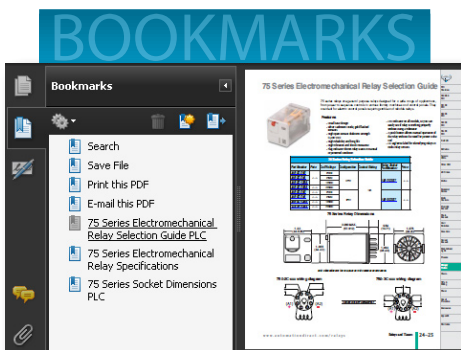


Direct LOGIC / Koyo

DL105 Programmable Logic Controllers (PLC)



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Direct LOGIC DL05/06

Direct LOGIC DL105

Direct LOGIC DL205

Direct LOGIC DL305

Direct LOGIC DL405

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Productivity 3000

Universal Field I/O

Software

C-More HMI

C-More Micro HMI

ViewMarq Industrial Marquees

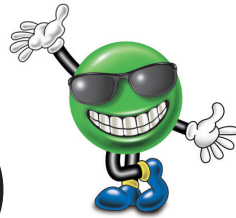
Other HMI

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Appendix Book 1

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DL105



Micro PLC

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

Visit our Web page at <http://www.automationdirect.com/dl105> for more information



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 9,600 baud.

Specialty features

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

AC-powered units

F1-130AA
10 AC inputs, 8 AC outputs, 1.7 A/point

F1-130AD
10 AC inputs, 8 DC outputs, 1.0 A/point, two outputs can be used as 7 kHz pulse output, 0.5 A/point

F1-130AR
10 AC inputs, 8 relay outputs, 7 A/point

F1-130DA
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
8 AC outputs, 1.7 A/point

F1-130DD
10 DC inputs, 4 points are filtered inputs, can also be configured as a single 5 kHz high-speed counter, interrupt input, or pulse catch input
8 DC outputs, 1.0 A/point, 2 outputs can be used as 7 kHz pulse output, 0.5 A/point

F1-130DR
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
8 relay outputs, 7 A/point

DC-powered units

F1-130DD-D
10 DC inputs, 4 inputs can be used as 5 kHz high-speed counter, interrupt inputs, or pulse catch inputs
8 DC outputs, 1.0 A/point, two outputs can be used as 7 kHz pulse output, 0.5 A/point

F1-130DR-D
10 DC inputs, 4 inputs can be used as 5 kHz high-speed counter, interrupt inputs, or pulse catch inputs
8 relay outputs, 7 A/point

Programming

Handheld programmer.....D2-HPP.....\$321.00
DirectSOFT Programming for Windows
PC-DSOFT6.....\$395.00
PC-DS100.....Free
PC-R60-U (upgrade).....\$249.00

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

DL105 CPU Specifications	
System capacity	
Total memory available (words).....	2.4K
Ladder memory (words).....	2,048 EEPROM
V-memory (words).....	384
User V.....	256
Non-volatile user V.....	128
Battery backup.....	No
Total I/O.....	18
Inputs.....	10
Outputs.....	8
I/O expansion.....	No
Performance	
Contact execution (Boolean).....	3.3 µs
Typical scan (1K Boolean) ¹	5-6 ms
Instructions and diagnostics	
RLL ladder style.....	Yes
RLL ^{PLUS} /flowchart style (Stages).....	Yes/256
Run-time editing.....	Yes
Supports Overrides.....	No
Variable/fix scan.....	Variable
Instructions.....	91
Control relays.....	256
Timers.....	64
Counters.....	64
Immediate I/O.....	Yes
Subroutines.....	No
For/next loops.....	No
Timed interrupt.....	Yes
Integer math.....	Yes
Floating-point math.....	No
PID.....	No
Drum sequencers.....	Yes
Bit of word.....	No
ASCII print.....	No
Real-time clock/calendar.....	No
Internal diagnostics.....	Yes
Password security.....	Multi-level
System and user error log.....	No
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).....	9,600 baud
Specialty features	
Filtered inputs.....	Yes ²
Interrupt input.....	Yes ²
High-speed counter.....	Yes, 5 kHz ²
Pulse output.....	Yes, 7 kHz ²
Pulse catch input.....	Yes ²
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
OFF..... has detected an error
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

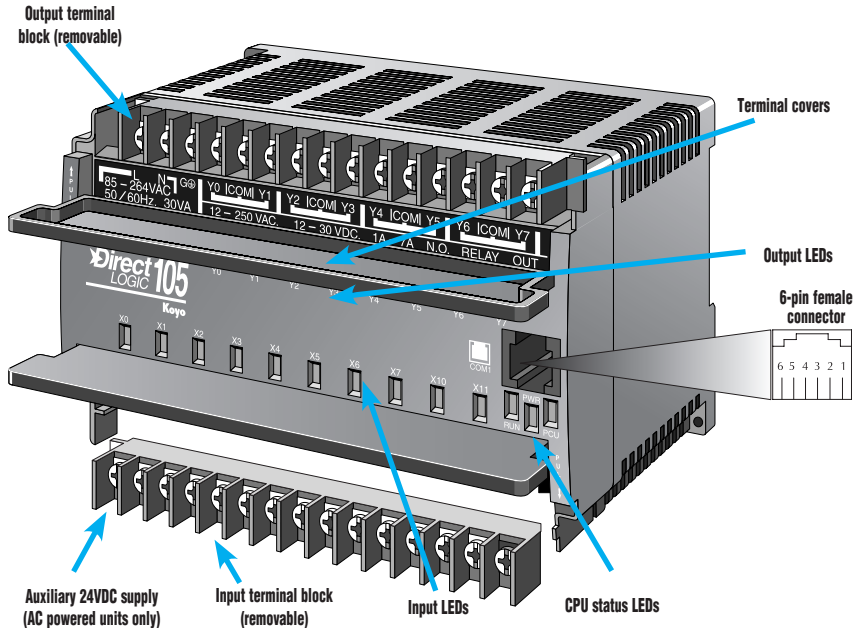
RJ12 Connector Port 1 Pinout

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.



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Dimensions and Installation

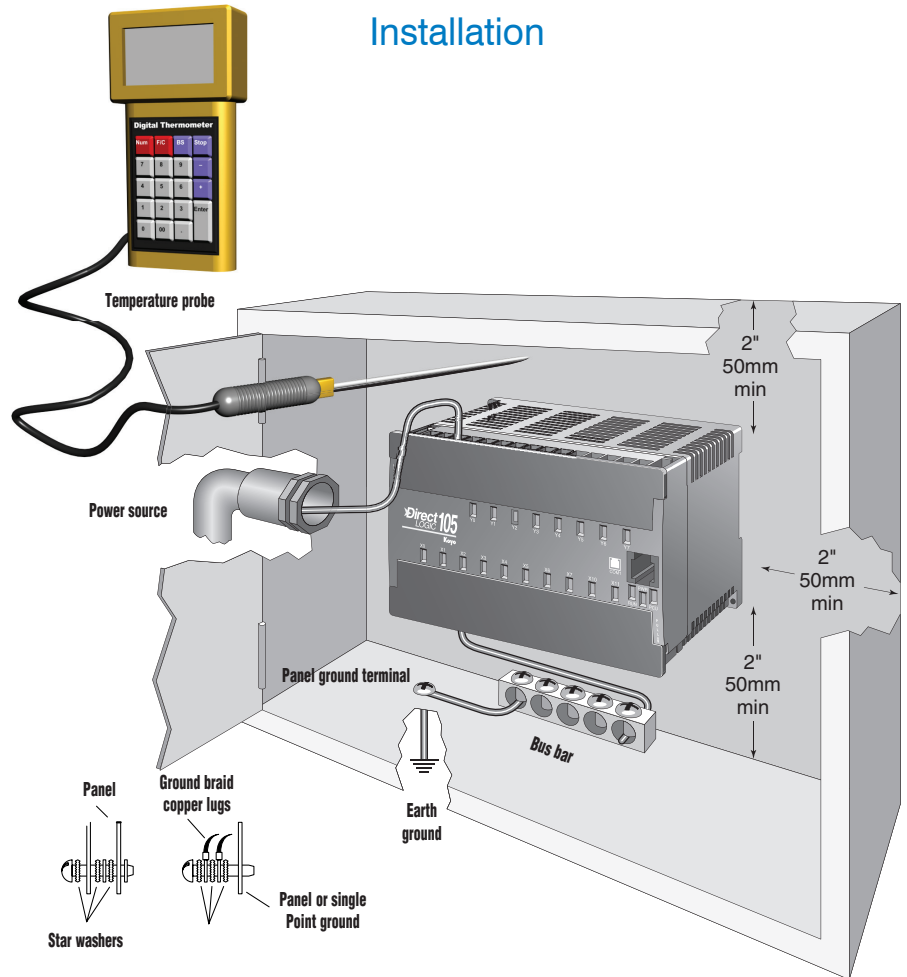
It is important to understand the installation requirements for your DL105 system. This will help ensure that the DL105 products operate within their environmental and electrical limits.

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.

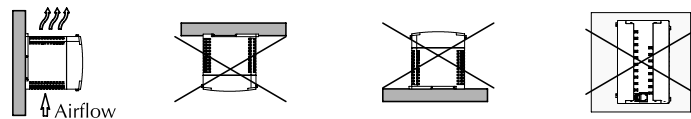
Unit dimensions and mounting orientation

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.

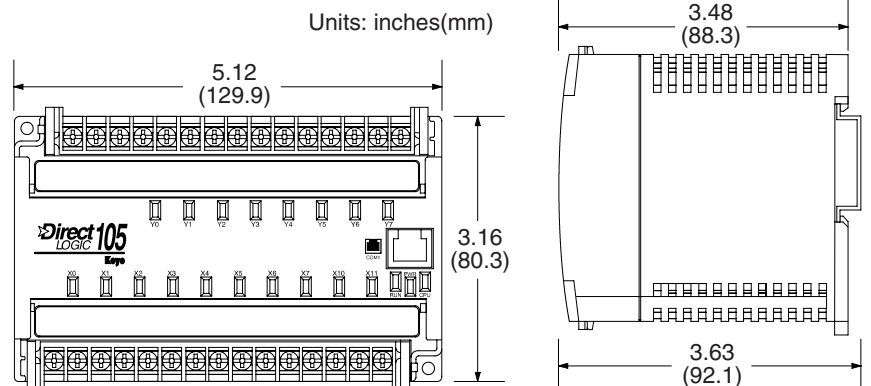


Note: There is a minimum of 2" (50mm) clearance required between the panel door or any devices mounted in the panel door and the nearest DL105 component.

Dimensions and mounting



Environmental Specifications	
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Ambient Operating Temperature	32°F to 131°F (0° to 55°C)
Ambient Humidity	30% to 95% relative humidity (non-condensing)
Vibration Resistance	MIL STD 810C, Method 514.2
Shock Resistance	MIL STD810, Method 516.2
Noise Immunity	NEMA(ICS3-304)
Atmosphere	No corrosive gases



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.

Power Supply Options		
Specification	AC Powered Units	24 VDC Powered Units
Part Numbers	F1-130AA, F1-130AR F1-130AD, F1-130DA F1-130DD, F1-130DR F1-DVNET-AR, F1-DEVNET-DD F1-DVNET-DR	F1-130DD-D F1-130DR-D
Voltage Withstand (dielectric)	one minute @ 1,500 VAC between primary, secondary and field ground	
Insulation Resistance	> 10 MΩ @ 500 VDC	
External Power Requirement	85-132 VAC (110 nominal) 170-264 VAC (220 nominal) 100-264 VDC (125 nominal)	10-30 VDC (12 to 24 VDC) with < 10 percent ripple
Auxiliary 24 VDC Output	500 mA max.	Not available
Maximum Inrush Current	12 A	8 A
Maximum Power	30 VA max.	1 A (approx. 10 W)

Addresses automatically assigned

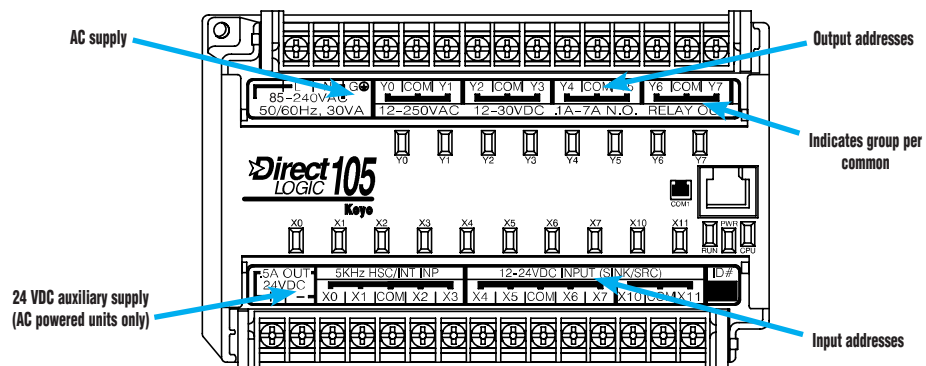
The DL105 uses automatic addressing, so for the vast majority of applications, there is no setup required. We use octal addressing for many of our products, which means there are no 8s or 9s. The first eight input points use addresses X0-X7, and the last two input points use X10 and X11. If you plan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

AC-powered units

Part No.	I/O Mix
F1-130AA.....	10 AC in .8 AC out
F1-130AD.....	10 AC in .8 DC out
F1-130AR.....	10 AC in .8 relay out
F1-130DA.....	10 DC in .8 AC out
F1-130DD.....	10 DC in .8 DC out
F1-130DR.....	10 DC in .8 relay out

DC-powered units

Part No.	I/O Mix
F1-130DD-D.....	10 DC in .8 DC out
F1-130DR-D.....	10 DC in .8 relay out



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F1-130AA

\$239.00

Wiring diagram and specifications

Power requirements

Voltage range.....94-240 VAC (30 VA)
.....100-240 VDC (30 W)

AC input specifications

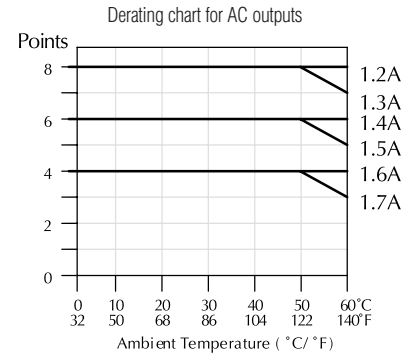
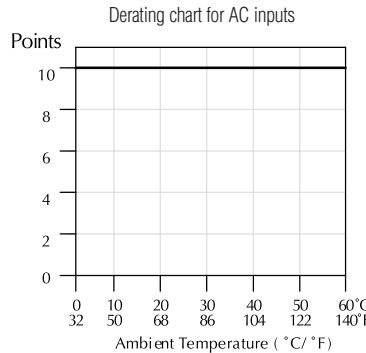
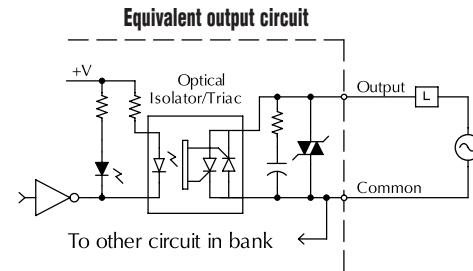
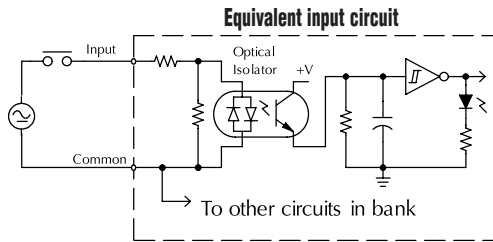
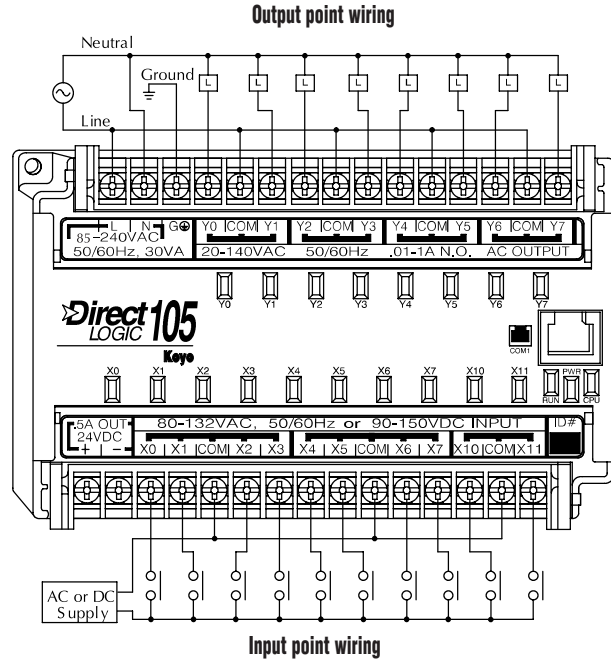
Number of input points10
Number of commons3(isolated)
Input voltage range.....80-132 VAC
.....90-150 VDC
Input current.....6 mA @ 132 VAC
.....6.8 mA @ 150 VDC
ON current/voltage level.....> 4 mA / 80 VAC
.....> 4 mA / 90 VDC
OFF current/voltage level.....< 2 mA / 45 VAC
.....< 2 mA / 60 VDC
OFF to ON response.....< 8 ms
ON to OFF response.....< 15 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.....400 VAC
ON voltage drop.....1.3 VAC at 2 A
Maximum current.....1.7 A/point
.....(subject to derating)
Maximum leakage current.....1 mA at 400 VAC
Maximum inrush current.....30 A for 10 ms
.....15 A for 100 ms
Minimum load.....10 mA
OFF to ON response.....8.33 ms @ 60 Hz
.....10 ms @ 50 Hz
On to OFF response.....8.33 ms @ 60 Hz
.....10 ms @ 50 Hz
Fuses.....None (external recommended)

Auxiliary 24 VDC Output

Voltage range.....21.6 - 26.4 VDC
Output.....500 mA max., isolated
Ripple.....less than 200 mV p - p



DL105 I/O Specifications

F1-130AD **\$239.00**

Wiring diagram and specifications

Power requirements

Voltage range.....94-240 VAC (30 VA)
.....100-240 VDC (30 W)

AC input specifications

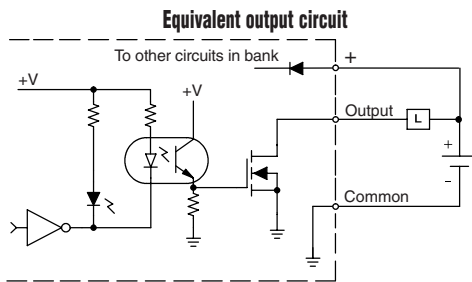
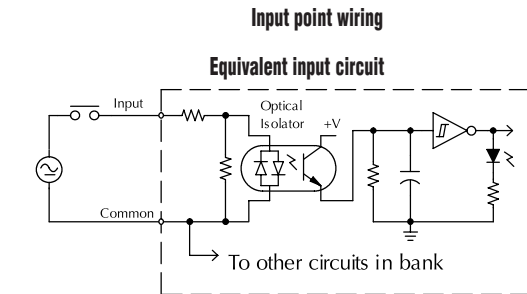
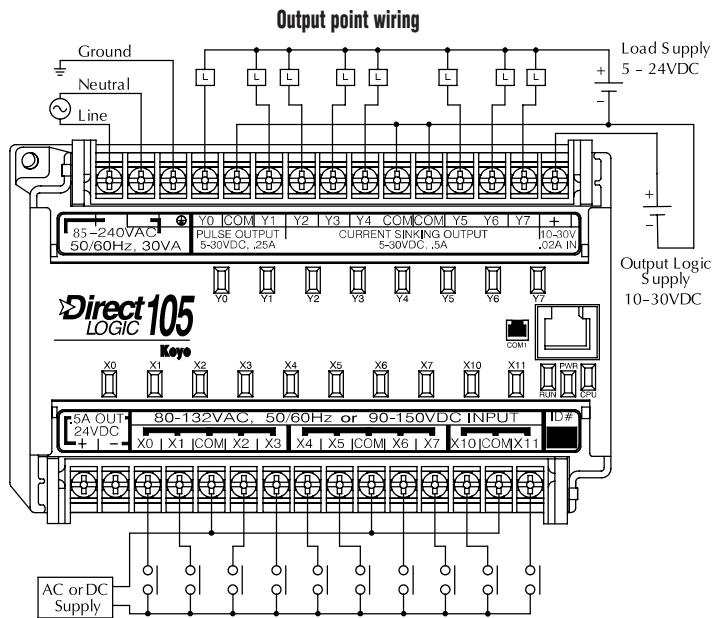
Number of input points.....10
Number of commons.....3 (isolated)
Input voltage range.....80-132 VAC
.....90-150 VDC
Input current......6 mA @ 132 VAC
......6.8 mA @ 150 VDC
ON current/voltage level.....> 4 mA / 80 VAC
.....> 4 mA / 90 VDC
OFF current/voltage level.....< 2 mA / 45 VAC
.....< 2 mA / 60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

DC output specifications

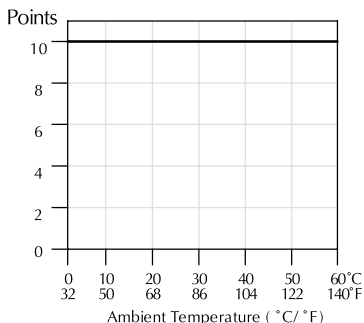
Number of output points.....8 (sinking)
Number of commons.....3 (internally connected)
Output circuitry.....MOSFET
Output voltage range.....5-30 VDC
Peak voltage.....60 VDC
ON voltage drop.....0.45 VDC @ 0.5 A
Maximum current......0.5 A/point (Y0-Y1)
.....1.0 A/point (Y2-Y7)
Maximum leakage current.....15 µA at 30 VDC
Maximum inrush current.....1.5 A for 10 ms (Y0-Y1)
.....3 A for 10 ms (Y2-Y7)
Minimum load.....None
OFF to ON response.....Y0-Y1: 10 µs
.....Y2-Y7: 3.5 µs
ON to OFF response.....Y0-Y1: 70 µs
.....Y2-Y7: 110 µs
External DC power required.....10-30 VDC
.....@ 30 mA + load current
Fuses.....None (external recommended)

Auxiliary 24 VDC Output

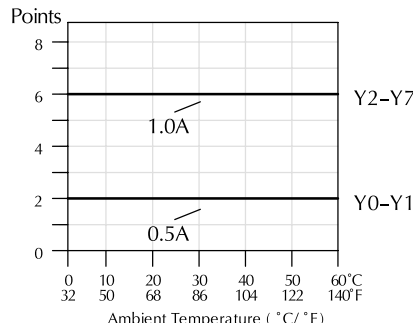
Voltage range.....21.6 - 26.4 VDC
Output......500 mA max., isolated
Ripple.....less than 200 mV p - p



Derating chart for AC inputs



Derating chart for DC outputs



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DL105 I/O Specifications

F1-130AR \$210.00

Wiring diagram and specifications

Power requirements

Voltage range.....94-240 VAC (30 VA)
.....100-240 VDC (30 W)

AC input specifications

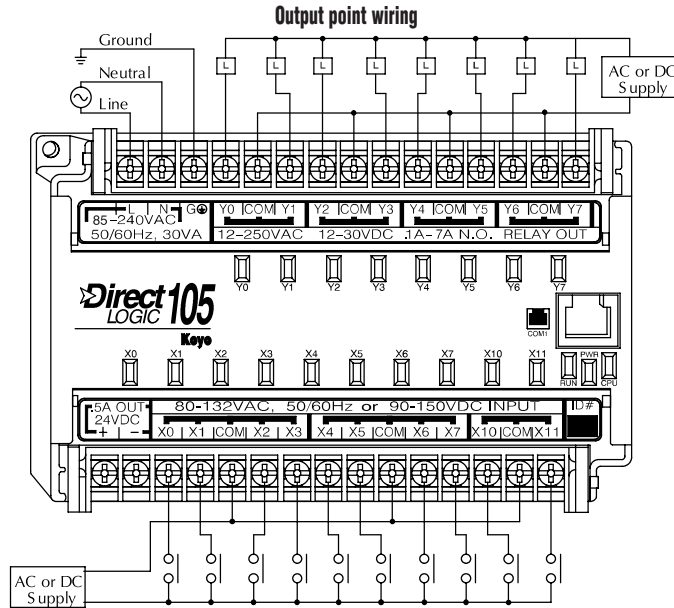
Number of input points.....10
Number of commons.....3 (isolated)
Input voltage range.....80-132 VAC
.....90-150 VDC
Input current......6 mA @ 132 VAC
......68 mA @ 150 VDC
ON current/voltage level.....> 4 mA / 80 VAC
.....> 4 mA / 90 VDC
OFF current/voltage level.....< 2 mA / 45 VAC
.....< 2 mA / 60 VDC
OFF to ON response.....< 8 ms
ON to OFF response.....< 15 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......265 VAC, 150 VDC
Maximum current......7 A/point (see derating)
Maximum inrush current......12 A
Minimum load......10 mA
Minimum OFF resistance.....100 MΩ @ 500 VDC
OFF to ON response......15 ms
ON to OFF response......5 ms
Fuses.....None (external recommended)

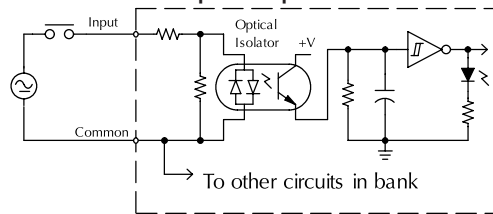
Auxiliary 24 VDC Output

Voltage range......21.6 - 26.4 VDC
Output......500 mA max., isolated
Ripple.....less than 200 mV p - p

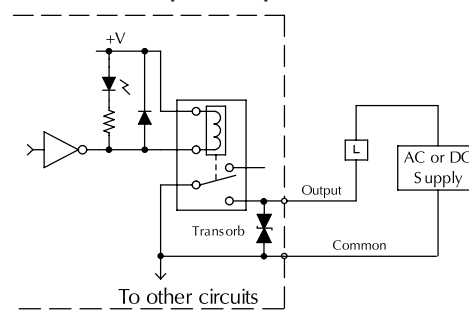


Input point wiring

Equivalent input circuit

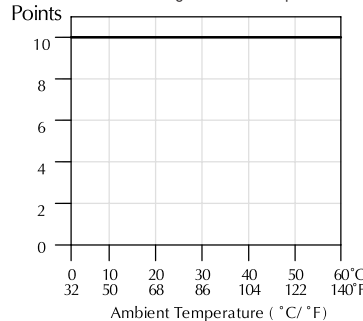


Equivalent output circuit

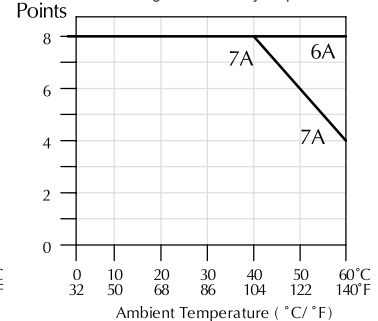


Typical Relay Life (Operations) at Room Temperature			
Voltage and Type of Load	Load Current		
	50 mA	5 A	7 A
24 VDC Resistive	10M	600K	300K
24 VDC Solenoid	—	150K	75K
110 VAC Resistive	—	600K	300K
110 VAC Solenoid	—	500K	200K
220 VAC Resistive	—	300K	150K
220 VAC Solenoid	—	250K	100K

Derating chart for AC inputs



Derating chart for Relay outputs



DL105 I/O Specifications

F1-130DA

\$239.00

Wiring diagram and specifications

Power requirements

Voltage range.....94-240 VAC (30 VA)
100-240 VDC (30 W)

DC input specifications

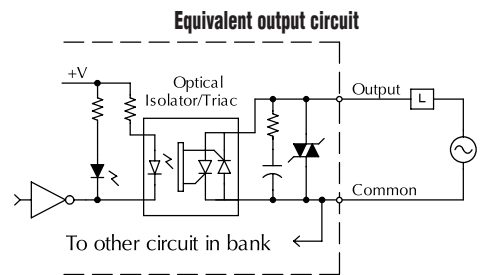
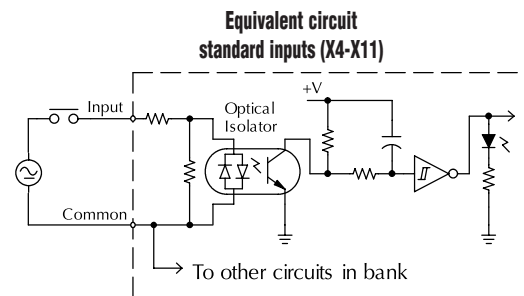
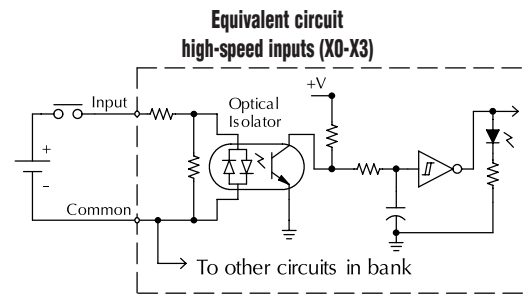
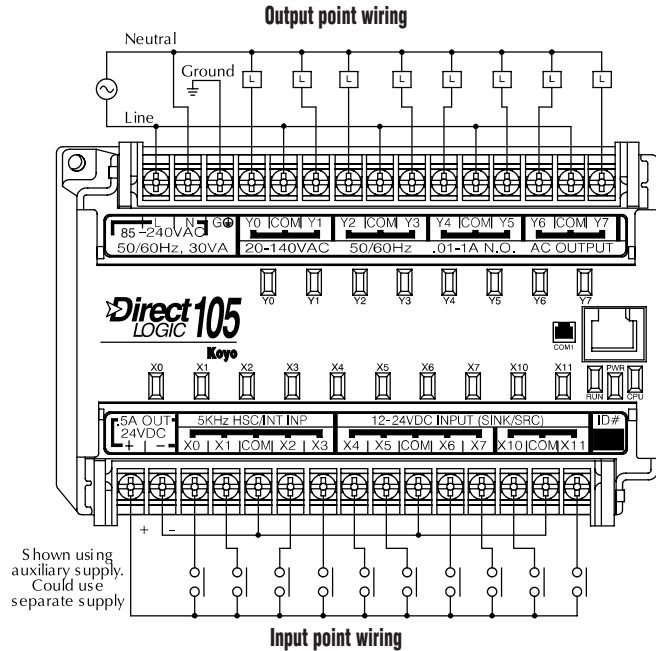
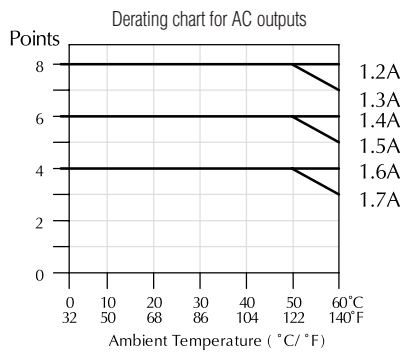
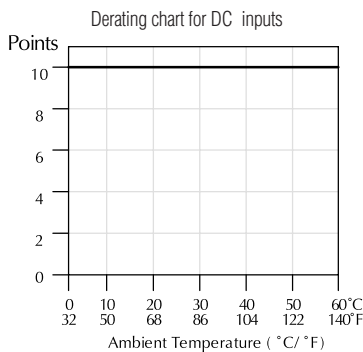
Number of input points.....10 (sink/source)
 Number of commons.....3 (isolated)
 Input voltage range.....(X0-X3) 10-26.4 VDC
(X4-X11) 10-26.4 VDC or
21.6-26.4 VAC
 Input impedance.....2.8 K Ω @ 12 VDC
2.8 K Ω @ 24 VDC
 ON current/voltage level.....> 3 mA / > 9 VDC
 OFF current/voltage level.....< 0.5 mA / < 2 VDC
 Response.....X0-X3 X4-X11
 OFF to ON.....50 μ s 2-8 ms
 ON to OFF.....50 μ s 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.....400 VAC
 ON voltage drop.....1.3 VAC @ 2 A
 Maximum current.....1.7 A/point
(subject to derating)
 Maximum leakage current.....1 mA at 400 VAC
 Maximum inrush current.....30 A for 10 ms
15 A for 100 ms
 Minimum load.....10 mA
 OFF to ON response.....Y0-Y7: 8.33 ms @ 60 Hz
Y2-Y7: 10 ms @ 50 Hz
 ON to OFF response.....Y0-Y7: 8.33 ms @ 60 Hz
Y2-Y7: 10 ms @ 50 Hz
 Fuses.....None (external recommended)

Auxiliary 24 VDC Output

Voltage range.....21.6 - 26.4 VDC
 Output.....500 mA max., isolated
 Ripple.....less than 200 mV p - p



DL105 I/O Specifications

F1-130DD

\$239.00

Wiring diagram and specifications

Power requirements

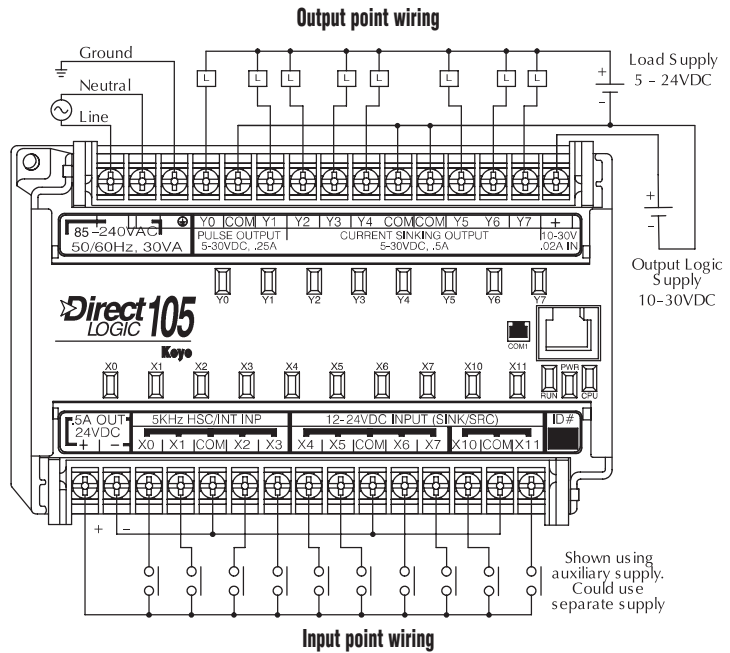
Voltage range.....94-240 VAC (30 VA)
100-240 VDC (30 W)

DC input specifications

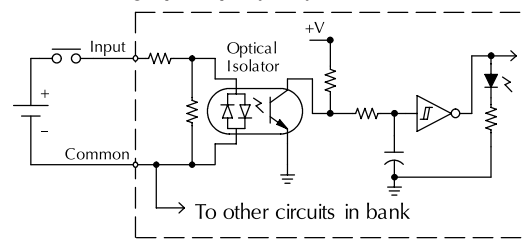
Number of input points.....10 (sink/source)
 Number of commons.....3 (isolated)
 Input voltage range.....(X0-X3) 10-26.4 VDC
(X4-X11) 10-26.4 VDC or
21.6-26.4 VAC
 Input impedance.....2.8 KΩ @ 12-24 VDC
 ON current/voltage level.....> 3 mA / > 9 VDC
 OFF current/voltage level.....< 0.5 mA / < 2 VDC
 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

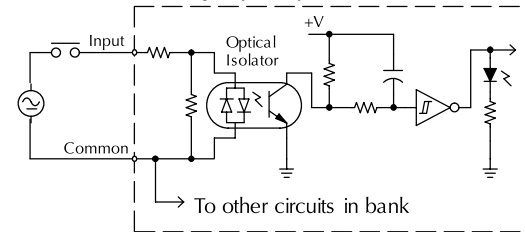
Number of output points.....8 (sinking)
 Number of commons.....3 (internally connected)
 Output circuitry.....MOSFET
 Output voltage range.....5-30 VDC
 Peak voltage.....60 VDC
 ON voltage drop.....0.4 VDC @ 0.5 A
 Maximum current.....0.5 A /point (Y0-Y1)
1.0 A /point (Y2-Y7)
 Maximum leakage current.....15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



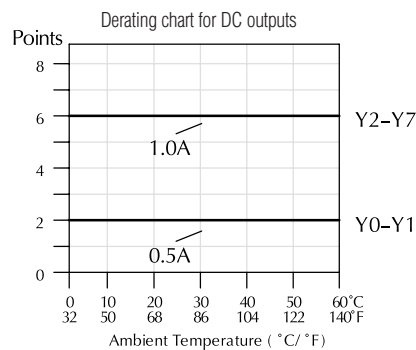
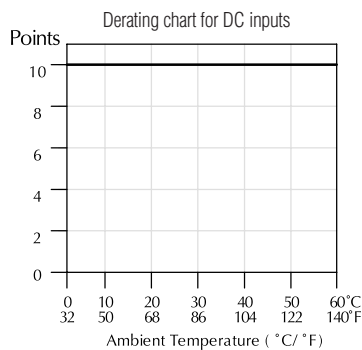
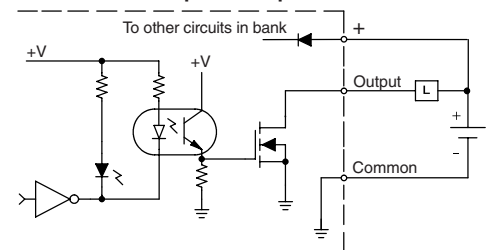
Equivalent circuit high-speed inputs (X0-X3)



Equivalent circuit standard inputs (X4-X11)



Equivalent output circuit



DL105 I/O Specifications

F1-130DR

\$199.00

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.....> 3 mA / > 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

Relay output specifications

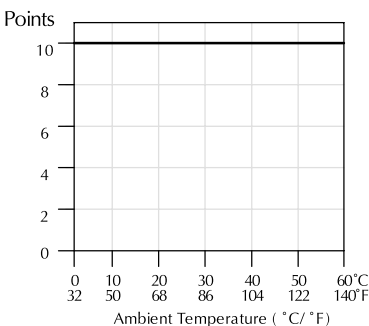
Number of output points.....8
 Number of commons.....4 (isolated)
 Output circuitry.....Relay
 Output voltage range.....12-250 VAC
12-30 VDC
 Maximum voltage.....265 VAC, 150 VDC
 Maximum current.....7 A/point (see derating)
 Maximum inrush current.....12 A
 Minimum load.....10 mA
 Minimum OFF resistance.....100 MΩ @ 500 VDC
 OFF to ON response.....15 ms
 ON to OFF response.....5 ms
 Fuses.....None (external recommended)

Auxiliary 24 VDC Output

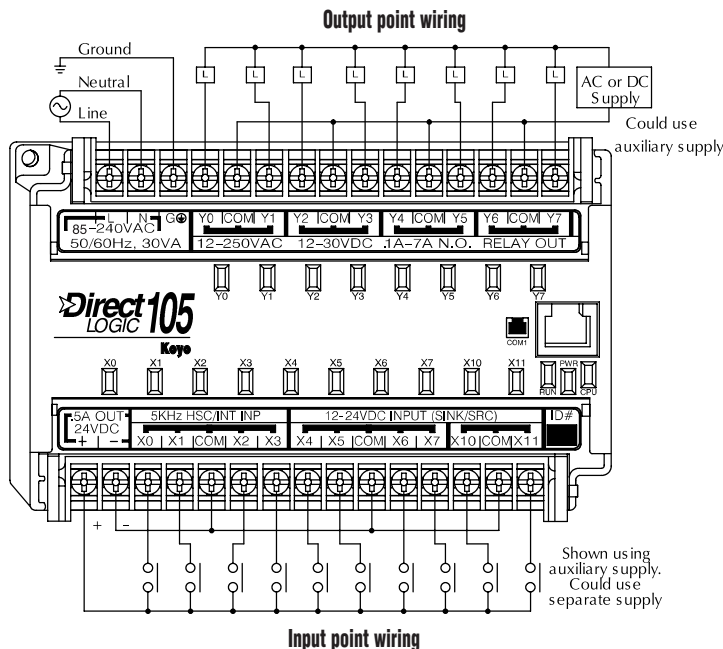
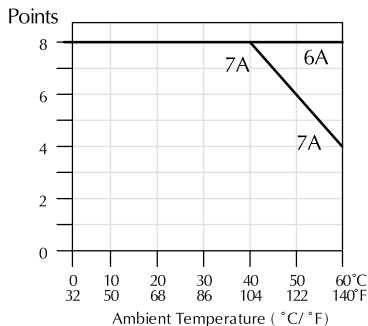
Voltage range.....21.6 - 26.4 VDC
 Output.....500 mA max., isolated
 Ripple.....less than 200 mV p - p

Typical Relay Life (Operations) at Room Temperature			
Voltage and Type of Load	Load Current		
	50 mA	5 A	7 A
24 VDC Resistive	10M	600K	300K
24 VDC Solenoid	—	150K	75K
110 VAC Resistive	—	600K	300K
110 VAC Solenoid	—	500K	200K
220 VAC Resistive	—	300K	150K
220 VAC Solenoid	—	250K	100K

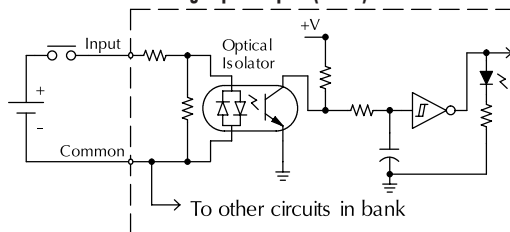
Derating chart for DC inputs



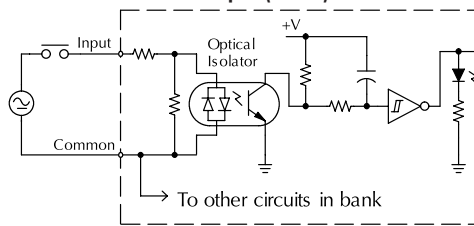
Derating chart for relay outputs



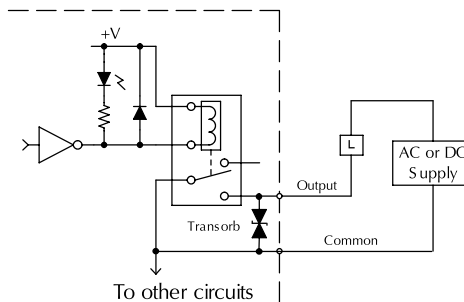
Equivalent circuit high-speed inputs (X0-X3)



Equivalent circuit standard inputs (X4-X11)



Equivalent output circuit



DL105 I/O Specifications

F1-130DD-D \$239.00

Wiring diagram and specifications

Power requirements

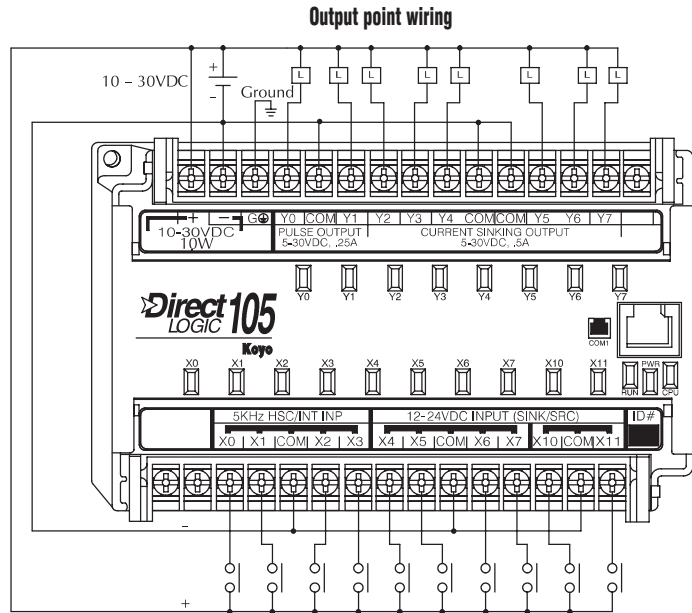
Voltage range.....10-30 VDC
10 W max.

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.....> 3 mA / > 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

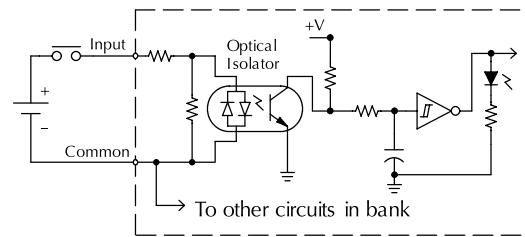
DC output specifications

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.....Y0-Y1: 0.5 A/point
Y2-Y7: 1.0 A/point
 Maximum leakage current.....15 μA at 30 VDC
 Maximum inrush current.....Y0-Y1: 1.5 A for 10 ms
Y2-Y7: 3 A for 10 ms
 Minimum load.....None
 OFF to ON response.....Y0-Y1: 10 μs
 Y2-Y7: 3.5 μs
 ON to OFF response.....Y0-Y1: 70 μs
Y2-Y7: 110 μs
 Fuses.....None (external recommended)

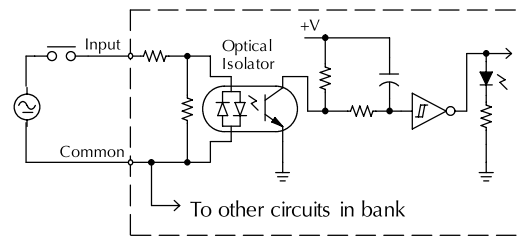


Note: Same supply can be used to power both input and output circuits because all circuits are isolated from the internal logic.

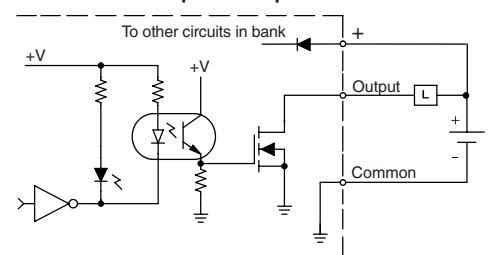
Equivalent circuit high-speed inputs (X0-X3)



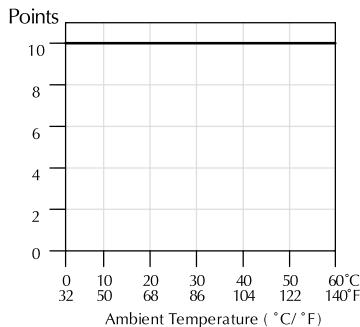
Equivalent circuit standard inputs (X4-X11)



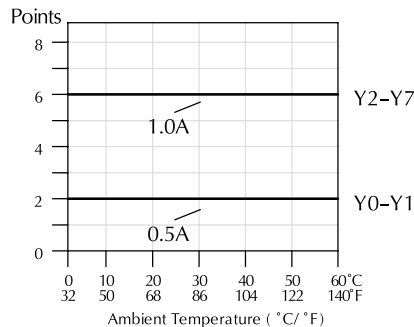
Equivalent output circuit



Derating chart for DC inputs



Derating chart for DC outputs



DL105 I/O Specifications

F1-130DR-D \$209.00

Wiring diagram and specifications

DC power supply specifications

Voltage range.....10-30 VDC
10 W max.

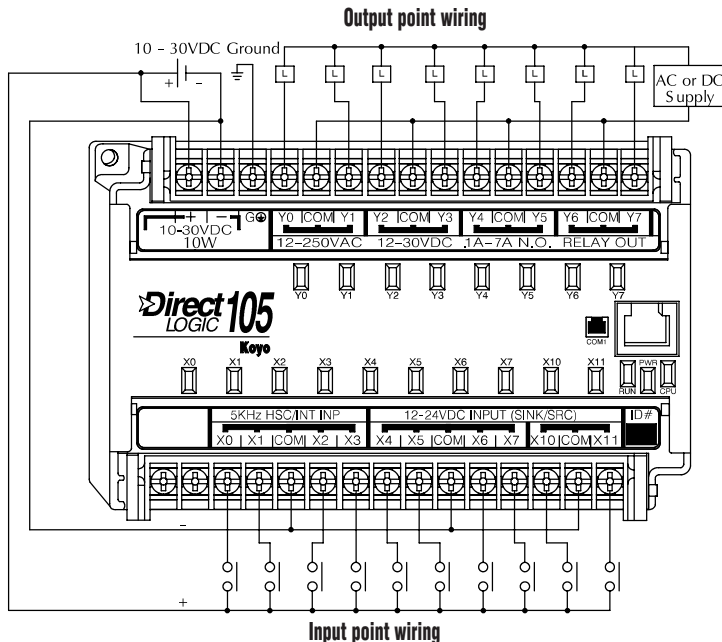
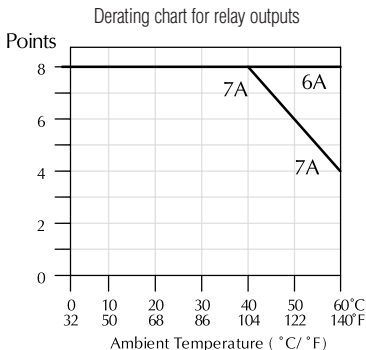
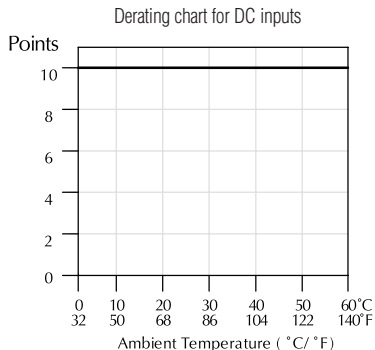
DC input specifications

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.....> 3 mA / > 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

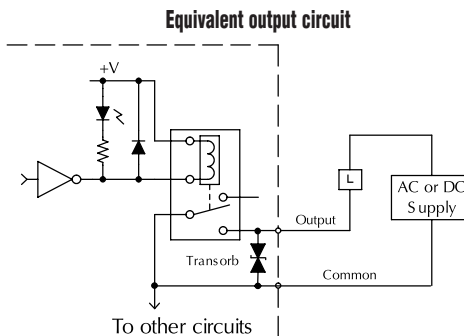
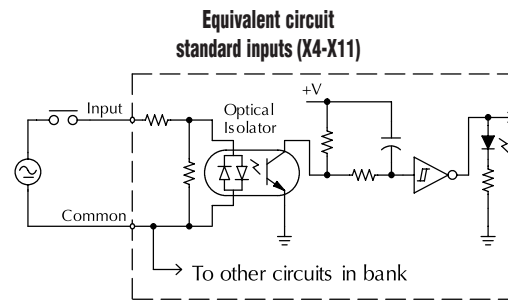
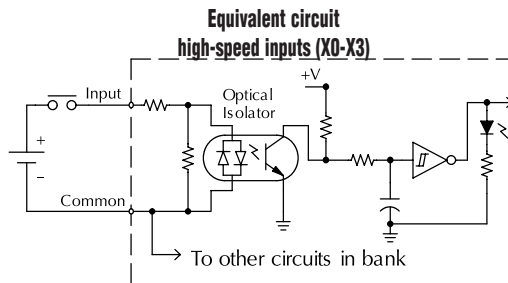
Relay output specifications

Number of output points.....8
 Number of commons.....4 (isolated)
 Output circuitry.....Relay
 Output voltage range.....12-250 VAC
2-30 VDC
 Maximum voltage.....265 VAC, 150 VDC
 Maximum current.....7 A/point (See derating)
 Maximum inrush current.....12 A
 Minimum load.....10 mA
 Minimum OFF resistance.....100 MΩ @ 500 VDC
 OFF to ON response.....15 ms
 ON to OFF response.....5 ms
 Fuses.....None (external recommended)

Typical Relay Life (Operations) at Room Temperature			
Voltage and Type of Load	Load Current		
	50 mA	5 A	7 A
24 VDC Resistive	10M	600K	300K
24 VDC Solenoid	—	150K	75K
110 VAC Resistive	—	600K	300K
110 VAC Solenoid	—	500K	200K
220 VAC Resistive	—	300K	150K
220 VAC Solenoid	—	250K	100K



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



Four-Point Simulator

F1-04SIM \$20.00

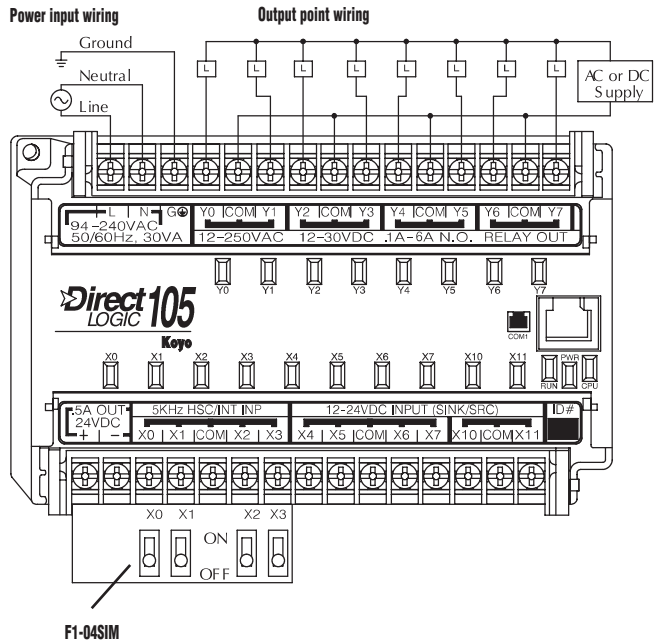
Wiring diagram and specifications

The F1-04SIM is a simple 4-point simulator that can be used with DC input versions of the DL105 micro PLCs. It uses input points X0-X3 and is great for testing purposes.

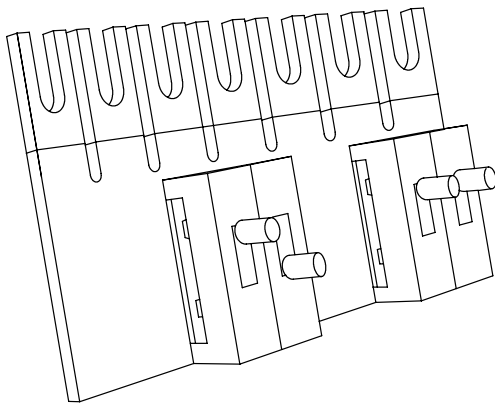
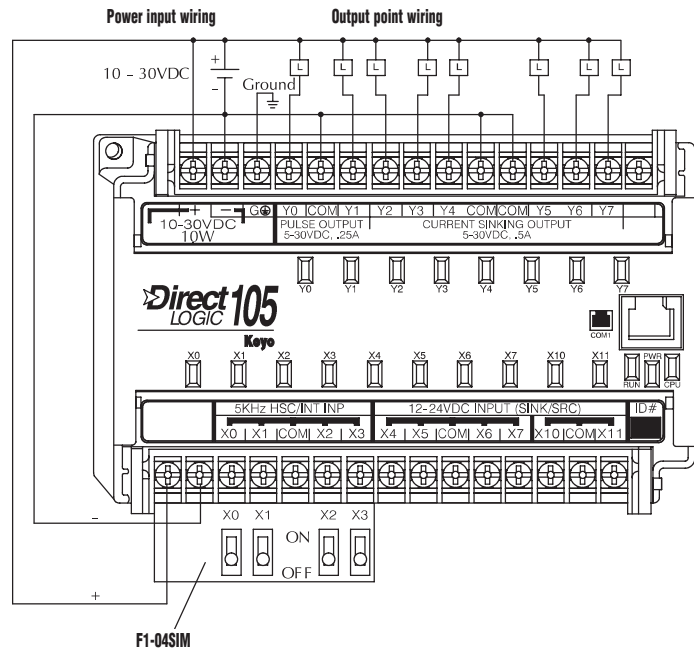
Note: you cannot use this simulator with units that have AC discrete input points.

The simulator is a single circuit board that simply slides underneath the screw terminals on the DL105 micro PLC. One advantage with this simulator is that power is obtained directly from the auxiliary 24 VDC supply located on the input terminal strip. So for most applications, the task is extremely simple. If you are using an F1-130DD-D or F1-130DR-D, then you have to jumper the power input before you can use the simulator. This is because the DC-powered units do not offer this auxiliary supply.

For AC powered units, there are no extra wiring connections. Power is obtained directly from the 24 VDC auxiliary supply.



To use with DC powered units, simply connect the input power wiring to the unused terminals normally occupied by the 24 VDC auxiliary supply.

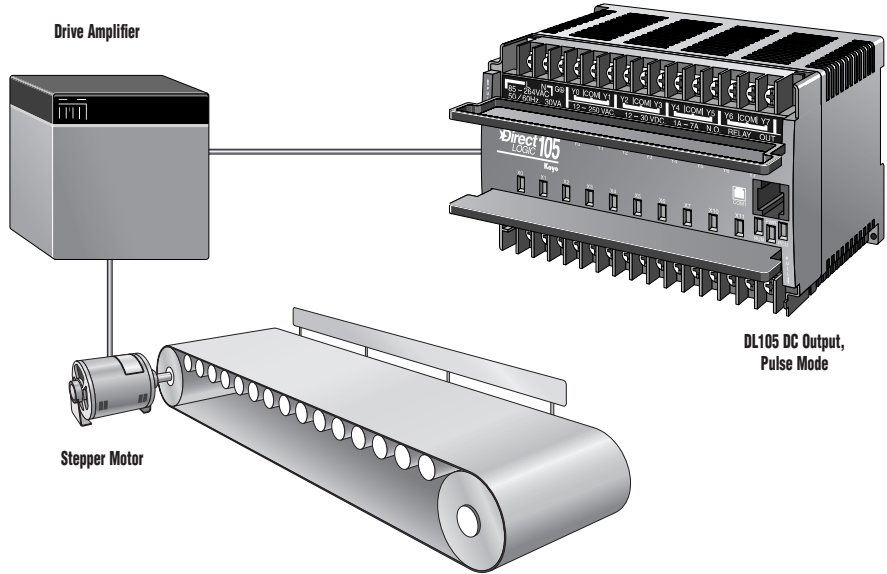


Built-in High-Speed I/O Features

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 5 kHz 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 7 kHz 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 10 ms 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.

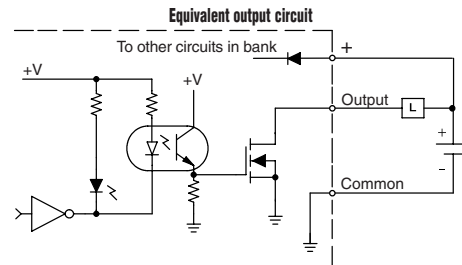
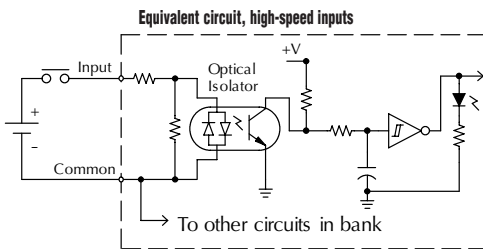
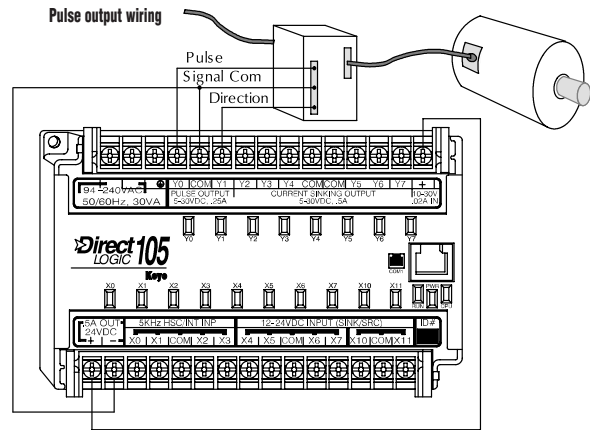
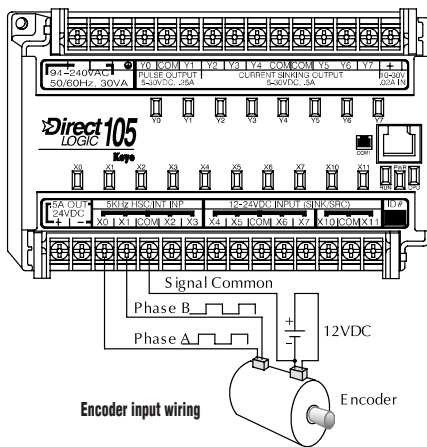
Counter Mode Options						
Mode	DC Input Points				DC Output Points	
	X0	X1	X2	X3	Y0	Y1
Filtered Input	Filtered Input	Filtered Input	Filtered Input	Filtered Input	Regular Output	Regular Output
Up Counter	Count Input	Filtered Input	Filtered Input, or Counter Reset	Filtered Input	Regular Output	Regular Output
Up/Down Counter	Phase A Input	Phase B Input	Filtered Input, or Counter Reset	Filtered Input	Regular Output	Regular Output
Interrupt Input	Interrupt Input	Filtered Input	Filtered Input	Filtered Input	Regular Output	Regular Output
Pulse Catch	Pulse Catch	Filtered Input	Filtered Input	Filtered Input	Regular Output	Regular Output
Pulse Output	Not available for use	Filtered Input	Filtered Input, or Interrupt to Trigger Pulse Output	Filtered Input	Pulse or CW Output	Direction or CCW Output
Timed Interrupt	Filtered Input	Filtered Input	Filtered Input	Filtered Input	Regular Output	Regular Output

Built-in High-Speed I/O Specifications

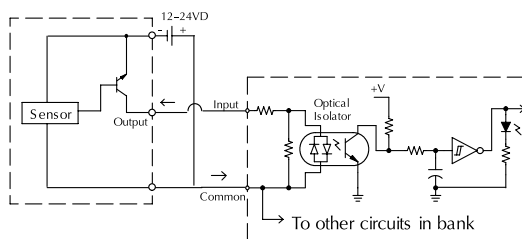
High-Speed Input Specifications	
Inputs	4 pts. max., X0-X3, sink or source 5 kHz max.
Minimum Pulse Width	100 μ s
Input Voltage Range	10-26.4 VDC
Input Impedance	3.0 K Ω @ 12 VDC 2.8 K Ω @ 24 VDC
ON Current/Voltage Level	> 3 mA / > 9 VDC
OFF Current/Voltage Level	< 0.5 mA / < 2 VDC
OFF to ON Response	< 50 μ s
ON to OFF Response	< 50 μ s

High-Speed Output Specifications	
Outputs	2 pts. Max., Y0&Y1 current sinking, 7 kHz Max.
Voltage Range	5-30 VDC
Maximum Load Current	0.5 A/point
ON Voltage Drop	0.45 VDC @ 0.5 A
Leakage Current	15 μ A @ 30 VDC
Inrush Current	1.5 A (10 ms) 0.5 A (100 ms)
OFF to ON Response	< 50 μ s
ON to OFF Response	< 50 μ s

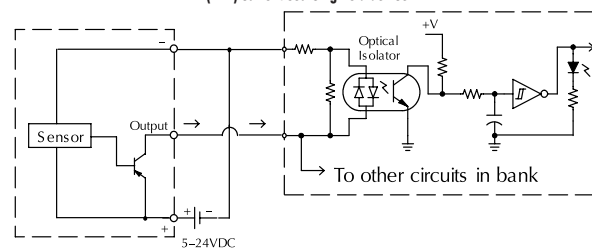
Wiring diagram



Equivalent circuit, high-speed inputs (NPN) current sinking field device



Equivalent circuit, high-speed inputs (PNP) current sourcing field device



Understanding the Timed Interrupt

Overview

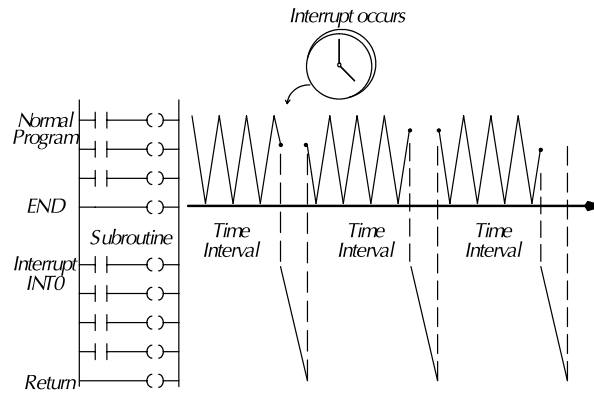
There is a timed interrupt feature available in the DL105 micro PLCs. This cyclical interrupt allows you to easily program a time-based interrupt that occurs on a scheduled basis. This feature is available in all units, regardless of input type. The CPU's timed interrupt operates in a manner similar 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 INTO. 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 (1 ms increments)
 Interrupt subroutine.....INTO



DL105 Instruction Set

Boolean Instructions

- Store (STR)**
Begins a new rung or an additional branch in a rung with a normally open contact.
- Store Not (STRN)**
Begins 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 (ORN)**
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.
- And Store (ANDST)**
Logically ands two branches of a rung in series.
- Or Store (ORST)**
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 point or memory location.
- Or 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 point(s) OFF that were set ON with the set instruction.
- Reset (RST)**
An output that resets a point or a range of points.
- Pause Outputs (PAUSE)**
Disable the update for range of specified output points.

Accumulator/Stack Load and Output Data

- Load (LD)**
Loads a 16 bit word into the lower 16 bits of the accumulator / stack.
- Load Double (LDD)**
Loads a 32 bit word into the accumulator / stack.
- Load Formatted (LDF)**
Loads the accumulator with a specified number of consecutive discrete memory bits.
- Load Address (LDA)**
Loads the accumulator with the HEX value for an octal constant address.
- Out (OUT)**
Copies the values in the lower 16 bits of the accumulator to a specified V memory location.
- Out Double (OUTD)**
Copies the value in the accumulator to two consecutive V memory locations.
- Out Formatted (OUTF)**
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 shifts each value in the stack up one level.

Comparative Boolean Instructions

- Store if Equal (STRE)**
Begins a new rung or additional branch in a rung with a normally open equal contact. The contact will be on when A = B.
- Store If Not Equal (STRNE)**
Begins a new rung or additional branch in a rung with a normally closed equal contact. The contact will be on when A ≠ B.
- Or if Equal (ORE)**
Connects a normally open equal contact in parallel with another contact. The contact will be on when A = B.
- Or if Not Equal (ORNE)**
Connects a normally closed equal contact in parallel with another contact. The contact will be on when A ≠ B.
- And if Equal (ANDE)**
Connects a normally open equal contact in series with another contact. The contact will be on when A = B.
- And if Not Equal (ANDNE)**
Connects a normally closed equal contact in series with another contact. The contact will be on when A ≠ B.
- Store (STR)**
Begins a new rung or additional branch in a rung with a normally open comparative contact. The contact will be on when A ≥ B.
- Store Not (STRN)**
Begins a new rung or additional branch in a rung with a normally closed comparative contact. The contact will be on when A < B.
- Or (OR)**
Connects a normally open comparative contact in parallel with another contact. The contact will be on when A ≥ B.
- Or Not (ORN)**
Connects a normally closed comparative contact in parallel with another contact. The contact will be on when A < B.
- And (AND)**
Connects a normally open comparative contact in series with another contact. The contact will be on when A ≥ B.
- And Not (ANDN)**
Connects a normally closed comparative contact in series with another contact. The contact will be on when A < B.

Timer, Counter, and Shift Register Instructions

- Timer (TMR)**
Single input incrementing timer with 0.1 second resolution (0-999.9 seconds).
- Fast Timer (TMRF)**
Single input incrementing timer with 0.01 second resolution (0-99.99 seconds).
- Accumulating Timer (TMRA)**
Two input incrementing timer with 0.1 second resolution (0-9,999,999.9 sec.). Time and enable/reset inputs control the timer.
- Accumulating Fast Timer (TMRAF)**
Two input incrementing timer with 0.01 second resolution (0-999,999.99 sec.). Time and enable/reset inputs control timer.
- Counter (CNT)**
Two input incrementing counter (0-9999). Count and reset inputs control the counter.
- Stage Counter (SGCNT)**
Single input incrementing counter (0-9999). RST instruction must be used to reset count.
- Up Down Counter (UDC)**
Three input counter (0-99999999). Up, down, and reset inputs control the counter.
- Shift Register (SR)**
Shift data through a range of control relays with each clock pulse. The data, clock, and reset inputs control the shift register.

Immediate Instructions

- Store Immediate (STRI)**
Begins a rung/branch of logic with a normally open contact. The contact will be updated with the current input field status when processed in the program scan.
- Store not Immediate (STRNI)**
Begins a rung/branch of logic with a normally closed contact. The contact will be updated with the current input field status when processed in the program scan.
- Or Immediate (ORI)**
Connects a normally open contact in parallel with another contact. The contact will be updated with current input field status when processed in the program scan.
- Or Not Immediate (ORN)**
Connects a normally closed contact in parallel with another contact. The contact will be updated with the current input field status when processed in the program scan.
- And Immediate (ANDI)**
Connects a normally open contact in series with another contact. The contact will be updated with the current input field status when processed in the program scan.
- And Not Immediate (ANDNI)**
Connects a normally closed contact in series with another contact. The contact will be updated with the current input field status when processed in the program scan.
- Or Out Immediate (OROUTI)**
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. The output field device status is updated when the instruction is processed in the program scan.
- Set Immediate (SETI)**
An output that turns on a point or a range of points. The reset instruction is used to turn the point(s) off that were set. The output field device status is updated when the instruction is processed in the program scan.
- Reset Immediate (RSTI)**
An output that resets a point or a range of points. The output field device status is updated when the instruction is processed in the program scan.

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-digit 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-digit constant.
- Exclusive Or (XOR)**
Performs an Exclusive Or of the value in the lower 16 bits of the accumulator and a V memory location.
- Exclusive Or Double (XORD)**
Performs as Exclusive Or of the value in the accumulator with two consecutive V memory locations or an 8-digit constant.
- Compare (CMP)**
Compares the value in the lower 16 bits of the accumulator with a V-memory location.
- Compare Double (CMPD)**
Compares the value in the accumulator with two consecutive V-memory locations or an 8-digit constant

Math Instructions (Accumulator)

- Add (ADD)**
Adds a BCD value in the lower 16 bits in the accumulator with a V-memory location. The result resides in the accumulator.
- Add Double (ADD D)**
Add a BCD value in the accumulator with two consecutive V-memory locations or an 8-digit constant. The result resides in the accumulator.
- Subtract (SUB)**
Subtract a BCD value, in a V memory location from the lower 16 bits in the accumulator. The result resides in the accumulator.
- Subtract Double (SUBD)**
Subtract a BCD value, which is either two consecutive V-memory locations or an 8-digit constant, from a value in the accumulator. The result resides in the accumulator.(continued below)

Multiply (MUL)

Multiplies 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 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 (INCB)

Increases a binary value in a specified V memory location by 1 each time the instruction is executed.

Decrement Binary (DECB)

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 Cartridge/Load Label (MOVMC/LDLBL)

Copies data from data label area in program ladder memory to V-memory.

Bit Instruction (Accumulator)

Shift Left (SHFL)

Shifts the bits in the accumulator a specified number of places to the left.

Shift Right (SHFR)

Shifts the bits in the accumulator a specified number of places to the right.

Encode (ENCO)

Encodes the bit position set to 1 in the accumulator, and returns the appropriate binary representation in the accumulator.

Decode (DECO)

Decodes a 5-bit binary value (0-31) in the accumulator by setting the appropriate bit position to 1 in the accumulator.

Interrupt Instructions

Interrupt Routine / 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 IRT instruction (unconditional interrupt return). When an interrupt return is reached the execution of the program continues from the instruction where the program execution was prior to the interrupt.

Enable Interrupt (ENI)

Enable hardware and software interrupt to be acknowledged.

Disable Interrupt (DISI)

Disable hardware and software interrupt from being acknowledged.

CPU Control Instructions

No Operation (NOP)

Inserts a N.O. operation coil 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 (STOP)

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. The result resides in the accumulator.

Binary Coded Decimal (BCD)

Converts the binary value in the accumulator to the equivalent BCD value. The result resides in the accumulator.

Invert (INV)

Takes the one's complement of the 32-bit value in the accumulator. The result resides in the accumulator.

RLPLUS Stage / Drum Programming/

Stage Instructions:

Initial Stage (ISG)

The initial stage instruction is used for a starting point for user application program. The ISG instruction will be active on power up and PROGRAM to RUN transitions.

Stage (SG)

Stage instructions are used to create structured program. They are program segments which can be activated or deactivated with control logic.

Jump (JMP)

N.O. coil that deactivates the active stage and activates a specified stage when there is power flow to the coil.

Master Line Set/Master Line Reset (MLS/MLR)

Allows the program to control sections of logic by forming a new power rail. The MLS marks the beginning of a power rail and the MLR marks the end of the power rail control.

Drum Instructions: Time and Event Drum with Discrete Outputs (EDRUM)

Time and/or event driven drum with up to 16 steps and 16 discrete output points. Output status is written to the appropriate output during each step. Specify a time base per count (in ms). Each step can have a different number of counts and an event to trigger the counting. Once the time has expired, a transition to the next step occurs. Also define preset step as destination when reset occurs.

Message Instructions

Fault/Data Label (FAULT/DLBL)

Displays a V-memory value or a 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.