
ABB Ability™ System 800xA

MOD 300 CCF Library for AC 800M



Executive overview

ABB is committed to providing its MOD 300 system owners with Extended Automation solutions while protecting the capital equipment and the intellectual property investments made in their installed systems.

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01 Using the same algorithms as its MOD 300 counterparts, this library allows for the incremental and step-wise evolution of field proven MOD 300 control configurations.

This commitment extends to control assets where ABB solutions protect investments in:

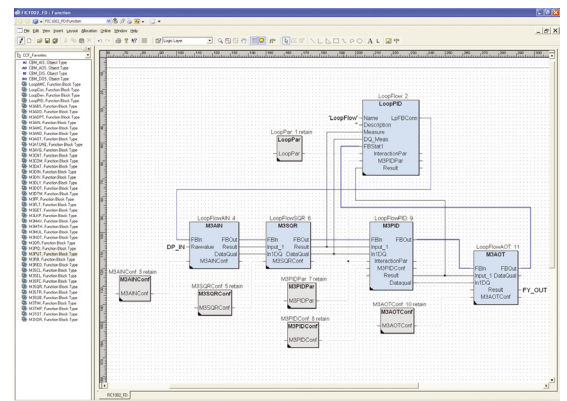
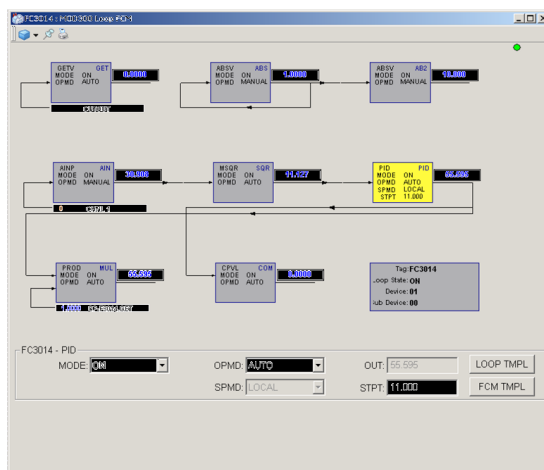
- Controller software applications
- Control & I/O hardware
- Field wiring and terminations

The MOD 300 CCF Library (MOD300CCFLIB) for AC 800M control library protects the investment made in MOD 300 control applications. Using the same algorithms as its MOD 300 counterparts, this library allows for the incremental and step-wise evolution of field proven MOD 300 control configurations.

Features and Benefits

- Protects intellectual property
 - MOD300CCFLib protects proven process control application investment by providing an easy means to evolve MOD 300 controller configurations to AC 800M.
- Provides simple 1-FOR-1 function mapping MOD 300 to AC 800M
 - MOD300CCFLib provides an equivalent function block in AC 800M for each of the most commonly used function codes from MOD 300.

- Minimizes engineer training
 - The MOD300CCFLib function blocks are simple to understand because the inputs, outputs, and parameters provide the same behavior as the corresponding CCF in MOD 300.
- Provides same or better performance
 - The MOD 300 CCF algorithms have been completely re-engineered for the IEC 61131-3 environment of AC 800M, and are configured and perform identically as their MOD 300 counterparts.
- Maintains operations “Look & Feel”
 - All of the faceplates from 800xA for MOD 300 are provided for the AC 800M function blocks; ensuring smooth transition of operator control.
- Uses graphical engineering environment
 - Function Diagrams provide graphical documentation of AC 800M MOD300CCFLib based control logic onfiguration.
- Delivers flexibility & power of AC 800M based control
 - The modular design of AC 800M and its I/O options provides a very flexible and powerful automation platform. AC 800M runs IEC-61131-3 control languages and supports popular field bus technologies.



Introduction

MOD 300 CCF Library (MOD300CCFLIB) for AC 800M is a control library that contains the most frequently used MOD 300 Configurable Control Functions (CCF).

MOD 300 CCF library support the seamless, incremental evolution of MOD 300 control applications to the AC 800M control environment.

Just as with CCF, MOD300CCFLib implements continuous and discrete control functions by combining individual function modules. All three main classes of modules have been preserved: Loop Class Modules (LCM), Function Class Modules (FCM) and Device Loops.

MOD300CCFLib addresses the needs of those system owners who want to extend their MOD 300 system using AC 800M controllers but continue to base their control applications on MOD 300’s field proven / field tested CCF algorithms. For control engineers, the benefit is the ability to develop control applications using familiar components (CCF modules). For operators, a seamless transition to AC 800M based control is ensured because use of the library makes the data source (the MOD 300 controller or the AC 800M controller) completely transparent.

This library provides a set of configurable object types referred to as Function Block Types (FBT). Process control loops are defined by configuring

function blocks that are derived from FBTs in the library. AC 800M Function Blocks are control algorithms that reside in active controllers. Advanced PID loops, math functions, and more are all possible with Function Blocks. In addition to control logic, Function Blocks define control elements such as control stations and device drivers in operator interfaces.

By containing the extensive set of field proven MOD 300 CCF modules, the MOD300CCFLib removes the risks and costs associated with typical control upgrade projects. As opposed to ‘rip and replace’ upgrades, the library allows system owners to re-use their proven control strategies, thereby lowering system lifecycle costs. This is achieved by maximizing the use of their control application assets and by minimizing the associated project’s engineering, commissioning, and start-up costs (see Table 1).

Over the next several sections, the AC 800M CCF library features and benefits are described in detail.

Traditional “Rip and Replace” Upgrades	ABB MOD 300 CCF Library for AC 800M upgrades
Re-engineering of control applications	Minimal to no engineering required
New algorithms result in new process control behaviors	Process control is same as before
Long commissioning and start-up periods (re-tuning of loops)	Minimal commissioning and start-up (no re-tuning of loops required)
Create new documentation	Documentation converted and enhanced
Results in:	Results in:
<ul style="list-style-type: none"> • Greater loss of production • Increased risk • Higher project cost 	<ul style="list-style-type: none"> • Minimal loss of production • Minimal risk • Lower project costs

Table 1. Comparison of Strategies

Protects intellectual property

Minimizes engineer training required

The primary purpose of the MOD 300 CCF function block library is to allow MOD 300 system owners to protect the intellectual property embedded within their existing controllers. Specifically, the library is designed to make evolution of MOD 300 control applications to AC 800M straightforward and simple.

The MOD300CCFLib does this by providing an equivalent function block in AC 800M for each of the most commonly used function codes from MOD 300. Table 2 lists all of the Function Block Types (FBT's) provided in the MOD300CCFLib.

A powerful feature of MOD300CCFLib is that FBTs from other AC 800M libraries can be seamlessly integrated with CCF FBTs.

FBT Name	Function	FBT Name	Function
M3ABS	ABSOLUTE_VALUE	M3MAV	MOVING AVERAGE
M3ADD	ADDITION	M3MTH	MATH
M3ADPT	Adaptive Gain/Adaptive Reset	M3MUL	MULTIPLICATION
M3AIN	ANALOG_INPUT	M3NOT	LOGICAL_NOT
M3AMC	AUTO/MANUAL/CONTROLLER	M3OR	LOGICAL_OR
M3AND	LOGICAL_AND	M3PID	PID_CONTROLLER
M3AOT	ANALOG_OUTPUT	M3PUT	PUT_GENERIC_VALUE
M3AVG	AVERAGE	M3RB	RATIO/BIAS
M3CNT	COUNTER	M3RED	REDUNDANT_SIGNAL
M3COM	REAL_COMPARE	M3SCL	SCALE
M3DAT	DATA_ENTRY	M3SEL	SELECT_NEXT
M3DIN	DIGITAL_INPUT	M3SFC	SELECT_NEXT_FCM
M3DIV	DIVISION	M3SQR	SQUARE_ROOT
M3DLY	DELAY	M3STR	STRING
M3DOT	DIGITAL_OUTPUT	M3SUB	SUBTRACTION
M3DTM	DEAD_TIME	M3TIM	TIMER
M3FF	FEED_FORWARD	M3TMP	TEMPERATURE_COMPENSATION
M3FLT	FIRST_ORDER_FILTER	M3TOT	TOTALIZER
M3GET	GET_GENERIC_VALUE	M3TUNE	Auto Tune
M3LKP	LINEARIZATION	M3XOR	EXCLUSIVE_OR

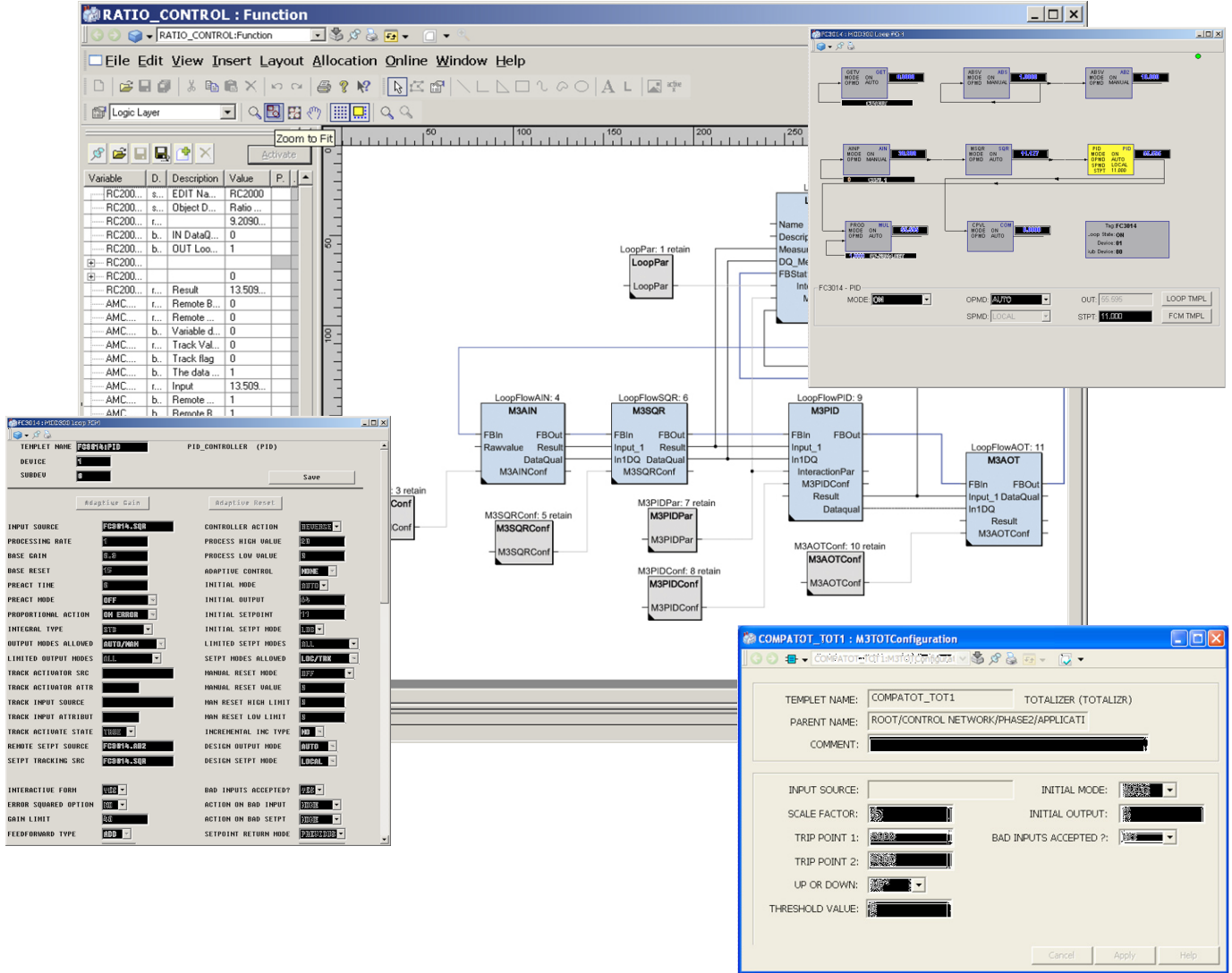
Table 2. List of FCMs

Device Loop Type				
0_IN_1_C_OUT	1_IN_0_OUT	2_IN_0_OUT	3_IN_0_OUT	4_IN_0_OUT
0_IN_1_M_OUT	1_IN_1_C_OUT	2_IN_1_C_OUT		4_IN_2_C_OUT
0_IN_2_C_OUT	1_IN_2_M_OUT	2_IN_2_C_OUT		
0_IN_2_M_OUT		2_IN_2_M_OUT		

Table 3. List of Device Loops, the 14 Standard Descriptor Sets

FBT Name	Function
LoopPID	PID
LoopAMC	Auto/Manual
LoopCON	Indication

Table 4. List of Loop Class Modules (LCM)



01 Similar Function Block Shapes

The MOD300CCFLib function blocks are simple to understand because their inputs, outputs, and parameters provide the same behavior as the corresponding Function Class Module in MOD 300 CCF. Most importantly, the structure and behavior of the Loop Control Module (LCM) has been preserved, providing the same capabilities.

These capabilities include: loop name, description, engineering units, etc. Input, Output, and Parameter names are descriptive. The same default values and allowable ranges are defined. In Function Designer, MOD300CCFLib Function Blocks have a graphical “look and feel” that is similar to their corresponding Loop FCM Display, but with much more information (see Figure 1). Configuration templates provide the same functions as the data entry templates in AdvaBuild or the Configurator. An engineer who knows how to configure or tune a loop/device in MOD 300 will know how to configure/tune the corresponding function block in AC 800M.

Provides same or better performance

Maintains operations “Look & Feel”

— 01 Identical control loops executed in AC460 and AC 800M controllers result in identical control response to demand changes

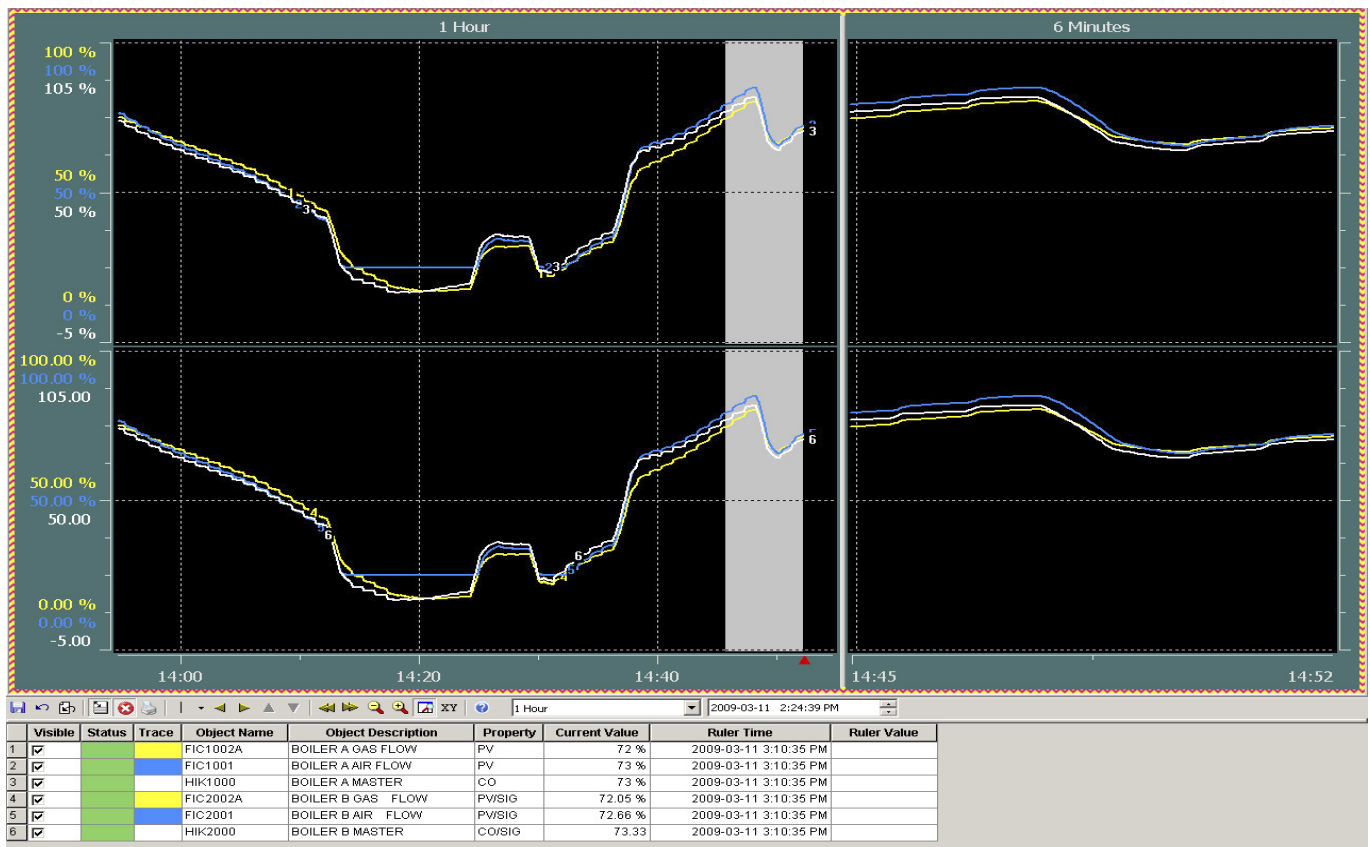
MOD300CCFLib Function Blocks are based on the same algorithms as their MOD 300 FCM equivalents (e.g., the PID). Because they behave identically to their counterparts, re-tuning of the AC 800M based control loops is not necessary. This saves significant time and reduces risk associated with controller upgrades.

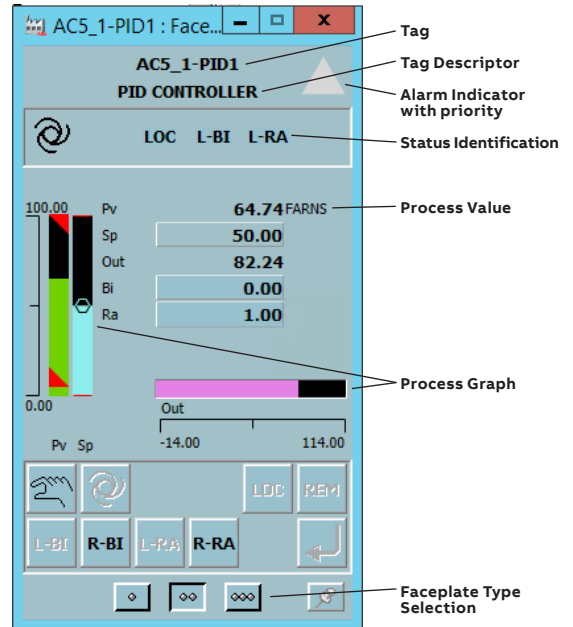
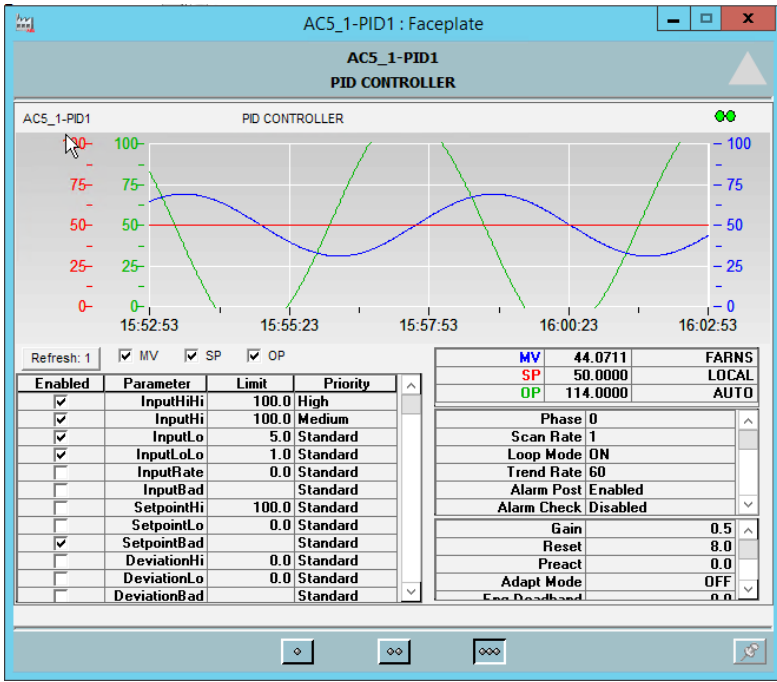
MOD300CCFLib Function Block based control schemes are compatible with all of the other IEC 61131-3 control languages, such as Sequential Function Charts (SFC), Ladder Diagrams (LD), Structure Text (ST), and Instruction Lists (IL).

In addition, MOD300CCFLib Function Blocks can be used with any of the industry specific libraries available for AC 800M controllers. These include the Pulp and Paper Library, Oil and Gas Library, and Power Generation Library.

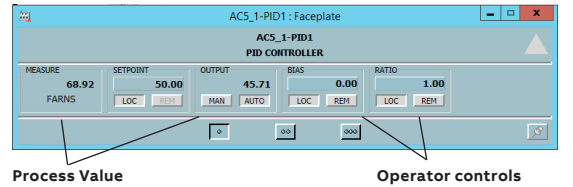
MOD 300 based control strategies are further strengthened by using them in conjunction with the 800xA system’s Information Management, Asset Optimization, Device Management, and Batch Management functions.

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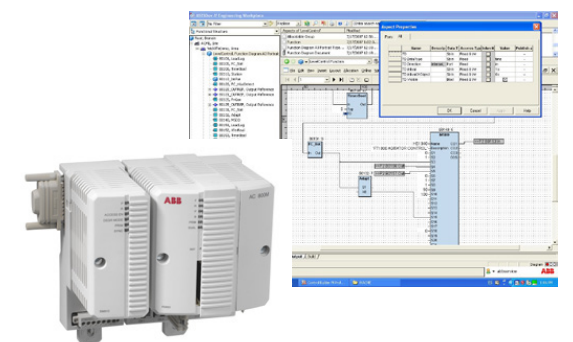
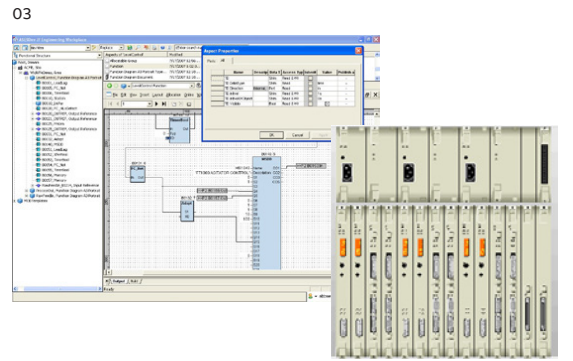
02 MOD 300 Faceplates provided by MOD300C-CFLib. System 800xA faceplates include these three views.

03 Identical Operator Look & Feel regardless of controller and logic.

The faceplates and displays (extended and reduced) associated with the MOD 300 Loops and Devices are the same as those provided by 800xA for MOD 300. From an operations perspective, this means that the faceplate for an Auto/Manual, PID, Device, or Indication loop is the same regardless of whether the faceplate is connected to a Loop or Device executed in a MOD 300 controller, or connected to a function block executed in an AC 800M controller. As depicted in Figure 03, the source of the data (AC 800M or MOD 300) is totally transparent to operators.

The following MOD300CCFLib Function Blocks have faceplates:

- PID
- Auto/Manual
- Device
- Indication (Continuous)



Uses graphical engineering environment

Function Designer is a graphical engineering tool of System 800xA that maintains AC 800M's MOD300CCFLib based configurations.

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01 Function Diagrams contain various control entities

Function Designer provides a unique graphical function design capacity. It designs and modifies the process functions that make up the control strategy. Users can create a single process function or build an entire control loop, by dragging items from a browser to the functional diagram. Each diagram can contain control entities from different functional areas of the plant such as controllers, I/O, field devices, and drives (see Figure 01). Representations can extend across multiple diagrams or sheets through the use of page and cross-reference links.

For more information on Function Designer features, please refer to the 800xA Engineering Overview document (3BDD013082).

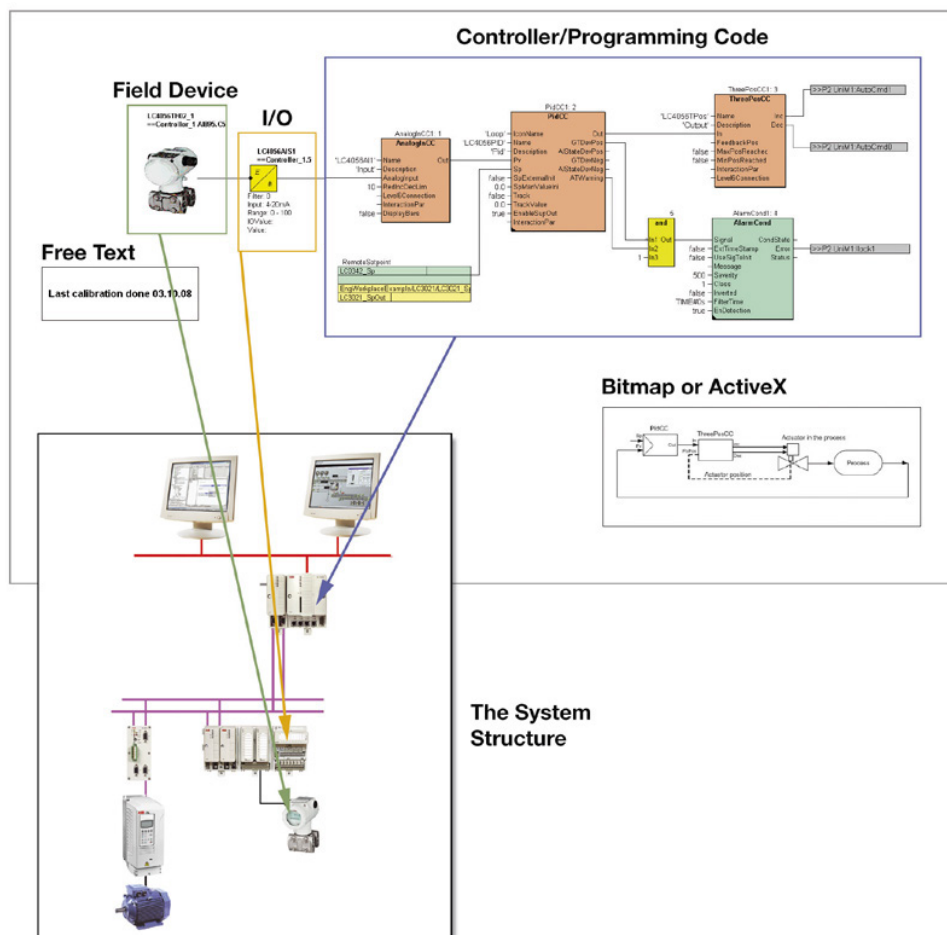
Control Templates

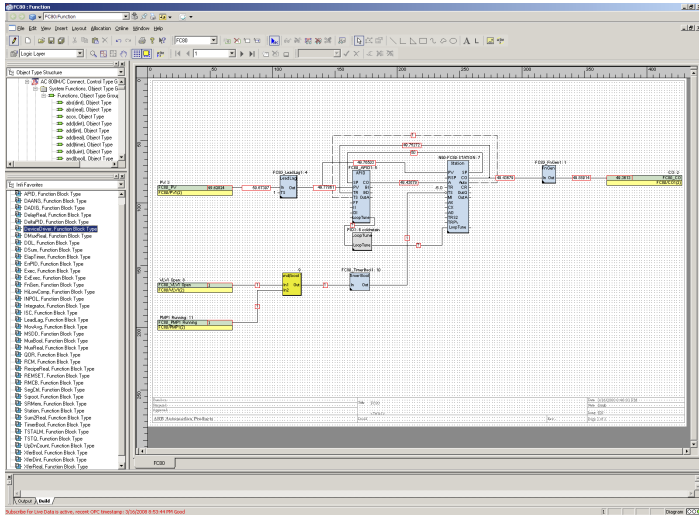
In addition to building loop diagrams using individual Function Blocks, the MOD300CCFLib provides four standard loop templates:

- Basic PID Loop
- Basic A/M Loop
- Basic Indicator Loop
- Basic Device

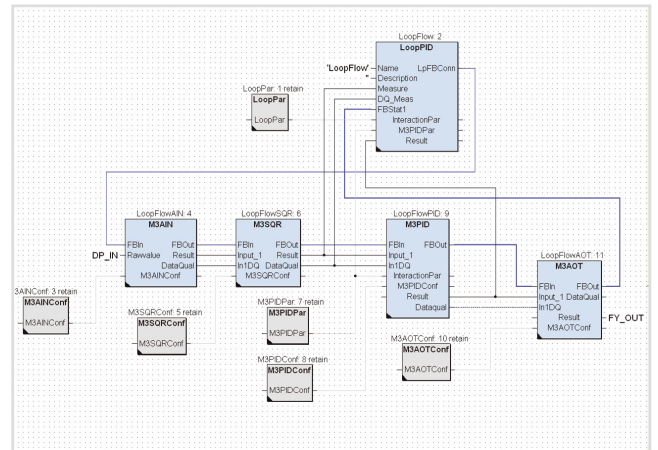
These templates are available as object types and are located within the Function Structure of Function Designer (see next page, Figure 02). Further details are described in the MOD300CCFLib User Manual identified in the following section.

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02 “Basic PID Loop Flow” Template
 03 Function Designer Monitor / Tune Functions

Documentation

To support the development of control strategies using MOD300CCFLib, the following documents should be referenced:

- 3BUA000943 MOD300CCFLib Function Block Evolution Guide
- 3BUA000942 MOD300CCFLib Function Block User Manual

The Function Block Evolution Guide describes in detail the differences between Function Block Types contained within the library and the original Function Class Modules (FCMs) from MOD 300. The document provides comparisons of object views in AdvaBuild and Function Designer for each block. It also provides spec by spec mapping of the MOD 300 FCM to the appropriate parameters of the associated

AC 800M Function Block Types (FBTs). Additional information is provided on mapping of console tag list information (e.g. Engineering Unit Descriptors, Logic State Descriptors, Alarm Priorities and Comments, etc.) to parameters of the FBT.

The MOD300CCFLib Function Block User Manual (3BUA000942) is very similar to the MOD 300 FCM Manual. It lists all the available Function Blocks and explains the parameters and behavior of each block.

Delivers flexibility & power

AC 800M based control

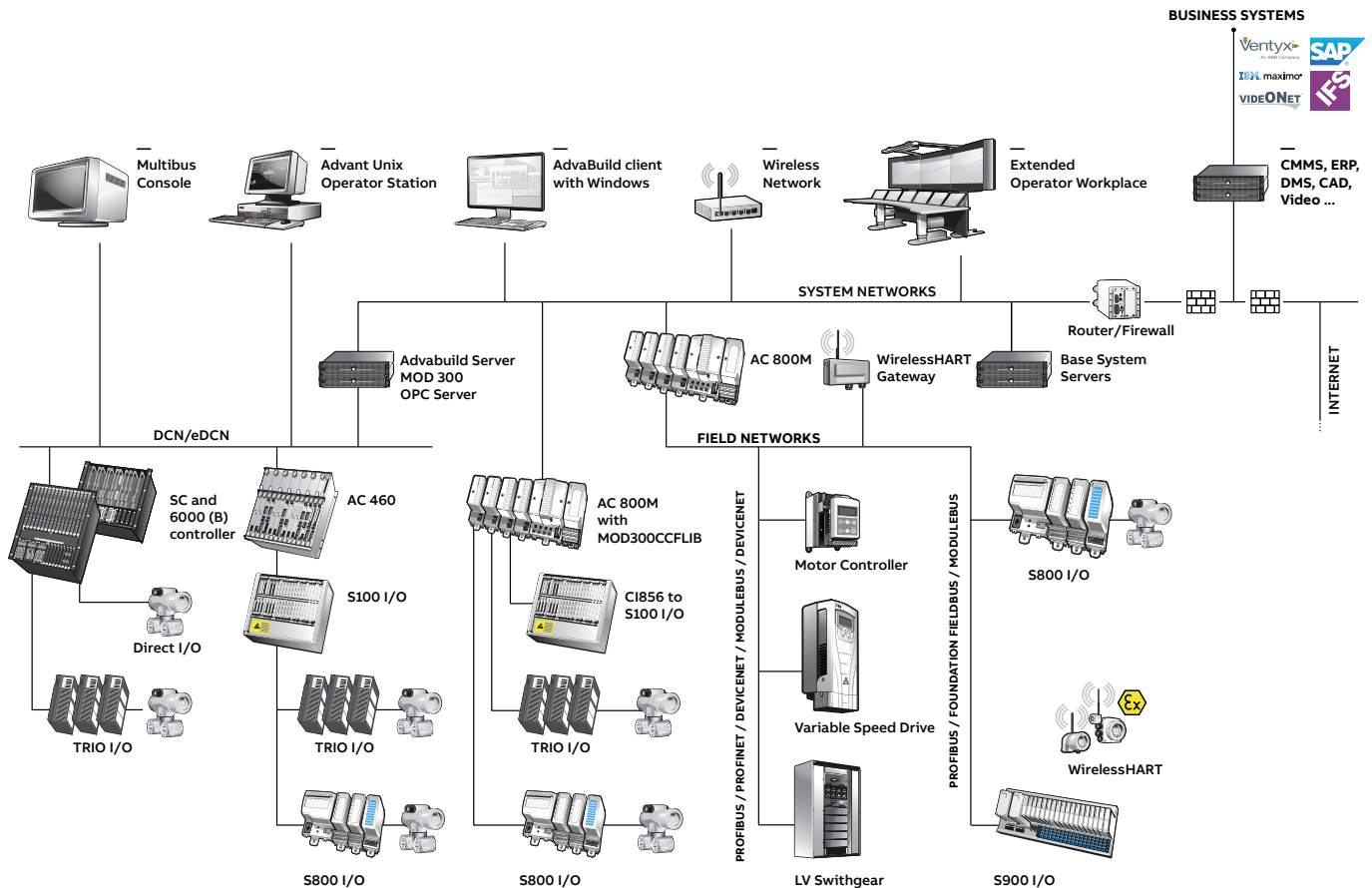
— 01 The configuration shows a typical integration of Advant MOD 300 with AC 800M and ABB Ability™ System 800xA

AC 800M Controller

Through their modular design, AC 800M controllers and associated I/O options contribute to lower costs, higher engineering quality and higher operating efficiency. Equally effective for small hybrid systems and large, integrated automation applications, the modularity of the subsystem results in higher return on assets by providing the flexibility to choose the specific functions required to meet the automation need. Using the same base hardware, a wide variety of Controller Processor Units (CPU), I/O, Communication Modules, and power options provide flexibility in terms of functionality, performance, and size.

With the release of MOD300CCFLib for AC 800M, MOD 300 system owners can now take advantage of all of the powerful and flexible capabilities of AC 800M. Designed for plant automation, and SIL 2 and SIL 3 safety applications, the AC 800M controller family provides MOD 300 system owners with the opportunity to expand their automation system capabilities. Additionally, the AC 800M controller and associated I/O modules support industry standard data interfaces, network protocols, and fieldbuses allowing a wide range of devices and systems to be accessed and their resident information to be used to produce tighter and more reliable process control solutions.

To learn more about the AC 800M controller, please refer to the AC 800M Control and I/O Overview document 3BSE047351.



Summary

ABB is committed to providing its MOD 300 system owners with Extended Automation solutions while protecting their capital equipment and intellectual property investments.

The MOD300CCFLib for AC 800M control library protects the investment made in MOD 300 control applications. It contains the most frequently used MOD 300 Configurable Control Functions (CCF). It is used to support the seamless, incremental evolution of MOD 300 control applications to the AC 800M control environment.

This library addresses the needs of those system owners who want to extend their MOD 300 system using AC 800M controllers but continue to base their control applications on MOD 300's field proven / field tested CCF algorithms. For control engineers, the benefit is the ability to develop control applications using familiar components

(CCF modules). For operators, a seamless transition to AC 800M based control is ensured because use of the library makes the data source (the MOD 300 controller of the AC 800M controller) completely transparent.

As opposed to 'rip and replace' upgrades, the library allows system owners to re-use their proven control strategies, thereby lowering system lifecycle costs. This is achieved by maximizing the use of their control application assets and by minimizing the associated project's engineering, commissioning, and start-up costs.

To learn more about the evolution of ABB's MOD 300 control system, visit abb.com/controlsystems





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