

1756-L7x Processors



Allen Bradley ControlLogix

Module 1 Lesson 3.0

Lesson 3.0

ControlLogix 1756-L7x Processors

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Introduction 1756-L7x Processors

With the introduction of the 1756-L7x series of processors, Allen Bradley made in number of significant hardware changes to ControlLogix processors.

- 2.0 USB communication port vs. RS-232 port
- SD card vs. CompactFlash Card
- ESM – Energy Storage Module vs. Battery
- 4 Character Alpha / Numeric Scrolling Display plus 4 diagnostic LEDs vs. 6 diagnostic LEDs

Additional changes that are not as obvious include:

- Dual Core CPUs – improves scan times
- Extended Tag Properties – Min/Max, Engineering Units
- Documentation Stored in Controllers – Online documentation
- Module Discovery – Starting with version 20 allows for Online I/O Configuration
- Use of Studio 5000 software – Starting with version 21 of the 1756-L7x processors.
- CIP (Common Industrial Protocol) connections increased from 250 to 500.

While there are a number of changes with L7x processors, monitoring project files offline or online with Studio 5000 software is similar to working with 1756-L1, 1756-L5x or 1756-L6x processors using RSLogix 5000 software.

The Key switch on the front of the L7x processors functions the same as the Key switch on early ControlLogix processors and legacy PLCs such as SLC 500 and PLC 5s.

Also the L7x processors use the same key as SLC 500, L1, L5x and L6x processors.

L7x Processors includes:

- 1756 - L71 initial version 20 – memory 2MB
- 1756- L72 initial version 19 - memory 4MB
- 1756- L73 initial version 18 - memory 8MB
- 1756- L74 initial version 19 - memory 16MB
- 1756- L75 initial version 18 - memory 32MB

L7x – USB Port



The USB port is located on the lower right side of the L7x processors, to the right of the black slide tab for the ESM module.

Note: The USB port is intended only for temporary local programming purposes and not intended for permanent connection.

The USB cable is not to exceed 3.0 m (9.84 ft.)

WARNING: Do not use the USB port in hazardous locations.



Figure 1-A

The controller has a USB port that uses a Type B receptacle.
The port is USB 2.0 compatible and runs at 12 Mbps.

Note: To use the USB port, RSLinx Classic must be revision 2.57
or later.

The first time a computer is connected to a USB port on the L7x processor
or any Allen-Bradley module that has a USB port (Ethernet or DeviceNet
communication modules) a USB driver will be downloaded to the computer.

Note : USB cable connected from computer to processor
Power to the processor.

The Found New Hardware Wizard in Windows OS opens



Figure 2-A

Click any of the options and click the Next button.

Choose Install the software automatically



Figure 3-A

Click Next button

The USB driver is downloaded to the computer



Figure 4-A

Click the Next button when the USB driver is finished downloading.



Figure 5-A

Click the Finish button to close Found New Hardware wizard.

Note: Downloading the Rockwell Automation USBCIP driver is a one time process.

Windows Device Manager will have a selection for A-B Virtual Backplane once the driver is downloaded.

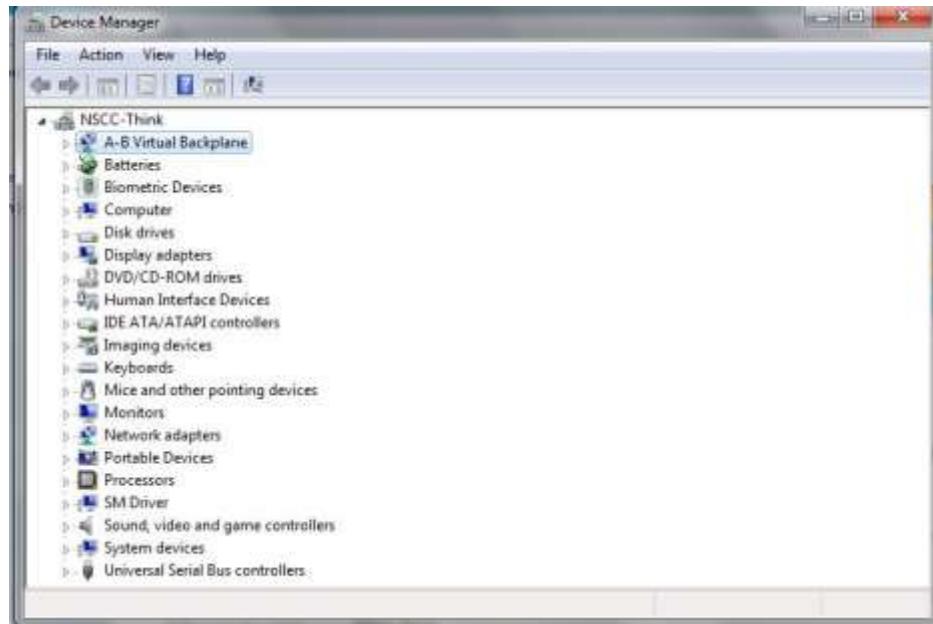


Figure 6-A

To use the USB port open RSLinx to the RSWho screen.

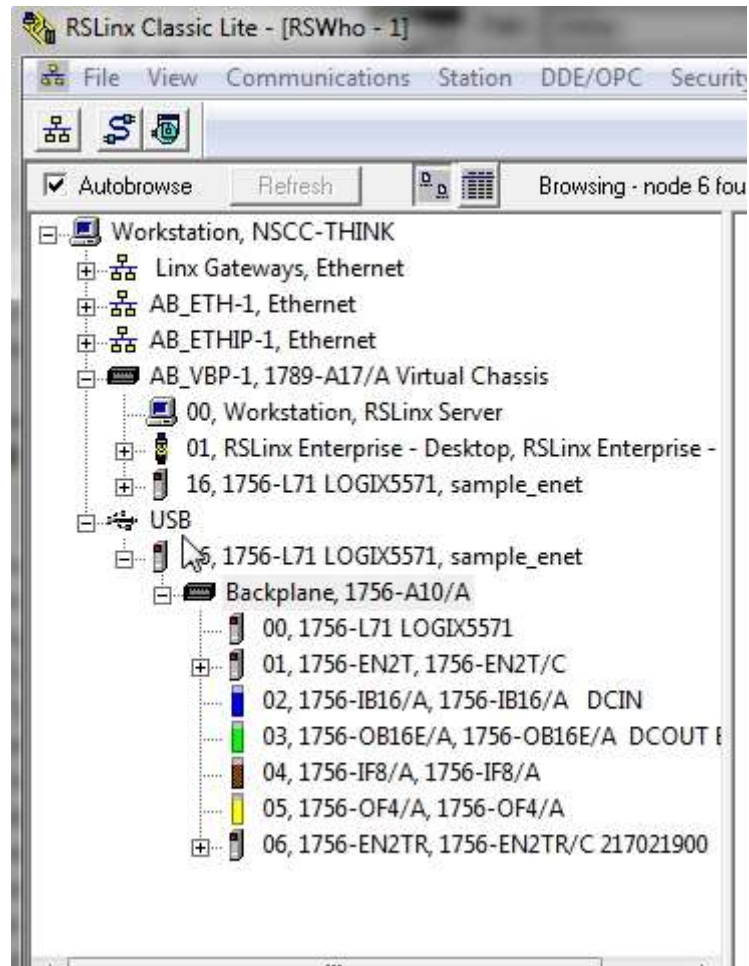


Figure 7-A

A RSLink USB drivers will automatically install when a connection is made to the USB port on the processor.

Click to + sign to the left of the USB driver to view processor and chassis modules. The USB driver is similar to working with the AB_DF1 driver (RS-232) with processors having an RS-232 port as such 1756-L5x, L6x ControlLogix processors.

If the AB_VBP, 1789-A17/A Virtual Chassis is configured in RSLink, this driver can also be used with the USB port connection.

See Figure 8-A.

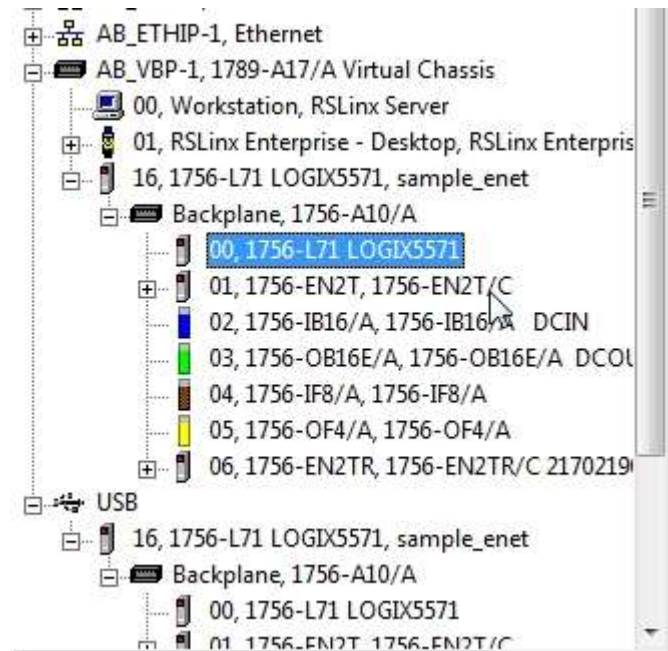


Figure 8-A

To use either of the drivers to monitor or upload / download projects to a 1756-L7x processor, open Studio 5000 software and navigate to the Who Active screen.

Click the Who Active icon

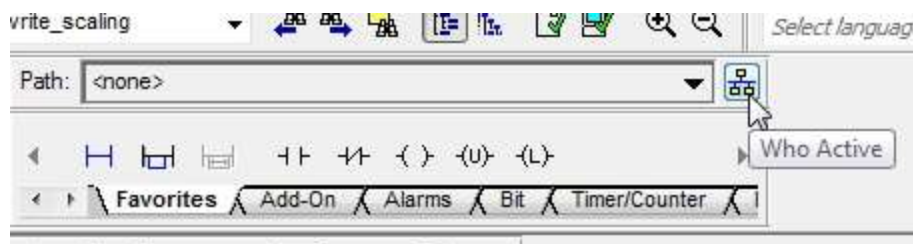


Figure 9-A

To use the USB driver click the + sign to the left of USB and select the processor.

Choose to Download, Go Online, Upload

See Figure 10-A

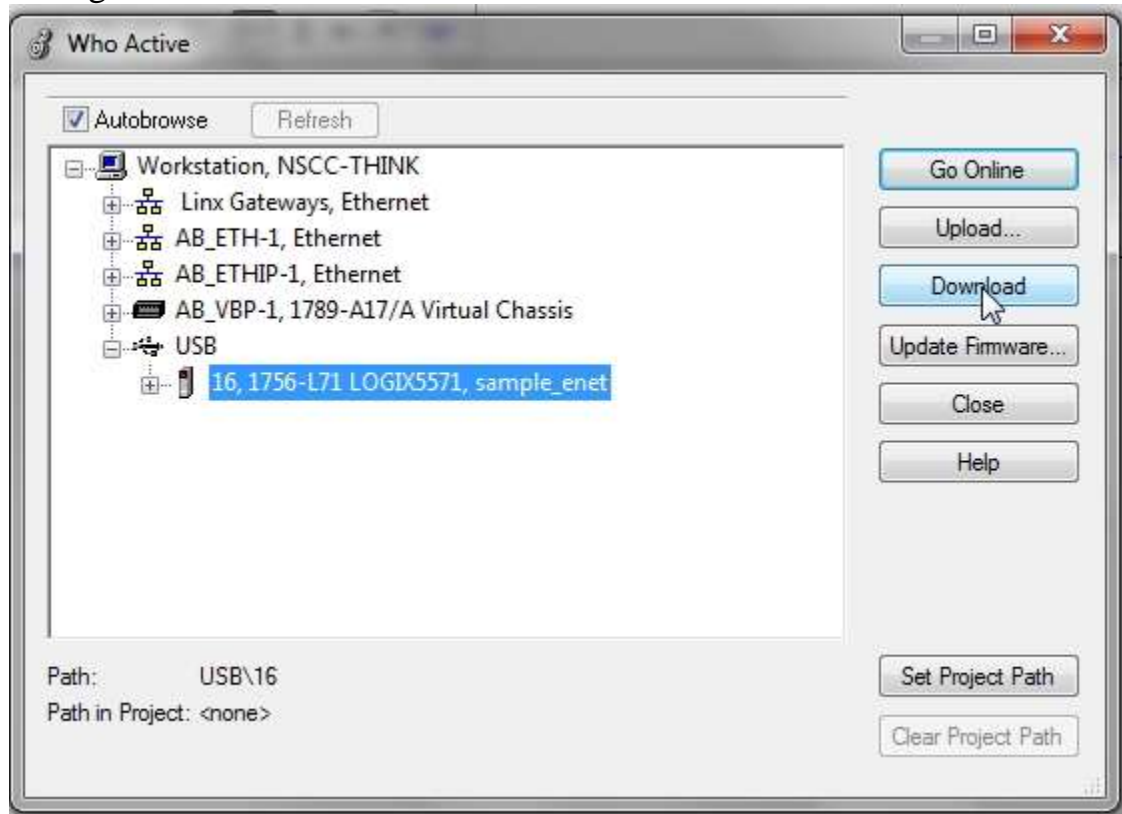


Figure10-A

The Path in Studio 5000 will be configured to use the USB driver in RSLinx.

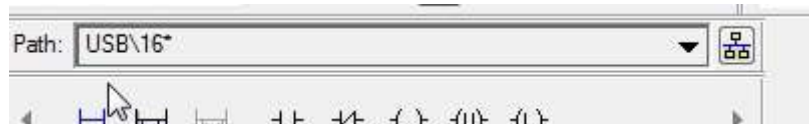


Figure 11-A

To use the AB_VBP, 1789-A17/A Virtual Chassis driver click the + sign to the left of the driver and select the processor.

Choose to Download, Go Online, Upload

See Figure 12-A

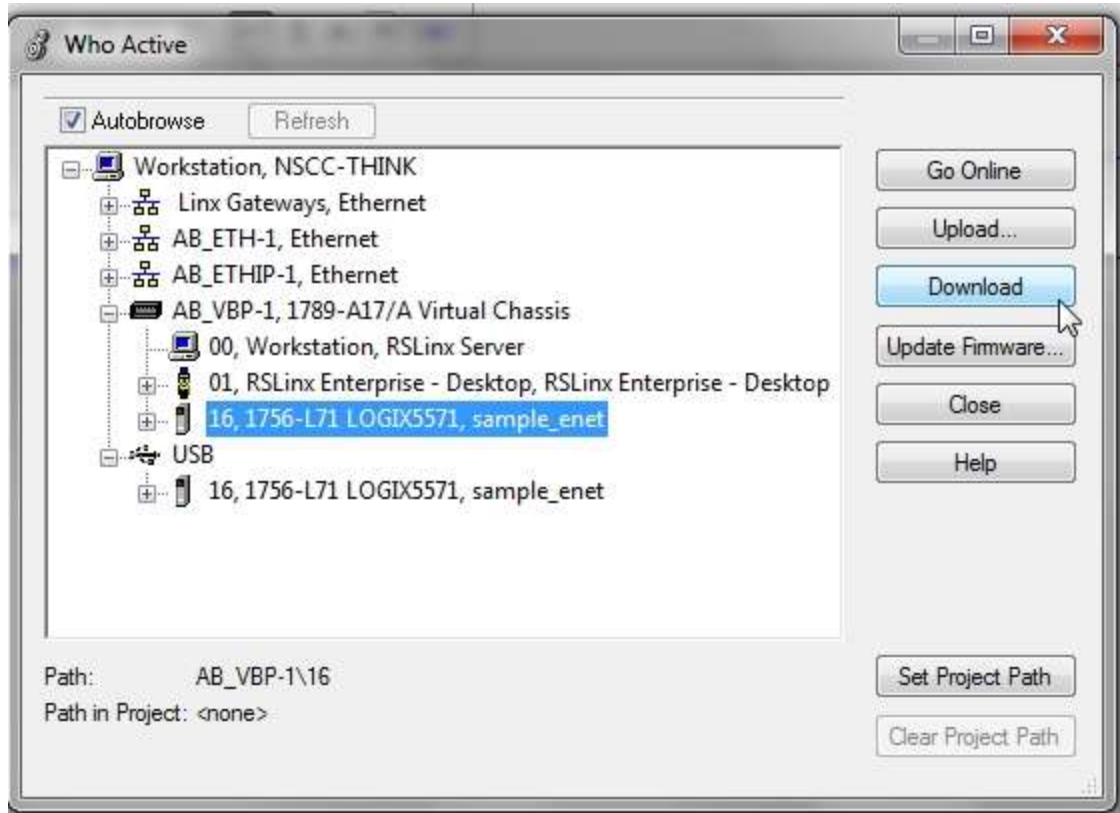


Figure 12-A

The Path in Studio 5000 will be configured to use the AB_VBP, 1789-A17/A Virtual Chassis driver in RSLogix.

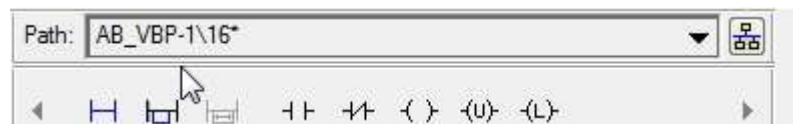


Figure 13-A

See Lesson 1.0 - Ethernet I/P Driver RSLogix /Studio5000 Configuration for additional information on configuring and communication drivers in RSLogix and Studio 5000 software.

1756-L7x Processors – SD Memory Card

The 1756-L7x processors come with a 1784-SD1 (Secure Digital) card installed.



The SD card is located behind the small door to the right of the processor key switch.

The SD card is similar to the functionality of the 1784-CF128 CompactFlash cards used with 1756-L6x processors.

Note: CompactFlash cards were not shipped with L6x processors. SD cards are shipped with L7x processors.

Allen-Bradley recommends that the SD be left installed in the processor even if it is not being used.

The SD indicator LED on the processor faceplate will be on Green when the SD card is in use.

Figure 14-A

Allen-Bradley has two types of SD cards.

- 1784-SD1- 1GB – ships with processor
- 1784-SD2 – 2GB

Note from Rockwell about using other SD cards with the processor.

While other SD cards can be used with the controller, Rockwell Automation has not tested the use of those cards with the controller. If you use an SD card other than those cards that are available from Rockwell Automation, you can experience data corruption or loss.

Note from Rockwell about using SD cards in hazardous areas.

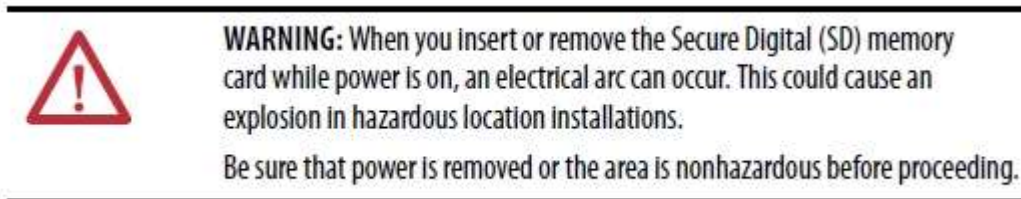


Figure 15-A

SD cards have a Lock / Unlock switch.

With the switch in the Locked position, the card cannot be written to.

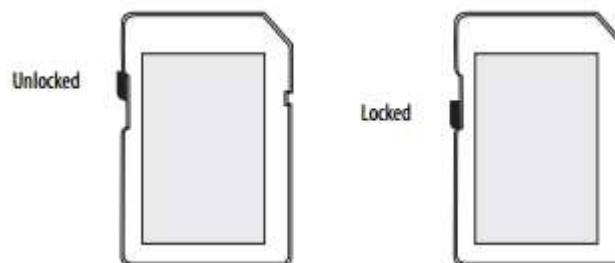


Figure 16-A

The processor must be in Program mode to Read / Write (Load / Store) project information to the SD Card.

Load / Store project information the SD Card

Go online or download a project to a 1756-L7x processor.

See Lesson 1.0 - Ethernet I/P Driver - RSLinx /Studio5000 Configuration for information of connecting to a processor

Navigate to the Controller Properties window by clicking the Controller Properties icon in the On-Line Toolbar.



Figure 17-A

In the Controller Properties window – Click Nonvolatile Memory tab.

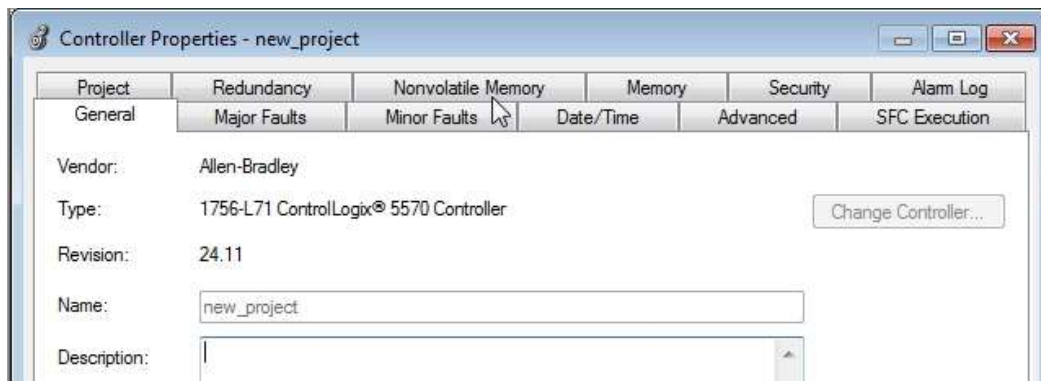


Figure 18-A

If the Load/Store button is greyed out
Verify

- SD Card is installed in the processor
- Processor is in Program mode

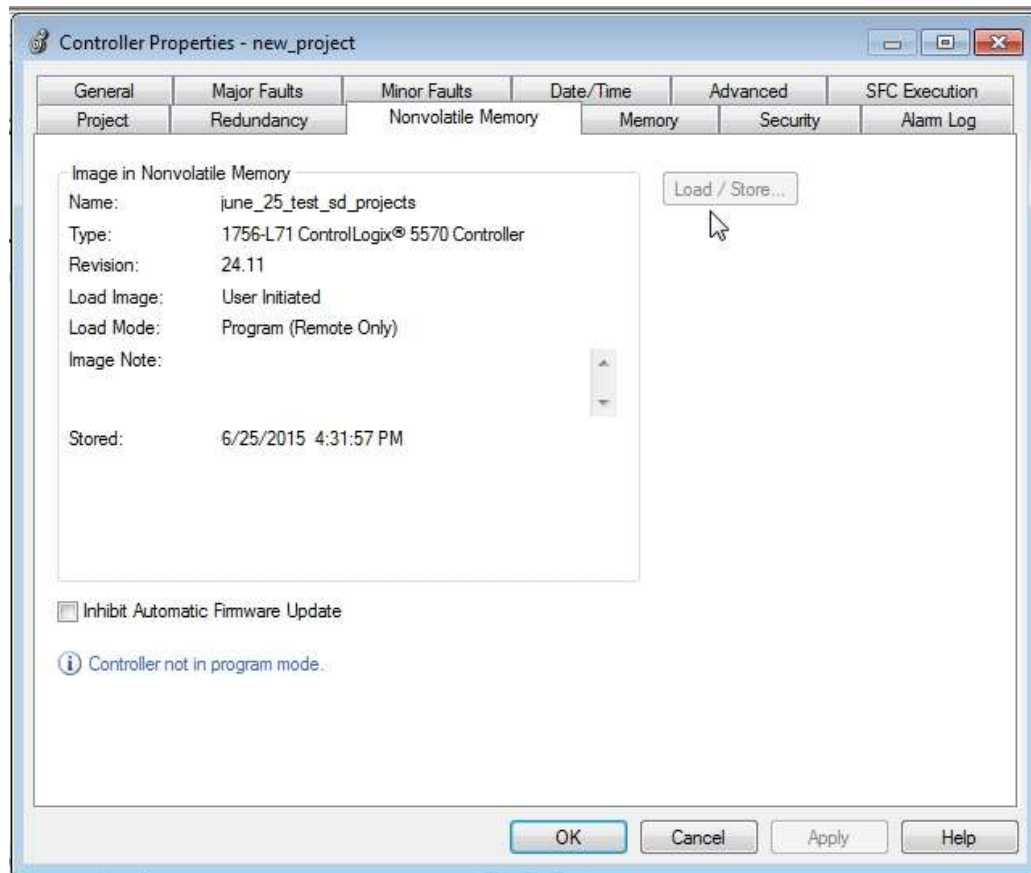


Figure 19-A

Note: In Figure 19-A the Load / Store button is greyed out do to the processor not being in Program mode – See message lower left side of window – Controller not in program mode.

If there is no SD installed in the processor the following message will appear in the same area of the window.



Figure 20-A

If the Load / Store button is active – project information can be loaded or stored on the SD card.

If there is a project image stored on the card – the project information appears on the upper left side of the Nonvolatile Memory window.

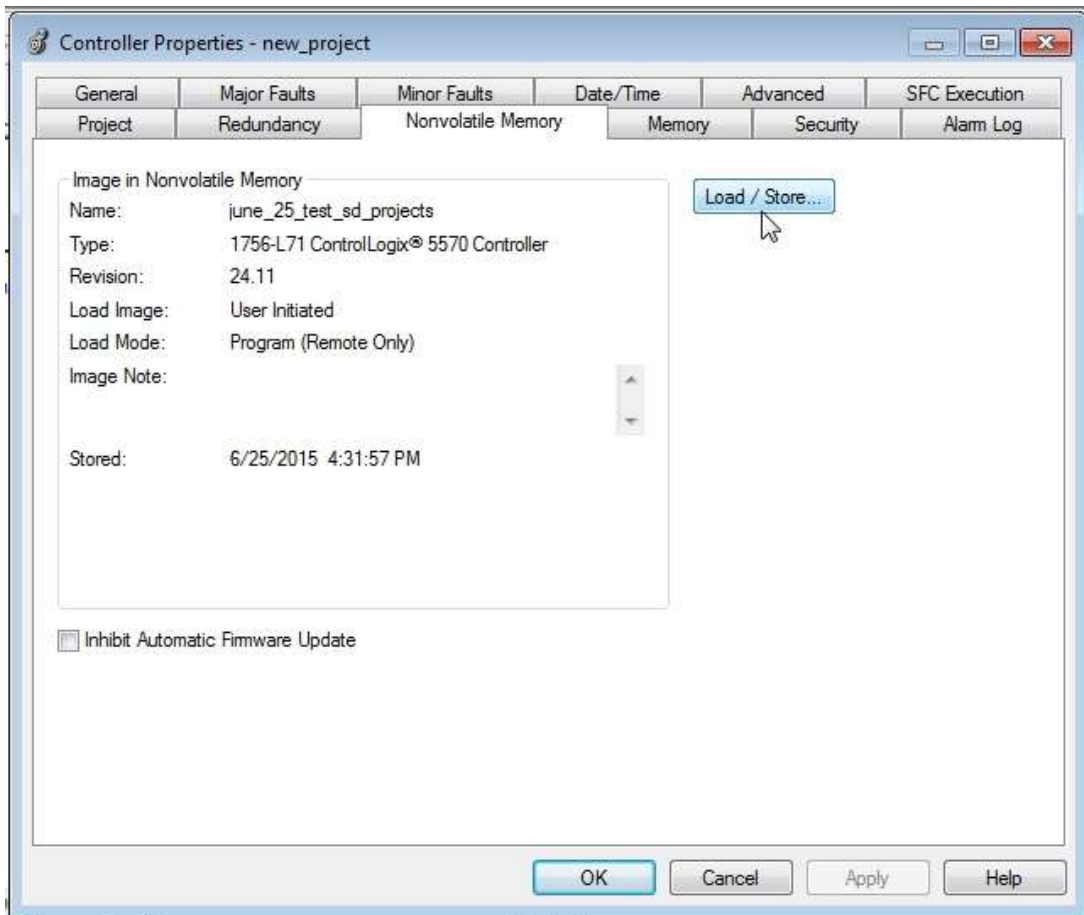


Figure 21-A

If there is no project image stored on the card – the project information area is blank in Nonvolatile Memory window.

No image in the nonvolatile memory appears on the lower left side of the window.

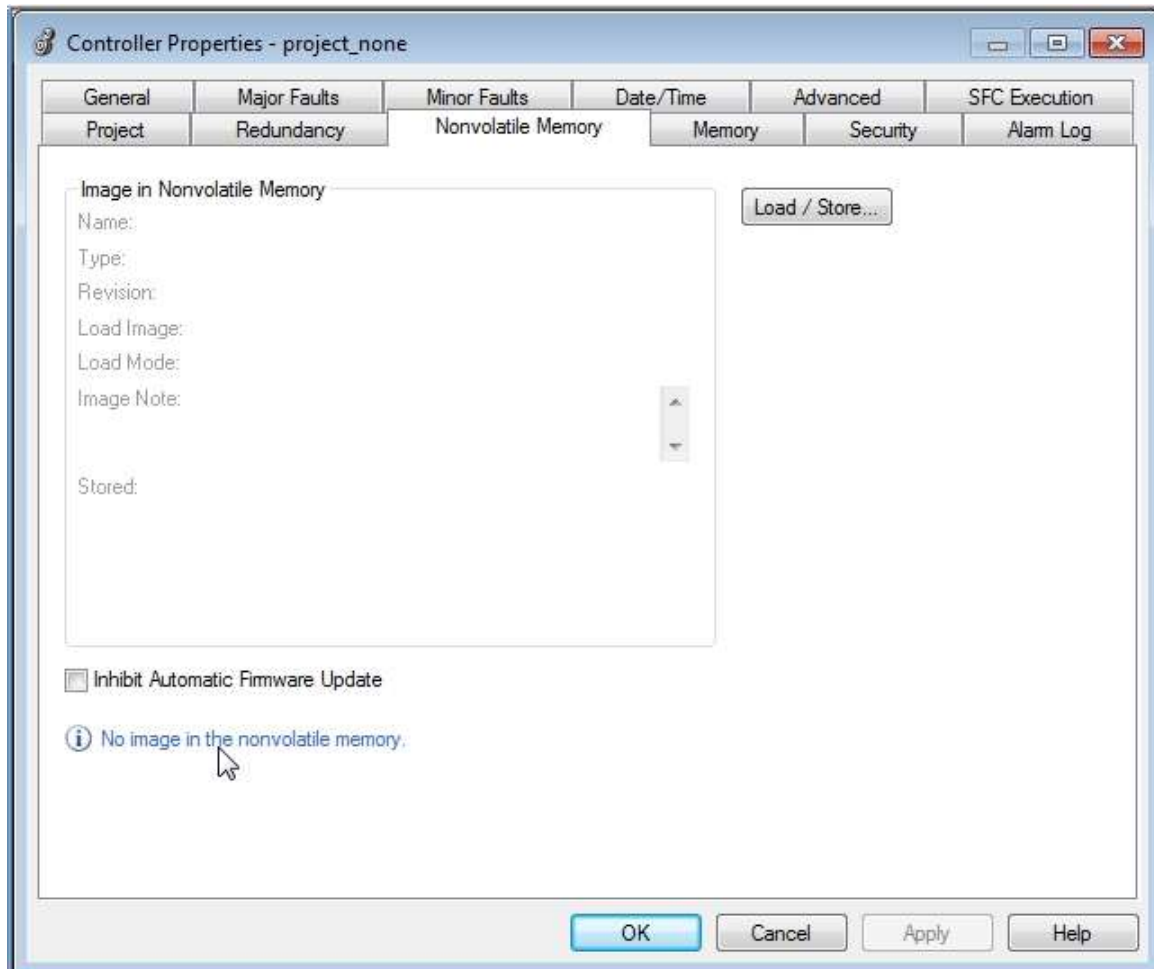


Figure 22-A

Click the Load / Store button to open the Nonvolatile Memory Load / Store window.

See Figure 23-A

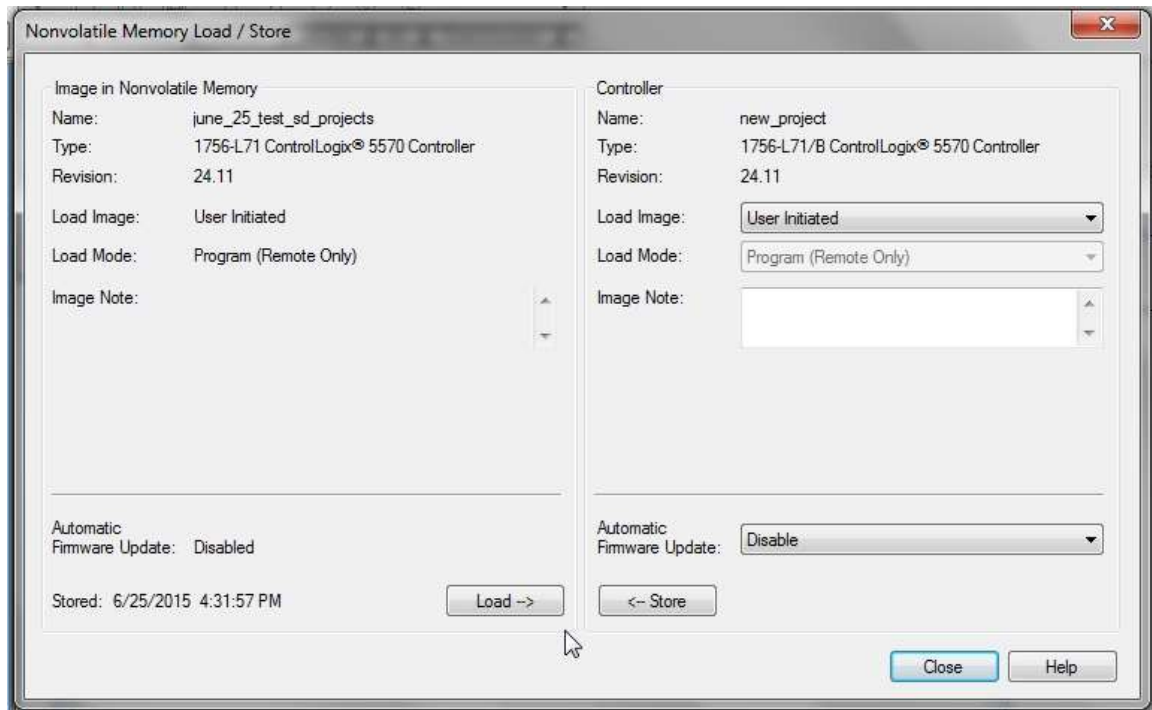


Figure 23-A

If both the Load and Store buttons in the lower middle area of the window are active – the SD card Lock / Unlock switch is in the unlocked position and there is a project image present on the installed SD Card.

The upper left area of the Nonvolatile Memory Load / Store window shows information about the project presently stored on the SD card.

The upper right area of the Nonvolatile Memory Load / Store window shows information about the project presently loaded in the processor.

If the Store button is greyed out verify Lock / Unlock switch position on the SD card.

See Figure 24-A

If the Load button is greyed out verify there is a project image on the SD card.

See Figure 25-A

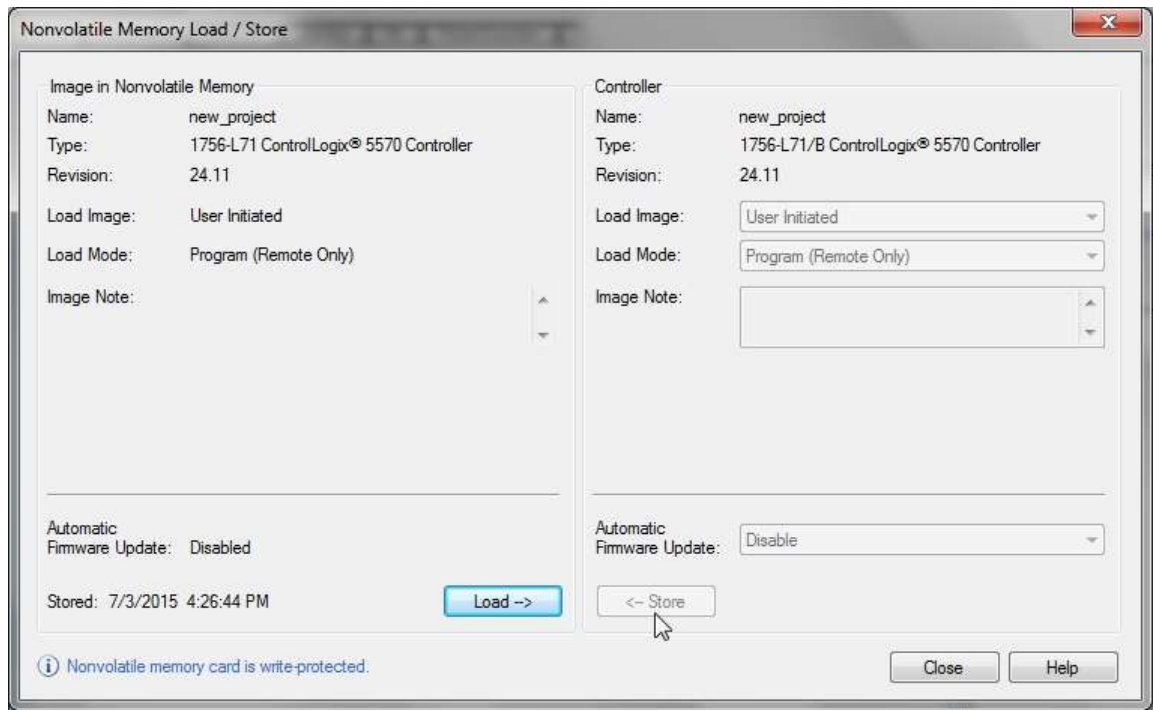


Figure 24-A
Store Button Greyed Out

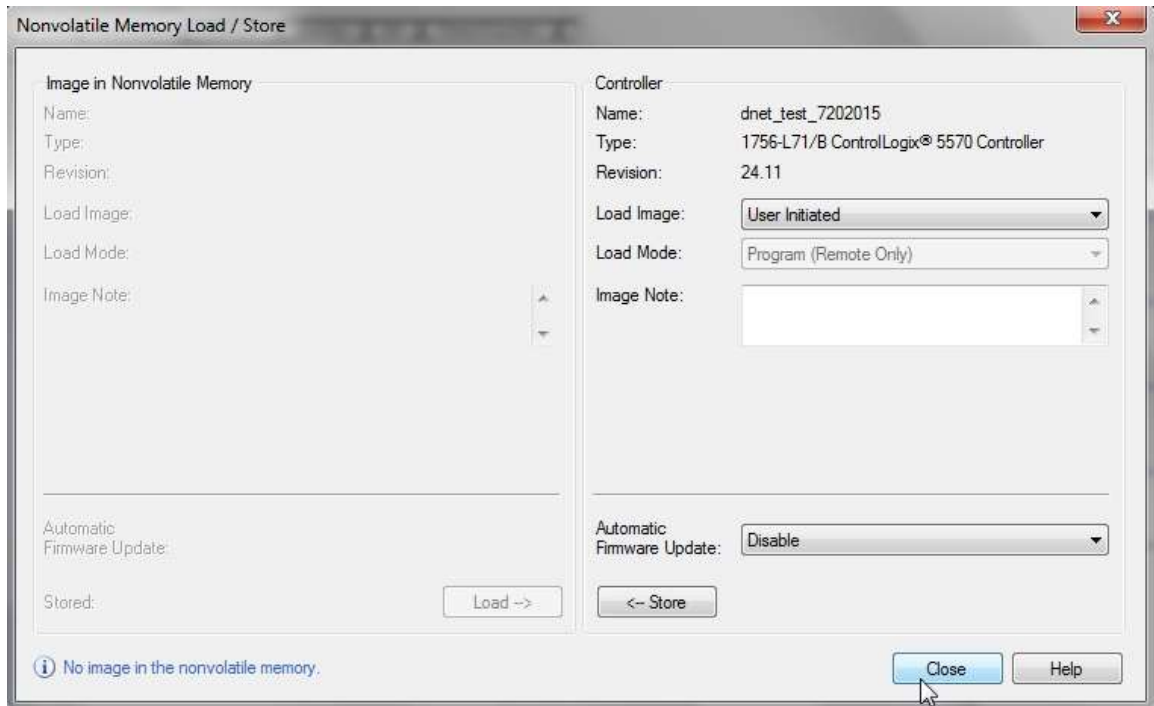


Figure 25-A
Load Button Greyed Out

The three selection boxes on the Nonvolatile Memory Load / Store window configures the following options:

Load Image:

- User Initiated – the user manually loads image from SD card
- On Power Up – image is automatically loaded on Power Up
- On Corrupt Memory – image is automatically loaded on power cycle if project image is lost / corrupted

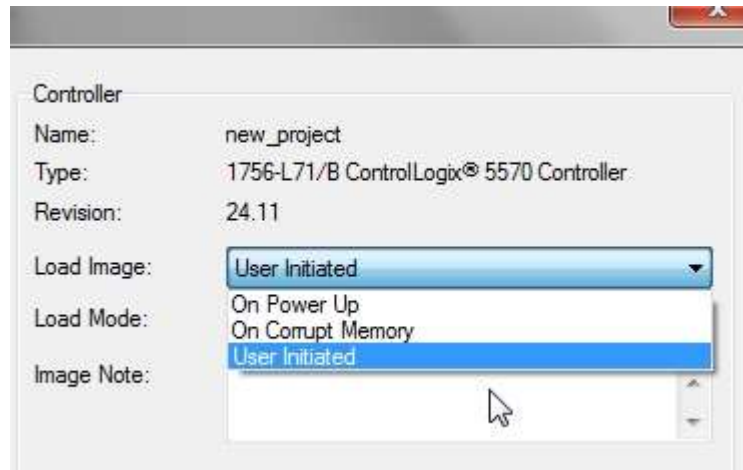


Figure 26-A

Load Mode: Only available when Load Image is set to On Power Up or On Corrupt Memory

Sets the mode of the processor when power is cycled and an image is loaded from the SD card.

Note: Key switch must be in REM position for the setting to take effect.

If the Load Image setting is User Initiated – the only Load Mode setting is Program (Remote Only)



Figure 27-A

Automatic Firmware Update:

Setting applies to I/O module firmware update when Electronic Keying setting of a module is set to Exact Match.

Enable and Store Files to Image – Update module firmware if required and Firmware files are available

Disable – Do not update module firmware

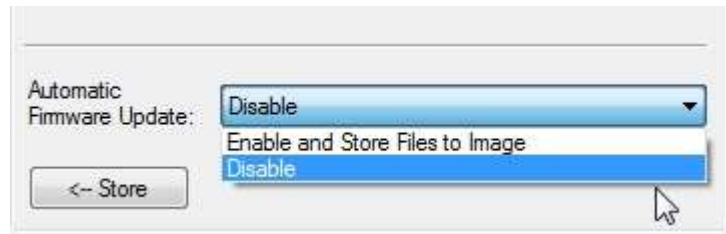


Figure 28-A

To load a project from the SD card to the processor, click the Load button on the Nonvolatile Memory Load / Store window

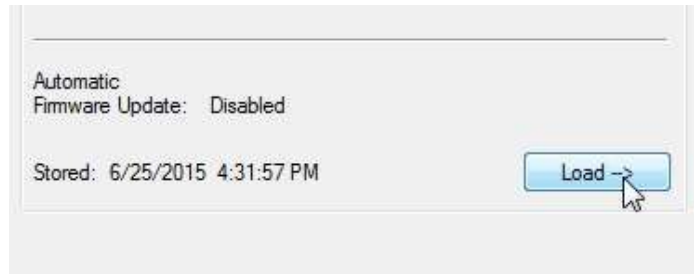


Figure 29-A

Note: Communication to the processor will be lost.



Figure 30-A

The SD LED on the processor will flash Green
The OK LED will transition from Green to solid Red
When the OK LED transitions back to Green the load process is complete.
Reestablish communications to the processor.

To store a project file to the SD card, click the Store button on the Nonvolatile Memory Load / Store window

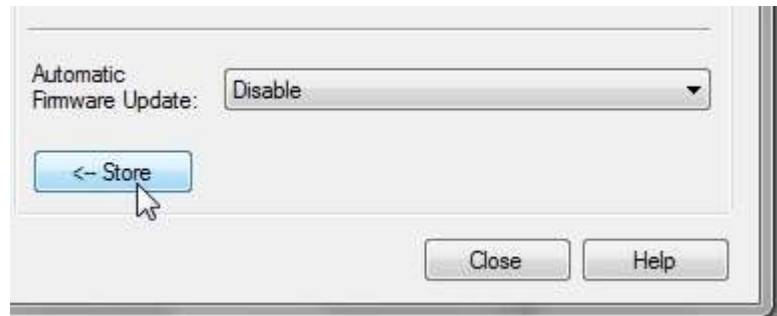


Figure 31-A

Note actions that will happen during a Store operation.



Figure 32-A

The SD LED on the processor will be flashing Green
The OK LED will start flashing Green then transition to solid Red
The following message screen appears
See Figure 33-A

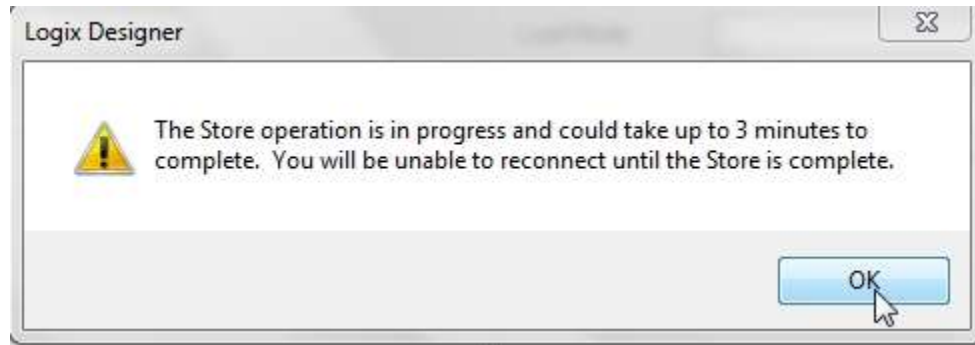


Figure 33-A

When the OK LED transitions back to solid Green the save process is complete.

Reestablish communications to the processor.

ESM – Energy Storage Module



Figure 34-A

You can use the ControlLogix ESMs to execute one of the following tasks:

Provide power to 1756-L7x controllers to save the project to the onboard nonvolatile storage (NVS) memory of the controller after power is removed from the chassis or the controller is removed from a powered chassis.

The ESM replaces the battery found on L1, L5x, L6x and legacy controllers.

Note: Onboard nonvolatile storage memory (NVS) is not the SD card.



The L7x processor can run a project without an ESM but if power is removed from the processor the processor loses the project file.

To remove the ESM from the processor – Remove key from key switch.

Press down the black tab to the left of the USB port.

Pull ESM away from processor.

Figure 35-A

To install an ESM on a processor – align the ESM to tracks on the processor. Slide the ESM toward the processor until it snaps in place.

DO NOT FORCE THE MODULE – module or processor damage could result

Do not remove the ESM while the OK LED on the processor is RED.



When power is removed from the processor the ESM provides the power to save the project to NVS memory.

The OK LED on RED indicates the ESM is being used to save the project file.

Figure 36-A

Note: The OK LED is also RED or blinking RED when the processor is in fault mode.

To clear NVS memory:

- Remove ESM with processor power applied.
- Remove power from processor
- Reinstall ESM
- Apply power to processor
- After booting the processor display will read – No Project if a project is not loaded from the SD card.

Note: Warning about removing ESM in hazardous area.

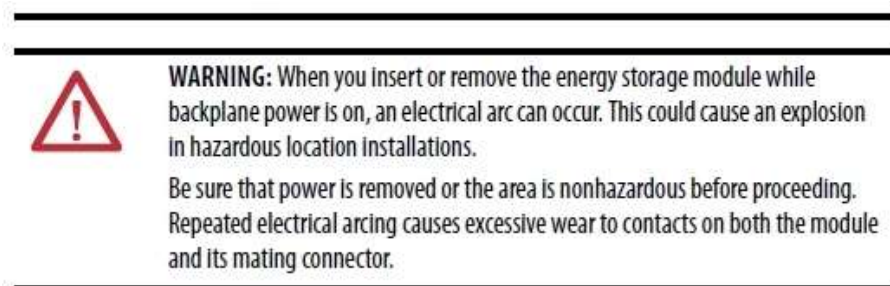


Figure 37-A

The following table describes the ESMs.

Cat. No.	Description
1756-ESMCAP	Capacitor-based ESM The 1756-L7x controllers come with this ESM installed.
1756-ESMNSE	Capacitor-based ESM without WallClockTime back-up power Use this ESM if your application requires that the installed ESM deplete its residual stored energy to 40μjoules or less before transporting it into or out of your application. Additionally, you can use this ESM with only a 1756-L73 (8 MB) or smaller memory-sized controller.
1756-ESMNRM	Secure capacitor-based ESM (non-removable) This ESM provides your application an enhanced degree of security by blocking physical access to the USB connector and the SD card.

Figure 38-A

When the ESM is functioning properly the On-line Toolbar in Studio 5000 appears as:



Figure 39-A

If there is a problem with the ESM or an ESM is not installed on the processor the On-line Toolbar in Studio 5000 appears as:

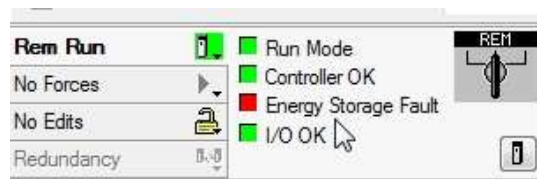


Figure 40-A

The Minor Fault tab on the Controller Properties window shows an ESM problem or not present as a minor fault.

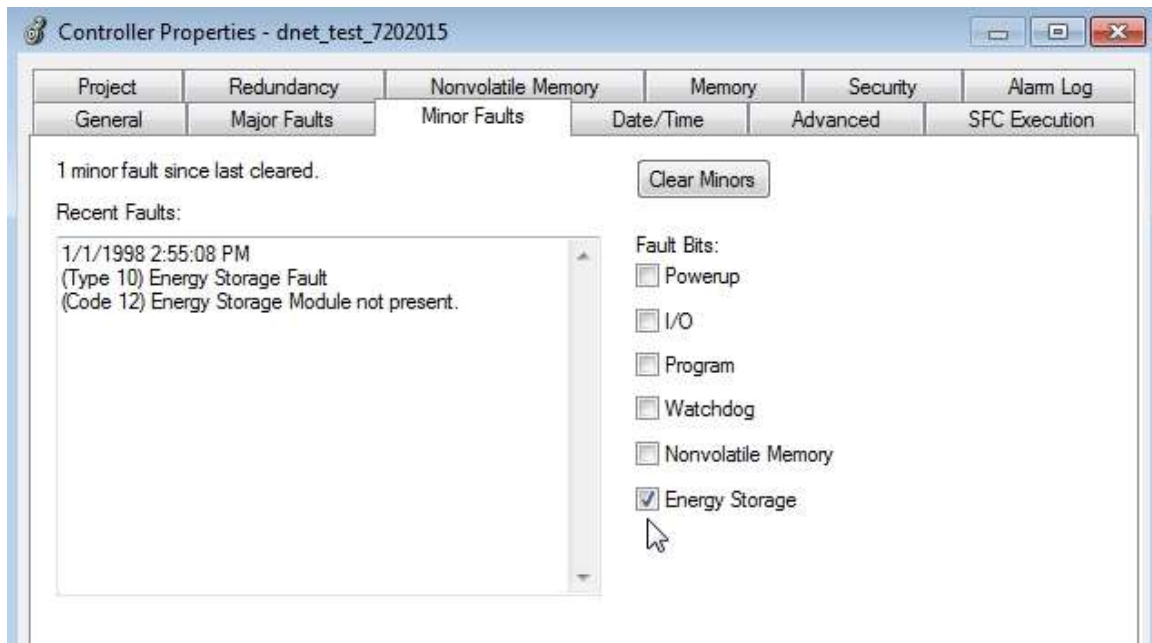


Figure 41-A

L7x Processor Diagnostic Indicators

A 4 Character Alpha / Numeric Scrolling Display plus 4 diagnostic LEDs replace the 6 diagnostic LEDs found on earlier versions of ControlLogix processors.



Figure 42-A
L6x Indicators



Figure 43-A
7x Display and Indicators

RUN LED – solid Green - processor in RUN or REM RUN mode
OFF – processor in Program, REM Program or TEST Mode

FORCE LED – OFF – no Force installed
Amber blinking – Forces installed – not enabled
Amber solid - Forces installed - enabled

SD LED – OFF - SD Card not being accessed
Green – a Load / Store operation using SD card
Blinking Red – SD card does not have valid file
Solid Red – processor does not recognize SD card

OK LED - OFF – no power to processor
Green – processor operating normally
Blinking Red – Major Fault has occurred – typically a recoverable fault
Solid Red – processor inoperable – non-recoverable fault
ESM being used

Processor booting – loading project from NVS memory

Alpha / Numeric Display

The 1756-L7x controller status display scrolls messages that provide information about the firmware revision, ESM status, project status, and major and I/O faults of the controller.

Normal Operation – processor name scrolls across the display

On power up the display shows

- Processor revision
- Processor part number
- TEST – processor conducting power-up tests
- PASS – Power-up test successful
- CHRГ – ESM capacitor charging

During SD load / store operations LOAD and SAVE are shown on the display.

Major Fault information Scrolling Display

- Type
- Code
- Brief Description

Major fault information is shown in Studio 5000 software on the On-Line toolbar

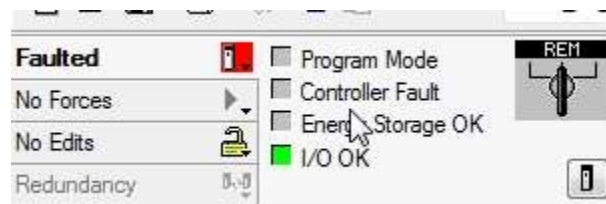


Figure 44-A

and in the Major Fault tab in the Controller Properties window.

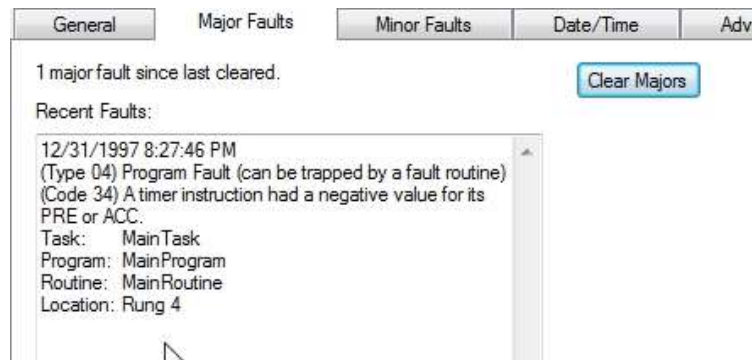


Figure 45-A

I/O Fault Information Scrolling Display

- Local – Slot Number, description and Code
- Remote – Module Name and Code
- Number of I/O present

I/O Fault information is shown in Studio 5000 software on the On-Line toolbar

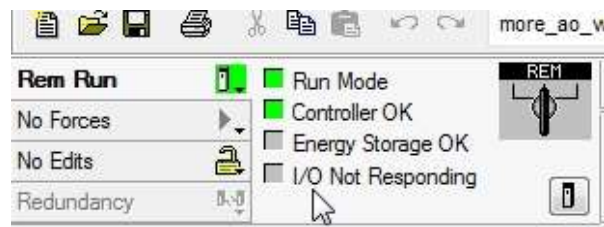


Figure 46-A

and in I/O Configuration folder of the Controller Organizer window. Yellow triangle on I/O Configuration folder indicates I/O problem.

Yellow triangle on module icon indicates specific module that has a problem.

[2] – module in slot 2
1756-IB16 part number of module
slot2 – module name

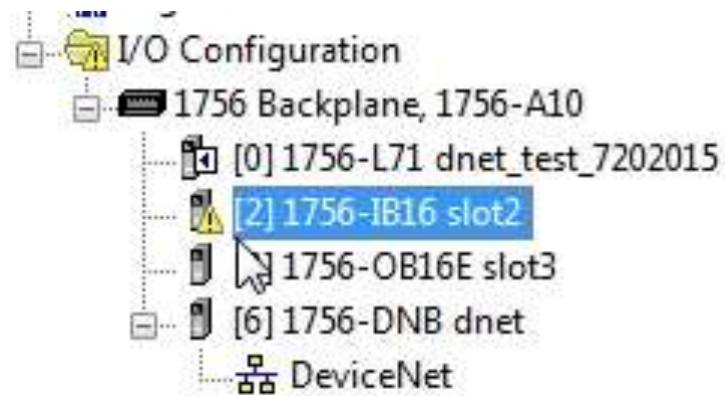


Figure 47-A

Lesson 3.0 Exercise

Use the ControlLogix training units to do the following tasks.

1. Connect to the PLC using USB port
2. Open RSLinx and view USB driver.
3. Using Studio 5000 software – connection to PLC using USB driver
4. Download project file via USB connection.
5. Store project file to SD card.
6. Power down processor – View OK LED as project is saved to NVS memory
7. Power up Processor
8. View Display information as processor is booting
9. Connect to processor using USB connection
10. Load project file store on SD Card

Lesson 3.0 – L7x: Review Questions

1. **T F The L7x processor must use a ESM**

2. **How many CIP connections are available for L7x processors**
 - a) 500
 - b) 256
 - c) 16,384
 - d) 128,000

3. **T F The L7x processor must use a SD card.**

4. **T F The L7x processor has a RS-232 connector on the front of it.**

5. **T F A Red OK LED indicator always means the processor is faulted.**

6. **T F An Allen-Bradley SD Card must be used with the 1756-L7x processors**

- 7. The display on the L7x processors show the what information.**
- a) Controller Faults
 - b) Processor Name
 - c) Processor Revision
 - d) I/O Faults
- 8. How can you determine if a L7x processor is faulted?**
- a) View fault information in Studio 5000 software
 - b) View OK LED indicator on front of processor
 - c) View Fault information on processor display
 - d) All the above
- 9. How can you determine if an L7x processor has an I/O fault?**
- a) View I/O LED indicator
 - b) View I/O Configuration information in Studio 5000 software
 - c) View I/O Fault information on processor display
 - d) All the above

- 10. T F USB ports are meant to be a temporary connection to a L7x processor.**
- 11. T F The USB driver must be configured using the driver configuration screen in RSLinx**
- 12. The maximum cable length for a USB connection to a L7x processor is:**
- a) 10 m
 - b) 50 Ft.
 - c) 3 m
 - d) 50 m
- 13. The ESM is used to store a project file in which type of processor memory**
- a) RAM
 - b) SD memory card
 - c) Onboard nonvolatile storage (NVS) memory of the controller
 - d) All the above
- 14. What software is used to monitor a v24 L7x processor?**
- a) RSLogix 5000
 - b) RSNetworx for ControlNet
 - c) Studio 5000

d) Remote Panelbuilder

Review Question Answers:

- 1) F
- 2) a
- 3) F
- 4) F
- 5) F
- 6) F
- 7) a, b, c, d
- 8) d
- 9) b, c
- 10) T
- 11) F
- 12) c
- 13) c
- 14) c



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