What is it?
The DL105 series is a fixed-I/O micro PLC with 10 inputs and 8 outputs. Eight configurations are available in combinations of AC, DC and relay I/O, as well as AC or DC powered models.

What’s it got?
- 10 inputs and 8 outputs
- 2K program memory
- 384 words data memory
- 110/220 VAC or 24 VDC powered models
- Built-in 24 VDC auxiliary power supply for field devices included with AC powered models
- 91-instruction programming, includes time or event-based drum sequencer, timed interrupt, immediate I/O, etc.
- One RS-232C communication port

What can I do with it?
- Build an electronic drum sequencer with 18 I/O points and connect an operator interface
- Drive high-current (up to seven amps) loads with the AC/relay model
- Use the high-speed I/O modes of a DC input or output model to perform counting or positioning tasks

It’s not the smallest micro, but it will put a big smile on your face!

The DL105 has 18 I/O points, high current capability, and removable I/O connectors. These features, plus heavy-duty power supply design and built-in surge suppression on the relay outputs, still make the DL105 one of the most versatile fixed-I/O units in the market.

**AC inputs and high current AC outputs**

Great for higher current applications, our AC outputs are rated at 1.6 A per point.

**Seven amp relays**

We used powerful 7A relays and combined them with a design that sheds heat! The DL105 offers eight relay outputs that can support up to seven amps per point. (You can drive all eight outputs at six amps per point up to 60°C.) Compare this to the 2.5 A of other micro PLCs.

**Removable connectors**

The DL05 was one of the first micro PLCs to offer removable terminal blocks. This feature makes wiring and installation a lot easier and less time consuming.
Features and Specifications

The DL105 micro PLCs contain the CPU, power supply and I/O all in the same housing. If you examine the CPU Specifications table, you’ll see that we included many features found in our modular CPUs.

Review the specs
Make sure these features can satisfy the requirements of your application. Since these units are completely self-contained, you cannot expand the system or replace the CPU as you would in a modular system.

System capacity
System capacity is the ability to accommodate a variety of applications. For ladder memory, most Boolean instructions require one word. Some other instructions, such as timers, counters, etc., require two or more words. Our V-memory words are useful for data storage, etc.

Performance
The performance is simply the scan time, which is the amount of time required to read the inputs, solve the RLL program and update the outputs.

Instructions and diagnostics
Make sure the unit offers the instructions you need.

Communications
All DL105 units offer one RS-232 port, capable of 9600 baud.

Specialty features
With the DC input and/or DC output versions, we also offer several high-speed I/O features.

AC-powered units

<table>
<thead>
<tr>
<th>Model</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1-130AA</td>
<td>10 AC inputs, 8 AC outputs, 1.7 A/point</td>
</tr>
<tr>
<td>F1-130AR</td>
<td>10 AC inputs, 8 relay outputs, 7A/point</td>
</tr>
<tr>
<td>F1-130DA</td>
<td>10 DC inputs, 4 inputs are filtered inputs, can also be configured as a single 5kHz high-speed counter, interrupt input, or pulse catch input</td>
</tr>
<tr>
<td>F1-130DD</td>
<td>10 DC inputs, 4 inputs are filtered inputs, can also be configured as a single 5 kHz high-speed counter, interrupt input, or pulse catch input</td>
</tr>
<tr>
<td>F1-130DR</td>
<td>10 DC inputs, 4 inputs are filtered inputs, can also be configured as a single 5kHz high-speed counter, interrupt input, or pulse catch input</td>
</tr>
</tbody>
</table>

DC-powered units

<table>
<thead>
<tr>
<th>Model</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1-130DD-D</td>
<td>10 DC inputs, 4 inputs can be used as 5kHz high-speed counter, interrupt inputs, or pulse catch inputs</td>
</tr>
<tr>
<td>F1-130DR-D</td>
<td>10 DC inputs, 4 inputs can be used as 5kHz high-speed counter, interrupt inputs, or pulse catch inputs</td>
</tr>
</tbody>
</table>

Programming

Handheld programmer: D2-HPP ................................ $432.00
DirectSOFT Programming for Windows .......................... $400.00
PC-DSOFT6: ................................................................ $30.00
PC-R60-U (upgrade) ................................................. $252.00

Note: Either high-speed input or pulse output can be used, but not in the same configuration.

<table>
<thead>
<tr>
<th>System capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total memory available (words) ........................................ 2.4K</td>
</tr>
<tr>
<td>Ladder memory (words) ..................................................... 2,048</td>
</tr>
<tr>
<td>V-memory (words) .............................................................. 384</td>
</tr>
<tr>
<td>User V. ........................................................................ 256</td>
</tr>
<tr>
<td>Non-volatile V. ............................................................... 128</td>
</tr>
<tr>
<td>Battery backup .............................................................. No</td>
</tr>
<tr>
<td>Total I/O ..................................................................... 18</td>
</tr>
<tr>
<td>Inputs ........................................................................ 10</td>
</tr>
<tr>
<td>Outputs ....................................................................... 8</td>
</tr>
<tr>
<td>I/O expansion ................................................................. No</td>
</tr>
</tbody>
</table>

Performance

Contact execution (Boolean) ........................................... 3.3 μs
Typical scan (1K Boolean) ................................................. 5-6 ms

<table>
<thead>
<tr>
<th>Instructions and diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLL ladder style ..................... Yes</td>
</tr>
<tr>
<td>RLL PLUS/flowchart style (Stages) ................................. Yes/256</td>
</tr>
<tr>
<td>Run-time editing ...................... Yes</td>
</tr>
<tr>
<td>Support Overrides ............. No</td>
</tr>
<tr>
<td>Variable/fixed scan ................. Variable</td>
</tr>
<tr>
<td>Instructions ........................... 91</td>
</tr>
<tr>
<td>Control relays .................. 256</td>
</tr>
<tr>
<td>Timers .................................. 64</td>
</tr>
<tr>
<td>Counters ................................ 64</td>
</tr>
<tr>
<td>Immediate I/O ...................... Yes</td>
</tr>
<tr>
<td>Subroutines ......................... No</td>
</tr>
<tr>
<td>For/Next loops .......................... No</td>
</tr>
<tr>
<td>Integer math .......................... Yes</td>
</tr>
<tr>
<td>Floating-point math ................. No</td>
</tr>
<tr>
<td>PID ........................................ No</td>
</tr>
<tr>
<td>Drum sequencers ........................ Yes</td>
</tr>
<tr>
<td>Bit of word ................................ No</td>
</tr>
<tr>
<td>ASCII print .......................... No</td>
</tr>
<tr>
<td>Real-time clock/calendar ............ No</td>
</tr>
<tr>
<td>Internal diagnostics ............... Yes</td>
</tr>
<tr>
<td>Password security ..................... Multi-level</td>
</tr>
<tr>
<td>System and user error log ......... No</td>
</tr>
</tbody>
</table>

Communications

Built-in ports ..................................................... one, RS-232-C
K-sequence (proprietary protocol) ......................... Yes
DirectNET™ ........................................................ No
MODBUS master/slave ........................................ No
ASCII out ......................................................... No
Baud rate (fixed) ............................................... 9600 baud

Specialty features

<table>
<thead>
<tr>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtered inputs ........................................... Yes2</td>
</tr>
<tr>
<td>Interrupt input ............................................. Yes2</td>
</tr>
<tr>
<td>High-speed counter ......................................... Yes, 5kHz2</td>
</tr>
<tr>
<td>Pulse output .................................................. Yes, 7kHz2</td>
</tr>
<tr>
<td>Pulse catch input ............................................. Yes2</td>
</tr>
</tbody>
</table>

1- Our 1K program includes contacts, coils, and scan overhead. If you compare our products to others, make sure you include their scan overhead.
2- Input features are only available on units with DC inputs. Output features are only available on units with DC outputs.
DL105 Hardware Features

CPU status indicators

RUN………………ON…………………… CPU is in RUN mode
………………OFF……………….. CPU is in PROGRAM mode
PWR…………ON…………..CPU power good
………………OFF………………CPU power failure
CPU…………ON…………..CPU internal diagnostics
…………………………………... has detected an error
………………OFF………………….. CPU is OK

Mode control

The DL105 units do not have mode switches like many of our modular CPUs. You can set the unit (using special V-memory locations) so that it will power up in RUN mode.

Communications port

Protocol…………………………… K-sequence slave
Devices…………………………... Can connect with HPP, DirectSOFT, DV-1000,
………………………………………… C-More Panels
Specs……………………………..6P6C RJ12 connector
………………………………………… RS-232-C, 9,600 baud,
………………………………………… Odd parity,
………………………………………… Fixed station address (1),
………………………………………… 8 data bits (one start,
………………………………………… one stop bit),
………………………………………… Asynchronous, half-duplex, DTE

RJ12 Connector Port 1 Pinout

Pin…………………………………..Signal
1………………………………….. 0V
2………………………………….. 5V
3………………………………….. RS-232 Data in
4………………………………….. RS-232 Data out
5………………………………….. 5V
6………………………………….. 0V

Fixed EEPROM memory

The DL105 units offer built-in EEPROM memory.

NOTE: Terminals accept 16–24 AWG. For 16 AWG, use type TFFN or Type MTW. Other types of 16 AWG may be acceptable, but it really depends on the thickness of the wire insulation.
Dimensions and Installation

It is important to understand the installation requirements for your DL105 system. This will help ensure that the DL105 products operate within their environmental and electrical limits.

Plan for safety
This catalog should never be used as a replacement for the user manual. The user manual, D1-USER-M, contains important safety information that must be followed. The system installation should comply with all appropriate electrical codes and standards.

Unit dimensions and mounting orientation
Use the following diagrams to make sure the DL105 system can be installed in your application. DL105 units must be mounted horizontally to ensure proper airflow for cooling purposes. It is important to check these dimensions against the conditions required for your application. For example, we recommend that you leave 2” depth for ease of access and cable clearance; however, your distance may be greater or less. Also, check the installation guidelines for the recommended cabinet clearances.

Note: There is a minimum of 2" (50mm) clearance required between the panel door or any devices mounted in the panel door and the nearest DL105 component.

Dimensions and mounting

<table>
<thead>
<tr>
<th>Environmental Specifications</th>
<th>Units: inches (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>4°F to 158°F (-20°C to 70°C)</td>
</tr>
<tr>
<td><strong>Ambient Operating Temperature</strong></td>
<td>52°F to 131°F (0° to 55°C)</td>
</tr>
<tr>
<td><strong>Ambient Humidity</strong></td>
<td>30% to 95% relative humidity (non-condensing)</td>
</tr>
<tr>
<td><strong>Vibration Resistance</strong></td>
<td>MIL STD 810C, Method 514.2</td>
</tr>
<tr>
<td><strong>Shock Resistance</strong></td>
<td>MIL STD 810, Method 516.2</td>
</tr>
<tr>
<td><strong>Noise Immunity</strong></td>
<td>NEMA(ICS3-304)</td>
</tr>
<tr>
<td><strong>Atmosphere</strong></td>
<td>No corrosive gases</td>
</tr>
</tbody>
</table>

For the latest prices, please check AutomationDirect.com.

www.automationdirect.com/dl105
Power Supply and Type of I/O

Power supply options
This product family offers units that operate on 110/220 VAC and 12/24 VDC. Choosing the power supply is probably the most important consideration when specifying a DL105 system, since not all I/O combinations are offered with each power supply option. The table to the right provides the I/O choices and power supply specifications for each type unit.

Choosing the I/O
The DL105 product family offers several different combinations of I/O points. Once you have chosen the power supply option, you need to choose the unit that offers the type of I/O points needed in your application.

Fixed I/O
All DL105 Micro PLCs have “fixed” I/O that is updated on every scan. This means that all units have 10 inputs and 8 outputs, regardless of the actual type of points on the units (DC in/Relay out, DC in/DC out, etc.) The DL105 micro PLC is non-expandable, so you cannot add I/O points. If you are concerned about future system expansion, check our DL06 (36 base I/O expandable to 100 total I/O), or the DL205 micro-modular product family. The DL205 also offers a wide array of features and flexible I/O arrangements with several different base sizes.

Addresses automatically assigned
The DL105 uses automatic addressing, so for the vast majority of applications, there is no setup required. We use octal addressing for many of our products, which means there are no 8s or 9s. The first eight input points use addresses X0-X7, and the last two input points use X10 and X11. If you plan on using the high-speed counting features, there is some very minimal setup required in special V-memory locations.

<table>
<thead>
<tr>
<th>Specification</th>
<th>AC Powered Units</th>
<th>24 VDC Powered Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Numbers</td>
<td>F1-130AA, F1-130AR</td>
<td>F1-130DD-D</td>
</tr>
<tr>
<td></td>
<td>F1-130DA</td>
<td>F1-130DR-D</td>
</tr>
<tr>
<td></td>
<td>F1-130DD, F1-130DR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F1-DVNET-AR, F1-DVNET-DD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F1-DVNET-DR</td>
<td></td>
</tr>
</tbody>
</table>

Voltage Withstand (dielectric)
One minute @ 1500VAC between primary, secondary and field ground

Insulation Resistance
> 10MΩ @ 500VDC

External Power Requirement
85–132 VAC (110 nominal) 170–264 VAC (220 nominal) 100–264 VDC (125 nominal)
500mA max. 10–30 VDC (12 to 24 VDC) With < 10 percent ripple

Auxiliary 24 VDC Output
Not available

Maximum Inrush Current
12A 8A

Maximum Power
30VA max. 1A (approx. 10W)

For the latest prices, please check AutomationDirect.com.
DL105 I/O Specifications

Wiring diagram and specifications

**Power requirements**
Voltage range: 94–240 VAC (30VA) 100–240 VDC (30W)

**AC input specifications**
- Number of input points: 10
- Number of commons: 3 (isolated)
- Input voltage range: 80–132 VAC 90–150 VDC
- Input current: 6mA @ 132VAC 6.8mA @ 150VDC
- ON current/voltage level: > 4mA / 80VAC > 4mA / 90VDC
- OFF current/voltage level: < 2mA / 45VAC < 2mA / 60VDC
- OFF to ON response: < 8ms
- ON to OFF response: < 15ms
- Fuses: None

**AC output specifications**
- Number of output points: 8
- Number of commons: 4 (isolated)
- Output circuitry: Triac
- Output voltage range: 20–140 VAC 47–63 Hz
- Peak voltage: 400VAC
- ON voltage drop: 1.3 VAC at 2A
- Maximum current: 1.7 A/point (Subject to derating)
- Maximum leakage current: 1mA at 400VAC
- Maximum inrush current: 1.5A for 10ms 15A for 100ms
- Minimum load: 10mA
- OFF to ON response: 8.33 ms @ 60Hz 10ms @ 50Hz
- On to OFF response: 8.33 ms @ 60Hz 10ms @ 50Hz
- Fuses: None (external recommended)

**Auxiliary 24 VDC Output**
- Voltage range: 21.6–26.4 VDC
- Output: 500mA max., isolated
- Ripple: less than 200mV p–p

For the latest prices, please check AutomationDirect.com.

www.automationdirect.com/dl105
DL105 I/O Specifications

Wiring diagram and specifications

Power requirements
Voltage range: 94–240 VAC (30VA) 100–240 VDC (30W)

AC input specifications
Number of input points: 10
Number of commons: 3 (isolated)
Input voltage range: 80–132 VAC 90–150 VDC
Input current: 6mA @ 132VAC
ON current/voltage level: > 4mA / 80VAC
OFF current/voltage level: < 2mA / 45VAC
OFF to ON response: < 8ms
ON to OFF response: < 15ms
Fuses: None

Relay output specifications
Number of output points: 8
Number of commons: 4 (isolated)
Output circuitry: Relay
Output voltage range: 12–250 VAC 12–30 VDC
Maximum voltage: 265VAC, 150VDC
Maximum current: 7A/point (see derating)
Minimum load: 10mA
Minimum OFF resistance: 100 MΩ @ 500 VDC
OFF to ON response: < 8ms
ON to OFF response: < 15ms
Fuses: None (external recommended)

Auxiliary 24 VDC Output
Voltage range: 21.6–26.4 VDC
Output: 500mA max., isolated
Ripple: Less than 200mV p-p

Typical Relay Life (Operations) at Room Temperature

<table>
<thead>
<tr>
<th>Voltage and Type of Load</th>
<th>Load Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 mA</td>
</tr>
<tr>
<td>24 VDC Resistive</td>
<td>10M</td>
</tr>
<tr>
<td>24 VDC Solenoid</td>
<td>—</td>
</tr>
<tr>
<td>110 VAC Resistive</td>
<td>—</td>
</tr>
<tr>
<td>110 VAC Solenoid</td>
<td>—</td>
</tr>
<tr>
<td>220 VAC Resistive</td>
<td>—</td>
</tr>
<tr>
<td>220 VAC Solenoid</td>
<td>—</td>
</tr>
</tbody>
</table>

For the latest prices, please check AutomationDirect.com.
DL105 I/O Specifications

F1-130DA  $243.00

Wiring diagram and specifications

**Power requirements**
Voltage range: 94–240 VAC (30VA)
100–240 VDC (30W)

**DC input specifications**
Number of input points: 10 (sink/source)
Number of commons: 3 (isolated)
Input voltage range: (X0–X3) 10–26.4 VDC or (X4–X11) 10–26.4 VDC or 21.6–26.4 VAC
Input impedance: 2.8 kΩ @ 12VDC
ON current/voltage level: > 3mA / > 9VDC
OFF current/voltage level: < 0.5 mA / < 2VDC
Response: X0–X3 X4–X11
OFF to ON: 50µs 2-8 ms
ON to OFF: 50µs 2-8 ms
Fuses: None

**AC output specifications**
Number of output points: 8
Number of commons: 4 (isolated)
Output circuitry: Triac
Output voltage range: 20–140 VAC
47–63 Hz
Peak voltage: 400VAC
ON voltage drop: 1.3 VAC @ 2A
Maximum current: 1.7 A/point
(Same as derating)
Maximum leakage current: 1mA at 400VAC
Maximum inrush current: 30A for 10ms
15A for 100ms
Minimum load: 10mA
OFF to ON response: Y0–Y7: 8.33 ms @ 60Hz
Y2–Y7: 10ms @ 50Hz
ON to OFF response: Y0–Y7: 8.33 ms @ 60Hz
Y2–Y7: 10ms @ 50Hz
Fuses: None (external recommended)

**Auxiliary 24 VDC Output**
Voltage range: 21.6–26.4 VDC
Output: 0.5mA max., isolated
Ripple: less than 200mV p–p

For the latest prices, please check AutomationDirect.com.
DL105 I/O Specifications

Wiring diagram and specifications

**Power requirements**
Voltage range: 94–240 VAC (30 VA) 100–240 VDC (30 W)

**DC input specifications**
- Number of input points: 10 (sink/source)
- Number of commons: 3 (isolated)
- Input voltage range:
  - (X0–X3) 10–26.4 VDC
  - (X4–X11) 10–26.4 VDC or 21.6–26.4 VAC
- Input impedance: 2.8 kΩ @ 12-24 VDC
- ON current/voltage level: > 3mA / > 9 VDC
- OFF current/voltage level: < 0.5 mA / < 2 VDC
- OFF to ON response:
  - X0–X3: 50 µs
  - X4–X11: 2–8 ms
- ON to OFF response:
  - X0–X3: 50 µs
  - X4–X11: 2–8 ms
- Fuses: None

**DC output specification**
- Number of output points: 8 (sinking)
- Number of commons: 3 (internally connected)
- Output circuitry: MOSFET
- Output voltage range: 5–30 VDC
- Peak voltage: 60 VDC
- ON voltage drop: 0.4 VDC @ 0.5 A
- Maximum current:
  - 0.5 A / point (Y0–Y1)
  - 1.0 A / point (Y2–Y7)
- Maximum leakage current: 15µA at 30VDC
- Maximum inrush current:
  - Y0–Y1: 15 A for 10ms
  - Y2–Y7: 3 A for 10ms
- Minimum load: None
- OFF to ON response:
  - Y0–Y1: 10µs
  - Y2–Y7: 3.5 µs
- ON to OFF response:
  - Y0–Y1: 70 µs
  - Y2–Y7: 110µs
- External DC power required: 10–30 VDC, @ 30mA + load current
- Fuses: None (external recommended)

For the latest prices, please check AutomationDirect.com.
DL105 I/O Specifications

**F1-130DR** $202.00

**Wiring diagram and specifications**

**Power requirements**
- Voltage range: 94–240 VAC (30VA) / 100–240 VDC (30W)

**DC input specifications**
- Number of input points: 10 (sink/source)
- Number of commons: 3 (isolated)
- Input voltage range: (X0–X3): 10–26.4 VDC / (X4–X11): 10–26.4 VDC or 21.6–25.4 VAC
- Input impedance: 2.8 kΩ @ 12–24 VDC
- ON current/voltage level: > 3mA / > 9VDC
- OFF current/voltage level: < 0.5 mA / < 2VDC
- OFF to ON response: X0–X3: 50µs / X4–X11: 2–8 ms
- ON to OFF response: X0–X3: 50µs / X4–X11: 2–8 ms
- Fuses: None

**Relay output specifications**
- Number of output points: 8
- Number of commons: 4 (isolated)
- Output circuitry: Relay
- Output voltage range: 12–250 VAC / 12–30 VDC
- Maximum voltage: 265VAC, 150VDC
- Maximum current: 7A/point (see derating)
- Maximum inrush current: 12A
- Minimum load: 10mA
- Minimum OFF resistance: 100MΩ @ 500VDC
- OFF to ON response: X0–X3: 50µs / X4–X11: 2–8 ms
- ON to OFF response: None (external recommended)

**Auxiliary 24 VDC Output**
- Voltage range: 21.6–26.4 VDC
- Output: 500mA max., isolated
- Ripple: less than 200mV p–p

**Typical Relay Life (Operations) at Room Temperature**

<table>
<thead>
<tr>
<th>Voltage and Type of Load</th>
<th>Load Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50mA</td>
</tr>
<tr>
<td>24VDC Resistive</td>
<td>10M</td>
</tr>
<tr>
<td>24VDC Solenoid</td>
<td>—</td>
</tr>
<tr>
<td>110VAC Resistive</td>
<td>—</td>
</tr>
<tr>
<td>110VAC Solenoid</td>
<td>—</td>
</tr>
<tr>
<td>220VAC Resistive</td>
<td>—</td>
</tr>
<tr>
<td>220VAC Solenoid</td>
<td>—</td>
</tr>
</tbody>
</table>

**Derating Chart for DC Inputs**

![Derating Chart for DC Inputs](image1)

**Derating Chart for Relay Outputs**

![Derating Chart for Relay Outputs](image2)

**Equivalent Circuit**

- **High-Speed Inputs (X0–X3)**
  - Optical Isolator
  - To other circuits in bank

- **Standard Inputs (X4–X11)**
  - Optical Isolator
  - To other circuits in bank

**Equivalent Output Circuit**

- AC or DC Supply
  - Output
  - To other circuits

For the latest prices, please check AutomationDirect.com.

www.automationdirect.com/dl105

DL105 PLCs 

For the latest prices, please check AutomationDirect.com.
DL105 I/O Specifications

**F1-130DD-D  $243.00**

### Wiring diagram and specifications

#### Power requirements
- Voltage range: 10–30 VDC
- Power requirement: 10W max.

#### DC input specifications
- **Number of input points**: 10 (sink/source)
- **Number of commons**: 3 (isolated)
- **Input voltage range**: (X0–X3): 10–26.4 VDC
- **(X4–X11)**: 10–26.4 VDC or 21.6–26.4 VAC
- **Input impedance**: 2.8 kΩ @ 12–24 VDC
- **ON current/voltage level**: > 3mA / > 9 VDC
- **OFF current/voltage level**: < 0.5mA / < 2 VDC
- **OFF to ON response**: X0–X3: 50µs
- **ON to OFF response**: X0–X3: 50µs
- **Fuses**: None

#### DC output specifications
- **Number of output points**: 8 (sinking)
- **Number of commons**: 3 (internally connected)
- **Output circuitry**: MOSFET
- **Output voltage range**: 5–30 VDC
- **Peak voltage**: 60VDC
- **ON voltage drop**: 0.4 VDC @ 0.5 A
- **Maximum current**: Y0–Y1: 0.5 A/point
- **Y2–Y7**: 1.0 A/point
- **Maximum leakage current**: 15µA at 30 VDC
- **Maximum inrush current**: Y0–Y1: 1.5 A for 10ms
- **Y2–Y7**: 3A for 10ms
- **Minimum load**: None
- **OFF to ON response**: Y0–Y1: 10µs
- **Y2–Y7**: 3.5 µs
- **ON to OFF response**: Y0–Y1: 70µs
- **Y2–Y7**: 110µs
- **Fuses**: None (external recommended)

**Note**: Same supply can be used to power both input and output circuits because all circuits are isolated from the internal logic.

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DL105 I/O Specifications

F1-130DR-D $212.00

Wiring diagram and specifications

**DC power supply specifications**
- Voltage range: 10–30 VDC
- 10W max.

**DC input specifications**
- Number of input points: 10 (sink/source)
- Number of commons: 3 (isolated)
- Input voltage range:
  - X0–X3: 10–26.4 VDC
  - X4–X11: 10–26.4 VDC or 21.6–26.4 VAC
- Input impedance: 2.8 kΩ @ 12–24 VDC
- ON current/voltage level: > 3mA / > 9VDC
- OFF current/voltage level: < 0.5 mA / < 2VDC
- OFF to ON response:
  - X0–X3: 50µs
  - X4–X11: 2–8 ms
- ON to OFF response:
  - X0–X3: 50µs
  - X4–X11: 2–8 ms
- Fuses: None

**Relay output specifications**
- Number of output points: 8
- Number of commons: 4 (isolated)
- Output circuitry: Relay
- Output voltage range:
  - 12–250 VAC
  - 2–30 VDC
- Maximum voltage: 250VAC, 150 VDC
- Maximum current: 7A/point (See derating)
- Maximum inrush current: 12A
- Minimum load: 10mA
- Minimum OFF resistance: 100MΩ @ 500VDC
- OFF to ON response: 15ms
- ON to OFF response: 5ms
- Fuses: None (external recommended)

### Typical Relay Life (Operations) at Room Temperature

<table>
<thead>
<tr>
<th>Voltage and Type of Load</th>
<th>Load Current</th>
<th>50mA</th>
<th>5A</th>
<th>7A</th>
</tr>
</thead>
<tbody>
<tr>
<td>24VDC Resistive</td>
<td>10M</td>
<td>60K</td>
<td>300K</td>
<td></td>
</tr>
<tr>
<td>24VDC Solenoid</td>
<td>—</td>
<td>150K</td>
<td>75K</td>
<td></td>
</tr>
<tr>
<td>110VAC Resistive</td>
<td>—</td>
<td>60K</td>
<td>300K</td>
<td></td>
</tr>
<tr>
<td>110VAC Solenoid</td>
<td>—</td>
<td>500K</td>
<td>200K</td>
<td></td>
</tr>
<tr>
<td>220VAC Resistive</td>
<td>—</td>
<td>300K</td>
<td>150K</td>
<td></td>
</tr>
<tr>
<td>220VAC Solenoid</td>
<td>—</td>
<td>250K</td>
<td>100K</td>
<td></td>
</tr>
</tbody>
</table>

Note: Same supply can be used to power both input and output circuits because all circuits are isolated from the internal logic.
Built-in High-Speed I/O Features

Selected DL105 micro PLCs offer special high-speed input features (on units with DC inputs) and pulse output features (on units with DC outputs). These features are available on the first four input points (X0–X3) and the first two output points (Y0–Y1). This allows you to use the economical DL105 micro PLC to solve a diverse range of high-speed machine control applications.

There are several modes of operation from which to choose. Here’s a brief description of the modes provided:

- Single 5kHz high-speed counter with 24 presets. When the preset is reached, an interrupt routine is executed.
- Single quadrature encoder input (up/down counter) for clockwise and counterclockwise position control.
- Single-channel programmable 7kHz pulse output with an external interrupt and separate acceleration/deceleration profiles for positioning and velocity control.
- A single external interrupt input for an immediate response to time-critical tasks.
- Single pulse catch input allows the CPU to read an input with a pulse width as small as 0.1 ms.
- Four inputs with selectable filters (0-99 ms) to ensure input signal integrity. This is the default mode, which is set at 10ms filter.
- A single timed interrupt that can be scheduled on a 5 ms – 999 ms cycle. (All units have this feature.)

Combine features to use the full potential of the module. Some modes do not use all available points, so in some cases you can assign one of the other features to the point(s) not used by the main mode of operations.

You cannot use the DL105 for closed-loop control. You cannot use the Up counter and pulse output features at the same time.

You can easily select the mode of operation just by entering an appropriate “code” in a special CPU V-memory location. These features are explained in more detail later in this section. Remember, not all features can be used at the same time. The Counter Mode Options table provides point-by-point usage for each mode of operation.

### Counter Mode Options

<table>
<thead>
<tr>
<th>Mode</th>
<th>DC Input Points</th>
<th>DC Output Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Filtered Input</strong></td>
<td>X0: Filtered Input, X1: Filtered Input, X2: Filtered Input, X3: Filtered Input</td>
<td>Y0: Regular Output, Y1: Regular Output</td>
</tr>
<tr>
<td><strong>Up Counter</strong></td>
<td>X0: Count Input, X1: Filtered Input, X2: Filtered Input, X3: Filtered Input</td>
<td>Y0: Regular Output, Y1: Regular Output</td>
</tr>
<tr>
<td><strong>Up/Down Counter</strong></td>
<td>X0: Phase A Input, X1: Phase B Input, X2: Filtered Input, X3: Filtered Input</td>
<td>Y0: Regular Output, Y1: Regular Output</td>
</tr>
<tr>
<td><strong>Interrupt Input</strong></td>
<td>X0: Interrupt Input, X1: Filtered Input, X2: Filtered Input, X3: Filtered Input</td>
<td>Y0: Regular Output, Y1: Regular Output</td>
</tr>
<tr>
<td><strong>Pulse Catch</strong></td>
<td>X0: Pulse Catch, X1: Filtered Input, X2: Filtered Input, X3: Filtered Input</td>
<td>Y0: Regular Output, Y1: Regular Output</td>
</tr>
<tr>
<td><strong>Pulse Output</strong></td>
<td>Not available for use, X1: Filtered Input, X2: Filtered Input, X3: Filtered Input</td>
<td>Y0: Pulse or CW Output, Y1: Direction or CCW Output</td>
</tr>
<tr>
<td><strong>Timed Interrupt</strong></td>
<td>X0: Filtered Input, X1: Filtered Input, X2: Filtered Input, X3: Filtered Input</td>
<td>Y0: Regular Output, Y1: Regular Output</td>
</tr>
</tbody>
</table>
Built-in High-Speed I/O Specifications

### High-Speed Input Specifications

<table>
<thead>
<tr>
<th>Inputs</th>
<th>4 pts. max., X0-X3, sink or source 5kHz max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Pulse Width</td>
<td>100µs</td>
</tr>
<tr>
<td>Input Voltage Range</td>
<td>10–26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>3.0kΩ @ 12VDC, 2.8kΩ @ 24VDC</td>
</tr>
<tr>
<td>ON Current/Voltage Level</td>
<td>&gt; 3mA / &gt; 9VDC</td>
</tr>
<tr>
<td>OFF Current/Voltage Level</td>
<td>&lt; 0.5 mA / &lt; 2VDC</td>
</tr>
<tr>
<td>OFF to ON Response</td>
<td>&lt; 50µs</td>
</tr>
<tr>
<td>ON to OFF Response</td>
<td>&lt; 50µs</td>
</tr>
</tbody>
</table>

### High-Speed Output Specifications

<table>
<thead>
<tr>
<th>Outputs</th>
<th>2 pts. Max., Y0&amp;Y1 current sinking, 7kHz Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Range</td>
<td>5–30 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point</td>
</tr>
<tr>
<td>ON Voltage Drop</td>
<td>0.45 VDC @ 0.5 A</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>15µA @ 30VDC</td>
</tr>
<tr>
<td>Inrush Current</td>
<td>1.5 A (10ms), 0.5 A (100ms)</td>
</tr>
<tr>
<td>OFF to ON Response</td>
<td>&lt; 50µs</td>
</tr>
<tr>
<td>ON to OFF Response</td>
<td>&lt; 50µs</td>
</tr>
</tbody>
</table>

### Wiring Diagram

- **Encoder Input Wiring**
  - Encoder
  - 12VDC
  - Signal Common
  - Phase A
  - Phase B
  - +V

- **Equivalent Circuit, High-Speed Inputs**
  - Optical Isolator
  - To other circuits in bank

- **Equivalent Circuit, High-Speed Inputs (Npn) Current Sourcing Field Device**
  - Sensor
  - Output
  - 5–24VDC
  - Optical Isolator
  - To other circuits in bank

- **Pulse Output Wiring**
  - Pulse
  - Signal Common
  - Direction

- **Equivalent Output Circuit**
  - +V
  - To other circuits in bank
  - Output

- **Equivalent Circuit, High-Speed Inputs (Pnp) Current Sinking Field Device**
  - Sensor
  - Optical Isolator
  - +V
  - To other circuits in bank

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DL105 PLCs

tDL1-13
Understanding the Timed Interrupt

Overview

There is a timed interrupt feature available in the DL105 micro PLCs. This cyclical interrupt allows you to easily program a time-based interrupt that occurs on a scheduled basis. This feature is available in all units, regardless of input type. The CPU’s timed interrupt operates in a manner similar to the external interrupt input, but instead of the interrupt subroutine being triggered by an external event tied to X0, it is now triggered by a cyclical interval of time. This interval can be programmed from 5ms to 999ms. Whenever the programmed time elapses, the CPU immediately suspends its routine scan cycle and jumps to interrupt subroutine INT0. When the subroutine execution is complete, the CPU automatically resumes its routine scan cycle starting from the exact location where it was interrupted. Since the CPU scan time and the interrupted time interval are different, the RLL program gets interrupted at various points in the execution over time. This does not present a problem. The CPU always returns to the point where it left to resume the program execution.

Input assignments for timed interrupt mode
X0:…………………Filtered input (uses filter time set for X1)
X1:……………………………………… Filtered input
X2:……………………………………… Filtered input
X3:……………………………………… Filtered input

Timed interrupt specification
Timed interrupts……………………… 1 (internal to CPU)
Time interval……………… 5 to 999 ms (1ms increments)
Interrupt subroutine……………………………… INT0
Boolean Instructions

Store (STO)
Begin a new rung or an additional branch in a rung with a normally open contact.

Store Not (STRN)
Begin a new rung or an additional branch in a rung with a normally closed contact.

Or (OR)
Logically ORs a normally open contact in parallel with another contact in a rung.

Or Not (ORCN)
Logically ORs a normally closed contact in parallel with another contact in a rung.

And (AND)
Logically ANDs a normally open contact in series with another contact in a rung.

And Not (ANDN)
Logically ANDs a normally closed contact in series with another contact in a rung.

Or (OR)
Logically ORs two branches of a rung in parallel.

Out (OUT)
Reflects the status of the rung (on/off) and outputs the discrete (on/off) state to the specified image register or memory location.

Out or Out (OUT OR OUT)
Reflects the status of the rung and outputs the discrete (ON/OFF) state to the image register. Multiple OR OUT instructions referencing the same discrete point can be used in the program.

Positive Differential (PD)
Is typically known as a one shot. When the input logic produces an off to on transition, the output will energize for one CPU scan.

Set (SET)
An output that turns on a point or a range of points. The reset instruction is used to turn the points OFF that were SET on the set instruction.

Reset (RST)
An output that resets a point or a range of points.

Pause Outputs (PAUSE)
Disable the update of specified output points.

Compare (CMP)
Performs comparisons between two memory locations. The result will be either 1 (true) or 0 (false).

Logical Instructions (Accumulator)

Load (LD)
Loads a 16-bit word into the lower 16 bits of the accumulator / stack.

Load Double (LDL)
Loads a 32-bit word into the accumulator / stack.

Load Formatted (LDF)
Loads the accumulator with the HEX value for an octal constant in the field device status is updated when the instruction is processed. The output point(s) are set when the point is OFF that were SET on the set instruction.

Load Address (LDA)
Loads the accumulator with the HEX value for an octal constant in the field device status is updated when the instruction is processed. The output point(s) are set when the point is OFF that were SET on the set instruction.

Load Double Out (LDO)
Copies the values in the lower 16 bits of the accumulator to a specified 16-bit V-memory location.

Load Out Format (LOF)
Copies the value in the accumulator to two consecutive V-memory locations.

Load Out Format (LOF)
Outputs a specified number of bits (1-32) from the accumulator to the specified discrete memory locations.

Pop (POP)
Moves the value from the first level of the accumulator stack to the accumulator and discards the value in the stack up one level.

Logical Instructions (Accumulator)

And (AND)
Logically ANDs the lower 16 bits in the accumulator with a V-memory location.

And Double (ANDD)
Logically ANDs the value in the accumulator with two consecutive V-memory locations or an 8-bit constant.

Or (OR)
Logically ORs the lower 16 bits in the accumulator with a V-memory location.

Or Double (ORD)
Logically ORs the value in the accumulator with two consecutive V-memory locations or an 8-bit constant.

Exclusive Or (XOR)
Performs an Exclusive Or of the value in the lower 16 bits of the accumulator.

Exclusive Or Double (XORD)
Performs an Exclusive Or of the value in the accumulator with two consecutive V-memory locations or an 8-bit constant.

Compare (CMP)
Compares the value in the lower 16 bits of the accumulator with a V-memory location.

Compare (CMP)
Compares the value in the accumulator with two consecutive V-memory locations or an 8-bit constant.

Shift Right (SHFR)
Shifts the bits in the accumulator specified number of places to the right.

Shift Right (SHFR)
Shifts the bits in the accumulator a specified number of places to the right.

Logic Instructions (Accumulator)

Add (ADD)
Add a BCD value in the accumulator with two consecutive V-memory locations or an 8-bit constant.

Add Double (ADD)
Add a BCD value, which is either a V-memory location or a 4-digit constant, by the value in the lower 16 bits in the accumulator. The result resides in the accumulator.

Divide (DIV)
Divides a 32-bit BCD value in the lower 16 bits of the accumulator by a BCD value which is either a V-memory location or a 4-digit constant. The result resides in the accumulator.

Increment Binary (INC)
Increments a binary value in a specified V-memory location by 1 each time the instruction is processed in the program scan.

Decrement Binary (DEC)
Decrements a binary value in a specified V-memory location by 1 each time the instruction is executed.

Table Instructions

Move (MOV)
Moves the values from one V-memory table to another V-memory table.

Move Memory Card/Load Label (MOVMC/DBLB)
Copies data from data label area in program ladder memory to V-memory.

Bit Instruction (Accumulator)

Shift Left (SFL)
Shifts the bits in the accumulator a specified number of places to the left.

Shift Right (SFR)
Shifts the bits in the accumulator a specified number of places to the right.

Enable Interrupt (EN)
Enables hardware and software interrupt to be acknowledged.

Disable Interrupt (DISI)
Disables hardware and software interrupt from being acknowledged.

CPU Control Instructions

No Operation (NOP)
Inserts a NO operation cell at specified program address.

End (END)
Marks the termination point for the normal program scan. An End instruction is required at the end of the main program body.

Stop (STP)
Changes the mode of the CPU from Run to Program (Stop).

CPU Control Instructions

No Operation (NOP)
Inserts a NO operation cell at specified program address.

End (END)
Marks the termination point for the normal program scan. An End instruction is required at the end of the main program body.

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Marks the termination point for the normal program scan. An End instruction is required at the end of the main program body.

Stop (STP)
Changes the mode of the CPU from Run to Program (Stop).

Number Conversion Instructions (Accumulator)

Binary (BIN)
Converts the BCD value in the accumulator to the equivalent binary value.

Binary Coded Decimal (BCD)
Converts the binary value in the accumulator to the equivalent BCD value.

Multiply (MULT)
Multiplying a BCD value, which is either a V-memory location or a 4-digit constant, by the value in the lower 16 bits in the accumulator. The result resides in the accumulator.

Divide (DIV)
Divides a 32-bit BCD value in the lower 16 bits of the accumulator by a BCD value which is either a V-memory location or a 4-digit constant. The result resides in the accumulator.

Increment Binary (INC)
Increments a binary value in a specified V-memory location by 1 each time the instruction is processed in the program scan.

Decrement Binary (DEC)
Decrements a binary value in a specified V-memory location by 1 each time the instruction is executed.

Interrupt Instructions

Interrupt Enable / Return (INT / IRT)
When a hardware or software interrupt occurs the interrupt routine will be executed. The INT instruction is the beginning of the interrupt routine. The interrupt routine is terminated with an RST instruction (the interrupts return). When a interrupt return is reached the execution of the program continues from the instruction where the program execution was suspended.

Enable Interrupt (EN)
Enables hardware and software interrupt to be acknowledged.

Disable Interrupt (DISI)
Disables hardware and software interrupt from being acknowledged.

Message Instructions

Fault/Data Label (FaulT/DBLB)
Displays a V-memory location or Data label constant to the handheld programmer or personal computer using DirectSOFT.

Numerical Constant/ASCII Constant (NCON/ACON)
Stores constants in numerical or ASCII form for use with other instructions.