



Greetings ...

This file contains the answers to our "Email PLC Quiz" Number 210. This edition is a "**Beyond Beginner**" quiz which focuses on the "retentive" action of Latches and Unlatches after a plant-wide power failure. It also covers some of the "power-down" differences between the Allen-Bradley PLC-5, SLC-500, and ControlLogix platforms.

If you'd like to discuss the information contained in any of our quizzes, please feel free to contact us. We'll be glad to answer any questions you might have.

The following equipment was used during the research and development of this edition of the Email PLC Quiz. Other configurations might possibly give different results.

PLC-5/20E Processor; Series E; Revision D.2
RSLogix5 Software; Version 6.00.00

SLC-5/04 Processor; Series C; OS401
RSLogix500 Software; Version 6.00.00
Note: Most MicroLogix1000 Processors will duplicate the SLC's operation

ControlLogix5555 Processor; Revision 15.4
RSLogix5000 Software; Version 15.00.00

Communication through DF1 Serial Port Connection; 19,200 Baud;
RSLinx Lite Software; Version 2.50.00.20 (CPR 7)

Microsoft Windows 2000 Software; Version 5.00.2195

A number of readers have responded to previous editions of our Email PLC Quizzes with requests for any books that we might have available covering this type of material. At this point in time, we are providing training mainly through our five-day PLC Boot Camp classes. So far we haven't found a satisfactory way to effectively present the same amount of detail in any format other than through face-to-face hands-on training. So no, we're sorry that we don't have any books or other types of training materials to offer - but we thank you very much for asking.

Answers for the Beyond Beginner Quiz - Number 210
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For an SLC-500 system - after a plant-wide power cycle ...

Question 1: Will FAN_A come back ON or will it stay OFF?

Answer 1: FAN_A will stay OFF ... because as soon as the 120VAC line power is turned OFF, the normally-closed contacts of the STOP_FAN_A button will quit passing current to the input module ... the tricky part is that the SLC-500 processor CONTINUES TO SCAN for at least one or two seconds after the 120VAC line power drops out ... during this period, the processor will interpret the loss of current through the STOP_FAN_A button exactly as if the normally-closed button had been pressed - in other words, as a valid "stop" signal from the operator ... rung 0001 will be executed with TRUE logic and its OTU instruction will "unlatch" the output bit for FAN_A ... FAN_A will NOT automatically "resume operation" once the 120VAC line power is restored ...

For an SLC-500 system - after a plant-wide power cycle ...

Question 2: Will FAN_B come back ON or will it stay OFF?

Answer 2: FAN_B will come back ON ... because the normally-open contacts of the STOP_FAN_B button will NOT "change state" when the 120VAC line power is turned OFF ... so even though the SLC-500 processor CONTINUES TO SCAN for at least one or two seconds after the 120VAC line power drops out, rung 0003 does NOT "unlatch" the output bit for FAN_B ... so FAN_B WILL properly "resume operation" once the 120VAC power is restored ...

For a PLC-5 system - after a plant-wide power cycle ...

Question 3: Will FAN_A come back ON or will it stay OFF?

Answer 3: FAN_A will come back ON ... unlike some other Allen-Bradley controllers, the PLC-5 processor normally does NOT continue to scan after its 120VAC line power drops out ... this means that the processor doesn't get a chance to see the loss of current through the normally-closed contacts of the STOP_FAN_A button ... consequently, the OTU instruction in rung 0001 will NOT "unlatch" the output bit for FAN_A ... so FAN_A WILL be able to automatically "resume operation" once the 120VAC line power is restored ...

For a PLC-5 system - after a plant-wide power cycle ...

Question 4: Will FAN_B come back ON or will it stay OFF?

Answer 4: FAN_B will come back ON ... because the normally-open contacts of the STOP_FAN_B button will NOT "change state" when the 120VAC line power is turned OFF ... and even if the contacts did happen to change state, the PLC-5 processor stops scanning instantly as soon as the 120VAC line power drops out ... there is no reason for rung 0003 to "unlatch" the output bit for FAN_B ... so FAN_B WILL properly "resume operation" once the 120VAC power is restored ...

For a ControlLogix system - after a plant-wide power cycle ...

Question 5: Will FAN_A come back ON or will it stay OFF?

Answer 5: FAN_A will stay OFF ... because as soon as the 120VAC line power is turned OFF, the normally-closed contacts of the STOP_FAN_A button will quit passing current to the input module ... the tricky part is that the ControlLogix processor CONTINUES TO SCAN for at least one or two seconds after the 120VAC line power drops out ... during this period, the processor will interpret the loss of current through the STOP_FAN_A button exactly as if the normally-closed button had been pressed - in other words, as a valid "stop" signal from the operator ... rung 0001 will be executed with TRUE logic and its OTU instruction will "unlatch" the output bit for FAN_A ... FAN_A will NOT automatically "resume operation" once the 120VAC line power is restored ...

For a ControlLogix system - after a plant-wide power cycle ...

Question 6: Will FAN_B come back ON or will it stay OFF?

Answer 6: FAN_B will come back ON ... because the normally-open contacts of the STOP_FAN_B button will NOT "change state" when the 120VAC line power is turned OFF ... so even though the ControlLogix processor CONTINUES TO SCAN for at least one or two seconds after the 120VAC line power drops out, rung 0003 does NOT "unlatch" the output bit for FAN_B ... so FAN_B WILL properly "resume operation" once the 120VAC power is restored ...

Summing up: Many technicians and programmers fail to give adequate consideration to the concepts demonstrated in our little quiz when making use of the "retentive" Latch and Unlatch instructions. There can be some surprising results when a "Latched" output unexpectedly fails to function properly due to the field wiring of its inputs. Add to this the fact that the operation of some processor platforms differs considerably from the operation of others and we have the potential for some rather interesting troubleshooting and debugging problems.

We could add even more opportunities for confusion to our quiz by using DC power for the system's I/O wiring. Most DC power supplies typically have a large capacitor in their final output circuits. This "filter" capacitor is used to remove the ripple from the rectified AC waveform. In many cases, the discharging of this capacitor is capable of "holding up" the DC output for several seconds after the AC line service fails. With an SLC-500 or a ControlLogix system, the question then revolves around which power supply will last longer - the processor's or the I/O power's? In some situations the final answer may vary randomly depending on how much of a load happens to be placed on the DC power supply at the time that the AC line power fails. This can lead to all sorts of challenging troubleshooting and debugging problems which are highly intermittent in nature.

This concludes the answers for the Beyond Beginner quiz - Number 210