

LACT Library

Overview

The Beyond HMI LACT Library (BhiLibLACT) for Wago e!COCKPIT provides features critical to the development of a Lease Automated Custody Transfer (LACT) application within a Wago PFC200 PLC. Library features conform to API 21.1 standards for electronic flow measurement. Data is transferred from the PLC using industry-standard CFX files. These files can be directly imported into hydrocarbon accounting systems.

The library also provides batching features which can support truck loading and unloading. Daily and Monthly batches are also provided. Using the companion BHI Library Tool (BLT) software for Windows computers, captured batches can be retrieved and printed in customer-specified formats. If desired, the library can be configured to email a daily summary of batches.

Additionally, the library supports multi-access-level user authentication and authorization.

The BhiLibLACT library uses runtime licensing. A license is required for each PLC which executes the library code. The program will run for approximately 4 days in trial mode before a license is required. Licenses must be purchased from Beyond HMI, Inc.

Beyond HMI also provides a template e!COCKPIT project featuring a complete truck loading application for Wago PFC200 PLCs. End users are free to use and/or modify this project at no cost.

BhiLibLACT integrates with BHI's printing library (BhiLibPCL) to facilitate batch ticket printing over Ethernet or Wifi. BhiLibPCL supports many point-of-sale printers as well as PCL 5-compliant laser printers.

Library Features

Meter Calculations		per API 12.2 for custody transfer or API 20.1 for allocation
	Meter calculation frequency	Full calc performed once per second
	Calculated Parameters: custody transfer	Indicated Quantity, Indicated Volume, Gross Volume, Gross Standard Volume, Net Standard Volume, S&W Volume, Gross Mass
	Calculated Parameters: allocation	Indicated Quantity, Indicated Volume, Gross Volume, Gross Theoretical Oil Volume, Net Theoretical Oil Volume, Gross Theoretical Water Volume, Theoretical Flash Gas Volume
	Aggregated values available	Flow Rate, Current Hour Total, Last Hour Total, Today Total, Yesterday Total, Current Month Total, Prior Hour Total, Lifetime Total
Oil Property Calculations	Liquid Correction Factors for <ul style="list-style-type: none"> • Crude Oil • Fuel Oil • Jet Fuel • Gasoline 	per API 11.1 (2009) Procedure 11.1.6.2 (based on observed density)
	Liquid Correction Factors for NGL and LPG	per API 11.1 (2009) Procedure 11.1.6.2 (based on observed density) CTL per GPA 8217 (Procedure T23)
	Natural Gas and Related Gases	Compositional Equation of State per AGA8 Part 2 (2017)
Water Property Calculations	Water Correction Factor	per API 20.1
Supported Meter Configurations		Coriolis, Turbine, Positive Displacement
Contract Hour	Configurable	Per meter
Units of Measure	Customary U.S. units only	psig, degrees F, API gravity, mass in lbs
	Volume/Rate	Barrels or gallons. Per day or per hour

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Diagnostics	Correction Factors	Corrected Density, Corrected SW, CTL, CPL, CTPL, CSW, Standard Density
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Generic Library Features

Data Retention	per API 21.1	Periodic (hourly) history, events, alarms
	Periodic history retention	Configurable by meter. Minimum of 35 days – ranging to file system capacity
	Event retention	256 events per meter per “day”
	Alarm retention	64 alarms per meter per “day”
	Ad hoc batch retention	Ad hoc batches retained in non-volatile memory
	Daily batch retention	Daily batches retained in non-volatile memory
	Monthly batch retention	Monthly batches retained in non-volatile memory
	Data pruning	Configurable pruning of historic data. 35 day minimum – configurable to 100’s of days
	Batch retrieval	Historical batches can be retrieved for viewing/printing either within the library or after transfer to a Windows PC.
	Multiple Totalizers	12 full-featured totalizers allow a single physical meter to accumulate totals for multiple business entities. Host program determines which totalizer(s) to use.
Data Transfer Method (Collection)	Via CFX files	Quorum/FLOWCAL Common File Exchange Format (CFX) 8.5.0
		Minimum of 1 CFX per day
		Per API 21.1, new file is created whenever calculation parameters are changed
		CFX file stored on PLC file system (password protected)
	<i>Manual/Local collection</i>	Users with limited permissions and network access can copy CFX files from the PLC to another computer for transfer to hydrocarbon accounting system

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	Remote/SCADA collection	Via secure FTP or SSH
	Transfer of batch information	Users with limited permissions and network access can copy batch files from the PLC to another computer
	Batch printing	Can be implemented in PLC program and/or batches can be printed in customer-designed format from Windows computer using free companion BLT software.
	Custom batch report formats	Markup language is used to define unlimited number of custom formats for printing via companion BLT Windows program
Daily Batch Summary Email	Email recipients	Up to 2 email recipients.
	Schedule, retry	First attempt to send at about 2 minutes after contract hour change. Retries until successful.
	Summary format	.csv file attached to email. Column headers + one line per batch for the contract day.
	Email details	Tested with Gmail account as sender. Sender Gmail account must be set to allow "less secure access" and POP must be enabled for all emails for the sender account.
SCADA Interface	Implemented in PLC program	Sample e!COCKPIT project implements a MODBUS interface – incorporating WORD, 32-bit, and 64-bit data types.
Configuration Loading/Transfer	Via text file	Library provides features to save configuration to file
		Library provides features to load all or part of the configuration from file
Power Loss Behavior	Configuration is retained	PLC persistent memory
	Flow History is retained	PLC persistent memory and file system
	Flow that occurs while PLC is not powered	Not measured
	When power is restored	Broken <i>day</i> is saved as CFX file and calculations resume. Daily, Monthly batch accumulations resume.
User/Driver Login	Configurable user authentication and authorization	Driver login information is compared against installed authentication file.

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		No limit to number of users in authentication file
		Authentication file can also contain user properties for pre-filling of batch parameters and/or to dictate which alternate totalizer will be used for batches.
		User Identifiers can be either alphanumeric or numeric ranges
Licensing	Free for developer	Library file is free and can be added to any Wago e!COCKPIT instance
	Runtime Licensed	Library generates a site code
		Beyond HMI, Inc. generates a license file from site code
		License file is installed on the PLC. License is perpetual but only usable on that PLC.
		Library features will execute for about 4 days after restart in <i>trial mode</i> . License must be installed before this period expires or data will be lost (unrecoverable).
	Unlicensed (free) sample project/program	Functional PLC template program provided at no cost on request.