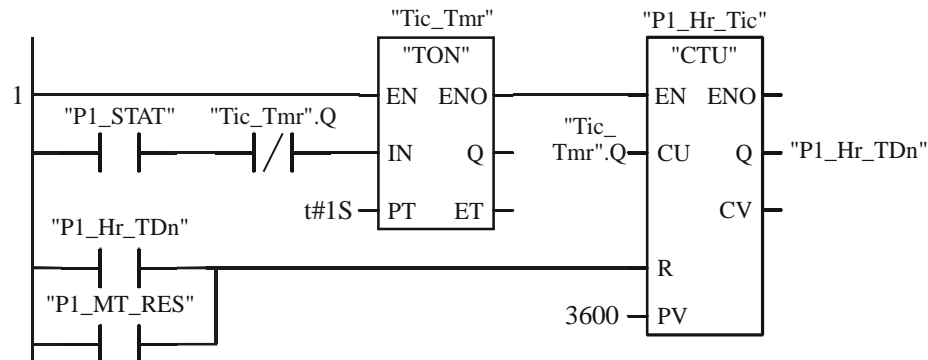


Errata

K. T. Erickson, *Programmable Logic Controllers: An Emphasis on Design and Application*, First edition, April 2005.

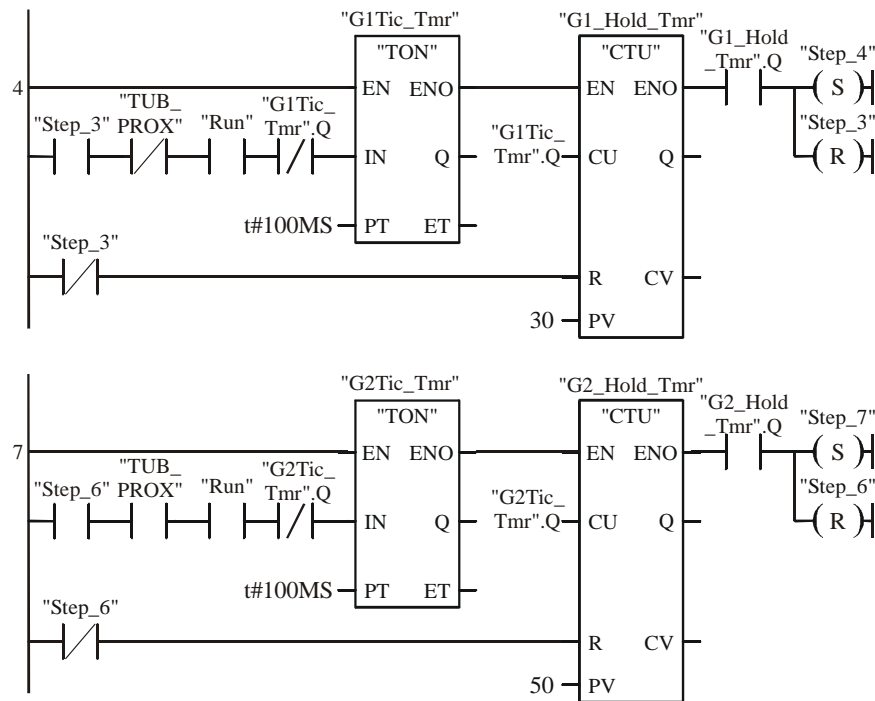
- p. ix Acknowledgements, 3rd paragraph, 3rd line: Insert “:” after “Electric”
- p. 67 Figure P2.1 caption: “P2-3” should be “P2-1”.
- p. 67 Figure P2.2 caption: “P2-4” should be “P2-2”.
- p. 67 Figure P2.3 caption: “P2-5” should be “P2-3”.
- p. 67 P2-4: Delete the last sentence, “Note that the rightmost gate is an exclusive-or-gate.”
- p. 68 Figure P2.4 caption: “P2-6” should be “P2-4”.
- p. 74 Figure P2.10 caption: “P2-12” should be “P2-10”.
- p. 92 Table of data types, the range of real should be $\pm 8.43 \times 10^{-37}$ to $\pm 3.36 \times 10^{+38}$ (sign missing)
- p. 108 Figure 3.24, the right-most chassis has ½ slot addressing.
- p. 119 Table of data types, the range for real should be $\pm 1.175 \times 10^{-38}$ to $\pm 3.403 \times 10^{+38}$ (sign and multiply missing)
- p. 128 Figure 3.41, second line of note at bottom, “note” should be “not”
- p. 131 Figure 3.44: The output coil should be like the output coil on Figure 3.51.
- p. 133 Table of data types, the range for real should be $\pm 1.175 \times 10^{-38}$ to $\pm 3.403 \times 10^{+38}$ (sign and multiply missing)
- p. 136 Second sentence after table of status addresses, “set or reset” should be “retentive”
- p. 141 P3-1(e): “channel 1 is address” should be replaced by “module start address is”
- p. 142 P3-1(f): For the discrete output, “channel 1 is address” should be replaced by “channel 1 reference address is %Q” followed by the number. For the discrete inputs, “channel 1 is address” should be replaced by “channel 1 reference address is %I” followed by the number.
- p. 142 P3-2(c): LS4112: I/O group should be “7”, not “8”
- p. 143 P3-2(e): “channel 1 is address” should be replaced by “module start address is”
- p. 143 P3-2(f): For the discrete output, “channel 1 is address” should be replaced by “channel 1 reference address is %Q” followed by the number. For the discrete inputs, “channel 1 is address” should be replaced by “channel 1 reference address is %I” followed by the number.
- p. 144 P3-3(e): “channel 1 is address” should be replaced by “module start address is”
- p. 144 P3-3(f): For the discrete output, “channel 1 is address” should be replaced by “channel 1 reference address is %Q” followed by the number. For the discrete inputs, “channel 1 is address” should be replaced by “channel 1 reference address is %I” followed by the number.

- p. 146 P3-4(e): “channel 1 is address” should be replaced by “module start address is”; LS101 should be channel 15.
- p. 146 P3-4(f): For the discrete output, “channel 1 is address” should be replaced by “channel 1 reference address is %Q” followed by the number. For the discrete inputs, “channel 1 is address” should be replaced by “channel 1 reference address is %I” followed by the number.
- p. 177 Figure 4.41: The contact labeled “CRM” on the L1 wire on the left side should be labeled “MCR”.
- p. 178 Figure 4.42: The contact labeled “CRM” on the DC V+ wire on the left side should be labeled “MCR”.
- p. 231 Section 5.6.3: The description of the Siemens retentive on-delay timers is incorrect. The Siemens retentive on-delay does not operate similarly to the retentive timers of the other PLC vendors covered by the text. A corrected section 5.6.3 and a corrected Figure 5.39 appear at the end of the errata.
- p. 237 Figure 5.46(a): The coil symbol attached to the Q output should be absent. The “Advance_Cyl” symbol should be attached directly to the Q output.
- p. 238 Figure 5.48(a): The label for the CD input should be “Down trigger”.
- p. 239 Figure 5.49(a): The coil symbol attached to the Q output should be absent. The “Prox3_Zero” symbol should be attached directly to the Q output.
- p. 241 Figure 5.51(a): The coil symbols attached to the QU and QD outputs should be absent. The “Remove_Box” symbol should be attached directly to the QU output and the “No_Box” symbol should be attached directly to the QD output.
- p. 261 Second paragraph of Example 5.5 solution. Sentence starting with “The S7 implementation...” should be “The S7 ladder logic implements a retentive timer similarly to the Modicon.” The table of internal variables above Figure 5.76 should contain one more line, Tic_Tmr defined as DB11 for the Siemens and “n/a” for the other PLCs.
- p. 262 Figure 5.78: The first network should be as follows:



- p. 269 Figure 5.85: The IN inputs and the Q outputs of the MOV_INT blocks should have a “[0]” after the symbol name.
- p. 278 P5-5, line 6, second word: “ten” should be “twenty”

- p. 279 P5-7, lines 3 and 4: "FLASH" should be "ALARM"
- p. 281 P5-8, line 7 of variable list: "ALARM_HRN" should be "ALARM_HORN"
- p. 284 P5-10, BUNK2_LLEV variable, ControlLogix column: "Local:0" should be "Local:1"
- p. 285 Last two lines, ControlLogix column: "Local:0" should be "Local:1"
- p. 286 First five lines, ControlLogix column: "Local:0" should be "Local:1"
Sixth line, ControlLogix column: "Local:1" should be "Local:2"
- p. 289 P5-16, 12th line: "EMPTY" should be "VACANT".
- p. 292 P5-20, third paragraph in control description, 4th line: insert "("" before period.
- p. 314 Table at top of page: Siemens data types for G1_Hold_Tmr and G2_Hold_Tmr should be DB3 and DB4, respectively. The table of internal variables should contain two more lines, G1Tic_Tmr and G2Tic_Tmr defined as DB5 and DB6, respectively for the Siemens and "n/a" for the other PLCs.
- p. 321 First full paragraph, after the first sentence should be replaced by the following: "The only minor differences are in the retentive timers and the counter and the restrictions on what can be connected to the S7 block inputs and outputs. Note the use of the "xxx".Q contact on the ENO output of the counter and the timers. Since the IEC-compatible timer/counter block Q output can only connect to a variable, this method allows one to place contacts in series with the Q output and to control the set and reset coils without starting a new network."
- p. 322 Figure 6.18 (second page): Networks 4 and 7 should be the following:



- p. 324 Figure 6.19 (first page): On rung 4, ONDTR_SEC block should be ONDTR_TENTHS
- p. 325 Figure 6.19 (second page): On rung 7, ONDTR_SEC block should be ONDTR_TENTHS

- p. 379 Second paragraph, last sentence: “The operator...” should be replaced by “The program must ensure that the operator...”
- p. 383 Third paragraph (starts with “To move only...”), third line: “(sensed by PROX2)” should be “(a 2 second delay allows this move)”.
- p. 404 Item 2, 2nd line: “...PS_1 clears, CYL_4 is ...” should be “...PS_1 clears (with PS_2 on), CYL-4 is ...”
Item 2, add the following: “There is no retract limit switch. Assume 2 seconds are needed to retract CYL-4.”
Items 3-7: “CYL_...” should be “CYL-...” (underscore should be dash)
- p. 415 Last line of physical I/O addresses: Siemens address for CLAMP_UP should be Q21.1
- p. 426 Physical I/O addresses for PROXBx: Siemens addresses should start with byte 18, not 20.
- p. 456 Figure 7.34: “4095” should be “4095.0” (should include decimal point)
- p. 464 Last entry of table below Figure 7.43: First column should be “CMP<>*” (add <>)
- p. 472 First line: “an” should be “a”
- p. 481 Second paragraph, starts with “Example MOVE...”: Period missing from end of third sentence.
- p. 503 Last paragraph, sentence starting with “The ADD_REAL...” and the succeeding one should be replaced with “The MOVE block is used to assign a literal (constant) to a memory location. However, the variable must first be connected to the MOVE output, in order to determine the proper data type for the literal.”
- p. 505 Figure 7.78, rung 3: There should be coils on ENO outputs of all comparisons except the first one and a contact that refers to each coil should be in series with the connection to the next comparison.
- p. 506 Figure 7.79, rung 12 and 13: ADD_REAL blocks should be MOVE blocks and the bottom input is deleted.
- p. 527 Paragraph about 2/3 down starting with “The solution should include...”: The last word should be “feet”.
- p. 533 Fourth paragraph describing operation (starts with “After the measurement...”), 4th line: “NEW_WIDTH” should be “NEW_MEAS”.
- p. 534 After the first (partial) sentence, add: “When paused, retain the delay that allows the part to move out and do not advance to the next step.”
First full paragraph: Delete last sentence that starts with, “In other words...”
- p. 535 Third line: Siemens address for NEW_MEAS should be “M8.1”
- p. 537 Sixth paragraph (starts with “There is a RESET_PB...”), second line: “RESET” should be “RESET_PB”; seventh line: Replace “... already paused.” with “... already paused and not pressing.”; seventh line: Delete “In other words,”
- p. 539 Ninth line: Siemens address for NEW_CODE should be “M8.1”

- p. 540 Next-to-last paragraph, third line from bottom, tenth word: “you” should be “your”
- p. 548 Middle paragraph, fifth line: “theses” should be “these”
- p. 549 Penultimate paragraph, describing reset: Delete last sentence and replace with “The RESET_PB switch must also have no effect while the drill is moving down or paused in the down position.”
- p. 550 Description of LS3: “**off**” should be “**on**”.
Descriptions of X_VAL, Y_VAL, DES_X, and DES_Y: Capitalize first character.
- p. 561 Descriptions of PULSE_A, PULSE_B, and PULSE_OUT: Capitalize first character
- p. 562 Eighth line: Siemens address for AGIT_AO should be “QW304”
- p. 656 Variable table: Add “First_Bit” which has an address of B3/95 for a PLC-5 and BOOL data type for a Logix. The other PLCs do not need this Boolean.
- p. 661 Figure 8.87, rung 4: In FFU block, the Dest field should be “Unstack_Dest”
- p. 678 Figure 9.1, rung 3: address of coil should be “B20/21”; rung 4: address of coil should be “B20/22”
- p. 679 Section 9.1, second paragraph, fourth line: S7 and GE Fanuc processors also have sequencer function blocks.
- p. 710 Figure 9.11, rung 1: Coil labeled “Eq2” should be attached to ENO of second EQ_WORD. NO contact labeled “Eq2” should be in series with input to EN of third EQ_WORD. Coil labeled “Eq3” should be attached to ENO of third EQ_WORD. NO contact labeled “Eq3” should be before “Run” contact.
- p. 810 First line after equation (10.5) missing word is “ $G_{ff}(s)$ ”
- p. 829 Figure 10.71, PD19:0 configuration: “Input Range Max” should be “4095”.
- p. 837 Figure 10.75, rung 3: NO contact should be a NC contact.
- p. 839 List after paragraph starting with “The solution should specify...”: Correct indent on third entry.
- p. 901 S7 variable and block input/output definitions:
Motor_Start_Req should have a default value of “False”
Motor_Stop_Reg should have a default value of “False”
FailTmr should not have a default value
- p. 943-4 Example 12.4: All instances of “LT428_MIN” in programs should be changed to “T428_MIN”. All instances of “LT428_MAX” in programs should be changed to “T428_MAX”.
- p. 944 Example 12.4, Siemens S7: First line should be
FUNCTION LT428_Ct1: VOID
(_BLOCK) should be deleted and “:” added after name of function.
- p. 944-5 Example 12.5, Modicon solution (corrections bolded):
line 9: DispConv(**In_Int** :=REAL_TO_INT(LT428_VAL*10.0));

```

line 15: TWConv( In_BCD:=AND_WORD(MIN_TW, 16#0FFF)); TempI :=
TWConv.Out_Int;
line 16: T428_MIN := INT_TO_REAL( TempI )/10.0;
line 27: HrnTrig(CLK:=T428_Hrn_Act);
last line: Ack_Tmr( IN:=Ack_Tmr_En, PT:=T#5m);

```

- p. 950 Problem P12-2, 2nd paragraph: “CrtAcc” should be “CtrAcc”
- p. 955 Table 13.1: Top horizontal line should be longer.
- p. 961 Figure 13.5(a): The coil symbol attached to the Q output should be absent. The “Advance_Cyl” symbol should be attached directly to the Q output.
- p. 979 Second paragraph (starting with “*Sequence selection...*”), 3rd line: Replace “must” with “should”
- p. 984 Second paragraph (starting with “Each step action...”), 4th line from bottom: “However, the implementations...” should be replaced by “However, most implementations...”
- p. 989 Paragraph about P – Pulse action qualifier, 3rd line: Replace “Send_Msg” with “Done_Msg”
- p. 989 Paragraph about P1 and P0 – Pulse action qualifiers, 4th line: Replace “Send_Msg” with “Done_Msg”
- p. 1079 Figure 15.5: Block labeled “Output Force or Disable Table” should be between the “Output Image” and the “State of Actual Output Device”
- p. 1081 Figure 15.7(b): “State of logic driving output coil” should be “Output image”; “Output image” should be “State of actual output”
- p. 1105 Figure 16.19: “Recieved Light” should be “Received Light”
- p. 1107 Second paragraph in section 16.2.3, second line: Delete first “the”.
- pp. 1168-73 Problems P16-1 to P16-21: The punctuation mark at the end of part (b) should be a period.
- p. 1171 Figure P16.13: label for thermocouple should be “R Thermocouple”
- p. 1196 First paragraph in section 17.5. “CIP” now stands for “Common Industrial Protocol”. Older Rockwell Automation documentation still calls it “Control and Information Protocol”.
- p. 1237 Figure 17.55: The port number should be “2”
- p. 1245 Second line: text in parentheses should be after the information for the SYSID input.
- p. 1354 Figure 21.26 (first page) Rung 2: The ENO output of the EQ_INT should have a coil labeled “Unit_Startup_ENO”; a normally-open contact labeled “Unit_Startup_ENO” should be in series with the unlabeled output of the EQ_INT; the coils for the _CtrRst’s should be set coils (four places).
- p. 1355 Figure 21.26 (second page) Rung 4: The ENO output of the CTUD should have a reset coil labeled “Unit_Startup_CtrRst” in parallel with the reset coil already there.
- p. 1356 Figure 21.26 (third page) Rung 15: The ENO output of the EQ_INT should have a coil labeled “Unit_Operate_ENO”; a normally-open contact labeled “Unit_Operate_ENO” should

- be in series with the unlabeled output of the EQ_INT; the coils for the _CtrRst's should be set coils (four places).
- p. 1357 Figure 21.26 (fourth page) Rung 16: The ENO output of the CTUD should have a reset coil labeled "Unit_Operate_CtrRst" in parallel with the reset coil already there.
- p. 1367 Figure 21.28 (second page) Rung 3: The normally-closed contact should be deleted; "Source B" for the ADD block should be "C5:0.ACC"; the symbol "UNIT_STRTUP_STBUF" above the NEQ and the MOV blocks should be "UNIT_STRTUP_STNUM"; "B33/..." should be "B20/..." (two places). Rung 4: "B35/..." should be "B21/..."
- p. 1369 Figure 21.28 (fourth page) Rung 16: The normally-closed contact should be deleted; "Source B" for the ADD block should be "C5:1.ACC"; the symbol "UNIT_STRTUP_STBUF" above the NEQ and the MOV blocks should be "UNIT_STRTUP_STNUM"; "B33/..." should be "B20/..." (two places). Rung 17: "B35/..." should be "B21/..."
- p. 1372 Figure 21.29 (first page) Network 2: The coils for the .CtrRst's should be set coils (four places).
- p. 1373 Figure 21.29 (second page) Network 4: The CTUD should be enclosed in quotes; the ENO output of the CTUD should have a reset coil labeled "Unit_Startup".CtrRst in parallel with the reset coil already there; the CTUD block should have "Unit_Startup_Ctr" above the block; the CTUD should be on a separate network.
- p. 1374 Figure 21.29 (third page) Network 15: The coils for the .CtrRst's should be set coils (four places).
- p. 1375 Figure 21.29 (fourth page) Network 16: The CTUD should be enclosed in quotes; the ENO output of the CTUD should have a reset coil labeled "Unit_Operate".CtrRst in parallel with the reset coil already there; the CTUD block should have "Unit_Startup_Ctr" above the block; the CTUD should be on a separate network.
- p. 1376 Figure 21.29 (fifth page) Network 67: The NO contact connected to the ENO output of the TON can be deleted and the output coil moved to the Q output. Network 83: "Unit_Operate".Ons should be "Unit_Operate".Running.
- p. 1377 Figure 21.29 (sixth page) Network 84: The NC contact should be a NO contact. Network 85: "Unit_Shutdown".Ons should be "Unit_Shutdown".Running. Network 86: The NC contact should be a NO contact.
- p. 1378 Figure 21.30 (first page) Rung 2: the positive transition contact cannot be in parallel with any other coil, so it must be on a separate rung, driven by an NO contact labeled "Unit_Startup_Running". Rung 3: the counter reset coils cannot be in parallel with the branch containing the MOVE, so these must be on a separate rung driven by two NO contacts, one labeled "Unit_Startup_Ons" and the other labeled "Unit_Startup_Jump"; the counter resets should be set coils. Rung 3 is now rung 4 and Rung 4 becomes rung 6 (affecting text on p. 1351)
- p. 1379 Figure 21.30 (second page) Rung 9: a reset coil labeled "Unit_Startup_CtrRst" should be added to the left side of the rung; the first BLK_CLR_WORD should be of length 2. All rungs numbers are incremented by 2 (affecting text on p. 1353)
- p. 1380 Figure 21.30 (third page) Rung 20: the positive transition contact cannot be in parallel with any other coil, so it must be on a separate rung, driven by an NO contact labeled "Unit_Operate_Running". Rung 21: the counter reset coils cannot be in parallel with the branch containing the MOVE, so these must be on a separate rung driven by two NO contacts,

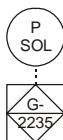
one labeled "Unit_Operate_Ons" and the other labeled "Unit_Operate_Jump"; the counter resets should be set coils. Rung 21 is now rung 22 and Rung 23 becomes rung 25 (affecting text on p. 1353).

- p. 1381 Figure 21.30 (fourth page) Rung 27: a reset coil labeled "Unit_Operate_CtrRst" should be added to the left side of the rung; the first BLK_CLR_WORD should be of length 2. All rungs numbers are incremented by 2.
- p. 1382 Figure 21.29 (fifth page) Rung 98: "Unit_Operate_Ons" should be "Unit_Operate_Running".
- p. 1383 Figure 21.29 (sixth page) Rung 101: "Unit_Shutdown_Ons" should be "Unit_Shutdown_Running".
- p. 1412 Figure 22.3: The "Regen Material" stream output from the Regen Material Storage cell should be an input to the Ion Exch. Cell.

Supplemental CD:

\Chem Process\Drawings\002IN0001.pdf should have "002IN001" in the CAD REF. NO. box.

\Chem Process\Drawings\002PD2002.pdf is missing the device tag for the P-SOL for Gate 2. It should be G-2235 and should be attached to P-SOL as:



\Chem Process\Drawings\002PD4001.pdf: The tags for the product flow indicators measuring the flow into Exchanger #1 and Exchanger #2 should be "FI4101" and "FI4102", respectively

5.6.3 Retentive On-Delay Timers

The Siemens retentive on-delay timer is not similar to the retentive on-delay timers of the other PLCs covered in this text. Instead of retaining the accumulator value when the timer input turns **off**, Siemens retentive timers retain the value of the timer input. A retentive on-delay timer can be implemented one of two ways, shown in Figure 5.38. There is no IEC-compatible retentive on-delay timer. An IEC-compatible retentive on-delay can be implemented as shown in Figure 5.15 for the Modicon PLC. The S_ODTS function block and the SS coil function like the on-delay timers except the timer continues to run when the timer input turns **off**.

The S_ODTS S5-compatible timer is shown in Figure 5.38a. When the S input is **on**, the accumulator is set to TV and decrements as for the S_ODT block. When the accumulator equals zero, the timer "times out" and the Q output turns **on**. If S turns **off** during the timing interval, timing continues until the timer times out. The R input is the timer reset. Anytime R is **on** the accumulator is zeroed and the Q output remains **off**.

As a coil, the S5-compatible timer is shown in Figure 5.38b. When the coil input is **on**, the accumulator is set to the preset time value shown below the coil and decrements as for the SD coil. When the accumulator equals zero, the timer "times out" and the contact reference to the timer turns **on**. If the coil input turns **off** during the timing interval, timing continues until the timer times out. As for other coil timers, a SS coil timer is reset by turning **on** a reset coil referring to the timer.

An example application implemented with each type of retentive on-delay timer is shown in Figures 5.39a,b and the associated timing diagram is shown in Figure 5.39c. The preset time is 200 seconds (3 minutes, 20 seconds). The LS3_On_Dn bit is turned **on** 200 seconds after LS_3 turns **on**. The timing continues even after LS_3 turns **off**. The All_Reset Boolean must be turned **on** to reset the timer.

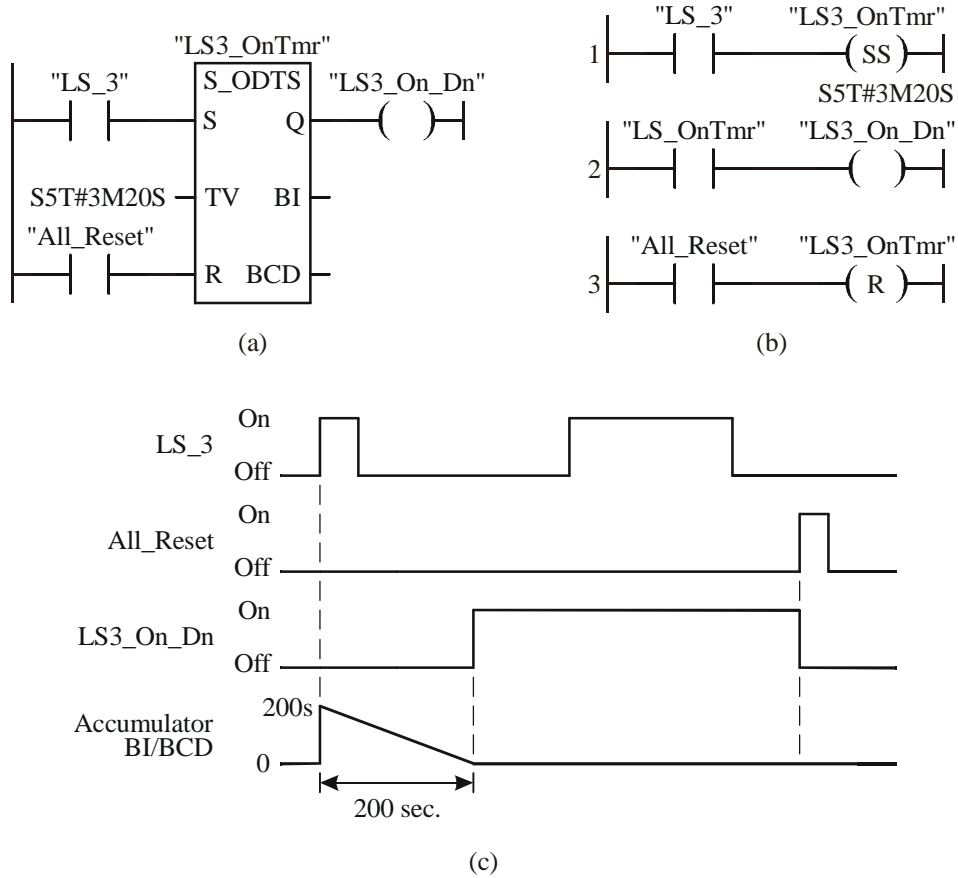


Figure 5.39. Example S7 retentive on-delay timers: (a) S_ODTS; (b) SS coil; (c) timing diagram.