Introduction

This document provides all the basic knowledge to help you develop your first TSX Nano PLC application using PL7-07 programming software.

It is divided into four parts :

1 Required hardware configuration for PL7-07
2 Installing PL7-07 programming software
3 Main menu bar
4 Programming tutorial (using example)

1 Required hardware configuration

1.1 Compatibility

The following class and/or types of computers can run the PL7-07 programming software:

- IBM PC-AT compatible machines
- Programming terminals
  - FTX 417 20/ 417 40 [1]
  - FTX 507.55 or FTX 507 6B/8C/8T/9T[1]

[1] recommended terminals for optimal performance

1.2 Configuration

The computer system should meet these minimum requirements:

- minimum 286 CPU, recommended 386 CPU or higher (running at least 20 Mhz)
- 640 kB of RAM and 2 megabytes of available extended memory
- 3 megabytes of available hard disk space
- EGA, VGA, or SVGA monitor
- One available COM serial port—COM1 through COM4
- One parallel port for printing—LPT1 through LPT4
- MS-DOS version 3.3 or higher

Typical configuration
- 286 microprocessor or higher

Although the PL7-07 PC programming software will run on a computer with the minimum requirements above, you may experience slow performance if you have multiple windows open simultaneously, a large amount of animated data, or a very large application.

2 Installing PL7-07 programming software

The PL7-07 PC programming software is contained on two, high-density 3.5" diskettes. To install the PL7-07 PC programming software:

1. With the DOS prompt at **c:,** insert **installation Disk #1** in the 3.5" floppy disk drive.
2. Select the floppy drive by typing **a:** or **b:** at the DOS prompt and press **<enter>**.
3. Type **install**. Press **<enter>** to launch the PL7-07 PC programming software.
4. Select the language for installing the program. The PL7-07 PC programming software can be installed in one of five standard languages : English, French, German, Italian, and Spanish. Other languages can also be installed using a disk (supplied separately) containing the files translated into the required language.

   The PL7-07 PC programming software can only operate in one language at a time. If support for multiple languages is required, create a new directory with a different name and reinstall the software in the new directory. If you reinstall the software in the same directory as the original installation, the newly-installed version will overwrite the old one.
5. When prompted, select a target drive for installing the PL7-07 software.
6. When prompted, select a name for the PL7-07 PC programming software directory. The default sub-directory is **<drive>\PL707.**
7. When prompted, select a communications port for the PLC.
8. The program decompresses the installation files and writes the PL7-07 PC programming software files to the selected drive.
9. When prompted, insert **installation Disk #2** in the floppy drive.
10. Respond **Yes** or **No**, (see note) to the prompt: «May I create/modify your CONFIG.SYS file if needed (Y/N)?
11. Respond **Yes** or **No**, (see note) to the prompt: «May I create/modify your AUTOEXEC.BAT file if needed (Y/N)?
12. When prompted, insert **installation Disk #1** in the floppy disk drive.
13. When prompted, press any key to terminate the installation program and reboot the computer.

Note: If you responded **No** in steps 10 and 11, write down the data displayed at the end of the installation program to manually update your configuration files. Before terminating the installation program, modify your configuration files as follows:

1. Display your AUTOEXEC.BAT file in a text editor. Insert the statement, C:\PL707, to the path statement:

   PATH=C:\WINDOWS;C:\DOS;C:\PL707

   where C: is the drive selected and \PL707 is the name selected for the PL7-07 PC programming software directory.
2. Display your CONFIG.SYS file in a text editor. Insert these statements:

   FILES=30 or more

   DEVICE=C:\PL707\DUNTLW.EXE PROFILE=C:\PL707\DUNTLW.001

   COM1 is the default communications port. To change the COM port setting, edit DUNTLW.001 in directory C:\PL707. In the Basic Parameters section, change the COM setting in the line PORT=COM1:O,8,1 to the desired COM port.
3. Reboot the computer.

3   Main menu bar

The main menu bar below is shown on launching the software :

```
                              PL7-07                                    ↑
  File   Edit   View   Tools   Configuration   PLC   Window   Help       ▔
```

File   To create, save, store, print, close an application, and exit the software.

Edit   To cut, copy, paste, replace, or find an item in a List or Ladder program.

View   To select one of the five editors, the Cross Reference tool, the Validate Errors display, or to select a preference for either the List or Ladder Editor.

Tools   To perform a specialized action in an editor. The Tools menu is a contextual menu; the options it displays change from editor to editor.

Configuration   To configure a hardware or software resource of the PLC.
PLC   To transfer an application between the programming terminal and the PLC, to connect and disconnect the programming terminal from the PLC, to view PLC operations, and to animate the program logic and data variables.

Window   To select or close a window.

Help   To display help text.

4 Programming tutorial

4.1 Introduction

A program is made up of a series of instructions which are executed by the PLC processor in order to give commands to outputs based on input data read by the same processor.

PL7 enables programs to be written in either List or Ladder program instruction set. The following Ladder rungs and List sequences are equivalent expressions. In this tutorial, we will develop this program logic in the Ladder Editor.

4.2 Presentation of the example

List sequence   **Ladder rung 0**

LD %I0.0
OR %Q0.0
ANDN %I0.1
ST %Q0.0

List sequence   **Ladder rung 1**

BLK %TM0
LD %Q0.0
ANDN %M0
IN
OUT_BLK
LD Q
ST %Q0.1
END_BLK

List sequence   **Ladder rung 2**
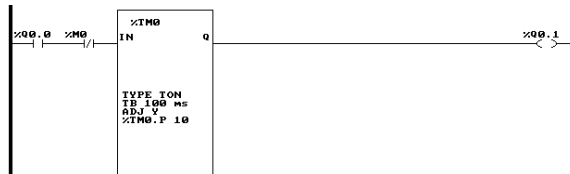
BLK %TM1
LD %Q0.1
IN
OUT_BLK
LD Q
ST %M0
END_BLK

Ladder is a diagrammatic language that uses both graphic elements and text. A Ladder *rung* is the collection of Ladder programming instructions that constitute one complete logical unit. The structure of the Ladder rung is relatively straightforward. The rung, which starts with the upper left connection of the rung to the left power rail, is a set of instructions, in series and in parallel, that lead to some output or outputs. If, when the Ladder rung is scanned, the input logic solves true, then the output instructions are enabled or energized.

List is a Boolean text-based instruction set. A List *sequence* is a collection of List program lines that constitute one complete logical unit. In either Ladder or List, you write instructions in the logical order required to control a machine or process.

List sequences always begin with a Load (LD), Block (BLK), or an unconditional List instruction, such as an unconditional jump instruction. The three List sequences shown on the previous page each start with a Load or Block instruction. Each sequence is complete when the next Load, Block, or unconditional instruction is encountered in the program.

4.3   Development methodology

This tutorial is divided into eight steps that show you how to insert the three rungs shown on the previous page :

4.4   Step 1 - Set up

• Run PL7-07 PC programming software

1. Enter this access path:
c:\PL707.

```
c:\>

c:\cd pl707

c:\PL707>pl707
```
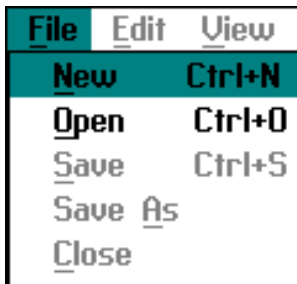
2. Type : PL707. Press
<enter>.

The main window is displayed. The main menu bar displays four active menu items - File, PLC, Window, and Help. The other menu bar items are grayed out.

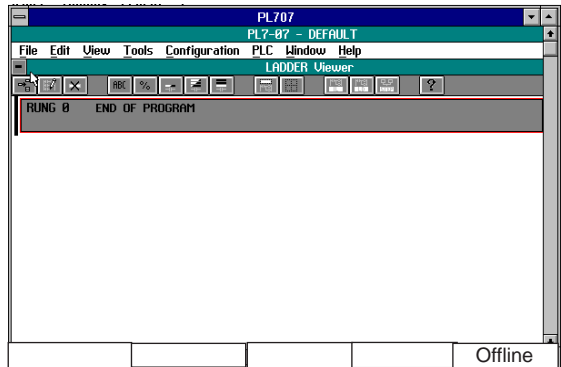The status bar (1) displays the word "Initial" to indicate that no application is open.
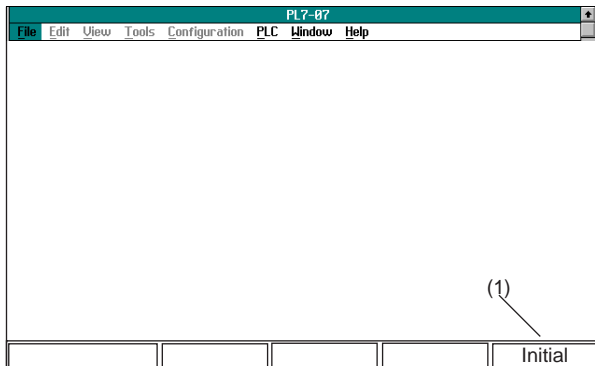
• Open a new file

Select **New** from the File menu

6

The items in the menu bar that were grayed out in the initial state are enabled.

The status bar reads "Offline" to indicate that an application is open, but that the PC is not communicating with the PLC.

The main window displays Ladder by default the first time it is used.
After this, the default display mode (List or Ladder) corresponds to the last display mode used in the previous session.

• Select the programming environment

To toggle from one display mode to the other, select List Editor or Ladder Editor in the View menu.

In this instance, we have used the Ladder display.
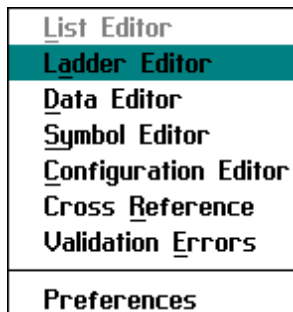
• File name

1. Select **Save** from the File menu to name an application file.

File	Edit	View
New	**Ctrl+N**	
Open	**Ctrl+O**	
Save	**Ctrl+S**	
Save **As**		
Close		
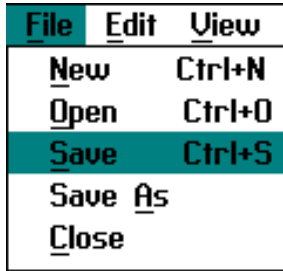
2. In the File Selection dialog box, overtype the asterisk in the **Filename** field with a name that meets DOS file naming standards. (8 characters max.). Select **OK**.
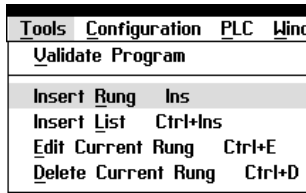
File Selection

Filename: `*.pl7`

Directories: `e:\pl707e\app`
- e:
- pl707e
- app

List Files of Type: `Application (*.pl7)`

Drives: `e:`

OK   Cancel
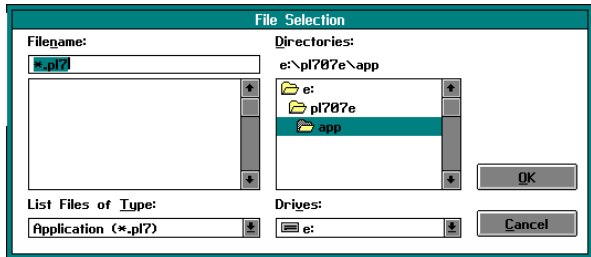
• Viewer

The Ladder Viewer window is displayed. You can scroll through a program in the Ladder Viewer window while you create a rung in the Ladder Editor.

PL707
PL7-07 - DEFAULT
File Edit View Tools Configuration PLC Window Help
LADDER Viewer

RUNG 0   END OF PROGRAM
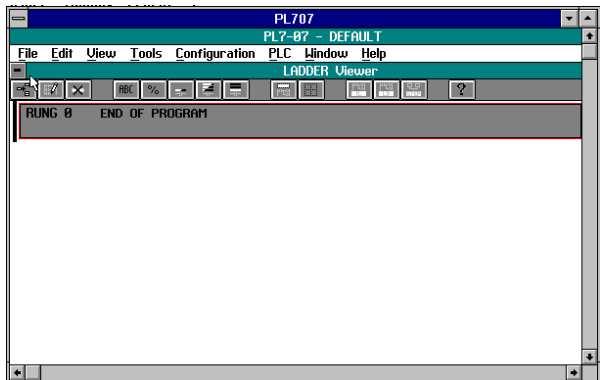
To display the Ladder Editor, select **Insert Rung** from the Tools menu.

Tools	Configuration	PLC	Wind
Validate Program			
Insert Rung Ins			
Insert List Ctrl+Ins			
Edit Current Rung Ctrl+E			
Delete Current Rung Ctrl+D			

• Editor

The Ladder programming environment has two tool bars and one instruction bar:

(1) Ladder Editor tool bar
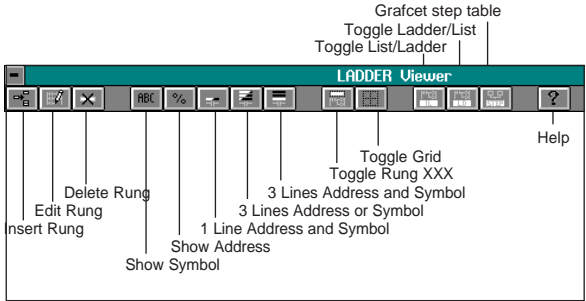
(2) Ladder Viewer tool bar

(3) Ladder Editor instruction bar
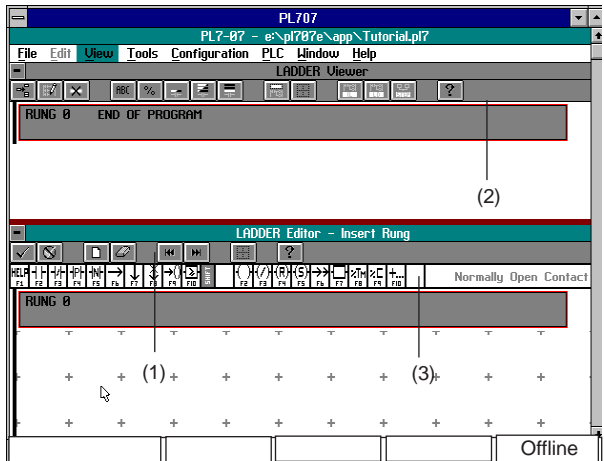
• Editor tool bar (1)

Each button corresponds to an option in the Ladder Editor tools menu.

Help
Toggle Grid
Next Rung
Previous Rung
Clear Rung
New Rung
Cancel Rung
Validate Rung
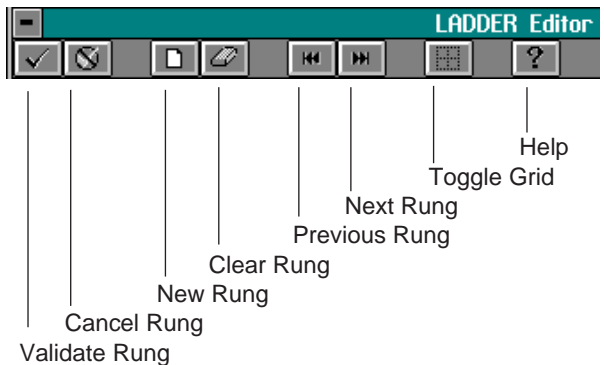
• Ladder viewer tool bar (2)

Each button corresponds to an option in the Ladder Viewer tools menu.

Grafcet step table
Toggle Ladder/List
Toggle List/Ladder

LADDER Viewer

Help

Toggle Grid
Toggle Rung XXX
3 Lines Address and Symbol
3 Lines Address or Symbol
1 Line Address and Symbol
Show Address
Show Symbol
Delete Rung
Edit Rung
Insert Rung

• Editor instruction bar (3)

Each button corresponds to a Ladder instruction. The **+...F10** button displays the Extended Ladder palette, with additional instructions.

The area at the far right of the instruction bar displays the name of the instruction currently selected.

function keys   shift + function keys

instruction name

Normally closed contact
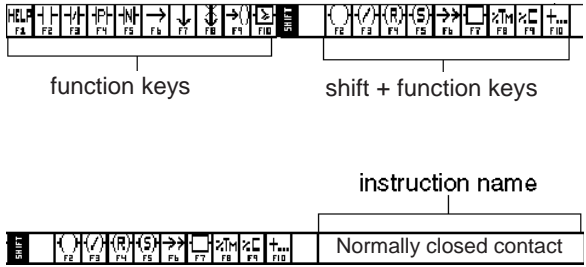
• Grid

The data area of the Ladder Editor had a programming grid with rows of cells.

The area at (1) is a **cell**. (2) is a selected **cell**. Use the mouse pointer or the cursor keys to select a cell.

PL7-
File   Edit   View   Tools   Configuration   PLC
LADDER

RUNG 0

(1)

(2)
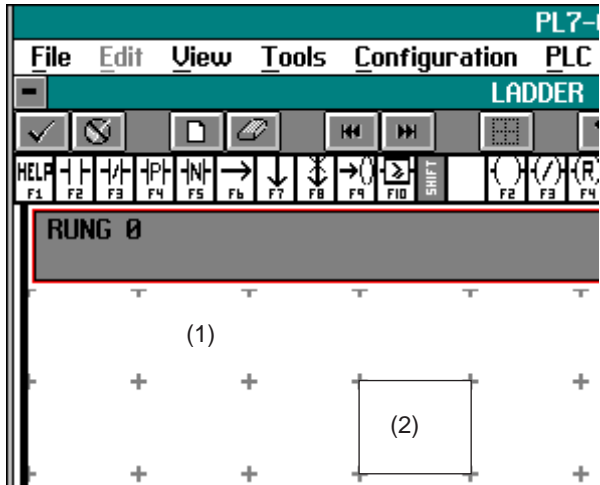
• Selecting an instruction

You select an instruction from the instructions bar and place it in a cell using the mouse or the keyboard.

- Mouse

To select an instruction, click the **left** mouse button on an instruction in the instructions bar.
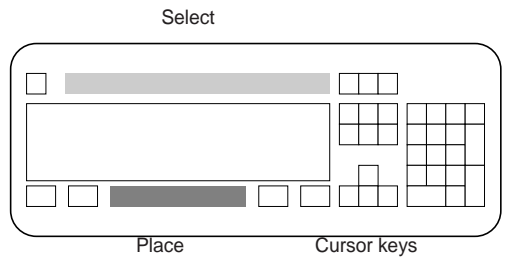
To place an instruction, click the **right** mouse button in a cell.
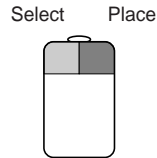
Select   Place

- Keyboard
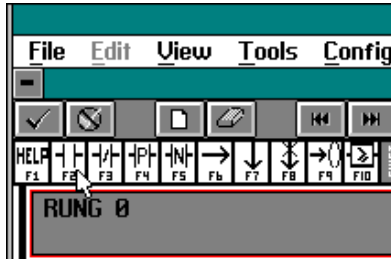
To select an instruction, press the corresponding **<function key>**.

To place an instruction, use the cursor keys to select a cell and press the **<spacebar>**.

Select

Place   Cursor keys

4.5   Step 2 - Insert rung 0

4.5-1   Insert instructions

1. Select a **normally open contact** by clicking the left mouse button on the contact in the instruction bar or by pressing <F2>.

2. Place a normally open contact by clicking the right mouse button in a cell. Or, select a cell with the cursor keys and press the **<spacebar>**.
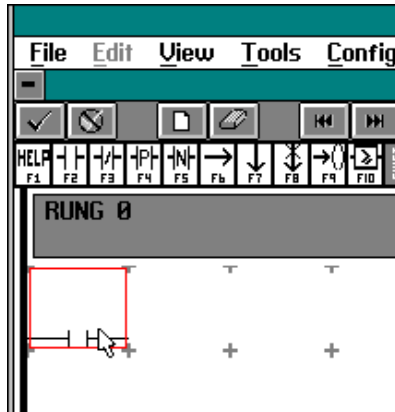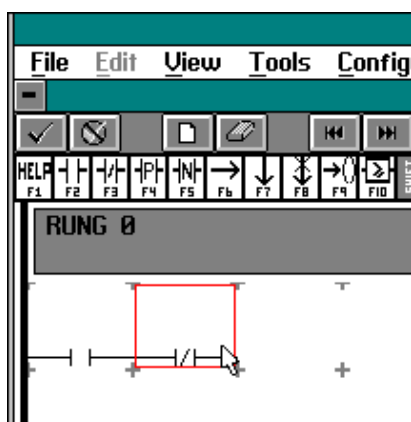

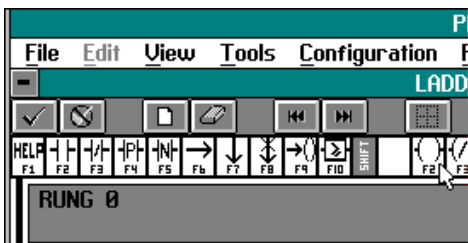The selected cell is shown by a red line (1). The contact is shown in solid lines beneath.
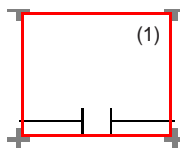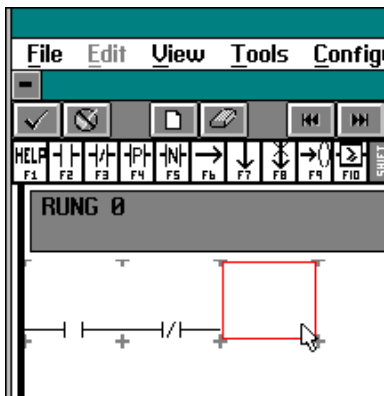
3. Select a normally closed
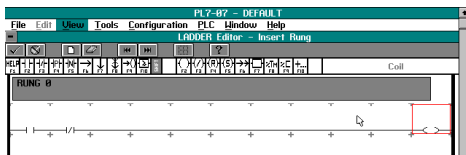contact.
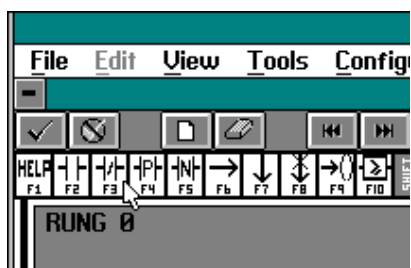
4. Place a normally closed
contact.
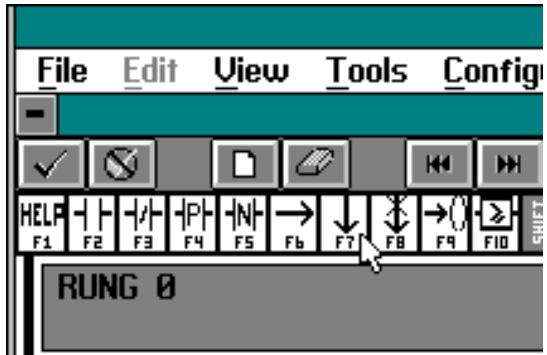
5. Select a coil.

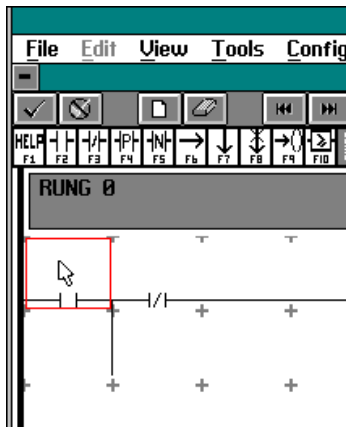**6.** Select the cell after the normally closed contact.

7. Place the coil. The horizontal connector is inserted automatically and the coil is inserted in the last cell.
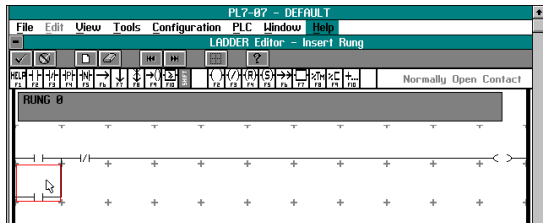
8. Select a down connector and then the desired cell.

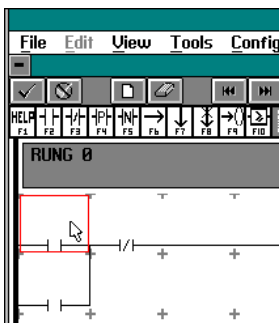
9. Place the down connector.

10. Select another contact and place it in the cell beneath the first contact to complete the graphic for this rung.
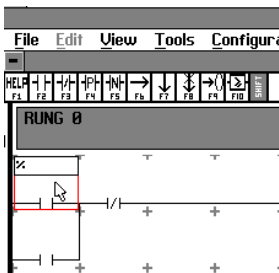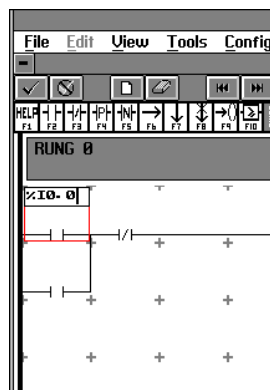
4.5-2 Insert addresses (operands)

1. Select the cell in which you want to insert an operand.

2. Double-click on the cell or press **<enter>**.
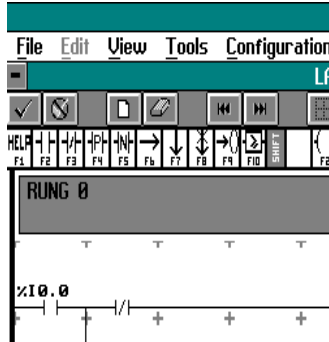A text insertion box is displayed.

3. Type an operand in the text insertion box.

4. Press **<enter>**.
The insertion box closes and the operand is displayed above the graphic instruction.

5. Repeat these steps to enter the remaining operands. The rung is now complete.
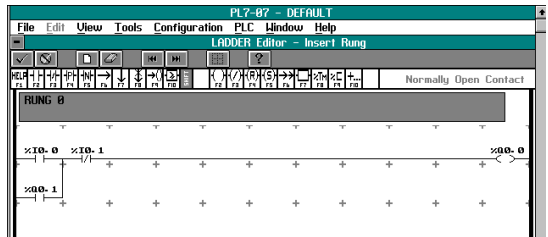
6. Select **New Rung** from the Tools menu. In this example, we selected the option from the Ladder Editor tool bar.

"New Rung" validates rung 0 and copies it to the Ladder Viewer. The Ladder Editor programming grid is cleared to prepare for a new rung.
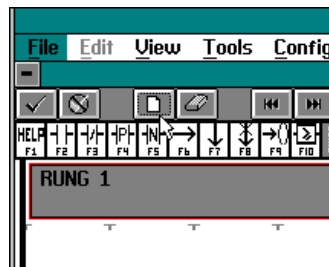
4.6   Step 3 - Insert rung 1

1. Select a normally open contact from the instruction bar and place it in the first cell.
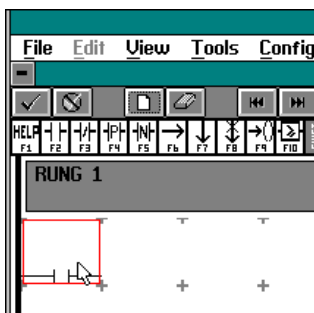
2. Select a normally closed contact from the instruction bar and place it in the second cell, after the normally open contact.
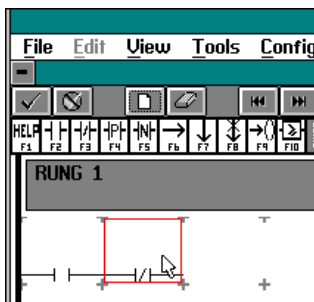
3. Select a Timer function block from the instruction bar.
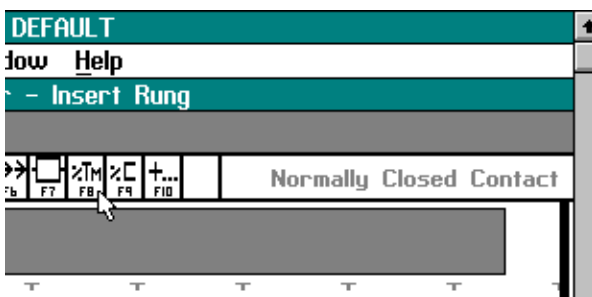
4. Select the cell after the normally closed contact.
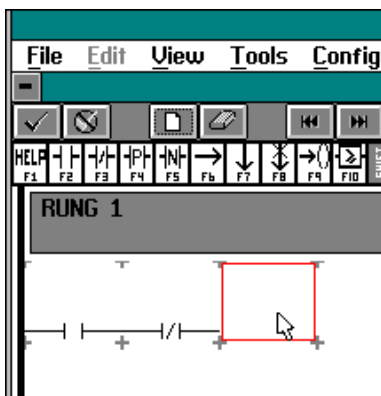
5. Place the Timer function block after the normally closed contact.

The cell outlined in grey shows the relationship of the selected cell to the resulting function block. A function block occupies 2x4 cells.
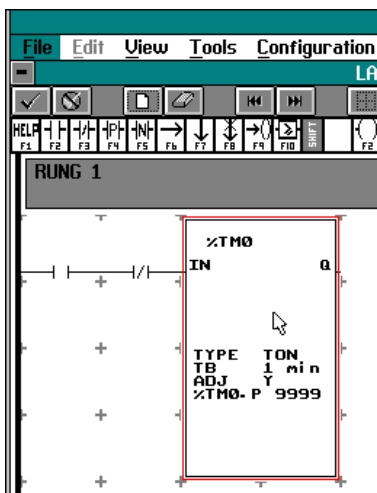
6. Select a coil from the instruction bar. Select the cell after the function block.
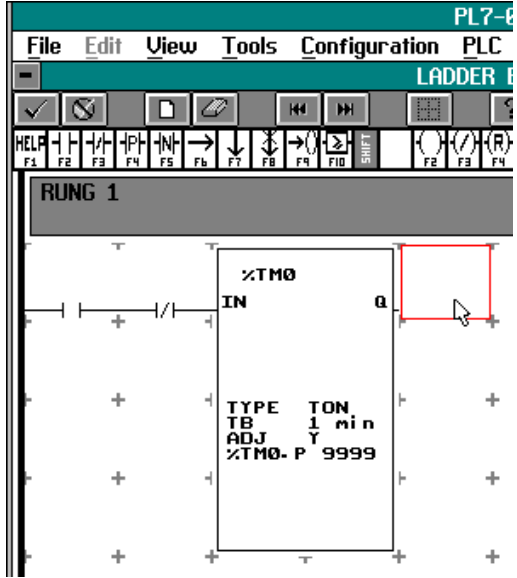
7. Place the coil. The horizontal connector is automatically inserted.
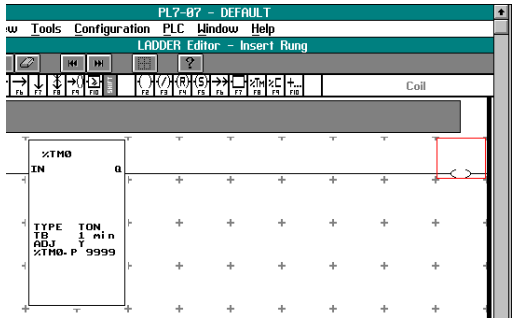
8. Insert operands %Q0.0, %I0.2, and %Q0.1.
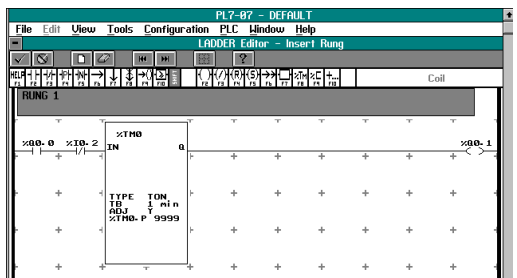
9. Select the function block %TM0 by double-clicking the mouse pointer on the block (or select the block with the cursor keys and press **<enter>**).
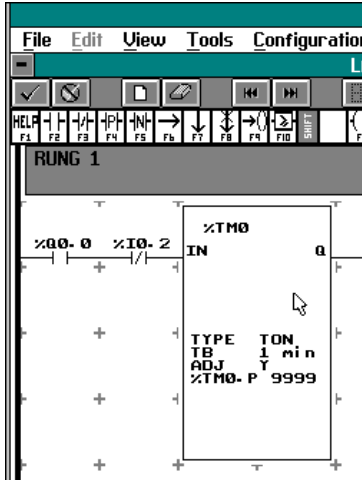
The Timer dialog box is displayed.

10. Select these values :

Preset value = 1
Timer Type = TON.
Timebase = 1 second.
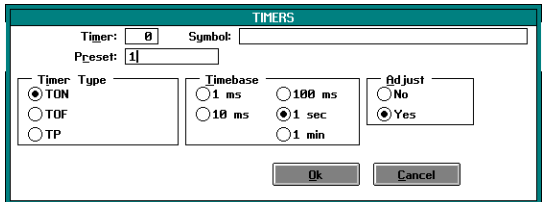
Select **OK**.

11. Validate the new rung by clicking on the button "Validate Rung".
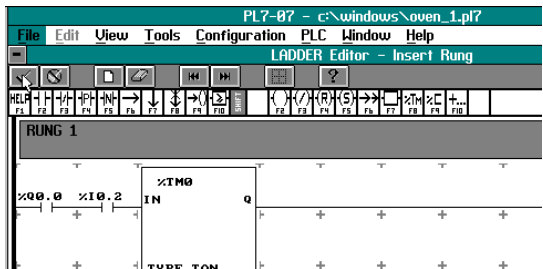
4.7   Step 4 - Test application

1. Select **Connect** from the PLC menu.

The PLC should be in **Stop** mode.

```
PL7-07 - DEFAULT
PLC  Window  Help
   PLC Address
   Transfer                ▶
   Connect (online)
   Disconnect (offline)
   PLC Operations
   Run
   Stop            Ctrl+F5
   Init

   Toggle Animation   Ctrl+F6
```
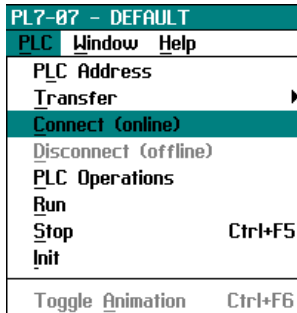
2. If you have a different or no application in the PLC, you are prompted to select whether you want to transfer one of the applications or monitor the application in the PLC.

```
                   Connect to PLC

  The applications on the PC and the PLC are different. Choose an
  option below to continue.

   PLC-> PC        PC ->PLC        Monitor        Cancel
```
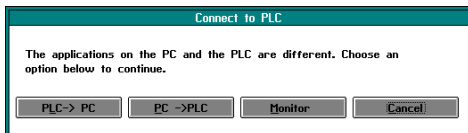
Select **PC -> PLC** to transfer (overwrite the application). If you are prompted to change the application version, select **PLC Version Management** in the configuration menu.

The status bar displays :
"PLC Connected" to indicate a successful connection :
- "Mem:" to display the number of bytes in the program,
- "Stop" to indicate that the PLC is not running; "Online" to indicate that the terminal is connected to the PLC.
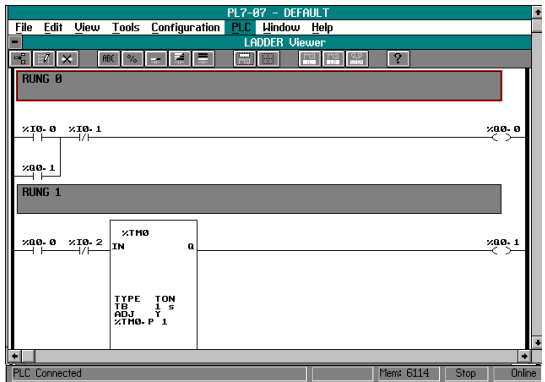
3. Select **PLC Operations** from the PLC menu.
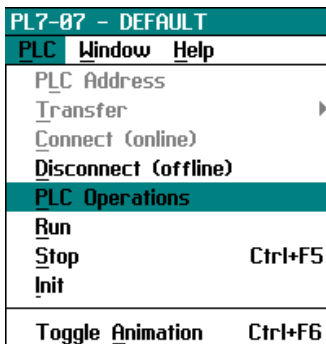
4. Select **Run** on the PLC Operations window.
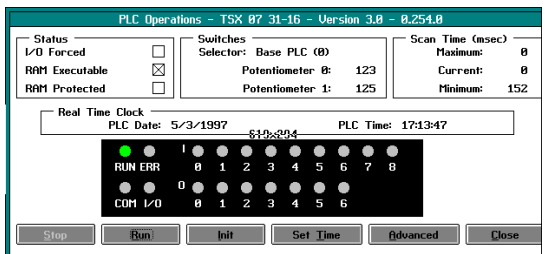
An information dialog box appears. Select **OK** to run the PLC program.
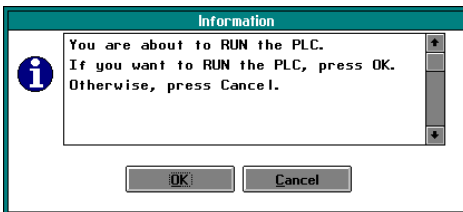
The Run LED turns on.

5. Toggle the switch at input %I0.0 (1).

The LEDs for input %I0.0 and for output %Q0.0 are turned on. Then the LED at %Q0.1 turns on.
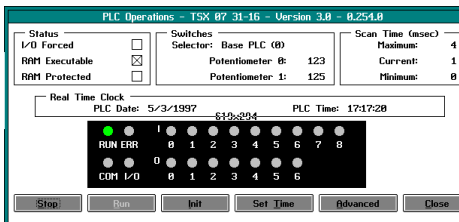
6. Close the **PLC Operations** dialog box.

(1)It is advisable to use a 24VDC input simulator : TSX SIM 06 (for TSX 07 10 I/O), TSX SIM 09 (for TSX 07 16 I/O) or TSX SIM 14 (for TSX 07 24 I/O)

4.8   Step 5 - Edit rung 1

Edit rung 1 which was created in step 3 (page 18) as follows:

• Stop the PLC
• Reset Timer Timebase value to 100 ms.
• Reset Timer Preset value to 5.
• Change the operand of the normally closed contact from %I0.2 to %M0.

1. Select **Stop** in the PLC menu.

An **Information** dialog box appears.
Select **OK**.
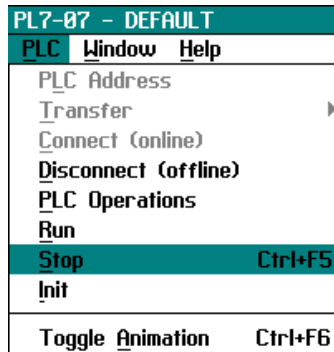
2. To edit rung 1, first select any cell in the rung or select the rung 1 header.
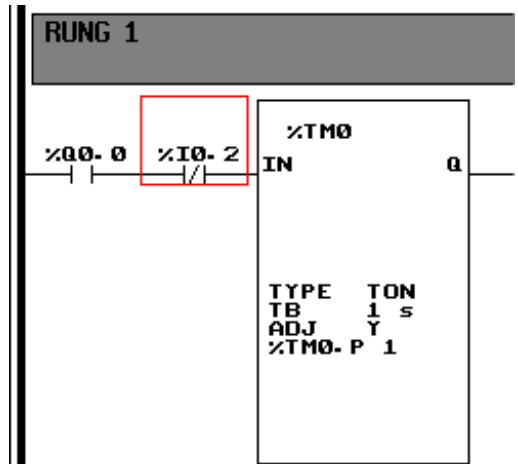
3. Select Edit current rung.

4. Select the function block %TM0. Double-click on the function block or select it with the cursor keys and press **<enter>**.
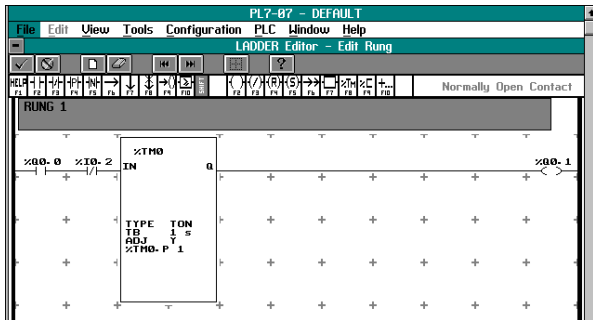
5. Select the new values :

Preset value = 10.
Timer Type = TON.
Timebase = 100 ms.
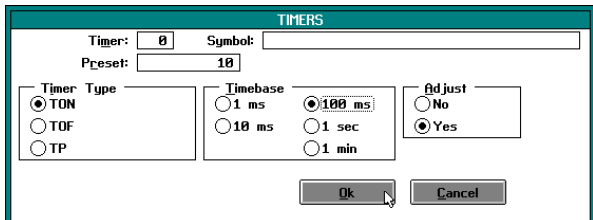
Select Ok.

6. Change the operand of the normally closed contact %I0.2 to %M0.
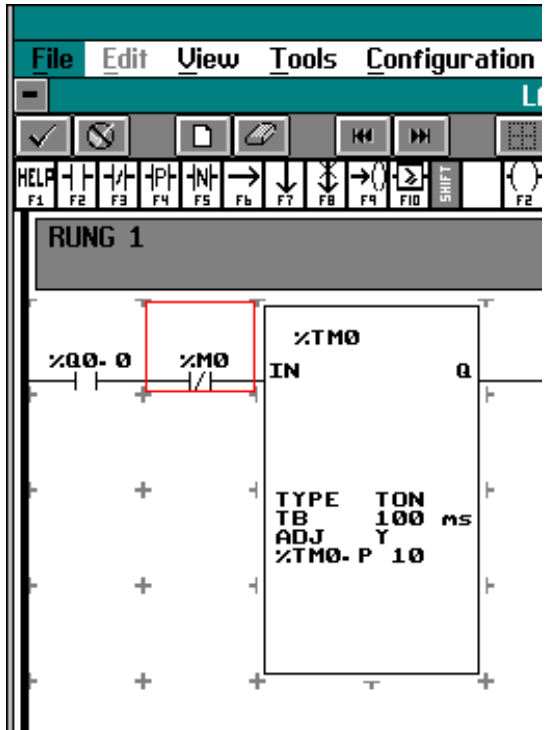
7. Select **New Rung**.

The Ladder Editor validates the rung, copies it to the Ladder Viewer, and clears the Ladder Editor for rung 2.
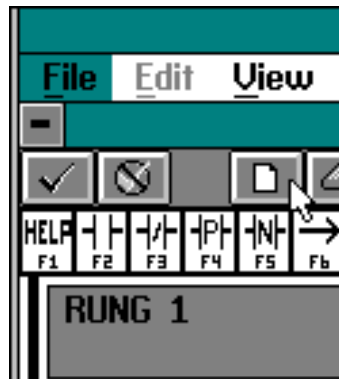
4.9   Step 6 - Insert rung 2

1. Insert the graphic instructions and the operands for rung 2.
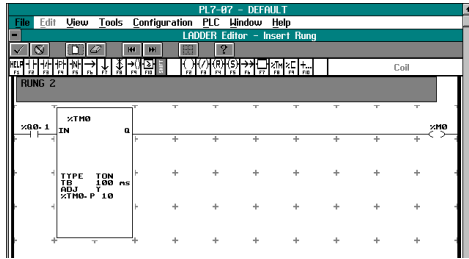
2. Select the Timer function block.

Double-click on the function block with the mouse pointer or press **<enter>**.
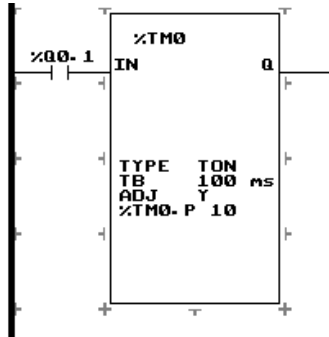
3. In the Timer dialog box, select these values :

Timer = 1

Preset value = 20.

Timer Type = TON.

Timebase = 100 ms.
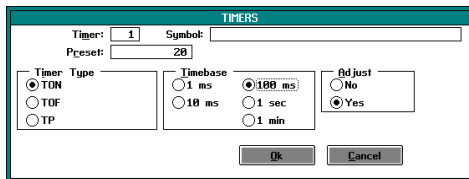
Select **Ok**.

4. Select Validate Rung.

4.10   Step 7 - Retest application

1. Select **Connect** from the
PLC menu. Follow the
prompts until the application
is on the *Online* state.

```
PL7-07 - DEFAULT
 PLC  Window  Help
  PLC Address
  Transfer                ▶
  Connect (online)
  Disconnect (offline)
  PLC Operations
  Run
  Stop           Ctrl+F5
  Init
  Toggle Animation   Ctrl+F6
```

2. Select **PLC Operations**
from the PLC menu.

```
PL7-07 - DEFAULT
 PLC  Window  Help
  PLC Address
  Transfer                ▶
  Connect (online)
  Disconnect (offline)
  PLC Operations
  Run
  Stop           Ctrl+F5
  Init
  Toggle Animation   Ctrl+F6
```

3. Select **Run** from the PLC Operations window to run the program on the PLC.
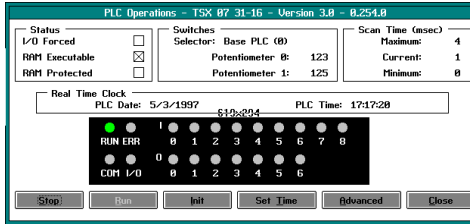
An information dialog box appears. Select **Ok** to run the PLC.
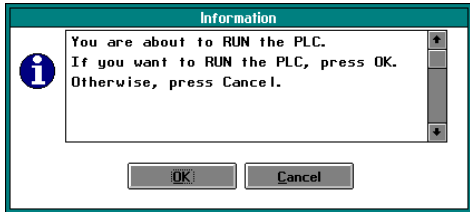
The Run LED turns on.

4. Toggle the switch connected to input %I0.0.
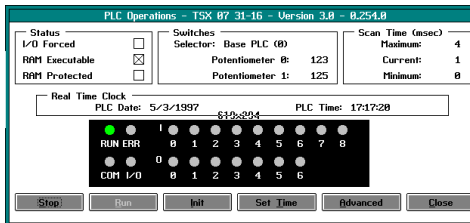
5. Close the **PLC Operation** dialog box.

6. Select the **Data Editor** from the View menu.

View	Tools	Configur
List Editor		
Ladder Editor		
Data Editor		
Symbol Editor		
Configuration Editor		
Cross Reference		
Validation Errors		
Preferences		
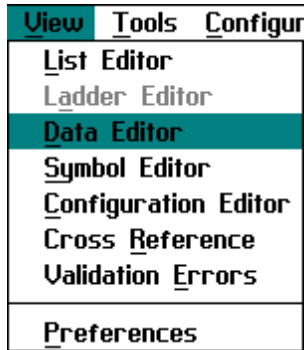
7. In the Data editor, select **Insert** to display the Data Object Edit dialog box.

File   Edit   View

Address
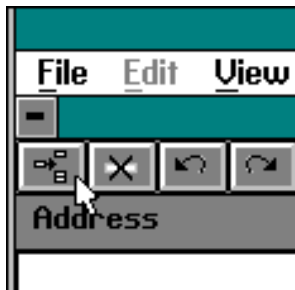
8. In the Data Editor dialog box, insert %TM0.V, the current value of the Timer 0 variable. Select **Ok**.

The variable is inserted in the Data Editor.

Data Object Edit

Enter Address or Symbol to Insert. Then press Enter:

%TM0.V

Address: Symbol:

%TM0.V

Display Format: Retained Value: (Decimal)

Decimal   0

OK   Cancel
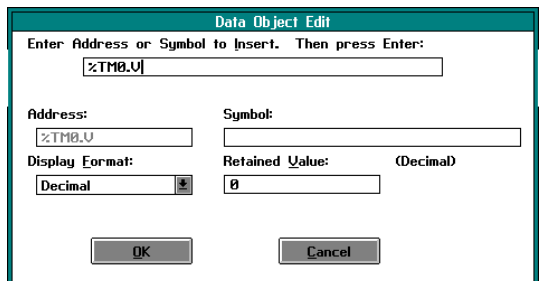
9. Insert 5 more data variables : %TM1.V, %Q0.0, %Q0.1, %I0.0, %I0.1.
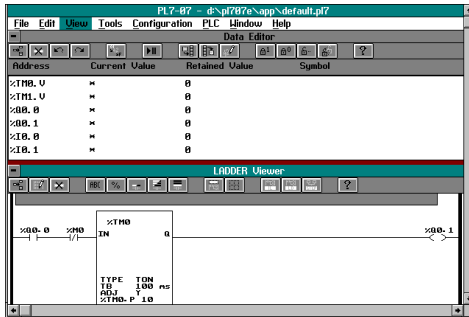
10. Select **Toggle Animation** from the PLC menu.

The Current Value of the variables changes as the program runs.
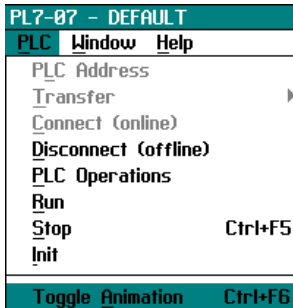
11. Stop animation by reselecting **Toggle Animation** from the PLC menu.

4.11   Step 8 - Document application

4.11-1 Insert comments

1. Stop the PLC.

2. Select a rung header, by double-clicking on it with the mouse pointer, (or select a rung header using the cursor keys and press **<enter>**).

The rung header dialog box is displayed.
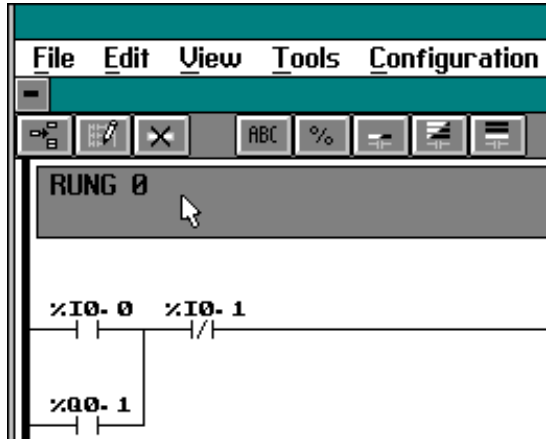
3. Type a title for the rung in the **Title** field, and comments about the rung in the **Comment** field.

Select **Ok**.
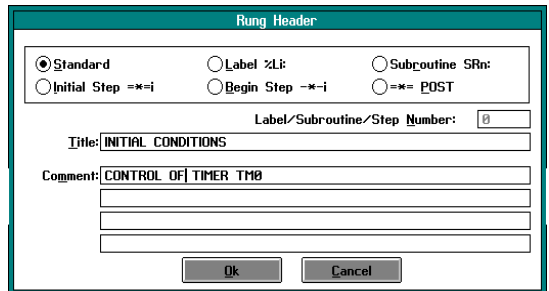
The rung header displays the rung title and the first line of comments.
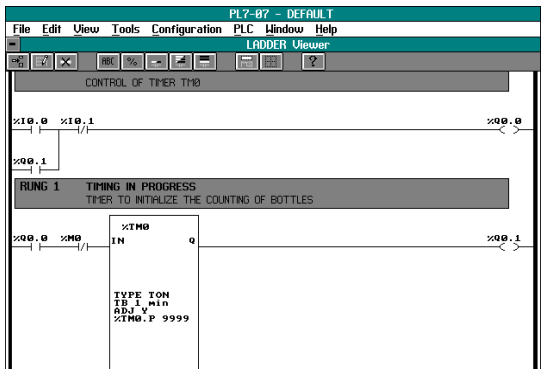
4.11-2 Print application

1. Select **Print Setup** from the **File** menu.

```
 File  Edit  View
    New      Ctrl+N
    Open     Ctrl+O
    Save     Ctrl+S
    Save As
    Close

    Import      ▶
    Export      ▶

    Security    ▶

    Print    Ctrl+P
    Print Setup

    Exit     Ctrl+Q
```
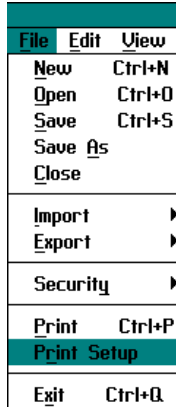
2. The **Print Setup** dialog box appears.

In the **Output To** field select:
Printer then select the communication port.

In the **Printer Setup** field select:
- the type of printer.

In the **Paper Size** field select:
- the size of paper.

Select **Ok**.

You can also define:
- the margins,
- the cover page,
- text for page headers and footers,
- a comments page.

For more information, see Section C.15 of the TSX Nano/PL7-07 manual.

```
                          Print Setup
 ┌ Margins ─────────┐  ┌ Output To ───────────────┐
 │    Top   [ 0 ] lines│  │ ⦿ Printer    [LPT1    ▣]│
 │ Bottom   [ 3 ] lines│  │ ○ File       [         ]│
 │   Left   [ 0 ] chars│  └──────────────────────────┘
 │  Right   [ 0 ] chars│  ┌ Printer Setup ───────────┐
 │ Page Adjust         │  │ Printer    [HP Compatible ▣]│
 │ Top Edge [ 1 ] lines│  │ Send Before Print _____│
 │ Left Side[ 1 ] chars│  │ Send After Print  _____│
 └─────────────────────┘  └──────────────────────────┘
                          ┌ Paper Size ──────────────┐
                          │ ⦿ A4 (21 x 29.7 cm)  ○ Letter (8-1/2 x 11)│
                          └──────────────────────────┘
 [Save Default] [Restore Default] [Header/Footer] [Cover Page] [Comments]
              [    OK    ]        [   Cancel   ]
```
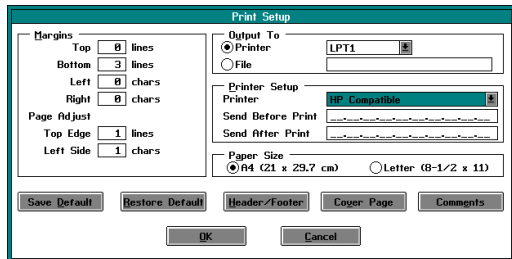
4. In the Print dialog box, select the application parts that you want to print.
We have chosen to print the Ladder program and the configuration data.

```
┌─────────────────────────────────────────┐
│                 Print                     │
│ ☐ Cover/Comments                          │
│ ☒ Configuration        ┌──────────────┐  │
│                        │  Settings... │  │
│ ☐ Symbols              └──────────────┘  │
│                        ┌──────────────┐  │
│ ☐ Cross Reference      │  Settings... │  │
│                        └──────────────┘  │
│ ☐ List                 ┌──────────────┐  │
│                        │  Settings... │  │
│ ☒ Ladder               ┌──────────────┐  │
│                        │  Settings... │  │
│ ☐ Summary              └──────────────┘  │
│ ○ Print All                               │
│     ┌──────┐      ┌──────────┐           │
│     │  OK  │      │  Cancel  │           │
│     └──────┘      └──────────┘           │
└─────────────────────────────────────────┘
```
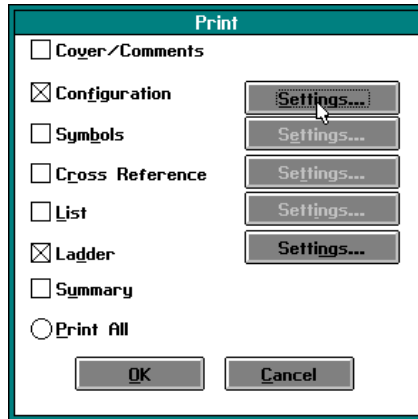
5. In the Print dialog box, select **Configuration/ Settings**.

6. In the Configuration Print Settings dialog box, select "Timers" to print all Timer configuration data.

Select **Ok**.

```
┌──────────────────────────────────────────┐
│       Configuration Print Settings         │
│ ☒ Timers              ☐ Fast Counter       │
│ ☐ Counters            ☐ %PLS / %PWM        │
│ ☐ Constants           ☐ Latch Input        │
│ ☐ LIFO/FIFO Registers ☐ Filter             │
│ ☐ Drum Controllers    ☐ I/O Extension      │
│ ☐ System Information  ☐ Schedule Block     │
│              ○ Print All                    │
│       ┌──────┐      ┌──────────┐           │
│       │  OK  │      │  Cancel  │           │
│       └──────┘      └──────────┘           │
└──────────────────────────────────────────┘
```
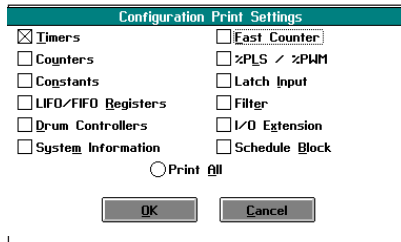
7. In the Print dialog box, select **Ladder/Settings**.

Print

☐ Cover/Comments
☒ Configuration   [Settings...]
☐ Symbols   [Settings...]
☐ Cross Reference   [Settings...]
☐ List   [Settings...]
☒ Ladder   [Settings...]
☐ Summary
◯ Print All

[OK]   [Cancel]
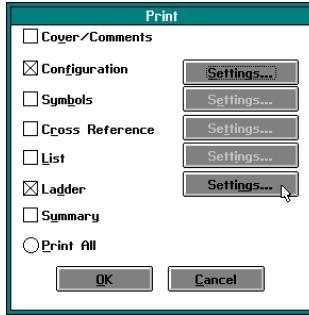
8. In the Ladder Print Settings dialog box:
- Select **All** in the **Range** field to print all Ladder rungs.
- Select the type of attribute.

Select **OK**.

Ladder Print Settings

Range
◉ All
◯ By Rung
   From: 0
   To: 9999

Attributes
◉ 4 lines with Addresses + Symbols
◯ 1 line   with Addresses
◯ 1 line   with Symbols

[OK]   [Cancel]
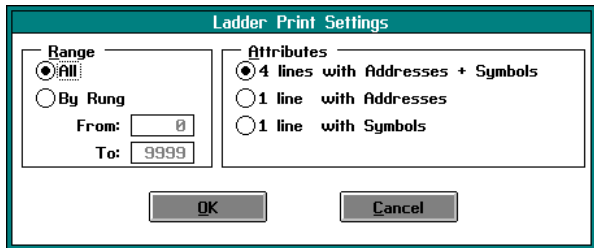
9. In the Print dialog box, select **Ok** to begin printing the file.

A partial printout is shown on the next page.

Print

☒ Cover/Comments
☒ Configuration   [Settings...]
☒ Symbols   [Settings...]
☒ Cross Reference   [Settings...]
☒ List   [Settings...]
☒ Ladder   [Settings...]
☒ Summary
◉ Print All

[OK]   [Cancel]
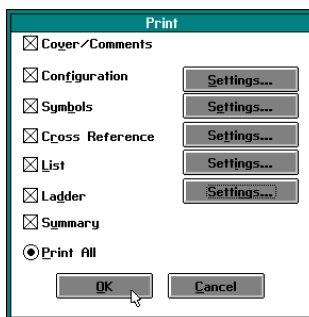
Timer Configuration

```
+-%TMxx-+-Type+-TB-+Preset+-Adj-+-----Symbol-------+
 | %TM0  | TON | 100 MS| 0010 | YES |                      |
 | %TM1  | TON | 100 MS| 0010 | YES |                      |
 | %TM2  | TON | 1 MN  | 9999 | YES |                    |
 | %TM3  | TON | 1 MN  | 9999 | YES |                    |
 | %TM4  | TON | 1 MN  | 9999 | YES |                    |
 | %TM5  | TON | 1 MN  | 9999 | YES |                    |
 | %TM6  | TON | 1 MN  | 9999 | YES |                    |
 | %TM7  | TON | 1 MN  | 9999 | YES |                    |
 | %TM8  | TON | 1 MN  | 9999 | YES |                    |
 | %TM9  | TON | 1 MN  | 9999 | YES |                    |
 | %TM10 | TON | 1 MN  | 9999 | YES |                    |
 | %TM11 | TON | 1 MN  | 9999 | YES |                    |
 | %TM12 | TON | 1 MN  | 9999 | YES |                    |
 | %TM13 | TON | 1 MN  | 9999 | YES |                    |
 | %TM14 | TON | 1 MN  | 9999 | YES |                    |
 | %TM15 | TON | 1 MN  | 9999 | YES |                    |
 | %TM16 | TON | 1 MN  | 9999 | YES |                    |
 | %TM17 | TON | 1 MN  | 9999 | YES |                    |
 | %TM18 | TON | 1 MN  | 9999 | YES |                    |
 | %TM19 | TON | 1 MN  | 9999 | YES |                    |
 | %TM20 | TON | 1 MN  | 9999 | YES |                    |
 | %TM21 | TON | 1 MN  | 9999 | YES |                    |
 | %TM22 | TON | 1 MN  | 9999 | YES |                    |
 | %TM23 | TON | 1 MN  | 9999 | YES |                    |
 | %TM24 | TON | 1 MN  | 9999 | YES |                    |
 | %TM25 | TON | 1 MN  | 9999 | YES |                    |
 | %TM26 | TON | 1 MN  | 9999 | YES |                    |
 | %TM27 | TON | 1 MN  | 9999 | YES |                    |
 | %TM28 | TON | 1 MN  | 9999 | YES |                    |
 | %TM29 | TON | 1 MN  | 9999 | YES |                    |
 | %TM30 | TON | 1 MN  | 9999 | YES |                    |
 | %TM31 | TON | 1 MN  | 9999 | YES |                    |
    +---+--+---+---+---+--+----------------+
```

(* CONDITIONS *)
 (* CONTROL OF TIMER TM0 *)

(* CONTROL OUTPUT 1 WITH A TIMER *)
(* WHEN OUTPUT 0 IS ON, TIMER 0 IS ENERGIZED AND THE LIGHT *)
(* TURNS ON. THIS ALSO STARTS TIMER 1. WHEN TIMER 1 TIMES *)
(* OUT, TIMER 0 STARTS AGAIN. *)

(* CONTROL THE FLASH RATE OF OUTPUT 1 *)
(* AFTER TIMER 0 TIMES OUT, AN INTERNAL STORAGE BIT IS *)
(* TURNED ON. THE INTERNAL STORAGE BIT (%M0) RESETS TIMER *)
(* 0, WHICH TURNS OUTPUT 1 OFF. THE COMBINATION OF TIMERS *)
(* 0 AND 1 PRODUCES A FLASHING. *)