

# Select an I/O Configuration

## Four configurations for system flexibility

The DL405 system offers four major configurations of I/O. The choices are described on the following two pages. Keep these choices in mind as you plan your I/O system.

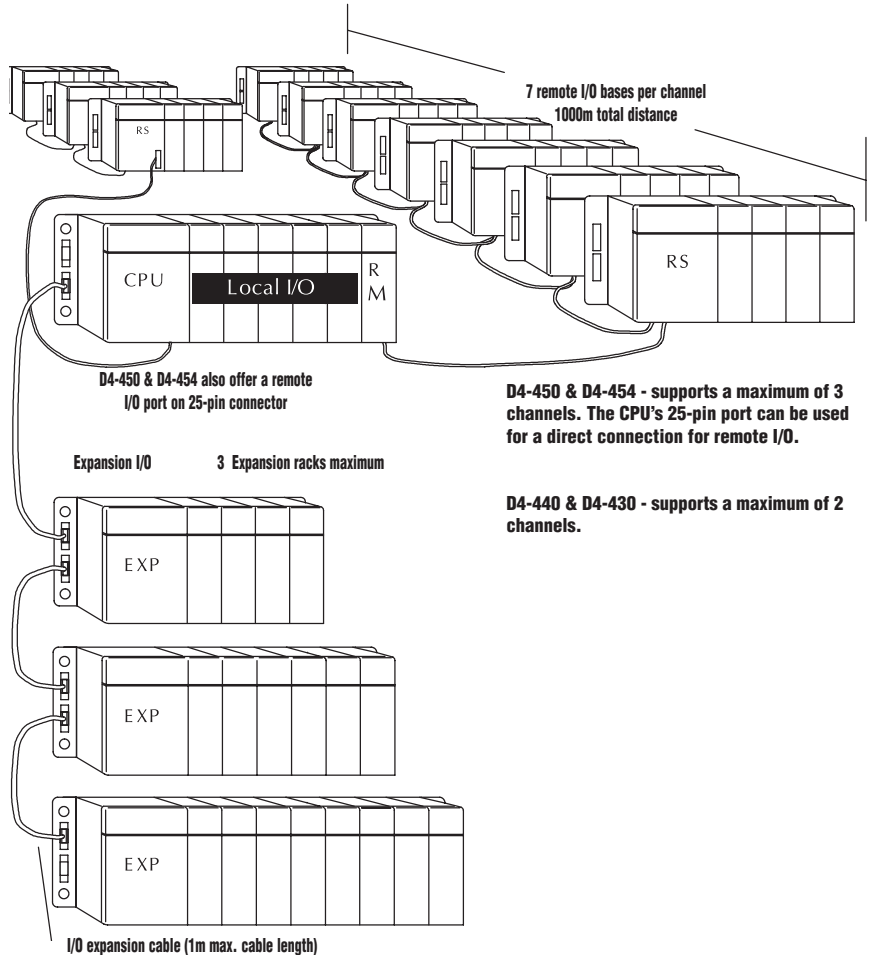
### Local I/O

The local base is the base that holds the CPU. The term "local I/O" refers to the modules that reside in the base with the CPU. Each local I/O point is updated on every CPU scan. Up to 512 points are available in the local base by using 64-point modules (requires a D4-440, D4-450 or D4-454).

### Expansion I/O

Expansion bases are commonly used when there are not enough I/O slots available in the local base, or when the power budget for the base will be exceeded with the addition of I/O. This configuration requires additional base(s), each of which require a D4-EX Local Expansion Unit in place of the CPU, and a cable to connect the expansion bases to the local CPU base. Up to three expansion bases can be connected to a local CPU base, for a total of four bases. The CPU updates expansion I/O points on every scan. The total number of local and expansion I/O points for the D4-450 and D4-454 is 2048 points. The total for the D4-430 and D4-440 is 640 I/O.

## Example of I/O system configurations



# I/O Configurations

## Ethernet remote I/O

The DL405 Ethernet Remote I/O system allows you to locate I/O bases at a remote distance from the CPU. For many applications, this can reduce wiring costs by allowing I/O points to be located near the devices they are controlling.

The Ethernet Remote Master module (H4-ERM100) is placed in an I/O slot of the local CPU base. Ethernet Base Controller (EBC) modules serve as the Remote Slave Units and are placed in the CPU slot of one or more remote bases. You can use standard DL405 modules in the remote bases. The Remote Slaves are connected to the Master using Category 5 UTP cables for cable runs up to 100 meters. Use repeaters to extend distances and hubs to expand the number of nodes. Each H4-ERM100 module can support up to 16 slaves: 16 H2-EBC systems, 16 Terminator I/O EBC systems, or 16 fully expanded H4-EBC systems.

The PLC, ERM and EBC slave modules work together to update the remote I/O points. These three scan cycles are occurring at the same time, but asynchronously. It is recommended that critical I/O points that must be monitored every scan be placed in the CPU base.

ERM Workbench is an easy-to-use Windows-based software utility that is used to configure the ERM and its remote slaves.

It is highly recommended that a dedicated Ethernet remote I/O network be used for the ERM and its slaves. While Ethernet networks can handle a very large number of data transactions, and normally handle them very quickly, heavy Ethernet traffic can adversely affect the reliability of the slave I/O and the speed of the I/O network. Keep ERM networks, multiple ERM networks and ECOM/office networks isolated from one another.

I/O Configuration Specifications		D4-450/ D4-454	D4-440	D4-430
<b>Total Channels Available</b>	Total number of Remote channels available	3	2	2
<b>Remote I/O</b>	Maximum number of D4-RM per system	2	2	2
	Number of masters built into CPU port	1	0	0
	Maximum I/O points supported per channel	512	512	512
	Maximum I/O points supported	1536	1024	512
	Maximum number of remote I/O bases per channel	7	7	7

## Serial remote I/O

Remote I/O solutions allow you to place I/O points at some remote distance from the CPU. The remote I/O points are updated asynchronously to the CPU scan. For this reason, remote I/O applications should be limited to those that do not require the I/O points to be updated on every scan.

Remote I/O requires a remote master to control the remote I/O channel. This master can be a module (D4-RM) in the local CPU base, or the D4-450/D4-454 CPU (through the 25-pin port). For the D4-RM solution, the CPU updates the remote master, then the remote master handles all communication to and from the remote I/O base by communicating to the remote slave module (D4-RS) installed in each remote base. If you use the D4-450 or D4-454 CPU, then it communicates directly with the D4-RS.

The maximum distance between a Remote Master and a Remote Slave is 3,300 feet (1000 m).

# Module Placement and I/O Usage Tables

## I/O module placement restrictions

The most commonly used I/O modules for the DL405 system (AC, DC, AC/DC, Relay, and Analog) can usually be used in any base you have in your local, expansion or remote system. However, some specialty modules (and the 64pt. discrete I/O modules) are limited to the CPU base, or our D4-xxB-1 bases. This table lists by category the valid locations for all modules/units in a DL405 system. Keep in mind the power budget may limit where some modules can be placed, since the necessary power may have been consumed.

## I/O point usage table for modules

The bottom tables indicate the number of I/O points consumed by each module. Use this information to ensure you stay within the I/O count of the I/O configuration you have chosen. Remember, each CPU supports a different amount of I/O. Check the specifications to determine the I/O limits.

Module/Unit	Local CPU Base	Expansion Base	Remote Base
<b>CPU's</b>	CPU slot only		
<b>Expansion Units</b>		CPU slot only	
<b>8/16/32pt DC Input</b>	✓	✓	✓
<b>64pt DC Input</b>	✓ <sup>1</sup>		
<b>AC Input</b>	✓	✓	✓
<b>AC/DC Input</b>	✓	✓	✓
<b>8/16/32pt DC Input</b>	✓	✓	✓
<b>64pt DC Output</b>	✓ <sup>1</sup>	✓	✓
<b>DC Input</b>	✓	✓	✓
<b>Relay Output</b>	✓	✓	✓
<b>Analog Input and Output</b>	✓	✓	✓
<b>Thermocouple Input</b>	✓	✓	✓
<b>Remote I/O</b>			
<b>Remote Masters (serial / Ethernet)</b>	✓		
<b>Remote Slave Unit</b>			✓ CPU slot only
<b>Communications and Networking Modules</b>	✓		
<b>CoProcessor Modules</b>	✓		
<b>Specialty Modules</b>			
<b>Interrupt with D4-430 with D4-440/D4-450</b>	Slot 0 only Slot 0 and 1		
<b>PID</b>	✓		
<b>4-Loop Temp. Controller</b>	✓	✓ <sup>2</sup>	
<b>High-speed Counter</b>	✓	✓	
<b>Simulator</b>	✓		✓

1 - If you are using 64pt. modules, you cannot install any specialty modules in slots 5,6, or 7 of the local D4-430/D4-440 CPU base.  
2 - D4-HSC only. H4-CTRIO may not be installed in a CPU expansion base.

## I/O points required per module

DC Input	I/O pt.
D4-08ND3S	8 in
D4-16ND2	16 in
D4-16ND2F	16 in
D4-32ND3-1	32 in
D4-64ND2	64 in
AC Input	
D4-08NA	8 in
D4-16NA	16 in
AC/DC Input	
D4-16NE3	16 in
F4-08NE3S	8 in

DC Output	I/O pt.
F4-08TD1S	8 out
D4-16TD1	16 out
D4-16TD2	16 out
D4-32TD1, (-1)	32 out
D4-32TD2	32 out
D4-64TD1	64 out
AC Output	
D4-08TA	8 out
D4-16TA	16 out
Relay Output	
D4-08TR	8 out
F4-08TRS-1	8 out
F4-08TRS-2	8 out
D4-16TR	16 out

Analog	I/O pt.
F4-04AD	16 or 32 in
F4-04ADS	16 in
F4-08AD	16 in
F4-16AD -1,(-2)	16 in
F4-04DA-1, (-2)	16 out
F4-04DAS-1, (2)	32 out
F4-08DA-1, (-2)	16 out
F4-16DA-1, (-2)	32 out
F4-08RTD	32 in
F4-08THM-n	16 in
F4-08THM	32 in
Communications/Networking	
All modules	0
CoProcessors	
All modules	0

Remote I/O	I/O pt.
H4-ERM100	0
D4-RM	0
D4-RS	0
D4-RSDC	0
Specialty Modules	
D4-INT	16 in
H4-CTRIO	0
D4-HSC	16 in/32 out
F4-16PID	0
F4-8MPI	0
D4-16SIM	8 or 16 in
F4-4LTC	0

# DL405 I/O Addressing

Many of our customers are familiar with other PLC systems prior to trying *Direct*LOGIC products. One of the key differences between various PLC systems is how they treat the I/O module addressing. This section will describe how we address the individual I/O points in a DL405 system.

## Octal addressing

The DL405 uses octal addressing. That is, the I/O point addresses do not include any "8s" or "9s". The I/O points start at 0 and continue in increments of 8, 16, 32, or 64 points, depending on the modules being used. We use the designator "X" for inputs and "Y" for outputs.

## Automatic addressing

The DL405 CPUs automatically examine any I/O modules in the local CPU and expansion bases to establish the correct I/O configuration and addressing on power-up. The modules don't have to be grouped by type and the discrete input and output modules can typically be mixed in any order. However, there may be restrictions placed on some specialty modules or combinations of modules (Check the Module Placement restrictions). The following diagram shows sample addresses for a simple system containing discrete I/O modules.

For most applications, you never have to change or adjust the configuration. However, if you use automatic addressing and you add modules in between existing modules, the I/O addresses may be subject to renumbering. If you want to add modules in the future, add them to the right of any existing modules to avoid any re-addressing of your I/O points, or use manual addressing.

## Manual addressing

The D4-440, D4-450 and D4-454 CPUs allow you to manually assign I/O addresses for any or all I/O slots on the local or expansion bases. This feature is useful if you have a standard configuration that you must sometimes change slightly to accommodate special requests. It is also useful if you have to leave empty slots in between I/O modules and you do not want an added module to cause addressing problems. In automatic configuration, the addresses are assigned on 8-point boundaries. Manual configuration assumes that all modules are at least 16 points, so you can only assign addresses that are a multiple of 20 (octal). This does not mean you can only use 16, 32, or 64-point modules with manual configuration. You can use 8-point modules, but 16 addresses will be assigned and 8 are unused.

## Remote I/O addressing

Remote I/O is very flexible when it comes to I/O addressing. For example, you specify the starting addresses, number of total points, etc. when you set up the system.

## Manual addressing and choice of data type designators

With Remote I/O, you can choose the designator type that is used for the addresses. For example, you could choose to map the remote points into GX data types or GY data types or even into control relays. This can be very helpful in those situations where the local and expansion I/O have consumed all of the X inputs or Y outputs. You make these various choices when you define the setup logic for the remote I/O.

