Machine Startup and Program Troubleshooting

The DL05 Micro PLCs provide several features that can help you debug your program before and during machine startup. This section discusses the following topics which can be very helpful.

- Program Syntax Check
- Duplicate Reference Check
- Special Instructions
- Run Time Edits
- Forcing I/O Points

Syntax Check

Even though the Handheld Programmer and *Direct*SOFT32 provide error checking during program entry, you may want to check a program that has been modified. Both programming devices offer a way to check the program syntax. For example, you can use AUX 21, CHECK PROGRAM to check the program syntax from a Handheld Programmer, or you can use the PLC Diagnostics menu option within *Direct*SOFT32. This check will find a wide variety of programming errors. The following example shows how to use the syntax check with a Handheld Programmer.

Use AUX 21 to perform syntax check

CLR C 2 B 1 AUX ENT

```
AUX 21 CHECK PRO
1:SYN 2:DUP REF
```

Select syntax check (default selection)

ENT (You may not get the busy display if the program is not very long.)

```
BUSY
```

One of two displays will appear

Error Display (example)

```
$00050 E401
MISSING END
```

(shows location in question)

Syntax OK display

```
NO SYNTAX ERROR
?
```

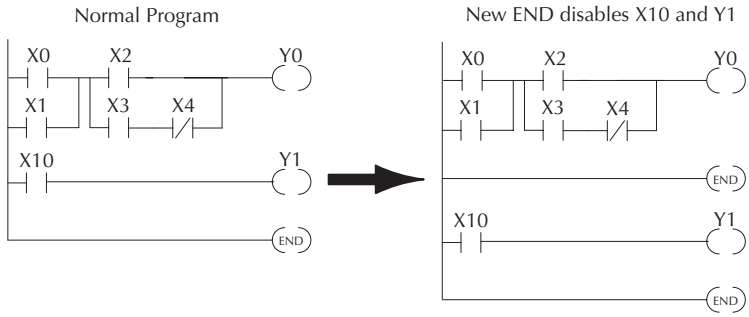
See the Error Codes Section for a complete listing of programming error codes. If you get an error, just press CLR and the Handheld will display the instruction where the error occurred. Correct the problem and continue running the Syntax check until the NO SYNTAX ERROR message appears.

Special Instructions

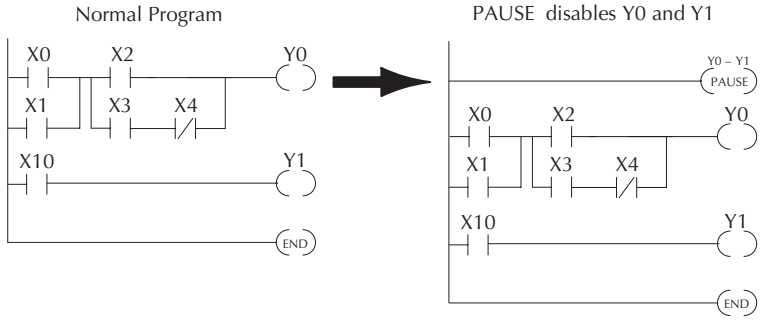
There are several instructions that can be used to help you debug your program during machine startup operations.

- END
- PAUSE
- STOP

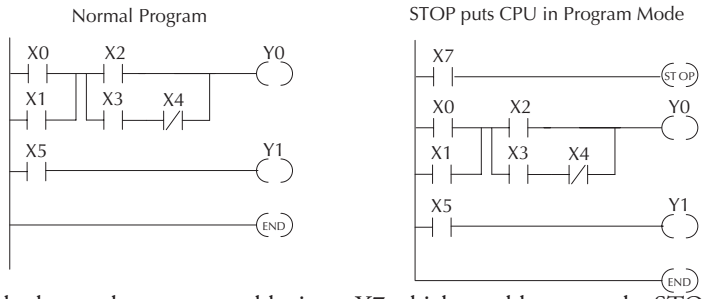
END Instruction: If you need a way to quickly disable part of the program, just insert an END statement prior to the portion that should be disabled. When the CPU encounters the END statement, it assumes that is the end of the program. The following diagram shows an example.



PAUSE Instruction: This instruction provides a quick way to allow the inputs (or other logic) to operate while disabling selected outputs. The output image register is still updated, but the output circuits are not. For example, you could make this conditional by adding an input contact or CR to control the instruction with a switch or a programming device. Or, you could just add the instruction without any conditions so the selected outputs would be disabled at all times.



STOP Instruction: Sometimes during machine startup you need a way to quickly turn off all the outputs and return to Program Mode. You can use the STOP instruction. When this instruction is executed the CPU automatically exits Run Mode and enters Program Mode. Remember, all outputs are turned off during Program Mode. The following diagram shows an example of a condition that returns the CPU to Program Mode.



In the example shown above, you could trigger X7 which would execute the STOP instruction. The CPU would enter Program Mode and all outputs would be turned off.

Duplicate Reference Check

You can also check for multiple uses of the same output coil. Both programming devices offer a way to check for this condition.. For example, you can AUX 21, CHECK PROGRAM to check for duplicate references from a Handheld Programmer, or you can use the PLC Diagnostics menu option within ***Direct***SOFT32. The following example shows how to perform the duplicate reference check with a Handheld Programmer.

Use AUX 21 to perform syntax check

CLR C 2 B 1 AUX ENT

```
AUX 21 CHECK PRO
1:SYN 2:DUP REF
```

Select duplicate reference check

→ ENT (You may not get the busy display if the program is not very long.)

```
BUSY
```

One of two displays will appear

Error Display (example)
(shows location in question)

```
$00024 E471
DUP COIL REF
```

Syntax OK display

```
NO DUP REFS
?
```

If you get an error, just press CLR and the Handheld will display the instruction where the error occurred. Correct the problem and continue running the Duplicate Reference check until no duplicate references are found.

***NOTE**: You can use the same coil in more than one location, especially in programs containing Stage instructions and / or OROUT instructions. The Duplicate Reference check will find occurrences, even though they are acceptable.*

Run Time Edits

The DL05 Micro PLC allows you to make changes to the application program during Run Mode. These edits are not "bumpless." Instead, CPU scan is momentarily interrupted (and the outputs are maintained in their current state) until the program change is complete. This means if the output is off, it will remain off until the program change is complete. If the output is on, it will remain on.

WARNING: Only authorized personnel fully familiar with all aspects of the application should make changes to the program. Changes during Run Mode become effective immediately. Make sure you thoroughly consider the impact of any changes to minimize the risk of personal injury or damage to equipment. There are some important operational changes during Run Time Edits.

1. If there is a syntax error in the new instruction, the CPU will not enter the Run Mode.

2. If you delete an output coil reference and the output was on at the time, the output will remain on until it is forced off with a programming device.

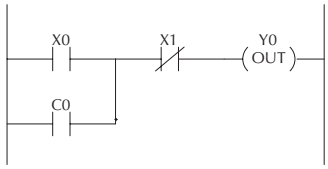
3. Input point changes are not acknowledged during Run Time Edits, so, if you're using a high-speed operation and a critical input comes on, the CPU may not see the change.

Not all instructions can be edited during a Run Time Edit session. The following list shows the instructions that can be edited.

Mnemonic	Description
TMR	Timer
TMRF	Fast timer
TMRA	Accumulating timer
TMRAF	Accumulating fast timer
CNT	Counter
UDC	Up / Down counter
SGCNT	Stage counter
STR, STRN	Store, Store not
AND, ANDN	And, And not
OR, ORN	Or, Or not
STRE, STRNE	Store equal, Store not equal
ANDE, ANDNE	And equal, And not equal
ORE, ORNE	Or equal, Or not equal
STR, STRN	Store greater than or equal Store less than
AND, ANDN	And greater than or equal And less than

Mnemonic	Description
OR, ORN	Or greater than or equal or less than
LD	Load data (constant)
LDD	Load data double (constant)
ADDD	Add data double (constant)
SUBD	Subtract data double (constant)
MUL	Multiply (constant)
DIV	Divide (constant)
CMPD	Compare accumulator (constant)
ANDD	And accumulator (constant)
ORD	Or accumulator (constant)
XORD	Exclusive or accumulator (constant)
LDF	Load discrete points to accumulator
OUTF	Output accumulator to discrete points
SHFR	Shift accumulator right
SHFL	Shift accumulator left
NCON	Numeric constant

We'll use the program logic shown to describe how this process works. In the example, we'll change X0 to C10. Note, the example assumes you have already placed the CPU in Run Mode.



Use the MODE key to select Run Time Edits

MODE NEXT NEXT ENT

```
*MODE CHANGE*
RUN TIME EDIT?
```

Press ENT to confirm the Run Time Edits

ENT (Note, the RUN LED on the D2–HPP Handheld starts flashing to indicate Run Time Edits are enabled.)

```
*MODE CHANGE*
RUNTIME EDITS
```

Find the instruction you want to change (X0).

SHFT X SET A 0 SHFT FD REF FIND

```
$00000 STR X0
```

Press the arrow key to move to the X. Then enter the new contact (C10).

→ → SHFT C 2 B 1 A 0 ENT

```
RUNTIME EDIT?
STR C10
```

Press ENT to confirm the change.

ENT (Note, once you press ENT , the next address is displayed.

```
OR C0
```

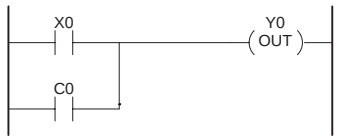
Forcing I/O Points

There are many times, especially during machine startup and troubleshooting, that you need the capability to force an I/O point to be either on or off. Before you use a programming device to force any data type it is important you understand how the DL05 CPUs process the forcing requests.

WARNING: Only authorized personnel fully familiar with the application should make program changes. Do thoroughly consider the impact of any changes to minimize the risk of personal injury or damage to equipment.

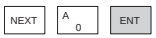
Bit Forcing — Bit forcing temporarily changes the status of a discrete bit. For example, you may want to force an input on even though the program has turned it off. This allows you to change the point status stored in the image register. The forced value will be valid until the CPU writes to the image register location during the next scan. This is useful you just need to force a bit on to trigger another event.

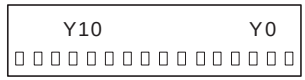
The following diagrams show a brief example of how you could use the D2–HPP Handheld Programmer to force an I/O point. The example assumes you have already placed the CPU into Run Mode.



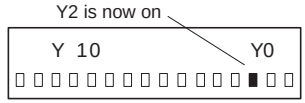
From a clear display, use the following keystrokes

Use the PREV or NEXT keys to select the Y data type. (Once the Y appears, press 0 to start at Y0.)



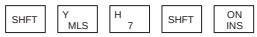


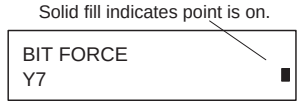
Use arrow keys to select point, then use ON and OFF to change the status



Bit Forcing with Direct Access

From a blank display, use the following keystrokes to force Y7 ON





From a blank display, use the following keystrokes to force Y7 OFF