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Solving New England's Electrical Power & Control Applications

IDEC PLC LADDER LOGIC PROGRAMMING AND DOCUMENTATION USING WINDLDR FOR WINDOWS SOFTWARE

I. PROGRAM ORIENTATION

A. Program Startup

1. Select WindIDR from Desktop Start/Programs Idec Applications
2. Maximize the WindLDR window and the Ladder01.ldr window
3. Place cursor to the right of Rung 01 and press Insert Key to move right vertical line just to the left of the right side of the screen
 - a.) A total of 7 to 9 columns should be viewable on the screen depending on the size of the monitor and the screen resolution
 - b.) If the right vertical bar is no longer viewable, click to the left of it to highlight the screen
 - 1.) Right Mouse Click and Select Delete Column and left click
4. PLC Selection
 - a.) Select Configure on top menu and click on PLC selection
 - 1.) Scroll Up/Down and left, click on Micro-3
 - 2.) Click on "Use as Default"
 - 3.) Click OK to select Micro-3
 - a.) If prompted select Yes to Finalize PLC CPU Selection

B. Drop down Menus

1. Left click mouse button to activate

C. Right Mouse Click Menus

1. In Ladder Logic section, the right mouse button displays its own menu when using Windows 95, 98 or NT

D. Relocating Tool Bar

1. Dockable Tool Bar Feature lets you left click and drag the Tool Bar to any area of the screen that is more convenient

E. Tool Tips

1. Yellow identification label that appears after about 1 second when positioning the mouse over a Tool Bar icon

II. LADDER LOGIC DOCUMENTATION

A. Rung Comments

1. Click on Edit Menu at the top and select Rung Comment
2. Right Mouse Click and select Rung Comment
3. Select "Edit Rung Comment" Icon from Tool Bar B. Label or Tag Editing

1. Click on Edit Menu and select Tag Name Editor
2. Right Mouse Click and select Edit Coil
3. Select "Edit Tag Names" Icon from Tool Bar

RUNG EDITING

A. Line Drawing

1. Draw Lines: Shortcut is to hold the Shift Key down and use the appropriate arrow key to draw lines - Shift Arrow Key
2. Erase Lines: Shortcut is to hold the Ctrl Key down and use the appropriate arrow key to erase lines - Ctrl Arrow Key
3. Right Mouse Menu: Right mouse click and select Line and then either Horizontal or Vertical to draw the appropriate line
4. Select Yellow Pencil from tool bar, click and drag the highlighted area in the direction you want a line drawn.
 - a.) To De-Select the Line Drawing using the "pencil", select a top menu item or an icon such as the arrow

B. Coil/Contact Deletion

1. Press the Backspace key when the mouse cursor is positioned to the right of the contact to be deleted.
2. Highlight the Coil or Contact to be removed and press the Delete Key
3. Position the mouse cursor on the contact or coil to be removed and click the right mouse button and select Delete and then select Coil

C. Rung Deleting

1. Position the mouse cursor anywhere on the rung to be removed and click the right mouse button and select Delete and then select Rung

D. Rung Insertion

1. Position the mouse cursor on the rung below where a new rung is to be inserted and click the right mouse button and select Insert and then select Rung
2. Position the mouse cursor on the rung above where a new rung is to be inserted (appended) and click the right mouse button and select Append and then select Rung.

E. Column Insertion

1. To Insert a Column to the right of the cursor press the Insert Key or Shift Insert
2. Right Mouse Click, then select Insert/Column

F. Column Deleting

1. To delete a column to the right of the cursor, press Shift Delete.
2. Right Mouse click, then select Delete/Column

IV. CONFIGURATION

A. PLC Selection Table

1. Micro 1
2. Micro-3
3. Micro-3C
4. Click on "Use as Default" to select the most commonly used PLC
5. Selecting CPU/Expansion size by selecting the "Configure" Button
 - a.) The status line at the bottom of the screen identifies the PLC that WINDLDR is configured to communicate with.

B. Function Area Settings

1. Internal Relay Keep - Selects the point where internal relays will retain their state during a power failure. I.R. below the value selected will retain their on/off status upon loss of power. I.R. above the value selected will be reset to an off status upon loss of power.
2. Input Filter Time Selection
 - a.) Catch Input - Designates certain inputs to be able to detect the rapid on/off change of an input to the PLC. This cannot be used for counting repetitive high speed pulse signals such as a proximity switch counting gear teeth. It can be used in a "dragstrip" application where it needs to detect the high speed passing of an object and the next passing will be several milliseconds later after the PLC has completed at least one to two scans.
 - b.) Soft Filter - Designates certain inputs to be able to detect input signals faster or slower if contact bounce or faster detection are required to detect.
 - c.) Hard Filter - Can be varied from 0 to 255 with a default value of 10. This is used to filter digital input signals from noise which could be detected as a "false on" signal for signals that might only be on less than a millisecond. d.) G1 - Input I 0 selection value in milliseconds for use with the Catch Input and Soft Filter selections to speed up or delay the detection of an input signal.
 - d.) G2 - Input I 1 selection value in milliseconds for use with the Catch Input and Soft Filter selections to speed up or delay the detection of an input signal.
 - e.) G3 - Inputs I 2 and I 3 selection value in milliseconds for use with the Catch Input and Soft Filter selections to speed up or delay the detection of an input signal.
 - f.) G4 - Inputs I 4, I 5, I 6, and I 7 selection value in milliseconds for use with the Catch Input and Soft Filter to speed up or delay the detection of an input signal.

3. **1:N Communication Device No.:** - Selects the PLC Node Number when a computer is setup to communicate with multiple Idec PLCs on a network. This establishes the PLC Network Node Number, which is stored within the PLC.
4. **Control Data Register Settings** - Micro-3 Data Registers D 90 to D 99 can be individually selected to monitor what CPU size is running, PLC and network error codes, Real Time Clock values, and the PLC scan time. Each data register is assigned its own specific task to monitor and they can to monitor these individually.
5. **Default** - This restores all of the PLC Function Settings to their normal default value.

C. Communication Settings

1. **COM Port Selection** - Assigns the proper serial port from the computer that the PLC is connected to. This is normally COM 1 or COM 2. If a Serial Mouse (9 Pin D-Sub Connector) is used (normally on COM 1) then try COM 2.
2. If a Bus or PS2 Mouse (small round connector) is used try COM 1.
 - a.) The Status Line at the bottom of the screen identifies the COM port configured for WINDLDR to use.
2. **PLC Network Settings** - Determines the PLC Node Number when connecting multiple Idec PLCs to a computer. This makes the networking selection in WINDLDR to determine which PLC in the network to communicate with. Refer also to the PLC Function Settings.

D. Ladder Preferences

1. **Display/Hide Rung Comments** - Click on "Show Rung Comment" to toggle between displaying or hiding the rung comments.
2. **Display/Hide Rung** - Click on "Show Rung" to view/print rungs of logic
 - a.) This would normally only be hidden to print memonics or boolean when using an Idec Hand Held program Loader
3. **Show Tag Name** - Normally this is the same as the Allocation Number and appears under the contact/coil
4. **Show Allocation Number** - This alternates with the Tag name from above and appears below the contact/coil as the Idec PLC Allocation Number Address
5. **Display/Hide Mnemonics** - Click on "Show Mnemonics" to toggle between displaying or hiding the Hand Held Program Loader programming instructions.
6. **Show Machine Code** - This appears to the right of memonics and would normally not be viewed/printed
7. **Coil Parameters** - Typical Settings depending on the monitor:
 - a.) Coil Width: 75 b.) Coil Height 22 c.) Line Width: 1
 - d.) Tag Comment Lines: 4
- 1.) **Additional Tag Comment Lines** can be added but reduces the rungs viewable on the screen
8. **Font** - Typical setting of Courier New as a Regular font with a size of 10
 - a.) This provides a width of 9 characters to be used as the Tag or Label width

COMPILING OF LADDER LOGIC PROGRAM

- A. Go to the top menu and select "Compile" and "Convert Ladder"

PROGRAM TRANSFER

A. Go to the top menu and select Online**1. Select "Download" to transfer a program from the computer to the PLC.****a.) Select Download to PLC or Loader****b.) PLC Network Type is normally 1:1 which is one computer communicating to one PLC. 1:N is one computer communicating to an Idec network of PLCs****2. Select "Upload" to transfer a program from the PLC to the computer****a.) The documentation including rung comments and tags will not be displayed when uploading since these values are only stored in WINDLDR not in the PLC.****b.) When using the Upload command with an existing program name be sure to create a new file name before uploading to avoid deleting the existing rung comments and tags.****LADDER LOGIC MONITORING****A. Online****1. Select Online from the top menu and select monitor****B. On-line Troubleshooting****HELP MENU****A. Contents****1. Shortcut Keys****2. PLC Features****a.) Identification of PLC Layout, Error Lights, Etc.****3. Allocation Table a.) PLC Internal Addresses****PROGRAMMING****A. Start/Stop****B. Alternate Action****C. 1 Shot 1. Leading Edge****2. Trailing Edge****D. Timers**

1. Format

- a.) All Idec PLC timers are On Delay. b.) Idec PLC timers only require 1 line of control logic.
- c.) Idec PLC timers time down from their preset to 0.
- d.) When power flows through the rung to the timer coil the timer begins timing.
- e.) If power is removed from the timer at any time it will immediately reset itself to the programmed preset value.

2. 1, 10, and 100 millisecond Time Base

- a.) The Micro 1 PLC utilizes timers with a 100 millisecond or a tenth of a second time base. Timing resolution is in 0.1 second increments.
- b.) The Micro-3 PLC utilizes timers with a 1, 10, or 100 millisecond time base. A standard 100 millisecond timer uses a description of TIM. A 10 millisecond timer uses TMH and a 1 millisecond timer uses TMS.

3. Enabling**4. Resetting****5. Cascading 6. Self-resetting****E. Counters****1. Format**

a.) A counter requires two lines of logic. The top line resets the counter to 0 (Except on Up/Down Counters). The bottom line of logic pulses the counter

b.) An Up/Down Counter uses three lines of control logic. The top one resets the counter to whatever its preset is programmed at. The middle line of logic provides either an up pulse signal or is the master pulse signal depending on which Up/Down Counter is being used. The bottom line of logic is the down pulse signal or controls whether the counter counts up or down depending on which Up/Down Counter is being used.

2. Enabling**3. Resetting****4. Cascading****5. Sequencers****6. Up/Down Counting****X. ADVANCED PROGRAMMING****A. MOV Command**

1. This is also referred to as a Data Store command
2. This instruction requires a total of 4 blocks. Be sure adequate column space is available to the right of the cursor.
3. Click on the S(D icon from the toolbar. Click on the rung where this instruction will be placed.
4. The far left block, MOV (W), indicates that this is a Word Move instruction.
 - a.) The second block, S1, is the source of the data store command.
 - b.) The third block, D1, is the destination of the data store command.
 - c.) The fourth block, REP, is the Repeat instruction which allows sequential reading or writing of the source and/or destination block by clicking on the Repeat box under the S1 and/or D1 block. The quantity of values that will repeat is entered in the REP block. A REP Value of 1 to 31 can be used.

B. Comparisons

1. Comparisons are a 5 block instruction.
 - a.) The far left block identifies whether this is an Equal To, Less Than, Greater Than, Less Than or Equal To, Greater Than or Equal, or Not Equal to comparison
 - b.) The Second Block, S1, identifies the left side of the comparison instruction to compare the S2 value against it
 - c.) The Third Block, S2, identifies the right side of the comparison instruction which is compared against S1.
 - d.) The Fourth Block, D1, identifies the Internal Relay or Output that is energized if the comparison instruction is true.
 - e.) The Fifth Block, REP, is used to repeat the S1, S2, and/or the D1 block values.

C. ADD Comand

1. Addition is done by selecting the calculator icon on the toolbar and clicking where it will be placed on the rung.
 - a.) Select ADD on the left side of the window
2. Addition requires a total of 5 blocks or columns of space.
 - a.) Block #1 is the ADD (W) command and identifies this as an addition instruction.
 - b.) Block #2, S1, identifies the Source #1 of the data to have another value added to it.
 - c.) Block #3, S2, identifies the Source #2 value which is added to Source #1.
 - d.) Block #4, D1, is the destination or the location to hold the sum of the addition.
 - e.) Block #5, REP, is the Repeat quantity

D. SUB Command

1. Subtraction is done by selecting the calculator icon on the toolbar and clicking where it will be placed on the rung.

a.) Select SUB on the left side of the window

2. Subtraction requires a total of 5 blocks or columns of space.

- a.) Block #1 is the SUB (W) command and identifies this as a subtraction instruction.**
- b.) Block #2, S1, identifies the Source #1 of the data to have another value subtracted from it.**
- c.) Block #3, S2, identifies the Source #2 value which is subtracted from Source #1.**
- d.) Block #4, D1, is the destination or the location to hold the result of the subtraction**
- e.) Block #5, REP, is the Repeat quantity E. MUL Command**

1. Multiplication is done by selecting the calculator icon on the toolbar and clicking where it will be placed on the rung.

a.) Select MUL on the left side of the window

2. Multiplication requires a total of 5 blocks or columns of space.

- a.) Block #1 is the MUL (W) command and identifies this as a multiplication instruction.**
- b.) Block #2, S1, identifies the Source #1 of the data to have another value multiplied to it.**
- c.) Block #3, S2, identifies the Source #2 value, which is multiplied by Source #1.**
- d.) Block #4, D1, is the destination or the location to hold the product of the multiplication.**
- e.) Block #5, REP, is the Repeat quantity**

F. DIV Command

1. Division is done by selecting the calculator icon on the toolbar and clicking where it will be placed on the rung.

a.) Select DIV on the left side of the window

2. Division requires a total of 5 blocks or columns of space.

- a.) Block #1 is the DIV (W) command and identifies this as a division instruction.**
- b.) Block #2, S1, identifies the Source #1 of the data which is divided by the value in S2.**
- c.) Block #3, S2, identifies the Source #2 value, which is divided into Source #1.**
- d.) Block #4, D1, is the destination or the location to hold the result of the division.**
- e.) Block #5, REP, is the Repeat quantity**

G. Real Time Clock

1. Executes logic based on time of day, week, month, or year.

a.) Applications include energy management, irrigation systems, HVAC control, lighting control, pump control, etc.

2. The PLC maintains the current time during a power failure for up to 30 days with an internal super capacitor and does not require a battery.

3. The present Calendar and Clock values are contained in program selected data registers.

a.) Comparison instructions are used to control Real Time Clock events based on time of day, day of week, time of year, etc.

H. Cut, Copy and Paste

1. To Cut or Copy highlight the desired rung and click on the Cut (Scissors) or Copy (2 sheets of paper) icon on the top tool bar.

a. Ctrl C can also be used as a shortcut key when copying a rung.

2. When cutting or copying multiple rungs hold down the Shift key while highlighting the selected rungs.

3. To Paste move the cursor to the desired location and click on the Paste (Clipboard) icon on the top tool bar.

a. Ctrl V can also be used to paste the rungs into place.

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