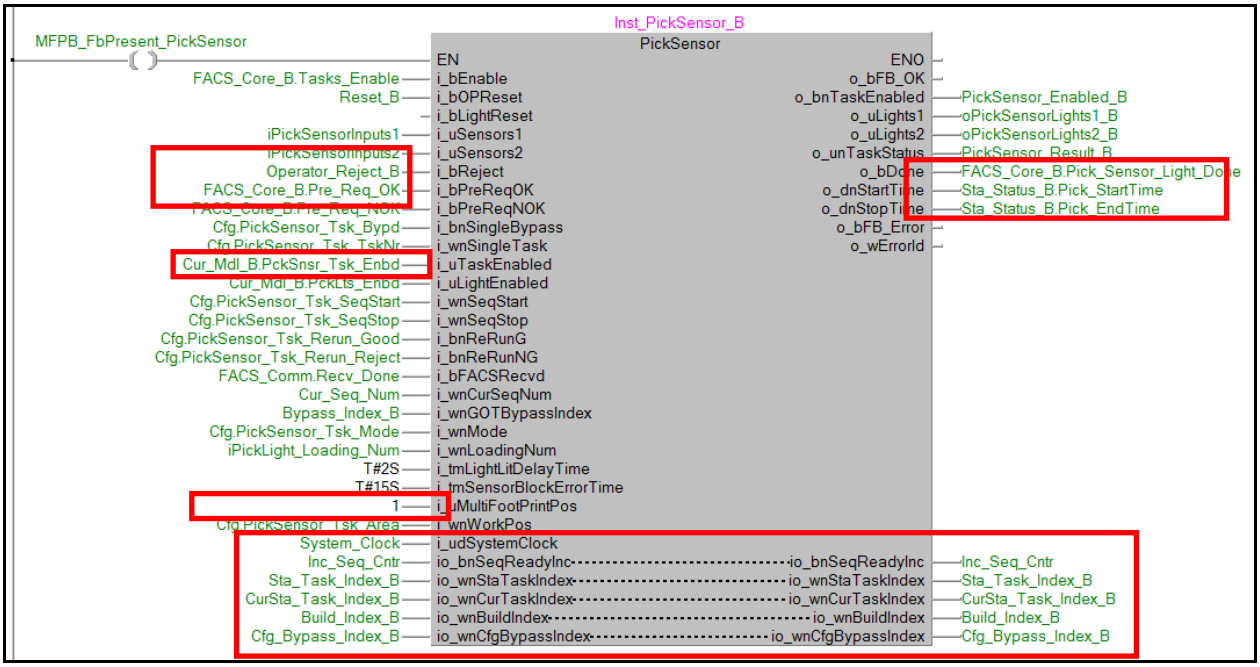
"i_uMultiFootPrintPos" = 2 for Position C on the input pins of the Task FBs.

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

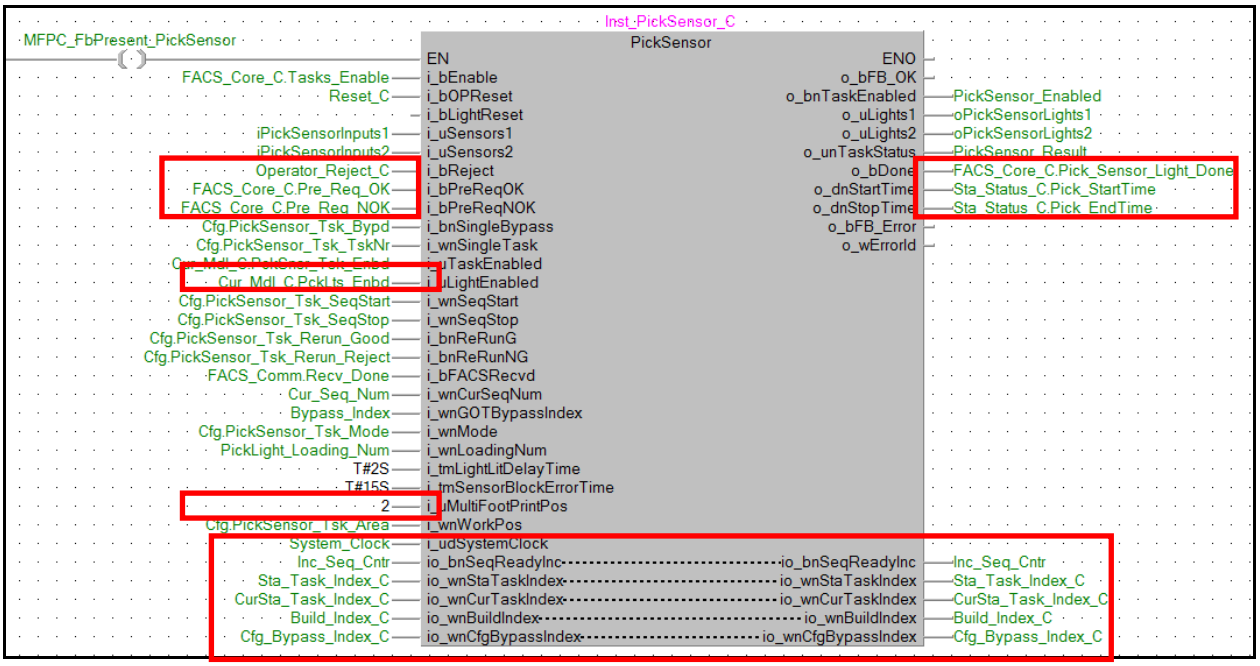
Position A - Program 01_Task_PickSensor



Position B – Program 01_PickSensor_MFP_B

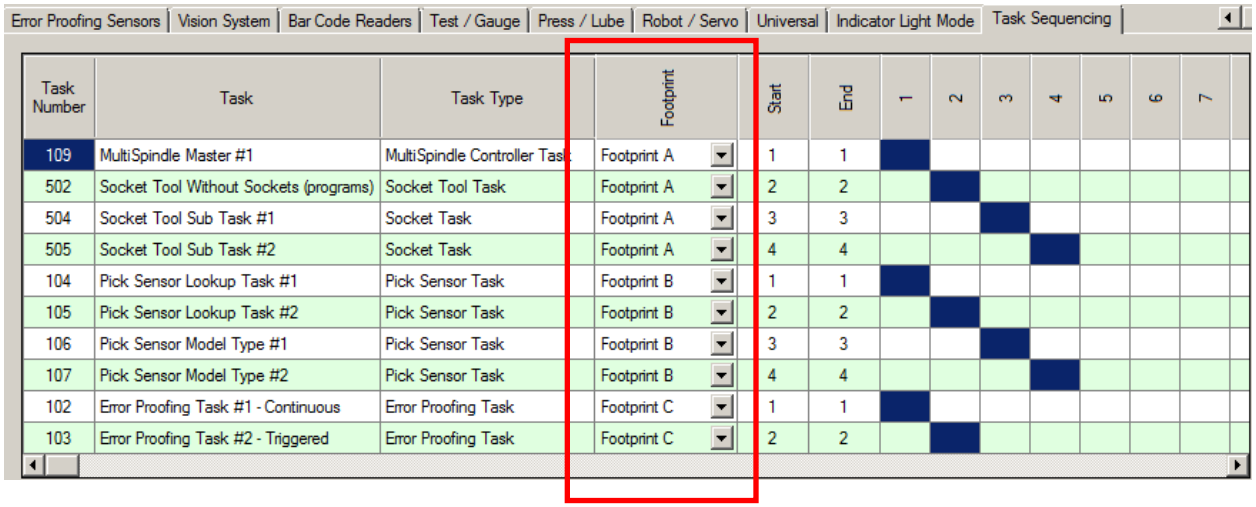


Position C - Program 01_PickSensor_MFP_C



Example eFlex, PLC Library and GOT screens for Multiple Foot Prints

The eFlex Task Sequencing for Multi-Foot Print station is shown below. The corresponding Programs are called into Scan Programs are show later in the section

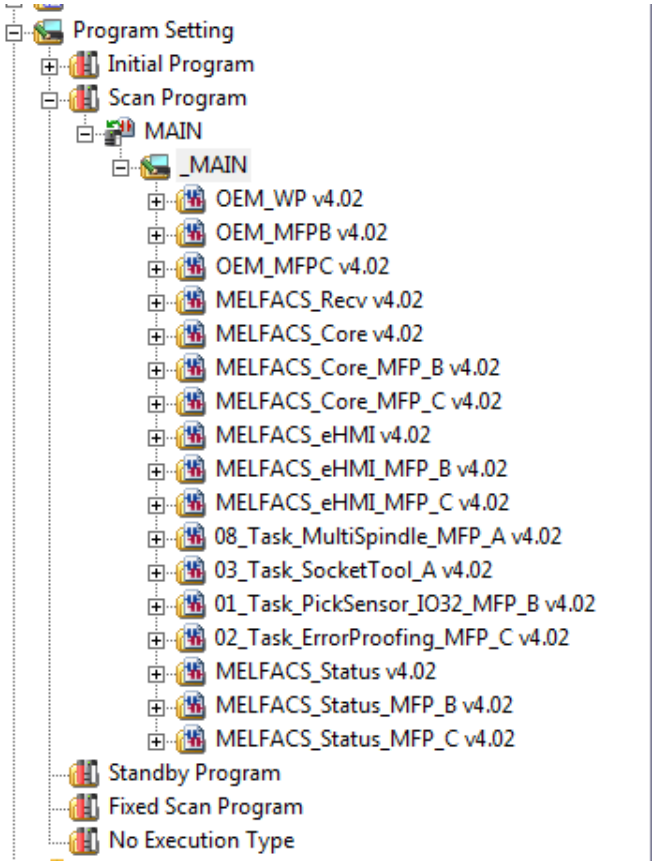


Task Number	Task	Task Type	Footprint	Start	End	1	2	3	4	5	6	7
109	MultiSpindle Master #1	MultiSpindle Controller Task	Footprint A	1	1	■						
502	Socket Tool Without Sockets (programs)	Socket Tool Task	Footprint A	2	2		■					
504	Socket Tool Sub Task #1	Socket Task	Footprint A	3	3			■				
505	Socket Tool Sub Task #2	Socket Task	Footprint A	4	4				■			
104	Pick Sensor Lookup Task #1	Pick Sensor Task	Footprint B	1	1	■						
105	Pick Sensor Lookup Task #2	Pick Sensor Task	Footprint B	2	2		■					
106	Pick Sensor Model Type #1	Pick Sensor Task	Footprint B	3	3			■				
107	Pick Sensor Model Type #2	Pick Sensor Task	Footprint B	4	4				■			
102	Error Proofing Task #1 - Continuous	Error Proofing Task	Footprint C	1	1	■						
103	Error Proofing Task #2 - Triggered	Error Proofing Task	Footprint C	2	2		■					

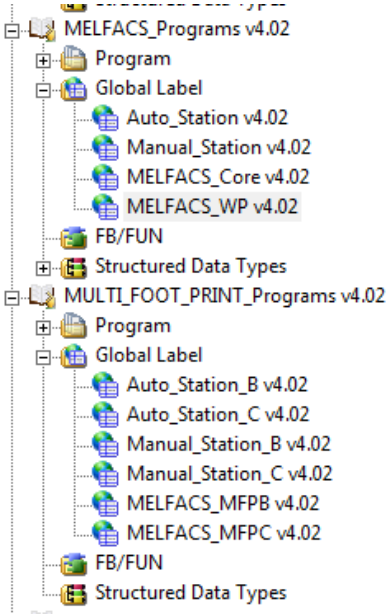
The Tasks configured for Multi-Foot Print stations are common as Single Foot Print Stations, the configuration is different only while Task Sequencing – Footprint selection.

Appropriate programs like eHMI_Dispaly_MFPB and eHMI_Dispaly_MFPC, MELFACS_Core_MFPB and MELFACS_Core_MFPC, MELFACS_Status_MFPB and MELFACS_Status_MFPC are called into the scan programs.

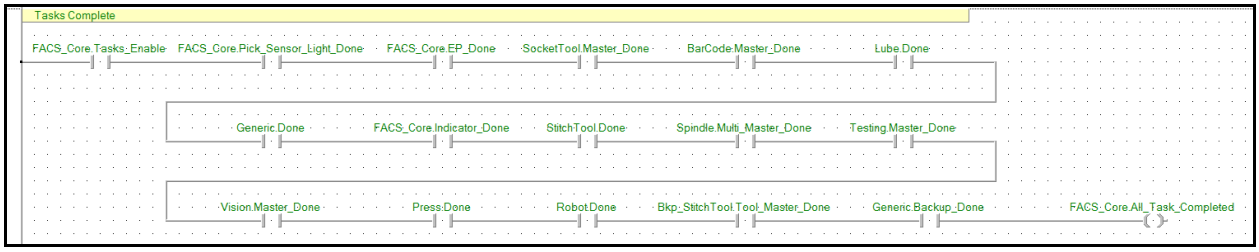
The typical example of the Programs are called into the Scan programs as shown below to suit eFlex Configuration



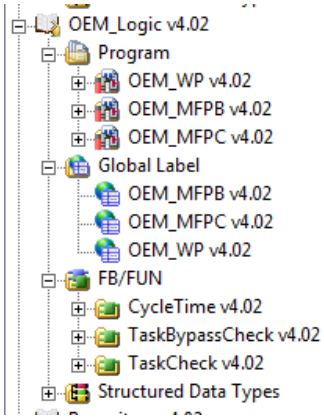
The example programs and Global Labels for Pos A are included in MELFACS Programs v4.xx. The example programs and Global Labels for Pos B and Pos C are included in MULTI_FOOT_PRINT_Programs v4.xx.



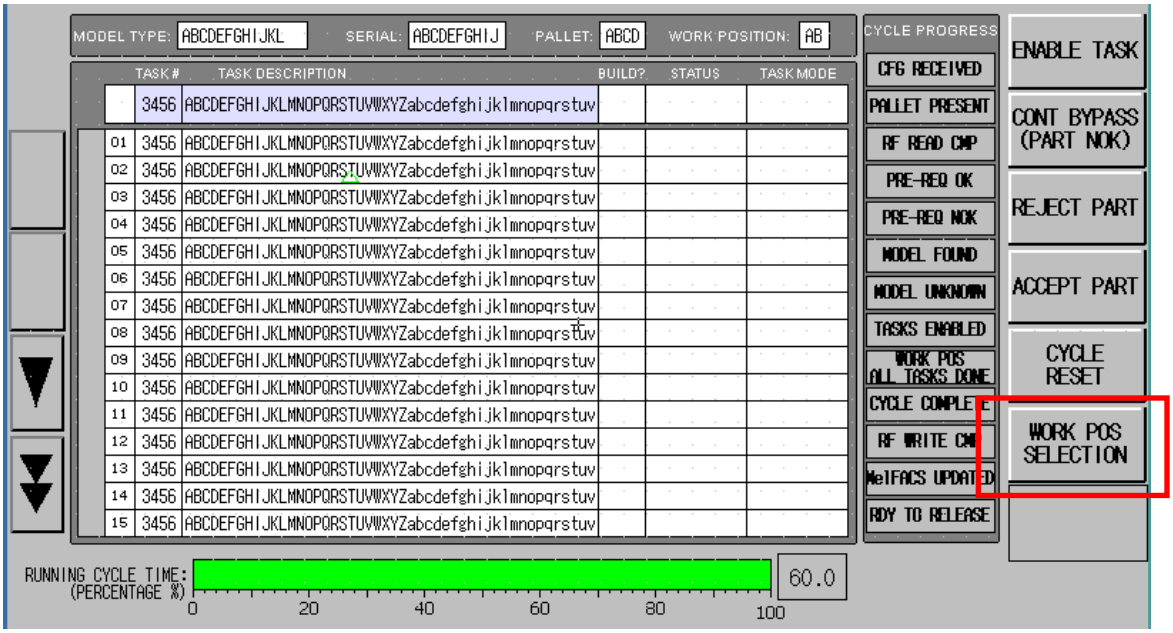
The User/OEM can edit example Programs in MELFACS Programs v4.xx and MULTI_FOOT_PRINT_Programs to suit to their application on User/OEM editable input and output pins of FBs. The list of User/OEM pins are given earlier in FB section. The Task Complete rung in each of MELFACS_Status can be edited based on the Task FBs are called into the Scan Programs



The Global Labels, FBs and Programs in User Library OEM_Logic v4.xx are information only and very important to run the Training Workshop. All the information can be transferred/edited to suit the application in the respective OEM Programs.

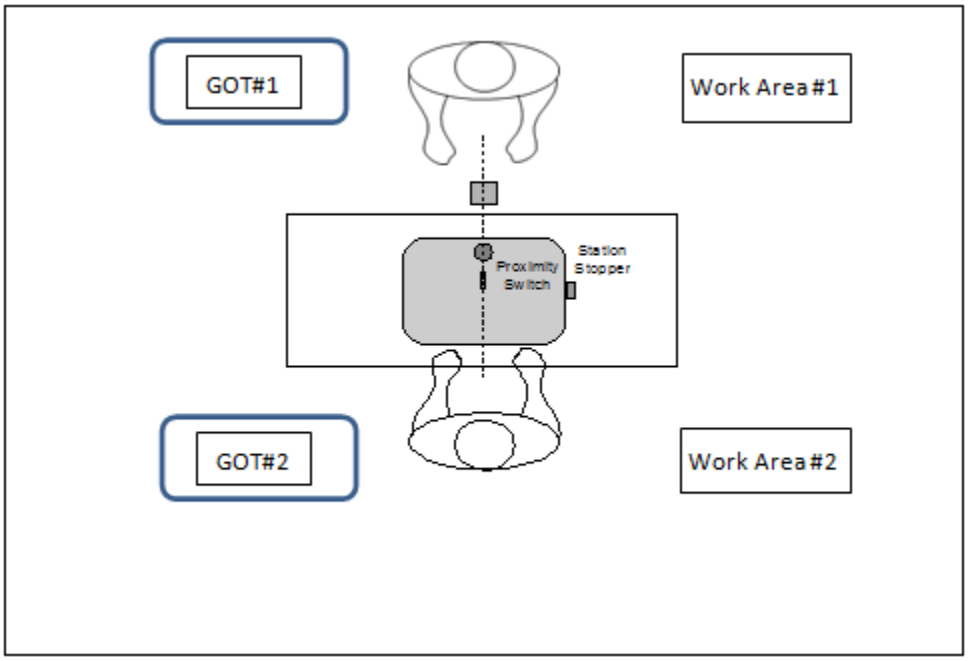


The Work Pos Selection PB on the eHMI Main screen is used to switch between different positions of Multi-Foot Print Positions A, B or C. The Tasks, status of each task, Cycle Progress Indicators, Cycle Time, Model Type, Serial #, Pallet # and Work Position are updated for each position selected.



6.2 Dual GOT Station

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.



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.

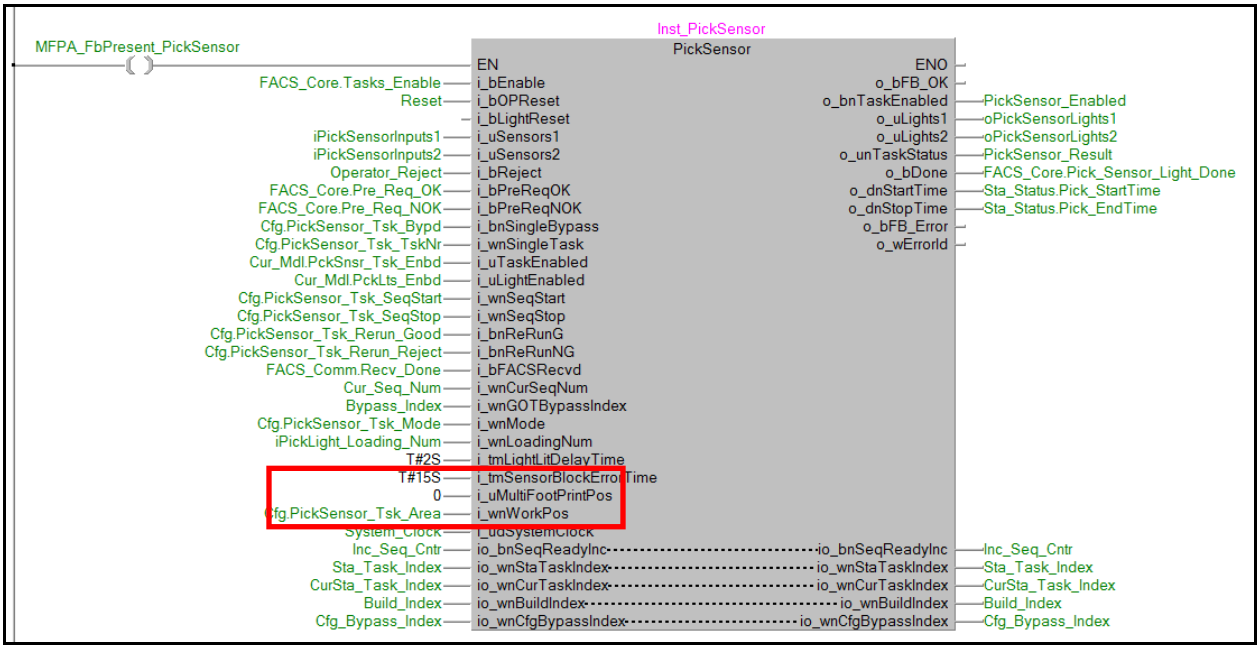
The Labels and Task Programs are used in Dual GOT Stations are same as Single Stations.

Side 1 and 2 (Left or Right):

Set “i_uMultiFootPrintPos” = 0

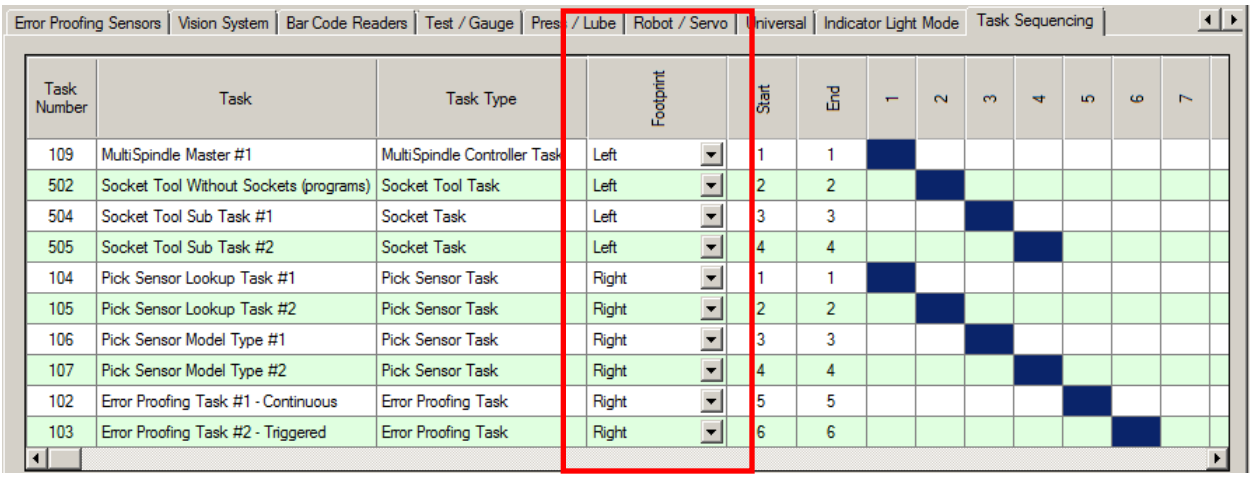
Cfg.xxx_Tsk_Area is set by Configuration Software based on the Left Work Area = 0 or Right Work Area = 1 on the pin i_wnWorkPos of each Task FB.

Program 01_Task_PickSensor



Example eFlex and PLC Library for Dual GOTs

The eFlex Task Sequencing for Dual GOT station is shown below. The corresponding Programs are called into Scan Programs are show later in the section

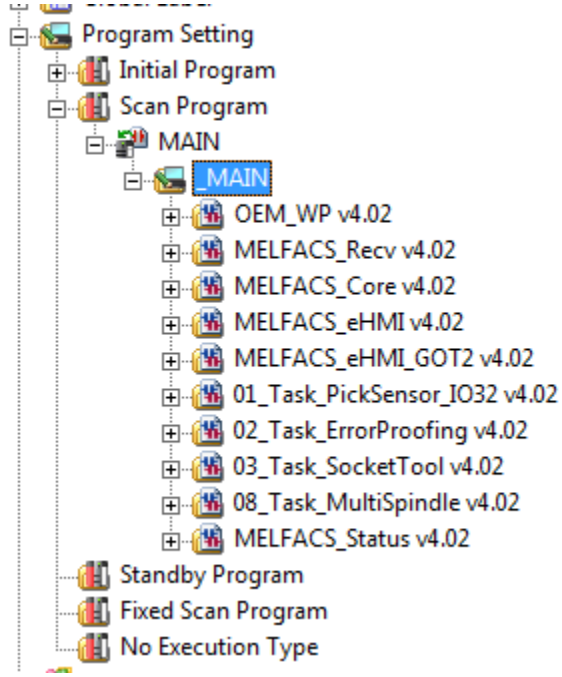


Task Number	Task	Task Type	Footprint	Start	End	1	2	3	4	5	6	7
109	MultiSpindle Master #1	MultiSpindle Controller Task	Left	1	1	■						
502	Socket Tool Without Sockets (programs)	Socket Tool Task	Left	2	2		■					
504	Socket Tool Sub Task #1	Socket Task	Left	3	3			■				
505	Socket Tool Sub Task #2	Socket Task	Left	4	4				■			
104	Pick Sensor Lookup Task #1	Pick Sensor Task	Right	1	1	■						
105	Pick Sensor Lookup Task #2	Pick Sensor Task	Right	2	2		■					
106	Pick Sensor Model Type #1	Pick Sensor Task	Right	3	3			■				
107	Pick Sensor Model Type #2	Pick Sensor Task	Right	4	4				■			
102	Error Proofing Task #1 - Continuous	Error Proofing Task	Right	5	5					■		
103	Error Proofing Task #2 - Triggered	Error Proofing Task	Right	6	6						■	

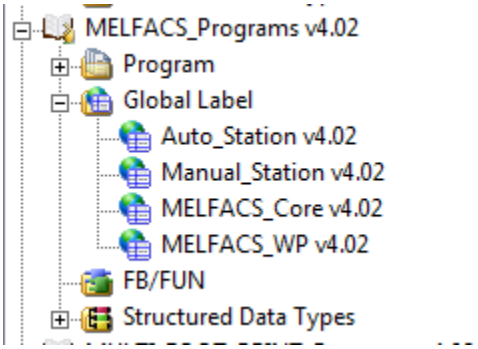
The Tasks configured for Dual GOT stations are common as Single Foot Stations, the configuration is different only while Task Sequencing – Footprint selection.

Appropriate programs like eHMI_Dispaly_GOT2 are called into the scan programs.

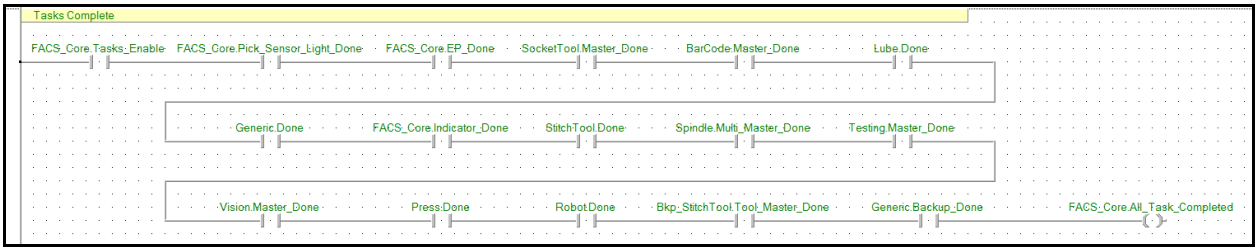
The typical example of the Programs are called into the Scan programs as shown below to suit eFlex Configuration.



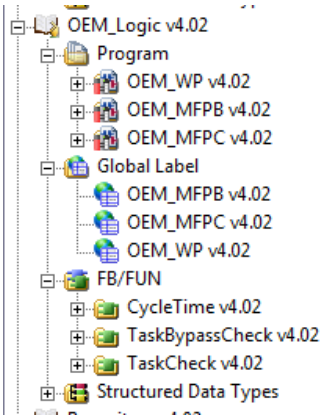
The example programs and Global Labels for Dual GOT Single Station are included in MELFACS Programs v4.xx.



The User/OEM can edit example Programs in Project–POU and MELFACS Programs v4.xx to suit to their application on User/OEM editable input and output pins of FBs. The list of User/OEM pins are given earlier in FB section. The Task Complete rung in MELFACS_Status can be edited based on the Task FBs are called into the Scan Programs

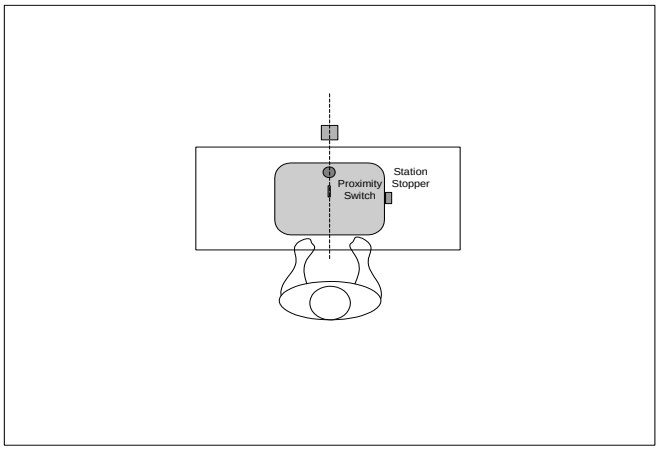


The Global Labels, FBs and Programs in User Library OEM_Logic v4.xx are information only and very important to run the Training Workshop. All the information can be transferred/edited to suit to the application in the respective OEM Programs.



6.3 Single Position Manual/Auto GOT Station

The stop-in-station is based on a conveyor system which allows stopping the workpiece pallets without stopping the conveyor system. Tracking of the workpieces (e.g. workpiece present in the work area) must be accomplished by means of in station proximity switches. The station stop area has an RFID antenna for reading and writing task statuses. All tasks are active within the station work area. The Mitsubishi software library provides a signal for “lower station stop” when all tasks report an “accepted” status code or the operator rejects the workpiece.

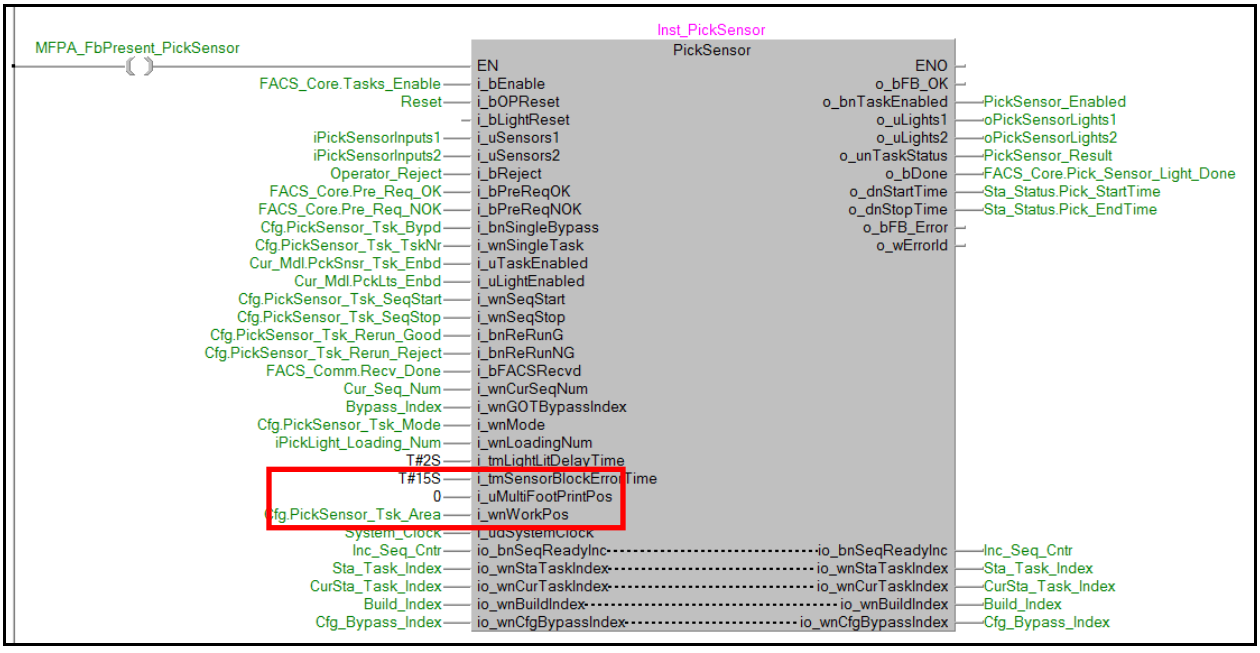


The Single Position Station has one PLC and one GOT.

Set “i_uMultiFootPrintPos” = 0 on the input pins of each Task FB

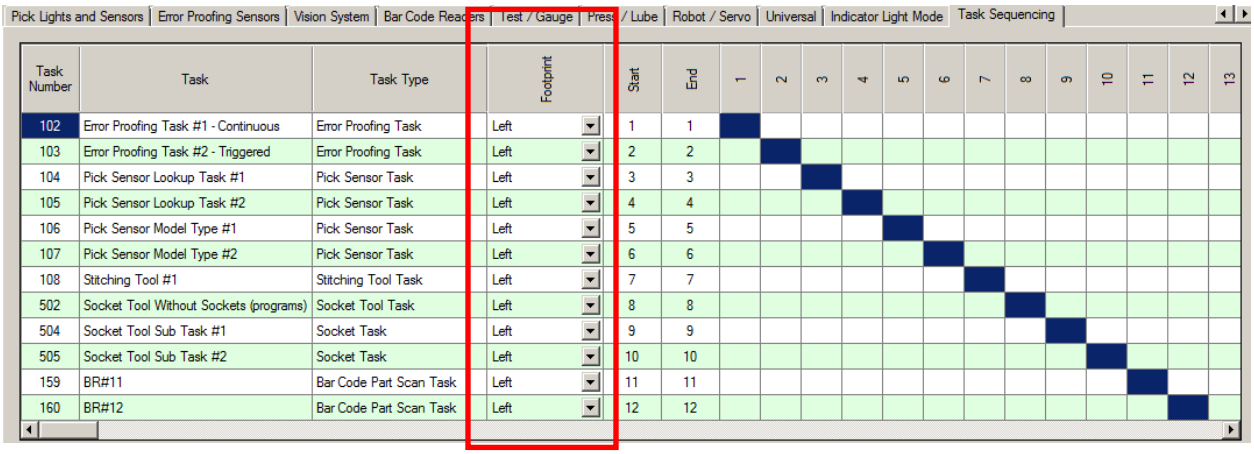
Cfg.xxx_Tsk_Area is set = 0 by Configuration Software on the pin i_wnWorkPos of each Task FB.

Program 01_Task_PickSensor



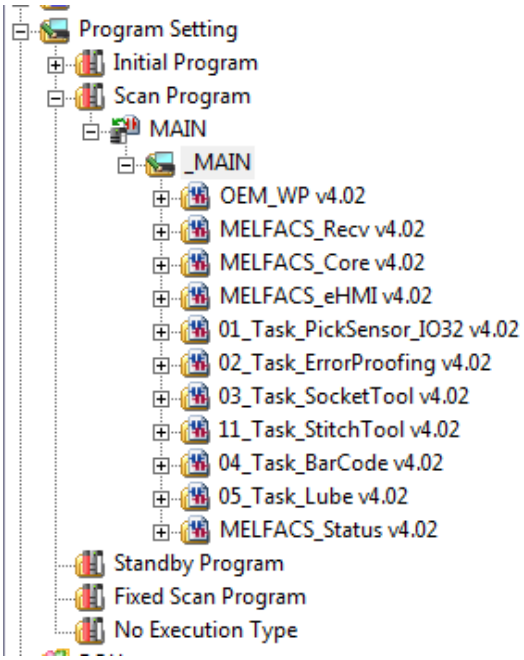
Example eFlex and PLC Library for Dual GOTs

The eFlex Task Sequencing for Single Position Manual Station is shown below. The corresponding Programs are called into Scan Programs are show later in the section

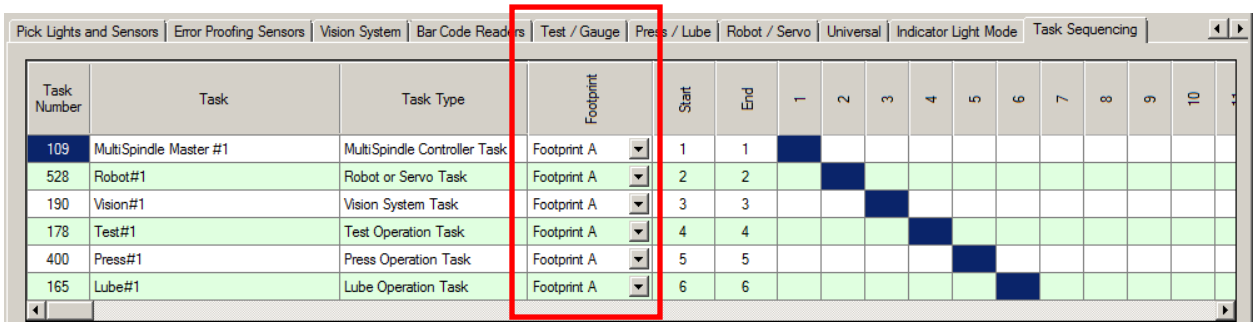


Task Number	Task	Task Type	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13
102	Error Proofing Task #1 - Continuous	Error Proofing Task	Left	1	1													
103	Error Proofing Task #2 - Triggered	Error Proofing Task	Left	2	2													
104	Pick Sensor Lookup Task #1	Pick Sensor Task	Left	3	3													
105	Pick Sensor Lookup Task #2	Pick Sensor Task	Left	4	4													
106	Pick Sensor Model Type #1	Pick Sensor Task	Left	5	5													
107	Pick Sensor Model Type #2	Pick Sensor Task	Left	6	6													
108	Stitching Tool #1	Stitching Tool Task	Left	7	7													
502	Socket Tool Without Sockets (programs)	Socket Tool Task	Left	8	8													
504	Socket Tool Sub Task #1	Socket Task	Left	9	9													
505	Socket Tool Sub Task #2	Socket Task	Left	10	10													
159	BR#11	Bar Code Part Scan Task	Left	11	11													
160	BR#12	Bar Code Part Scan Task	Left	12	12													

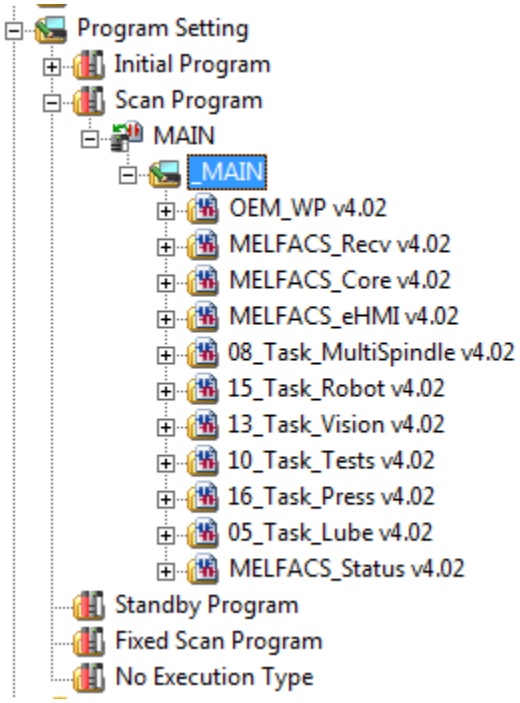
The typical example of the Single Position Manual Station Programs are called into the Scan programs as shown below to suit eFlex Configuration.



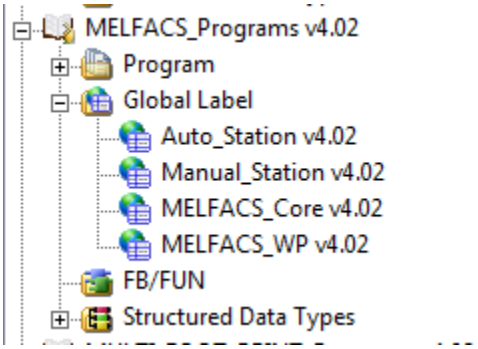
The eFlex Task Sequencing for Single Position Auto Station is shown below. The corresponding Programs are called into Scan Programs are show later in the section



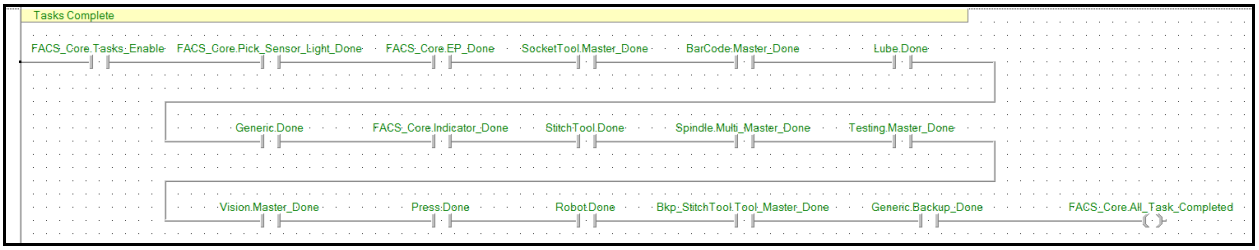
The typical example of the Single Position Auto Station Programs are called into the Scan programs as shown below to suit eFlex Configuration.



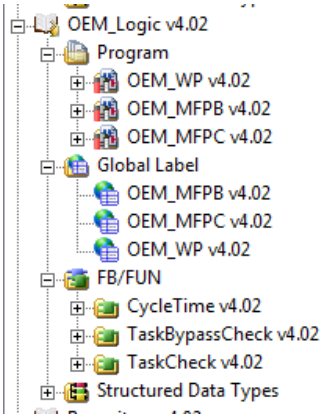
The example programs and Global Labels for Single Position Manual/Auto Station are included in MELFACS Programs v4.xx.



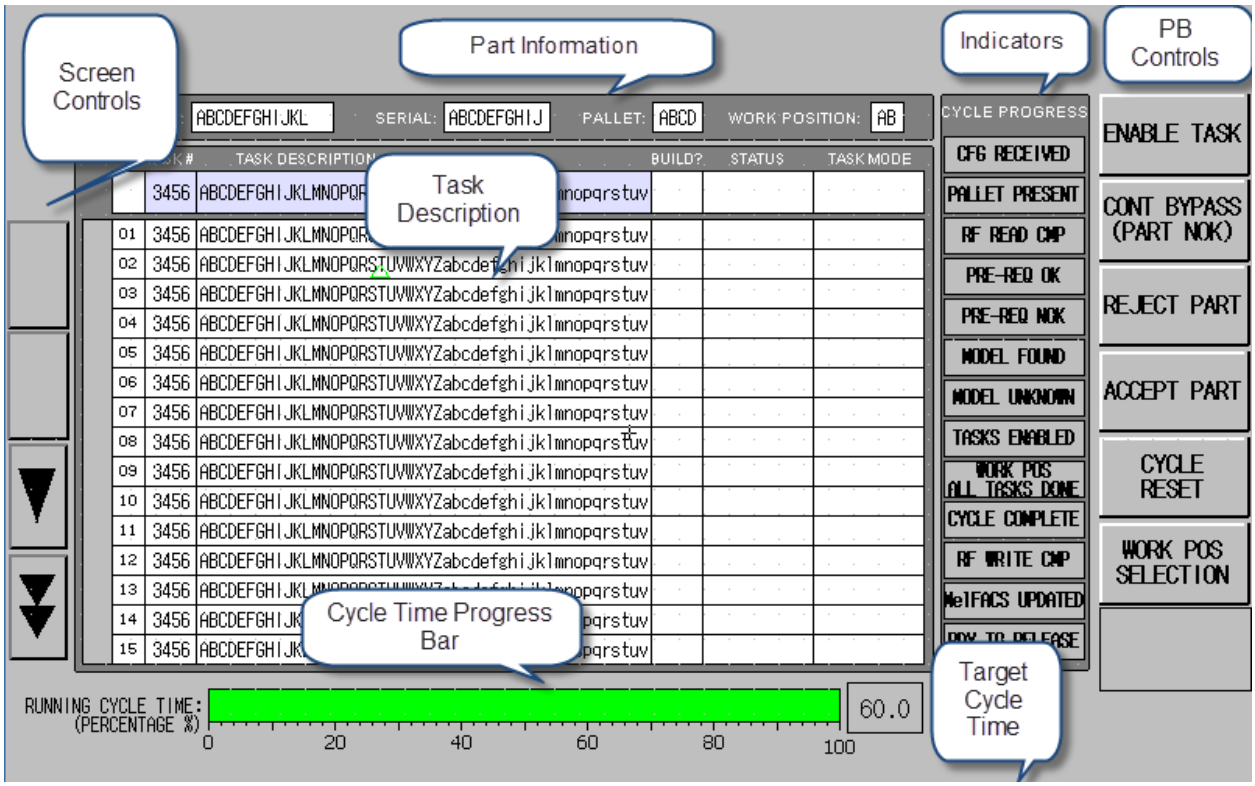
The User/OEM can edit example Programs in Project–POU and MELFACS Programs v4.xx to suit to their application on User/OEM editable input and output pins of FBs. The list of User/OEM pins are given earlier in FB section. The Task Complete rung in MELFACS_Status can be edited based on the Task FBs are called into the Scan Programs



The Global Labels, FBs and Programs in User Library OEM_Logic v4.xx are information only and very important to run the Training Workshop. All the information can be transferred/edited to suit to the application in the respective OEM Programs.



6.4 GOT Main Screen PB Controls



The Work Pos Selection PB on the eHMI Main screen is used to switch between different positions of Multi-Foot Print Positions A, B or C. The Tasks, status of each task, Cycle Progress Indicators, Cycle Time, Model Type, Serial #, Pallet # and Work Position are updated for each position selected. All the PB Controls work on the appropriate Foot Print Logic which has been selected.

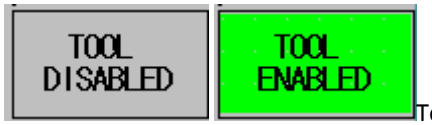
The Cycle Reset PB clears all the data in Data Structures related to Task FBs. If the RF Tag is re-read then Tasks are enabled again based on the previous completion status.

The Reject Part PB is used to Reject the part in the station during any time of the cycle. The Task FBs write Status Code 21 to the RF Tag for remainder Task not completed. Tasks completed before pressing Reject PB are not affected.

The Accept PB is used on the Back-up Manual Stations where operator Accepts the Task selected from the Task window.

The Continuous Byass (Bypass Bad) is used to Bypass Part on continuous basis where Status Code 190 is written to the Task and overall Station Task is “Task NOK”. The Part has to be built in the Back-up Station or in the Repair area. The Task to be Bypassed can be selected by pressing a particular Task from the Task window. This is alternative to the Bypass from eFACS Configuration Server.

The Enable Task PB is used to Enable Tasks which were Bypassed earlier by selecting that particular task in the Task window.



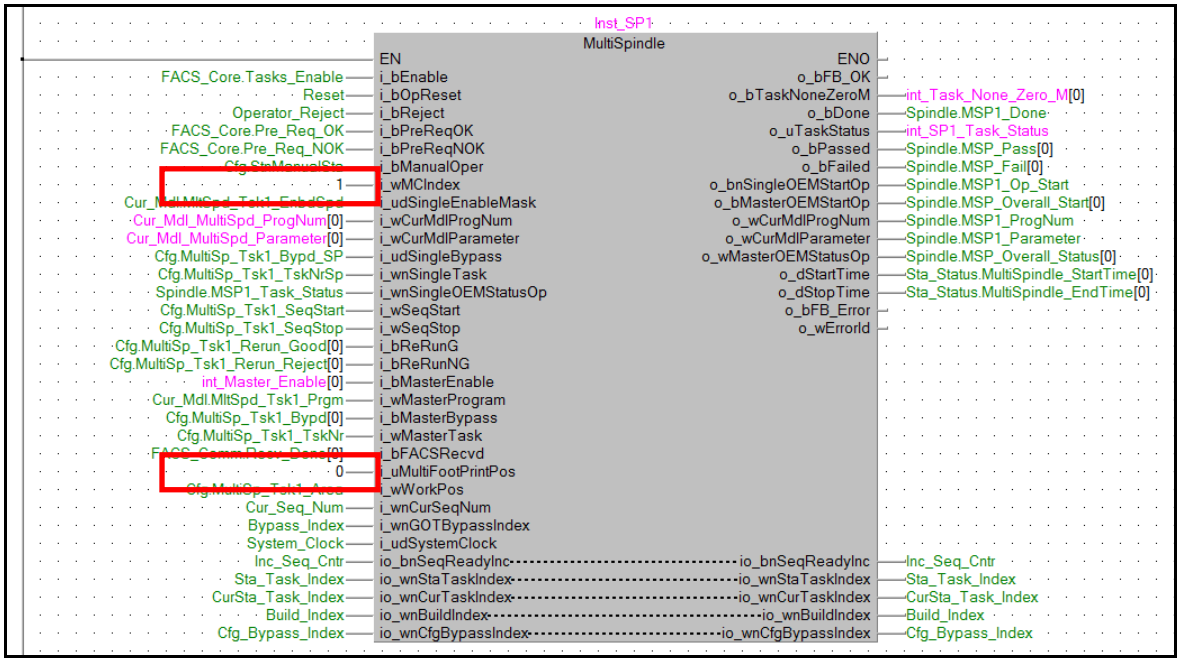
Tool Sharing Control is used in the Dual GOT station where one Socket Tool is shared between two operators. Initially Tool is Enabled to both operators. But if one of the operator presses the PB, then Socket Tool is disabled to the other opeartor until first operator compleates the task.

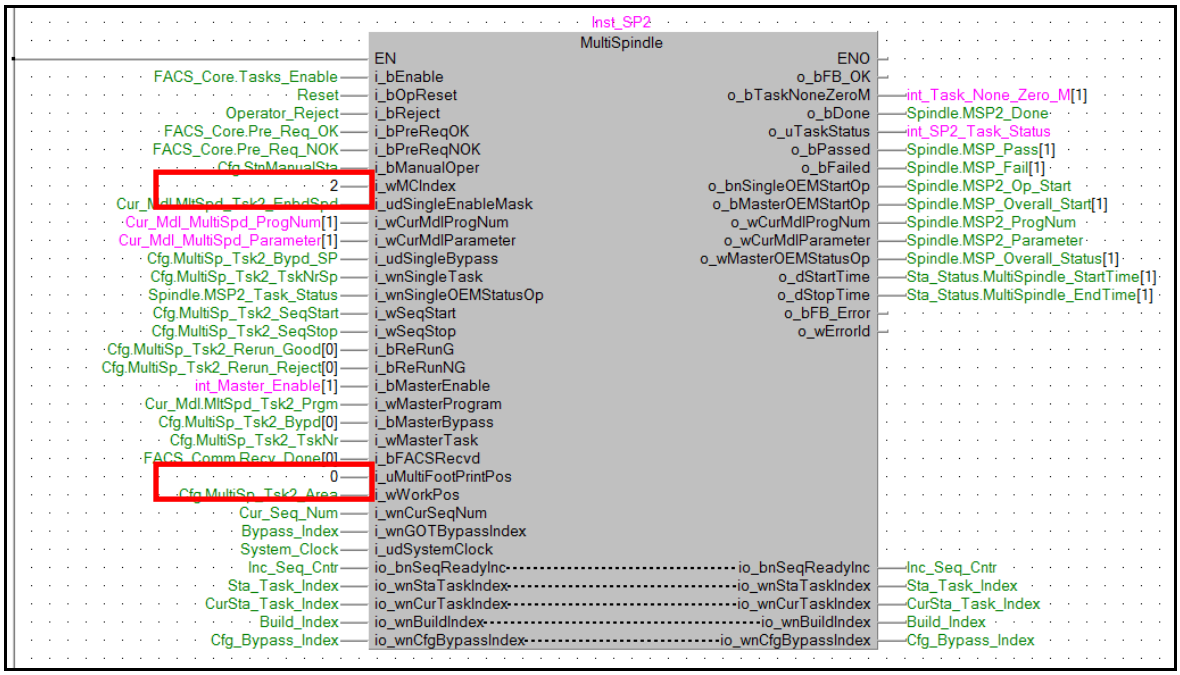
6.5 Stitch Tool Backup in Manual Station/Multi-Foot Print – Pos B/C Station

The Stitch Tool Backup Task can be used to repair Multi-Spindle Tasks configured in upstream station. One Stitch Tool Backup task can repair maximum of two Multi-Spindle tasks and maximum of two Stitch Tool Backup Tasks can be configured in a station. The Stitch Tool Backup tasks can be configured in Manual station or in downstream Multi—Foot Print Pos B/C.

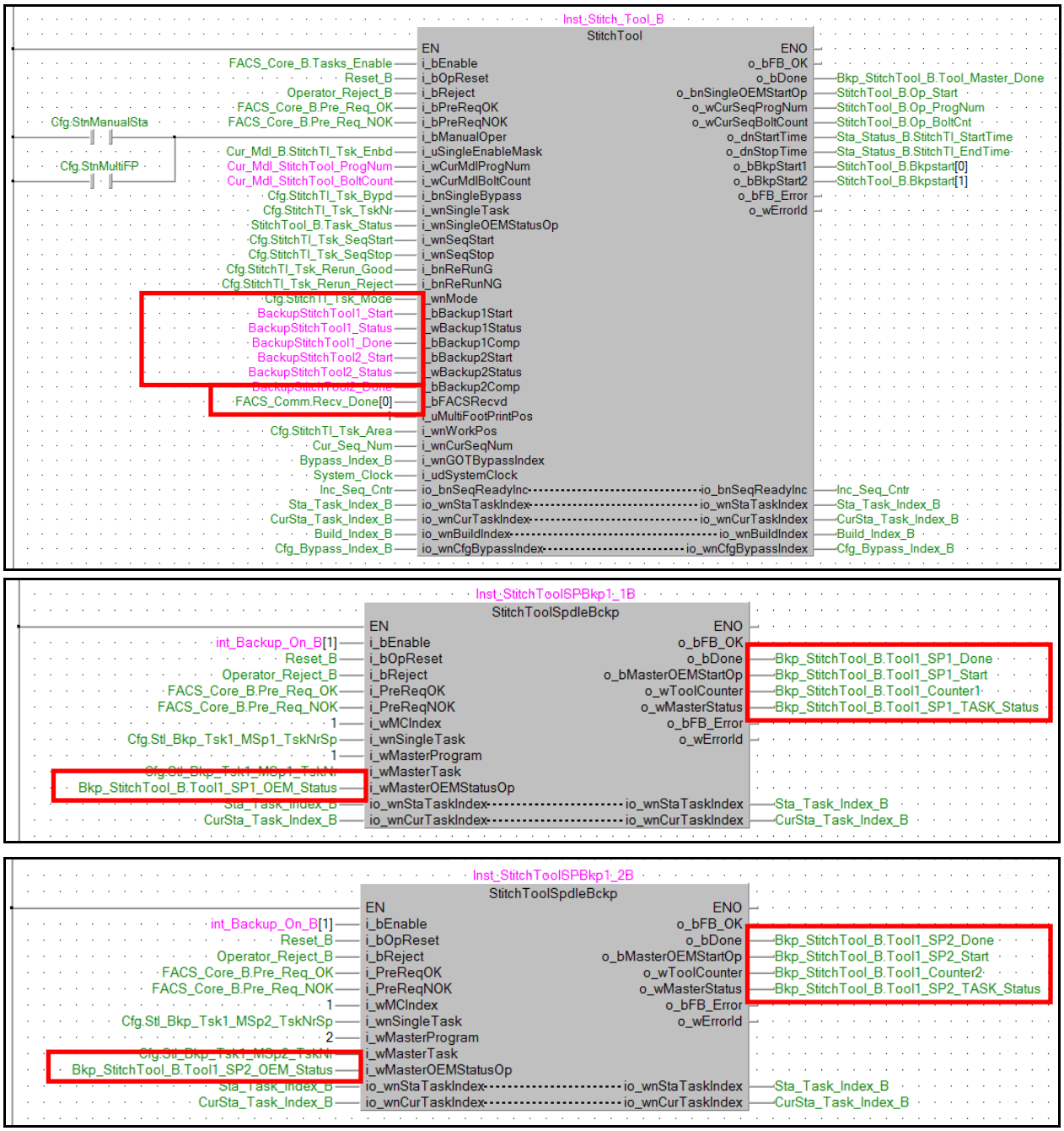
In the following example, two Multi-Spindle Master Tasks are configured in Multi-Foot Print Pos A and Stitch Tool Backup Task for both Multi-Spindle Tasks is configured in Multi-Foot Print Pos B.

Position A - Program 08_Task_MultiSpindle_MFP_A





Position B - Program 12_Task_StitchTool_Backup_MFP_B



When Stitch Tool Backup Task configured in a station, the RF Tag read from the Engine Pallet indicates how many of the spindles of Multi-Spindle Task configured upstram have been rejected. The number of Spindles to be repaired are shown in the label – "Bkp_StitchTool_B.Tool1_Counter1" for first Multi-Spindle Task and bit "Bkp_StitchTool_B.Tool1_SP1_Start" will come ON. When operator fixes all the bolts to be repaired, user OEM logic moves Status Code of ***"253"*** into "Bkp_StitchTool_B.Tool1_SP1_OEM_Status" and the bit "Bkp_StitchTool_B.Tool1_SP1_Done" will come ON.

If Operator is NOT able to repair all the spindles, then Operator presses "Reject PB" on the Main screen of eHMI that allows FB StitchToolSpindleBckp to move Status Code of ***"20"*** into all the non-repaired spindles.

Example eFlex and PLC Library for Stitch Tool Backup example

The eFlex Configuration Software configuration for two Multi-Spindle Master Tasks, Repair Stitch Tool Backup task for two upstream Multi-Spindles and Task Sequencing in Multi-Foot Print set-up are shown below

			Task	Spindles	Bypass	Task Rerun Method	Device Interface	Mode	Program Number	Parameter	Repair Program
	1		109-MultiSpindle Master #1	4		Always Re-Run	Normal Multispindle	Back Out All Bolts	5	6	
		1	110-MSP Bolt 11						☑		0
		2	111-MSP Bolt 12						☑		0
		3	112-MSP Bolt 13						☑		0
		4	113-MSP Bolt 14						☑		0
	2		154-MultiSpindle Master #2	4		Always Re-Run	Normal Multispindle	Back Out All Bolts	1	8	
		1	155-MSP Bolt 21						☑		0
		2	156-MSP Bolt 22						☑		0
		3	157-MSP Bolt 23						☑		0
		4	158-MSP Bolt 24						☑		0

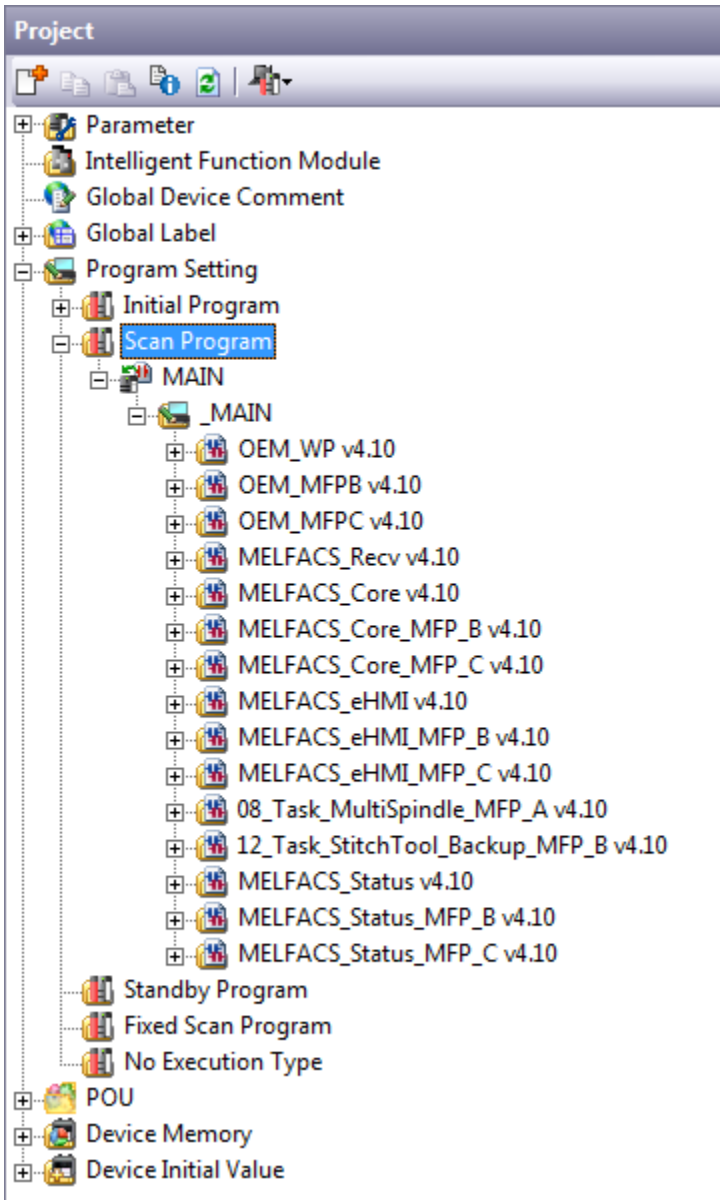
			Task	Bypass	Re-Run Method	Interface	Program Number	Bolt Count
	1		Repair Tool (In-Station and Upstream)		Always Re-Run	Profibus	11	
		1	109-MultiSpindle Master #1					
		2	154-MultiSpindle Master #2					
		3						
		4						

Error Proofing Sensors | Vision System | Bar Code Readers | Test / Gauge | Press / Lube | Robot / Servo | Universal | Indicator Light Mode | HMI Backup | RFID Addresses | Task Sequencing

Task Number	Task	Task Type	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12
109	MultiSpindle Master #1	MultiSpindle Controller Tas	Footprint A	1	1	■											
154	MultiSpindle Master #2	MultiSpindle Controller Tas	Footprint A	2	2		■										
308	Repair Tool (In-Station and Upstream) ...	Backup Tool Task	Footprint B	1	1	■											

Appropriate programs like eHMI_Dispaly_MFPB and eHMI_Dispaly_MFPC, MELFACS_Core_MFPB and MELFACS_Core_MFPC, MELFACS_Status_MFPB and MELFACS_Status_MFPC are called into the scan programs along with *Program 08_Task_MultiSpindle and Program 12_Task_StitchTool_Backup_MFP_B*

The typical example of the Programs are called into the Scan programs as shown below to suit eFlex Configuration

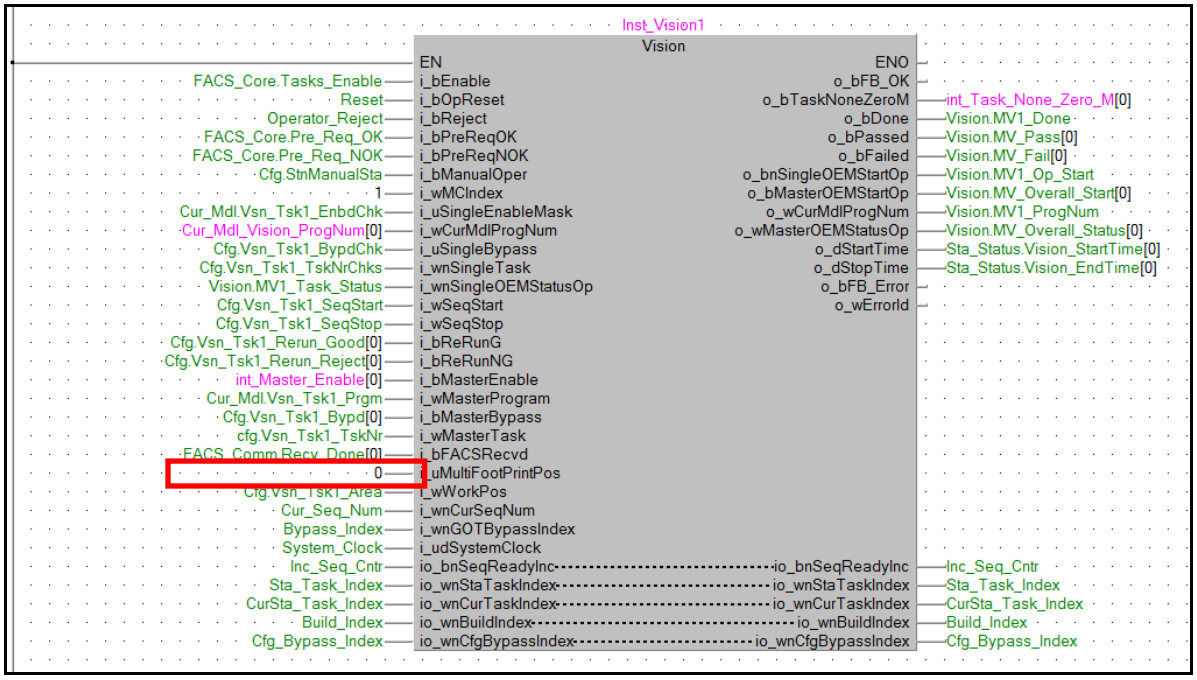


6.6 Generic Backup in Manual Station/Multi-Foot Print – Pos B/C Station

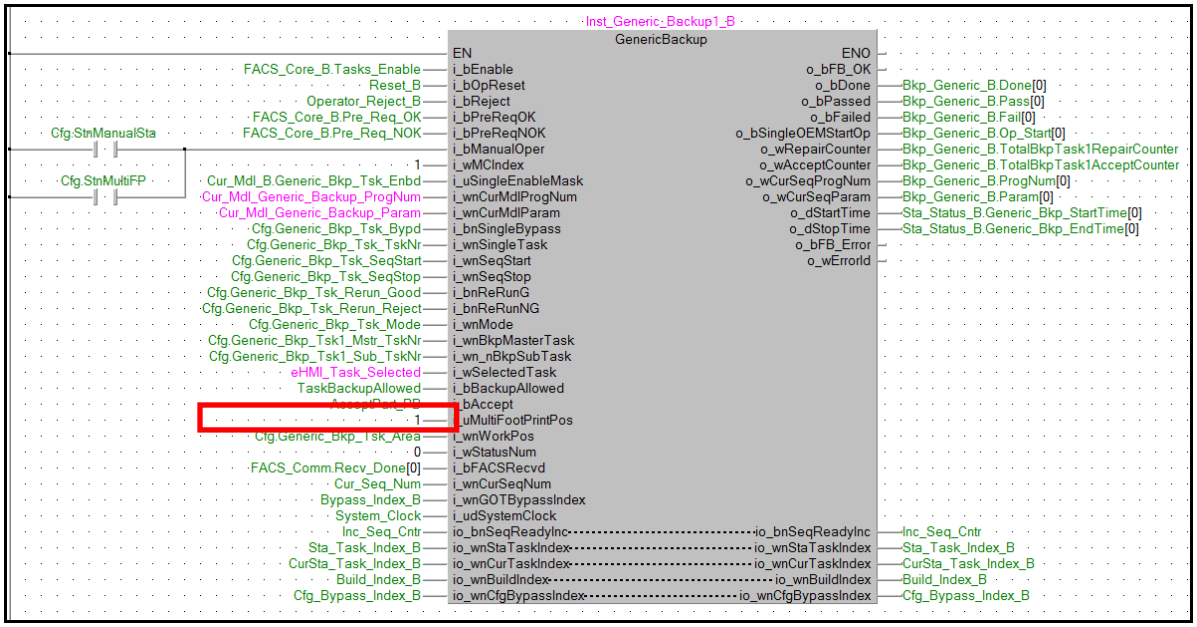
The Generic Backup Task can be used to repair any Tasks configured in upstream station without using electric feedback tools (with visual inspection or some simple manual tools). One Generic Backup task can repair any tasks and maximum of two Generic Backup Tasks can be configured in a station. The Generic Backup tasks can be configured in Manual station or in downstream Multi—Foot Print Pos B/C.

In the following example, Vision Tasks are configured in Multi-Foot Print Pos A and Generic Backup Task for is configured in Multi-Foot Print Pos B.

Position A - Program 13_Task_Vision_MFP_A

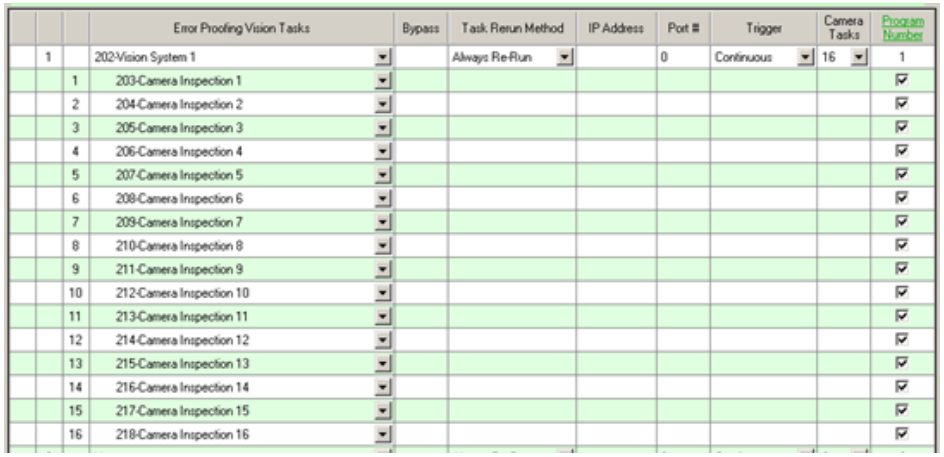


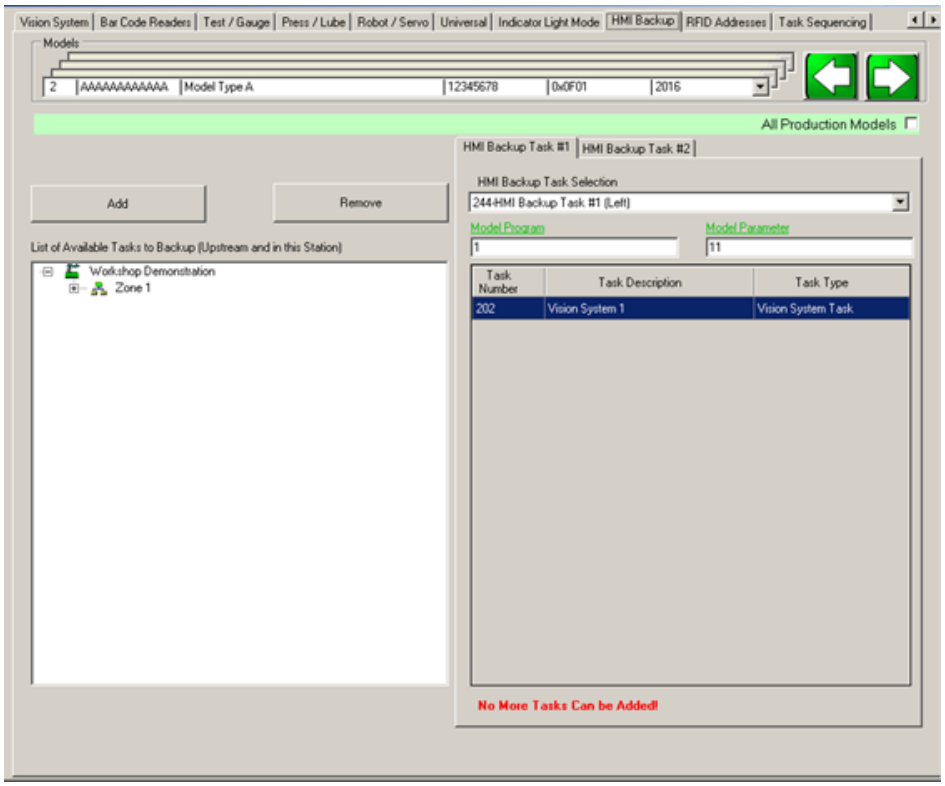
Position B - Program 07_Task_Generic_Backup_MFP_B

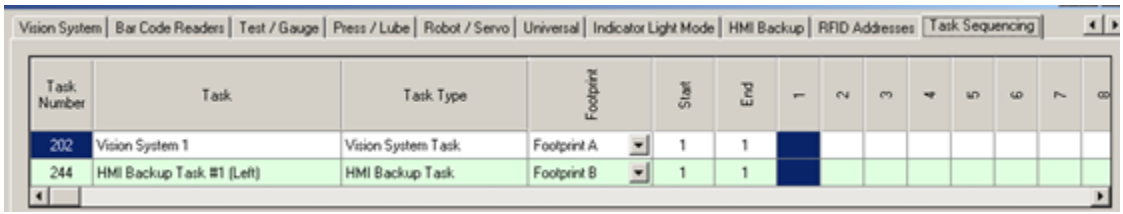


Example eFlex and PLC Library for Generic Backup example

The eFlex Configuration Software configuration for Vision Master Tasks, Repair Generic Backup task for upstream Vision Tasks and Task Sequencing in Multi-Foot Print set-up are shown below

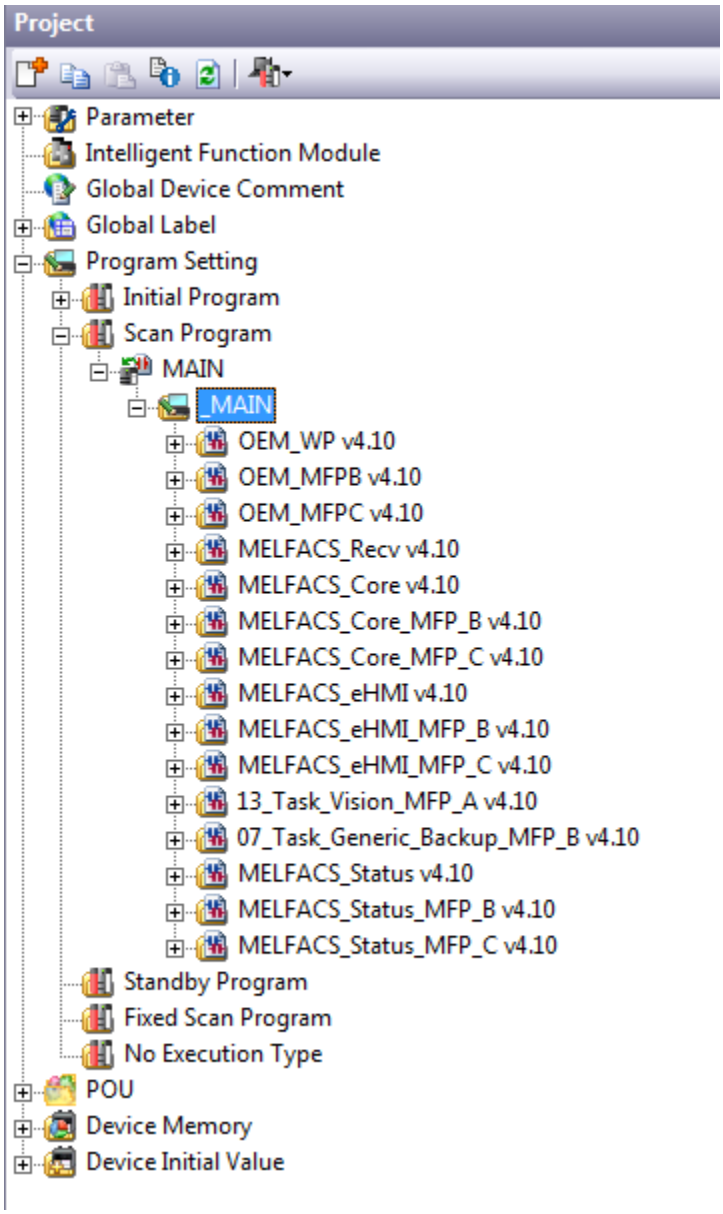






Appropriate programs like eHMI_Dispaly_MFPB and eHMI_Dispaly_MFPC, MELFACS_Core_MFPB and MELFACS_Core_MFPC, MELFACS_Status_MFPB and MELFACS_Status_MFPC are called into the scan programs along with *Program 13_Task_Visio_MFP_A and Program 07_Task_Generic_Backup_MFP_B*

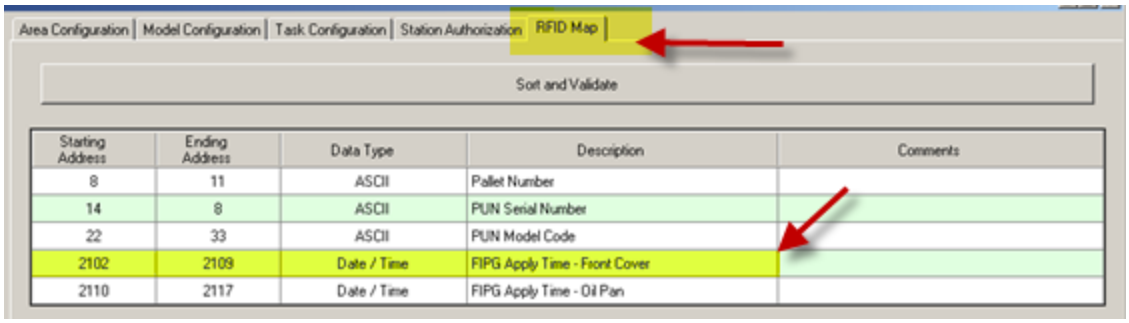
The typical example of the Programs are called into the Scan programs as shown below to suit eFlex Configuration



6.7 OEM / User defined RFID Start Addresses and Lengths

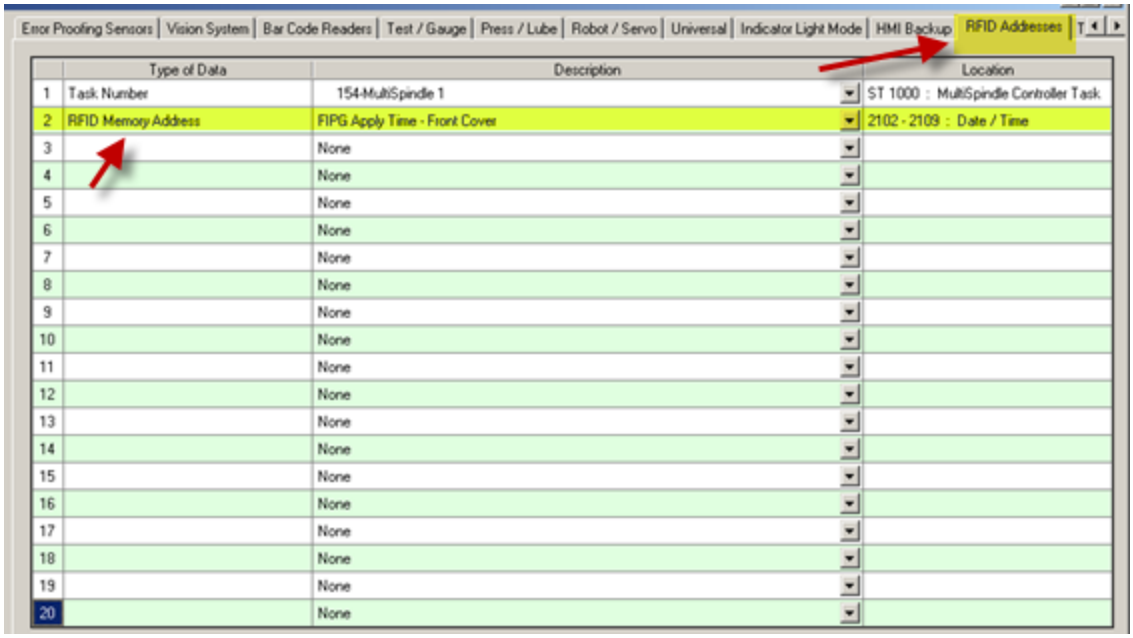
The OEM/User can setup RFID addresses and Task Numbers in the eFlex Configuration software for each station and after download that information is available in PLC Memory Cfg.OEM_RF_StartAddress(0..19) and Cfg.OEM_RF_Length(0..19).

The OEM/User can setup as many areas of the RF Tag address (Start and End Addresses), Data Type with description and Comments in the Line Configuration area under RFID Map.



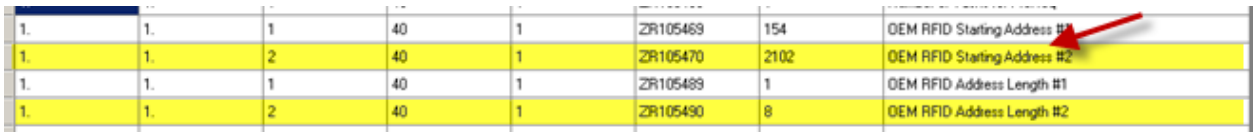
Starting Address	Ending Address	Data Type	Description	Comments
8	11	ASCII	Pallet Number	
14	8	ASCII	PUN Serial Number	
22	33	ASCII	PUN Model Code	
2102	2109	Date / Time	FIPG Apply Time - Front Cover	
2110	2117	Date / Time	FIPG Apply Time - Oil Pan	

Then in the station configuration area under RFID Addresses, User can select upto 20 RF ID addresses or Task Numbers per station to be downloaded from the list already configured in the Line Configuration.



	Type of Data	Description	Location
1	Task Number	154-MultiSpindle 1	ST 1000 : MultiSpindle Controller Task
2	RFID Memory Address	FIPG Apply Time - Front Cover	2102 - 2109 : Date / Time
3		None	
4		None	
5		None	
6		None	
7		None	
8		None	
9		None	
10		None	
11		None	
12		None	
13		None	
14		None	
15		None	
16		None	
17		None	
18		None	
19		None	
20		None	

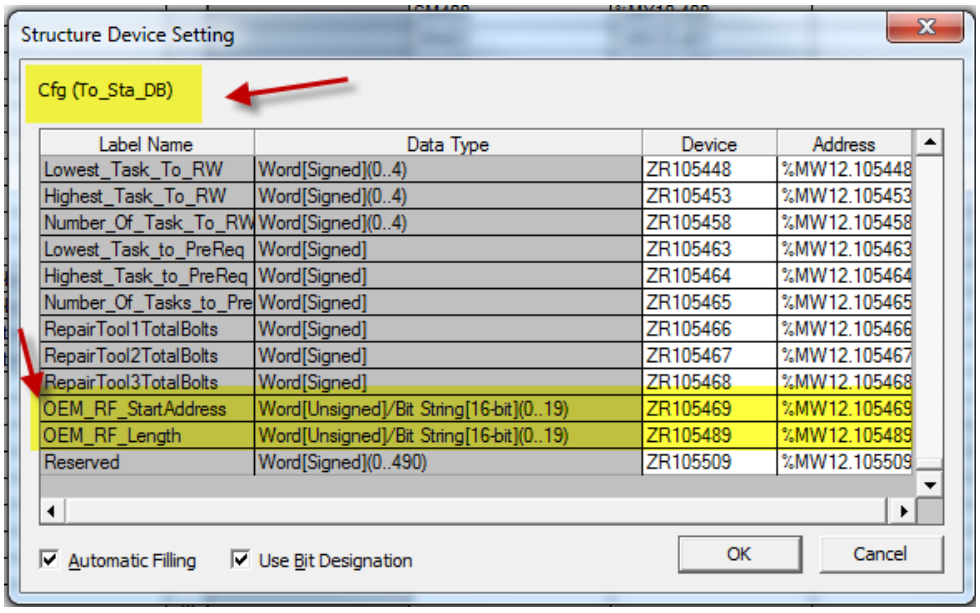
The data selected will be downloaded to PLC as shown below.



1.	1.	1	40	1	ZR105469	154	OEM RFID Starting Address #1
1.	1.	2	40	1	ZR105470	2102	OEM RFID Starting Address #2
1.	1.	1	40	1	ZR105489	1	OEM RFID Address Length #1
1.	1.	2	40	1	ZR105490	8	OEM RFID Address Length #2

For example, “FIPG Apply – Time – Front Cover” has been configured in the Line Configuration for Starting Address – 2102 and Ending Address – 2109 with Data Type Date/Time. Then in the Station Configuration that RFID Address is selected on the second line. The data downloaded to the PLC would be second element of the Array with Start Address – 2102 and Lenth – 8. This data can be used by the OEM/User to program the opeartion downstream to make decision on building Front Cover.

The PLC memory Cfg structure is shown below.



6.8 RFID Tag Data to Read and Write

To speed up RFID Tag Read and Write operation, instead of Reading and Writing all the Task information from RF Tag address 101 – 2100, the following data is downloaded to the PLC memory in Cfg Data structure.

For each station Task Numbers (Lowest Task Number, Highest Task Number and the Length) is downloaded. OEM/User can read only those areas of the RF Tag so that Read and Write time is saved instead of reading whole Tag.

Similarly for the Pre Req Tasks of the station, (Lowest PreRq Task, Highest PreReq Task and Length) is downloaded to the PLC memory in Cfg areas.

The PLC memory Cfg area is shown below.