

CRYSTAL XE - CHARACTERISTICS

Author: FC

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1. Introduction

Crystal XE is the culmination of 27 years of experience (in 2015) in MBE software. Crystal XE is a new development inspired by Crystal v8.0 so that users of the old software can easily manage this new product.

2. History of Riber software

1988: Release of the HMPC software (DOS) then CBEPC
1994: Release of the software Accessible under Next Step
1999: Release of the software Crystal (in Windows 98)
2014: Release of the software Crystal XE (Windows 7)

3. General Information

More than simple MBE software, Crystal XE incorporates a development environment of RAD (Rapid Application Development) type with the Pascal programming language. This language offers great freedom of scripts programming within the software. These scripts can be executed on a user action or on any other event. They are executed in multitasking and can be modified independently without requiring a recompilation of the application. The software also offers the possibility to customize and create new synoptic or dialog windows and this during the execution of other tasks.

All communication drivers are customizable by the user who can also create new ones. The recognized protocols are Modbus, ASCII, EI-bisync protocol or any other thanks to the script.

4. OS

- Works on PC systems XP, WIN7, WIN8 32-bit and 64-bit.
- A single process in execution, multiple threads.
- The software is portable and can be installed in a single folder.

5. Program

- Developed with an ultra efficient development environment of last generation allowing a management of exceptions to the nearest of the functions, Crystal XE is extremely reliable.
- Does appeal to any framework, or DLL, a single executable program, enhanced reliability and performance.
- Low power consumption in hardware resources: consumes 5 to 10 times less RAM than the previous version of Crystal.

6. Hardware Configuration

- Templates of chambers

6.1. Chambers

Multi-chamber system: An unlimited number of chambers can be created. For each chamber, the installer sets the list of equipment and appliances (drivers) which are installed and then performs the links between them.

- For each chamber, it is possible to define two pre-recipes and one post-recipe:
- The first pre-recipe is executed before the platen is sent in the chamber.
 - The second pre-recipe is executed just before the user's one.
 - The post-recipe is executed in the wake of the user's one.

6.2. Drivers

- A library of drivers is provided.
- A tool is used to create its own drivers and add them to the library.
- Supported protocols for Modbus ASCII, Ei-bisync and other thanks to scripts.
- Chart configurator: it makes the links between communication ports and drivers by graphically performing the connections.
- TCP/IP Support
- Support for series connections RS232, RS485, RS422
- Ability to run a script during the reading and writing of a Tag.
- Ability to run a script during the loading of the driver and during communication error.
- Optimization of the Modbus communication in order to limit traffic and therefore the bandwidth by grouping queries by packets.
- The frequency of updating the tags can be independently set for each tag.
- The timer is built on a real time task of 1ms which offers a very short time of answers.
- Application of a correction function of each tag by two factors: a and b.
- Each tag has min. and max. limits.

6.3. Equipment and sub-equipment

- A library of predefined equipment is provided.
- Represented in the form of a tree, the installer performs the links between the sub-equipment and drivers.
- An equipment editor allows the creation of your own equipment.
- An equipment is composed of sub-equipments.
- An editor of sub-equipment is also provided.
- The tags of sub-equipment may be a link on the regulator tags, local or external (configurable by the installer)

7. Software Configuration

- It is possible to define the appearance of the software at startup as well as the synoptics that are open.
- Choice of the visual appearance through different provided themes.
- Setting the security recipe which is executed by default.
- Setting the number of records placed in cache before running the data acquisition.
- Charts tools to create or customize your own temperature ramps.
- Setting/configuration of the messaging (email)
- Setting/configuration of text messages (GSM Server)
- Setting/configuration of the "cloud" for use in a multi-client on multi-platforms.
- Setting Up/configuring modbus server.

8. Black Box

- Crystal XE incorporates a black box in which all exchanges with the devices are registered. All these data are stored in several circular files (customizable size and number).
- The black box allows you to diagnose a problem.

9. Managing users

- Activation or not of the multi-user mode.
- Creation of user group of users.
- For each group, allocation of specific rights.
- Creating users and assigning to groups.
- Automatic disconnection after a configurable time.

10. Main View

- Ability to create a general custom view.
- System monitoring: CPU usage, RAM space, HD space.

11. Views from every chamber

- Ability to create a custom view.

11.1. System View

- This view is similar to the system view of Crystal v8.0.
- It is automatically generated by the configurator hardware.
- Provides full access to all equipment across the different user interfaces.
- Possibility to hide/show the equipment.
- Access to the configuration of each equipment (setup button).
- Ability to view all tags of equipment and sub-equipments (inspect button).

11.2. Charts

- The chart view is automatically generated by the configurator hardware.
- Possibility to hide/show one or several charts among the 8 charts representing different physical quantities.
- Each chart has a circular buffer whose size is configurable.
- Customizable acquisition time.
- Export data in CSV format.
- Many display options.
- Optimization of loops (the unnecessary points are automatically deleted).

11.3. Recorder

- Works on the principle of customizable templates.
- Circular cache before running the data acquisition.
- Format for the templates: XML
- A default template is automatically created by the configurator.
- Possibility to create your own templates.
- Files created in text format (CSV)
- The files are closed after each recording which allows you to copy or view them during the execution.
- Possibility to set a maximum number of lines per file.
- When the maximum number of lines per file is reached, a new file is created.
- The trigger can be the time and/or the change in layer.

- Up to 4 recorders can be created and executed simultaneously.
- Recording can start automatically on an event (launch of a recipe, of a batch, triggering of an alarm) or manually.

11.4. Recipes

- A recipe by chamber can be executed.
- Several chambers can each run a recipe simultaneously
- Real-time based on the calendar clock, no cumulation of error.
- Accuracy of layers to the millisecond.
- History of layers executed.
- Pause for a recipe in progress.
- Possibility to start a recipe anywhere.
- Possibility to skip a layer.
- Two possibilities for the user: use of the recipe editor tree (in mode representation of layers) or of the script editor.
- Possibility to import a recipe written in Excel in CSV format.
- Possibility to import old Crystal recipes thanks to the Excel converter.

11.4.1. Recipe Editor tree

- Tree view of layers
- Definition of an entry point.
- Possibility to make loops.
- Ability to insert sub-recipes.
- View of the layers in the form of a temporal stacker in color.
- Automatic generation of the script that will be executed.
- Possibility to export the generated script and to change it.
- File Format: XML

11.4.2. Script Editor

- Ability to schedule advanced recipes with functions such as the automatic calibration of the cells.
- Creation of dialog boxes to enter values used in the recipes.
- Advanced mathematics features, reading/writing log, sending text messages, email, timer, conversion, sound, webcam, charts etc. In total more than 150 functions.

11.5. Securities

- This view is automatically generated by the configurator.
- Tree representation of securities: system / chamber / equipment / sub-equipment / item
- One module per equipment.
- For each module, access to the security inspectors of each sub-equipment.
- Ability to enable/disable each element of safety.
- Parameterization of each security officer (thresholds, type of filtering, etc.)
- History of each security agent
- Settings of the actions carried out during the triggering of an alarm.

11.5.1. Actions on alarms

- Action on the recipes and the batch with management of priorities.
- Sound action (used the PC sound card), multiple settings.
- Action on an output (property or tag)

- Sending of text message.
- Sending of email.
- Execution of a script during the launch of the action.
- Execution of a script when the action stops.
- Ability to test the actions.

11.6. [Drivers view](#)

- Allows you to view the hardware architecture of the elements in communication with the PC and their status.
- Allows you to view the tags of the drivers.
- Allows you to view and archive all the frames that are circulating between the PC and the different devices for debugging purposes.
- Statistics on the communication errors: informs on the quality of messages transmission.
- Possibility of activation/deactivation of a module.

12. [Automation of platens](#)

- Displays the position of all the platens present in the system.
- Displays the status of each platen and stamped history of their movement.
- History of movements and messages that pass between the PC and the transfer PLC.
- Departure differs from the batch.
- Graphic animation of the movement of the platens.

12.1. [Editor of batch](#)

- Automatic recovery of the position of the platens.
- Possibility of limiting the number of platens simultaneously processed.
- Use of a free space to make an automatic exchange of platen.
- Prohibit beginning a path since a growth chamber.
- Prohibit to complete a path in a growth chamber.
- Definition of the path taken by each platen.
- Definition of the recipe and the post-recipe which is executed by platen and by chamber.

13. [Events History](#)

- All the important events are archived and listed by category.
- All user actions are recorded in a stamped and nominative log.
- Popup Window configurable for critical events and/or tips.
- The acknowledgments are archived.
- A specific help for each type of event is possible.
- Representation by different colors depending on the importance of the event.
- Export as a text file.
- Clearing the display.

14. [Editor of synoptic](#)

- Library of Windows standard objects: labels, buttons, checkboxes, radio button, combo box, progress bar, images, etc.
- Library of specific objects: indicator, animated images, charts, video live)
- Parameterization of each object by accessing all the properties and events.
- Possibility to run a script on an event.
- Password Protection.

15. [Script Editor](#)

- Syntactic coloring.
- Automatic Indentation.
- Integrated Compiler.
- Integrated Debugger.
- Multi-files Editor.
- Direct access to all data in the system.
- Many functions (mathematical, logical, file, mail, text message, system etc.)
- Online Help.

16. [Script Engine](#)

- The scripts (pascal language) are compiled in a code which is interpreted.
- The code is reduced to a dozen of elementary instructions which each occupies very little processor time.
- Parameterization of the execution time per script (in msec) or the number of lines simultaneously executed.
- Passing parameters to scripts.
- Function and procedure can be define by users
- File inclusion are allowed.
- Array of variables
- Variables of type byte, word, integer 32, integer 64, real etc.. and string of characters.

List of predefined functions:

Messages / dialog functions: ShowValue, ShowMessage, DisplayMsg, QueryValue, QueryStr, QueryYesNo, OpenDialog

Sound: PlayAudioFile, MessageBeep

String functions: StrToReal, RealToStr, FormatFloat, StrToASCI, ASCItoStr, IntToHex, IntToStr, StrToInt, Pos, Delete, StrReplace, CompareText, Length, Copy, Char, Ord

System functions: Exit, StopOnError, WinExec, Sleep, RunEvent, WriteConsole, ClearConsole, LogEvent

File functions: ReadIniValue, WriteIniValue, FOpen, FClose, FLoadValue, FSaveValue, FLoadStr, FSaveStr, FReadLn, FRead, FWriteLn, FSeparator, MakeDir, FileCat, DirExists, FileOpen

Mathematical functions: Sqrt, Abs, Cos, Sin, ArcTan, Exp, Ln, Log, Pi, Random, Frac, Int, Trunc, Round, Ceil, Floor

Logical functions: Not, CheckBit, Shl, Shr, NotBit, SetBit, ClearBit

Properties: SetPropValue, GetPropValue, SetPropStr, GetPropStr, GetPropType, GetHandleStr

Timer functions: GetTimer, ResetTimer

Profile for ramping: GetProfileValue, GetProfileName,

Date / time: GetDateTime, WaitDateTime

Email: SendEmail

SMS: SendSMS

Application: SaveSecurities, LoadSecurities

Batch (Automation: AppBatch): App.BatchStart, App.BatchStop, App.BatchPause, App.BatchResume, App.BatchLog, App.BatchLoadFromFile, App.BatchGetPlatenPosition

Recipe functions: Layer, Stop, Pause, Resume, Start, Skip, Log, LoadFromFile

Recorder functions: Recorder.Start, Recorder.Stop

Equipments functions: WriteTagValue, WriteTagValueEx, PopupDetailView, PopupSetupView, ppupListView

Sub Equipments: GetTagColumn

Modbus functions: WriteTable, WriteTableFloat32, ReadTable, ReadTableFloat32, ReadTagValue, ReadTagValueEx,

ReadTableFromDevice, GetTagId, WriteTagValue, WriteTagValueEx, SendTableToDevice, SendTagToDevice, ReadTagFromDevice, GetTagFieldStr

Forms functions: Close, LoadForeGroundFromFile, Print, CopyToClipboard, SaveImageToFile, CloseModal, SaveDataToIniFile, LoadDataFromIniFile, CreateObject

Charts: ShowCurve, InsertLabel, CopyToClipboard, SetScaleLimit, GetCount, CurveColor, AddPoint, DeletePoint, loadFromFile, SaveToFile, ClearCurve, ClearAll, GetX, SetX, GetY, SetY

17. Tools

- Modbus Client Test.
- Modbus Server Test.
- Port Series Analyzer.
- Access to the SMTP server (email) Test.
- ASCII Terminal Series.
- Server EibiSync.

18. Other features

- Version History with filtering by type (evolution, bug, features) and by character string.
- Export the project and/or program to backup or duplication on another computer.
- Multi-screen management with pop-up menu in each window that enables you to send any window in on a given screen.
- Monitoring of any value instantly displayed on the screen in a chart.
- Console for scripts debugging
- Visualization tool for the logs with intuitive help on each log.

19. LIST OF TEMPLATES SUPPLIED

19.1. Library of regulators

Category	Name	Hardware Manufacturer
Shutter Controller	ACMV1	Riber
	ACMV2	Riber
	ISC15	Riber
I/O	Adam 6066	Advantech (TCP/IP I/O module)
	Adam6217	Advantech Analog Inputs
	Generic	Generic I/O module
	S3PC_I/O	Riber
	TCU32	Riber
PLC (PLC)	Cluster	Riber
	RackGaz	Riber
	Aim	
	EIFlow_MFC	
	S3PC_TempAdv	
	S3PC_Temperature	
	S3PC_TempStd	
Valve Controller	AVP6504	Riber
	NVC6000	Riber
	Generic	
	VC_SMC_Eibisync	Veeco
Pyrometers	Bandit	KSpace
	Epinet2	Laytec
Pressure	DSP9000	Pressure reader
	JBA350_RS232	Granville phillips
	JBA350_RS422	Granville phillips
	MicroION	Granville phillips
Eurotherm	E2408	Eurotherm
	E2500_EGUN_QUARTZ	Eurotherm + Riber
	E2500_PSSI_Analog	Eurotherm + Riber
	E2500_temperature	Eurotherm + Riber
	E2704_modbus	Eurotherm
	E3216_v213	Eurotherm
	E3508_v311	Eurotherm
	E3508_v330	Eurotherm
Temperature	Lakeshore211	Lakeshore
Thickness	STM_2	Inficon

19.2. Library of equipment

Category	Name	Description
I/O	Logical inputs	6 X digital inputs
	Logical outputs	6 X digital outputs
	Analog inputs	6 X analog inputs
	Analog outputs	6 X analog outputs
	AnalogIO_and_Ramp	6 X ramp

Temperature	Temperature_8	8 X temperature
	BakeOut	Baking with ramp
	Pyrometer	Bandit and Laytec
Automation	Cluster	PLC transfer system
	Lift	Lift control and status
Pumping	CVEP	Transfer valve
	TSP	Titanium sublimation pump
Cells	DoubleFilament Effusion Cell	
	SimpleFilament Effusion Cell	
	EGun	Electronic gun
	Injector	
	JetLine	
	RFX_Source	
	ValvedSource	
Gauge	VC_SMC	
	Flux_gauge	
	Motorized flow gauge	
CBE	Pressure gauge	
	Under	
Manipulator	Manipulator simple filament	
	Manipulator double filament	
	Preparation furnace	
PSSI	PSSI	Power supply and safety interface
Thickness	Quartz	STM_2