Features and Benefits

- **Protects intellectual property:** INFI90FCLib protects proven process control application investment by providing an easy means to evolve Harmony / INFI 90 controller configurations to AC 800M.

- **Provides simple 1-FOR-1 function mapping from Harmony / INFI 90 to AC 800M:** INFI90FCLib provides an equivalent function block in AC 800M for each of the most commonly used function codes from Harmony.

- **Minimizes engineer training:** The INFI90FCLib function blocks are simple to understand because the inputs, outputs, and parameters provide the same behavior as the corresponding function code in Harmony.

- **Provides same or better performance:** The Harmony / INFI 90 function code algorithms have been completely re-engineered for the IEC 6-1131-3 environment of AC 800M and are configured and perform nearly identically as their Harmony counterparts.

- **Maintains operations "Look & Feel":** All of the faceplates from 800xA for Harmony are provided for the AC 800M function blocks, ensuring consistency of operator control.

- **Uses graphical engineering environment:** Function Diagrams provide graphical documentation of AC 800M INFI90FCLib based control logic configuration similar to CLD's for Harmony.

- **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-6-1131-3 control languages and supports popular field bus technologies.

ABB is committed to providing its Harmony / INFI 90 system owners with Extended Automation solutions while protecting the capital equipment and the intellectual property investments made in their installed systems. This commitment extends to control assets where ABB solutions protect investments in:

- Controller software applications

- Control & I/O hardware

- Field wiring and terminations

The INFI90FCLib for AC 800M control library is one of these solutions as it protects the investment made in INFI 90 control applications. Using the same algorithms as their INFI 90 counterparts, this library allows for the incremental and step-wise evolution of field proven INFI 90 control configurations. Further, an automated control configuration conversion utility transforms the existing control logic diagrams to like diagrams within AC 800M's graphical engineering environment. Through the use of the INFI90FCLib and conversion tool, INFI 90 system owners can confidently evolve their control strategies to AC 800M based control without the project costs or production risks associated with 'rip and replace' control upgrades methods.

Industrial^{IT} ▶▶▶enabled

ABB

Introduction

The INFI90FCLib, as described within this Overview Document, is a control library in the AC 800M that contains the INFI 90 function codes and is used to support the seamless, incremental evolution of Harmony / INFI 90 control applications to the AC 800M control environment.

INFI90FCLib addresses the needs of those system owners that want to extend their Harmony system using AC 800M controllers but continue to base their control applications on INFI 90's field proven / field tested function code algorithms. For control engineers, the benefit is the ability to develop control applications using familiar components (INFI 90 function codes). For operators, a seamless transition to AC 800M based control is ensured because use of the library will make it totally transparent as to the source of the data (Harmony controller or AC 800M).

The 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 evolution 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, device drivers in Operator Interfaces.

By containing the extensive set of field proven INFI 90 function codes, the INFI90FCLib removes the risks and costs associated with typical control upgrade projects. As opposed to 'rip and replace' upgrades, the evolution library allows system owners to re-use their proven control strategies, and thereby, lowering system lifecycle costs. This is achieved by maximizing the use of their control application assets and minimizing the associated project's engineering, commissioning, and start-up costs (see Table 1).

Traditional "Rip and Replace" Upgrades	ABB INFI90FCLib for AC 800M upgrades
Re-engineering or translation 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-configuration and re-tuning of loops)	Minimal commissioning and start-up (no re-tuning of loops required)
Create new documentation	Documentation converted and enhanced
Results in: • Greater loss of production • Increased risk • Higher project costs	Results in: • Minimal loss of production • Minimal risk • Lower project costs

Table 1. Comparison of Strategies.

Over the next several sections, these benefits are discussed in detail.

Protects intellectual property

The primary purpose of the INFI 90 function block library is to allow Harmony system owners to protect the intellectual property embedded within their existing controllers. The library is designed to make evolution of Harmony control applications to AC 800M straightforward and simple. The INFI90FCLib does this by providing an equivalent function block in AC 800M for the function codes from Harmony. Table 2 lists all of the Function Block Types (FBT's) provided in the INFI90FCLib.

FC#	INFI 90 FC	AC 800M FBT	FC#	INFI 90 FC	AC 800M FBT
1	F(n)	FnGen	97	REDDI	RedDI
3	F(t)	LeadLag	98	SLSEL	SLSEL
4	PULPOS	PulsePosn	110	RNG5	Rung5
5	PULSE	PulseRate	111	RNG10	Rung10
7	SQRT	Sqroot	112	RNG20	Rung20
8	VELLIM	RateLimiter	116	JUMP	JumpMCR
9	T	XferReal	117	RECIPB	RecipeBool
12	H//L	HiLowComp	118	RECIPR	RecipeReal
15	SUM	Sum2Real	119	BMUX	MuxBool
18	PID	ErrPID	120	RMUX	MuxReal
19	PID	DeltaPID	123	DD	DeviceDriver
21	M/A-BAS	BasicStation	124	SEQMON	SeqMon
30	AOL	AOL	125	DEVMON	DevMon
31	TSTQ	TSTQ	126	RDEMUX	DMuxReal
32	TRIP	TRIP	129	MSDD	MSDD
34	S/R	SRMem	134	MULTIMON	MULTIMON
35	TD-DIG	TimerBool	135	SEQMGR	SEQMGR
36	QOR	QOR	136	RMC	RMCB
45	DOL	DOL	141	SEQMST	SeqMstrSlv
52	T-INT	XferDint	142	SEQSLV	SeqMstrSlv
58	DELAY	DelayReal	151	TEXT	TexSel
59	T-DIG	XferBool	156	APID	APID
61	BLINK	Blink	160	Smith	ISC
62	RCM	RCM	161	SEQGEN	SeqGen
65	DSUM	DSum	165	MOVAVG	MovAvg
68	REMSET	REMSET	166	INTEGR	Integrator
69	TSTALM	TSTALM	167	POLY	POLY
80	M/A	Station	168	INPOL	INPOL
81	EX/MFC	Exec	171	TRIG	TRIG
85	UP/DN	UpDnCount	172	EXP	EXP1
86	ETIMER	ElapTimer	173	POWER	POWER
90	EEX/MFC	ExExec	174	LOG	Log1
95	MODSTAT	MODST	177	DAANG	DAANG
96	REDAI	RedAI	211	DADIG	DADIG

Table 2. INFI90FCLib 2.0-0 List of FBT's.

ABB   3

Table 3 depicts the standard AC 800M system functions that provide equal or superior functionality as those provided by the INFI 90 function codes. Therefore, when the following INFI 90 function codes are to be applied, the corresponding AC 800M system functions are used with equal or better results going forward.

FC#	INFI 90 FC Name	AC 800M System Function
2	A	real variable
6	LIMIT	limit(real)
10	HISEL	max(real)
11	LOSEL	min(real)
14	SUM4	add(real)
16	MULT	mul(real)
17	DIV	div(real)
33	NOT	not(bool)

FC#	INFI 90 FC Name	AC 800M System Function
37	AND2	and (bool)
38	AND4	
39	OR2	or (bool)
40	OR4	
50	ON/OFF	boolean variable
52	A-INT	dint variable
66	TREND	not required in AC 800M
179	ETREND	

AC 800M with INFI90FCLib

Table 3. 800xA System Functions vs. INFI 90 FC's.

Harmony function codes associated with peer-to-peer communications (e.g. AI/B, DI/B, AI/L, DI/L, etc.) and I/O signals (e.g. CISI/O, DOGRP, DIGRP, etc.) will be added to the library over time as functionality warrants.

BRC with INFI 90 function codes

Minimizes engineer training required

The INFI90FCLib function blocks are simple to understand because their inputs, outputs, and parameters provide the same behavior as the corresponding function code in Harmony. Input, Output, and Parameter names are descriptive and the same default values and allowable ranges are defined. In Function Designer, INFI90FCLib function blocks have the same graphical "look and feel" as their corresponding INFI 90 function codes have in Composer (see Figure 1). The net result is; if an engineer knows how to configure or tune a function code in Harmony, then he or she will know how to configure / tune the corresponding function block in AC 800M.


ABB 5

Figure 1. Similar Function Block Shapes.

Provides same or better performance

INF90FCLib function blocks are based on the same algorithms as their INFI 90 function code equivalents. Because they behave identically to their counterparts, re-tuning the AC 800M based control loops is not necessary. Figure 2 below compares identical control loops executed in the AC 800M using INFI90FCLib and a Harmony Bridge Controller (BRC) using INFI 90 function code counterparts. As seen from the trends, identical control algorithms using the same tuning parameters result in identical control response! This saves significant time and risk associated with controller upgrades.
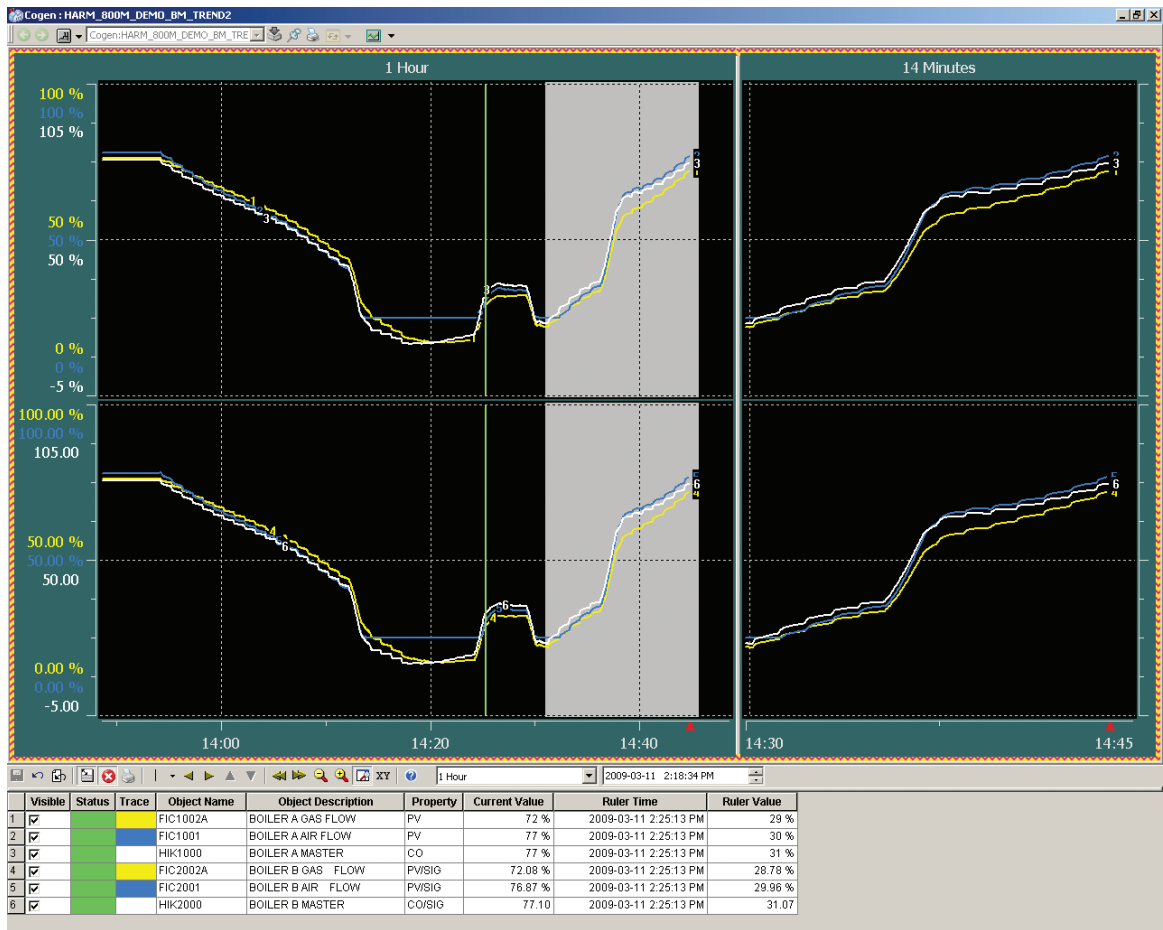
Figure 2. Identical control loops executed in BRC and AC 800M controllers result in identical control response to demand changes (upper trends - AC 800M with INFI90FCLib; Lower - BRC with INFI 90 function codes).

INF90FCLib Function Blocks 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), or Instruction Lists (IL). In addition, INFI90FCLib Function Blocks can be used with any of the ABB industry specific libraries available for AC 800M controllers. These include the Pulp and Paper Library, Oil and Gas Library, Power Generation Library, and Process Control Library.

INFI 90 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.

Maintains operations "Look & Feel"

System 800xA faceplates include several views; from normal for standard control to Point Display view for detailed control. Harmony Point Displays (Figure 3) are expanded faceplates that include trend elements that display the trace of the process value or state. Point Displays occupy the extended slot of the faceplate control of those tag types.
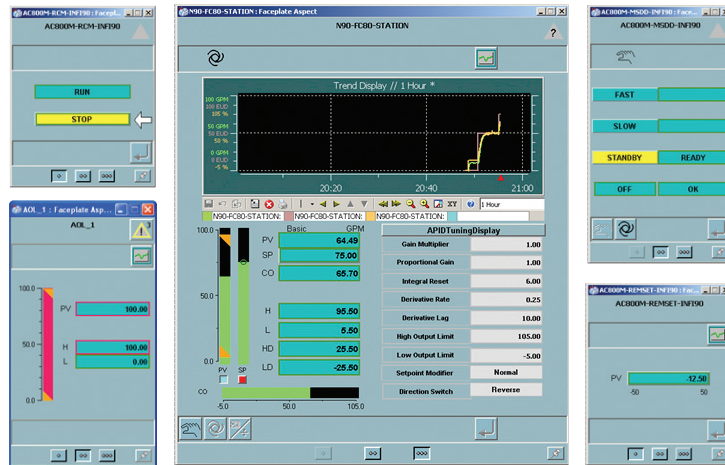

Figure 3. Harmony Faceplates provided by INFI90FCLib.

The faceplates and displays (extended and reduced) associated with the INFI 90 Function Blocks are the same as those provided by 800xA for Harmony. From an operations perspective, this means that the faceplate for a M/A Station, MSDD, RCM, etc. is the same regardless if the faceplate is connected to a function code executed in a Harmony / INFI 90 controller, or connected to a function block executed in an AC 800M controller. As depicted in Figure 4, the source of the data (AC 800M or Harmony/INFI 90) is totally transparent to operators.
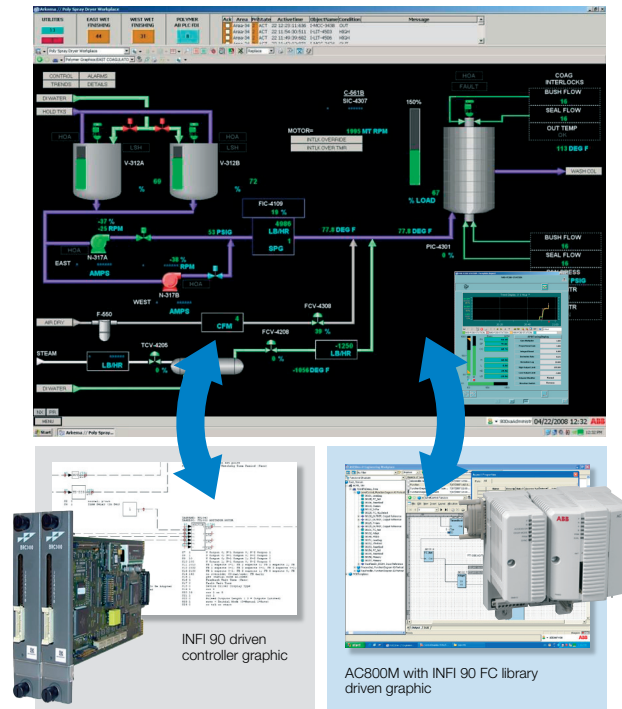
Figure 4. Identical Operator Look & Feel.

INFI90FCLib function blocks with faceplates include the following:

- Device Driver (DDrive)
- Multi State Device Driver (MSDD)
- Remote Control Memory (RCM)
- Remote Manual Set Constant (REMSET)
- Remote Motor Control Block (RMCB)
- Manual Auto Control Station (M/A Station)
- Analog Output (AOL)
- Digital Output (DOL)
- Data Acquisition Analog (DAANG)
- Data Acquisition Digital (DADIG)
- Text Selector (normal faceplate display only)

Uses graphical engineering environment

Function Designer is a graphical engineering tool for System 800xA and is used to maintain AC 800M's INFI90FCLib based configurations. Although not required by the library, Function Designer is the recommended engineering tool as it most closely approximates functions of Composer for Harmony.

Function Designer provides a unique graphical function design capacity that is used to design and modify 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

ABB 9

(see Figure 5). Representations can extend across multiple diagrams or sheets through the use of page and cross-reference links.
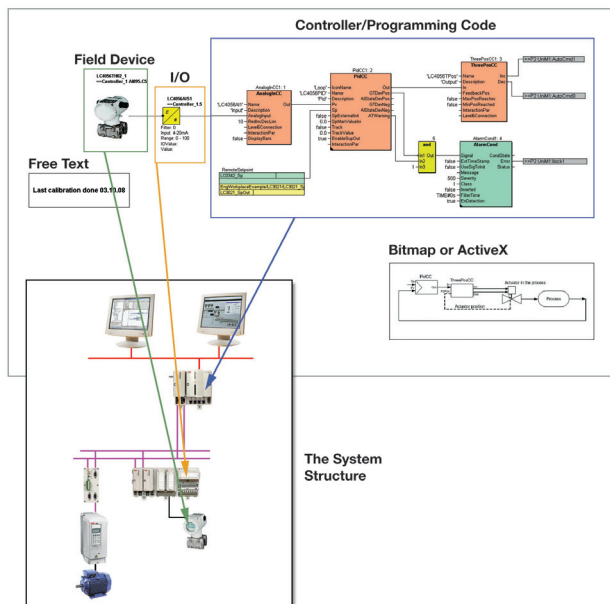

Figure 5. Function Diagrams contain various control entities.

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

Of particular interest to Harmony users is that Function Designer has a similar look and feel to the CAD type drawings used in Composer and previous Harmony / INFI 90 configuration tools. There are input and output reference blocks and page borders. Function Designer also supports Monitor / Tune functions similar to Composer as shown in Figure 6.
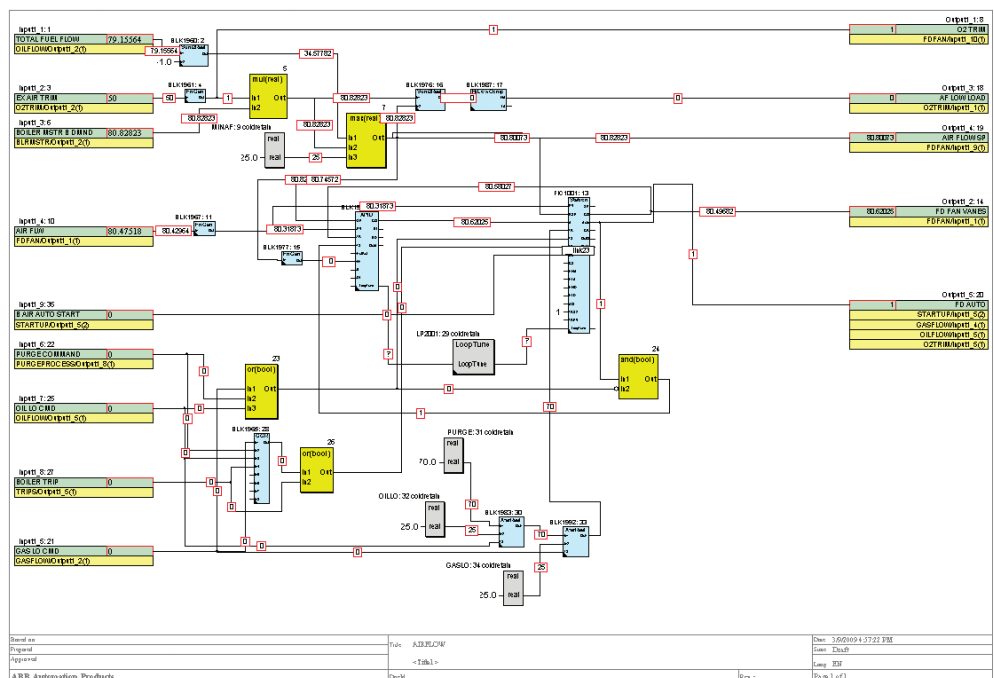
Figure 6. Function Designer Monitor / Tune Functions.

Control Templates

In addition to building loop diagrams using individual Function Blocks, the INFI90FCLib provides three standard loop templates:

- Basic PID Loop
- Basic Cascade Loop
- Basic Valve Control Loop

These templates are available as object types and are located within the Function Structure of Function Designer (Figure 7). Further details are described in the INFI90FCLib User Manual identified in the documentation section below.
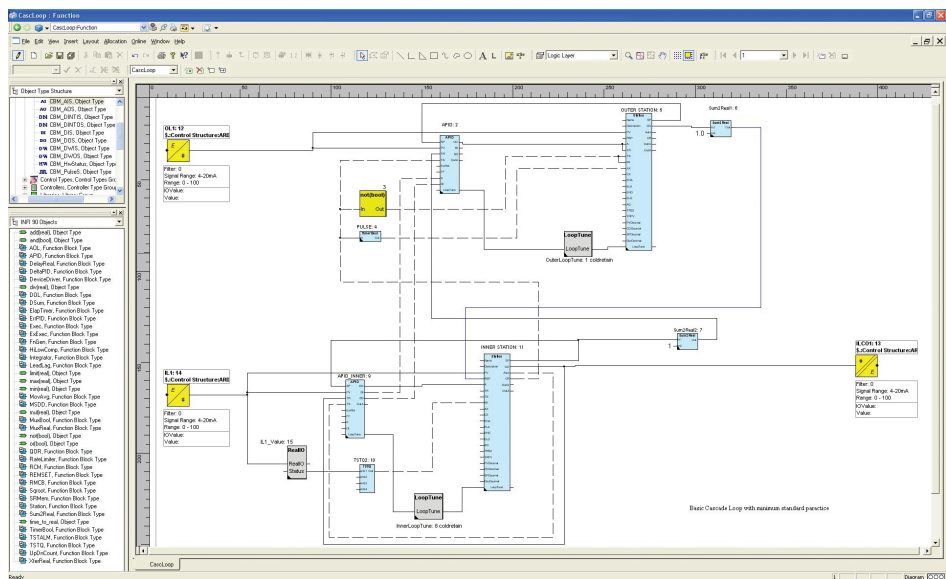

Figure 7. "Basic Cascade Loop" Template.

ABB   11

ABB

ABB
Process Automation Division
Västerås, Sweden
Phone: +46 (0) 21 32 50 00
Fax: +46 (0) 21 13 78 45
www.abb.com/controlsystems
email: processautomation@se.abb.com

ABB
Process Automation Division
Singapore
Phone: +65 6776 5711
Fax: +65 6778 0222
www.abb.com/controlsystems
email: processautomation@sg.abb.com

ABB
Process Automation Division
Wickliffe, Ohio, USA
Phone: +1 440 585 8500
Fax: +1 440 585 8756
www.abb.com/controlsystems
email: industrialitsolutions@us.abb.com

ABB
Process Automation Division
Mannheim, Germany
Phone: +49 (0) 1805 26 67 76
Fax: +49 (0) 1805 77 63 29
www.abb.de/controlsystems
email: marketing.control-products@de.abb.com