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Configuring Complementary I/O for PLC-5 Processors

(Catalog Number 1785 series)

Introduction

This document shows how to configure complementary I/O for PLC-5® processors when you use 2-slot, 1-slot, or 1/2-slot addressing. This information is in addition to your PLC-5 user documentation. You should already have a solid understanding of how to use your PLC-5 processor.

These PLC-5 processors support complementary I/O:

Processor family:	PLC-5 processor:	Catalog number:
Enhanced	PLC-5/20	1785-L20B
	PLC-5/30	1785-L30B
	PLC-5/40	1785-L40B
	PLC-5/60	1785-L60B
	PLC-5/80	1785-L80B
Ethernet®	PLC-5/20E	1785-L20E
	PLC-5/40E	1785-L40E
	PLC-5/80E	1785-L60E
ControlNet™	PLC-5/20C	1785-L20C
	PLC-5/40C	1785-L40C
VME	PLC-5/V30	1785-V30B
	PLC-5/V40	1785-V40B
	PLC-5/V80	1785-V80B
Classic	PLC-5/15	1785-LT
	PLC-5/25	1785-LT2

This document is one of a larger set of reference materials to help you better use your PLC-5® processor. The 1785-6.8.*x* series of documents provides individual documents for different applications. This reference set is continually expanding, so see your Allen-Bradley sales representative or distributor for an up-to-date list of available reference documents.

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Guidelines for applying complementary I/O

You configure complementary I/O by assigning an I/O rack number of one I/O chassis (primary) to another I/O chassis (complementary), complementing modules I/O group for I/O group. The I/O modules in the complementary chassis perform the opposite function of the corresponding modules in the primary chassis.

When configuring your remote complementary I/O, follow these guidelines:

Configuring complementary I/O

- You cannot configure the PLC-5 local chassis (a chassis with a PLC-5/40L or PLC-5/60L processor) with complementary I/O.
- You cannot use complementary I/O with a chassis that uses 32-point I/O modules with 1-slot addressing or with a chassis that uses 16-point I/O modules with 2-slot addressing.

Assigning rack numbers

- Assign the complementary I/O rack number to a chassis of any size.
- Treat complementary rack addresses individually when grouping racks; primary rack numbers are separate from complementary rack numbers. Group together 1/4-racks and 1/2-racks of each logical rack. Do not intersperse these with other rack numbers.

Group together all 1/4 racks and 1/2 racks within the same rack number. →

```
                          Scanner Mode
                       Channel 1B Status
                                                          COUNTERS LOCKED
Messages sent:                  0       Messages sent with error:        0
Messages received:              0       Messages received with error:    0
Messages unable to receive:     0

 Rack      Starting    Rack    Range       Fault    Inhibit    Reset    Retry
Address     Group      Size

   1          0         1/4    010-011               I          0          0
   1          2         1/4    012-013               0          0          0
   1          4         1/4    014-015               0          0          0
   2          0         1/4    020-021               0          0          0
   2          2         1/4    022-023               0          0          0
   2          4         1/2    024-027               0          0          0
   3          0         1/4    030-031               0          0          0
  17          0         FULL   170-177               0          0          0

Press a function key, page up or page down, or enter a value.
Rem Prog                Forces: NONE                        5/40E File TEMP
 Clear   Unlock                  Auto                           Chan 1B
 Counter Counter                 Config                         Config
  F1      F2                     F5                              F9
```

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Placing complementary I/O modules

- Place input modules opposite output modules; place output modules opposite input modules.
- You can place an output module opposite another output module. Use care because they use the same bits in the output image table. This type of placement is not recommended for redundant I/O.
- You cannot place an input module opposite an input module because they use the same bits in the input image table.
- Any module group that exists as a complementary group must also exist as a primary group. This means that the primary chassis can be larger than the complementary chassis. For example, the primary chassis can be a full rack and you could choose to complement only the first 1/4 rack.

Important: If a rack drops off the link and then returns, or if a rack is added to the link, a two-second delay may elapse before the rack is restarted.

- You can complement only racks 1-7. If you are using a PLC-5/40, -5/40C, -5/40L, -5/60, -5/60L, or -5/80 processor as a remote I/O scanner, you can use the remaining racks (10 and greater) for non-complementary I/O. You can split these remaining racks over physical channels as long as the racks do not contain block-transfer modules. A channel configured for complementary I/O cannot scan racks 10-17 or 20-27. You can scan these racks on a channel that is configured as a remote I/O scanner and configured for non-complementary I/O.

Important: For the PLC-5/11, -5/15, -5/20, -5/25, -5/30, -5/40, -5/40L, -5/60, -5/60L, or -5/80 processor, an autoconfigure is performed before the scanner begins communicating with the adapter.

See Table 1 for a summary of 8-, 16-, and 32-point I/O module placement guidelines. See Table 2 for a summary of block-transfer module placement guidelines.

Table 1
Placement summary for 8-, 16-, and 32-point modules used in complementary I/O

Addressing method:	Guidelines	
	Types of modules used:	Placement:
2-Slot	8- point	Install input modules opposite output modules and output modules opposite input modules.
1-Slot	8- point, 16-point,	
1/2-Slot	8- point, 16-point, 32-point	

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Table 2
Placement summary for block-transfer modules used in complementary I/O

Addressing method:	Block-transfer placement guidelines in primary chassis	
	Using single-slot modules:	**Using double-slot modules:**
2-slot	• The right slot of the primary I/O group can be another single-slot block transfer module, or an 8-point input or output module. • The left slot of the complementary I/O group must be empty. • In the right slot of the complementary I/O group, you can place an 8-point output module; this slot must be empty if the corresponding slot in the primary I/O group is a single-slot block transfer module.	• The left slot of the complementary I/O group must be empty. • In the right slot of the complementary I/O group, you can only place an 8-point output module (if any).
1-slot	Leave the corresponding I/O group in the complementary chassis empty.	• The left slot of the two corresponding I/O slots in the complementary chassis must be empty. • In the right slot of the two corresponding I/O slots in the complementary chassis, you can place an input, output, or single-slot block transfer module (if any); the modules can be either 8-point or 16-point I/O modules.
1/2-slot	Leave the corresponding I/O group in the complementary chassis empty.	• The left slot of the two corresponding I/O slots in the complementary chassis must be empty. • In the right slot of the two corresponding I/O slots in the complementary chassis, you can place an input, output, or single-slot block transfer module (if any); the modules can be 8-point ,16-point and/or 32-point I/O modules.

Considerations for PLC-5/40 and PLC-5/60 series A processors

If you are using 6200 PLC-5 programming software to address complementary I/O for PLC-5/40 and PLC-5/60 series A processors, do the following:

1. Configure the I/O data table for 7 racks (delete I/O I:10 and above).
2. On the processor configuration screen, set User Control Bit (S:26/3) to 1 to enable complementary I/O scanning.
3. Accept edits on the channel configuration screen.
4. Perform an autoconfigure on the scanner mode channel configuration screen.

   The primary racks are 1 through 7 and the complementary racks are 11 through 17. You can only use complementary I/O with 7 racks; remote rack addresses 10–17 and 20–27 cannot be used for any I/O addressing.

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Selecting specialty modules

You can use the following modules in either the primary or complementary I/O chassis opposite any type of module.

- communication adapter module (catalog number 1771-KA2)
- communication controller module (catalog number 1771-KE)
- PLC-2 family/RS-232-C interface module (catalog number 1771-KG)
- fiber optics converter module (catalog number 1771-AF)
- DH/DH+ communication adapter module (catalog number 1785-KA)
- DH+/RS-232-C communication interface module (catalog number 1785-KE)

Use the following modules in either the primary or complementary I/O chassis opposite any type of module. However, these modules do not work as stand-alone modules. Each of these modules has an associated master module. Use care when placing master modules in the I/O chassis.

- analog expander module (catalog number 1771-E1, -E2, -E3)
- analog output expander module (catalog number 1771-E4)
- servo (encoder feedback) expander module (catalog number 1771-ES)
- pulse output expander module (catalog number 1771-OJ)

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Placing complementary I/O modules with 2-slot addressing

Follow these guidelines when you configure complementary I/O with 2-slot addressing.

- Use 8-point or 16-point I/O modules.
- Place input modules opposite output modules; place output modules opposite input modules.
- You can place an output module opposite another output module. Both output modules will use the same bits in the output image table.

You can use block-transfer modules in a complementary I/O chassis using 2-slot addressing, with the restrictions:

- When you use double-slot block-transfer modules in a primary chassis:
  - the left slot of the complementary I/O group must be empty.
  - in the right slot of the complementary I/O group, you can only place an 8-point output module.
- When you use single slot block-transfer modules in a primary chassis:
  - the right slot of the primary I/O group can be another single-slot block-transfer module, an 8-point input module, or an 8-point output module.
  - the left slot of the complementary I/O group must be empty.
  - in the right slot of the complementary I/O group, you can place an 8-point output module if the corresponding slot in the primary chassis is an 8-point input or output module. If the corresponding slot in the primary chassis is a single-slot block-transfer module, the right slot of the complementary I/O group must be empty.

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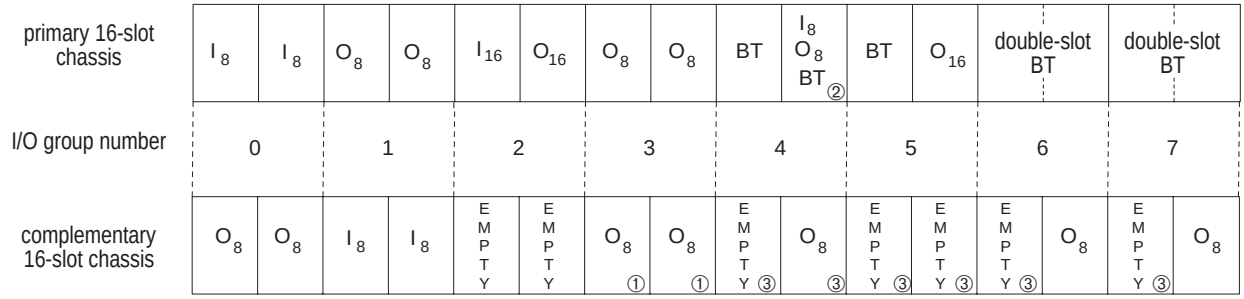
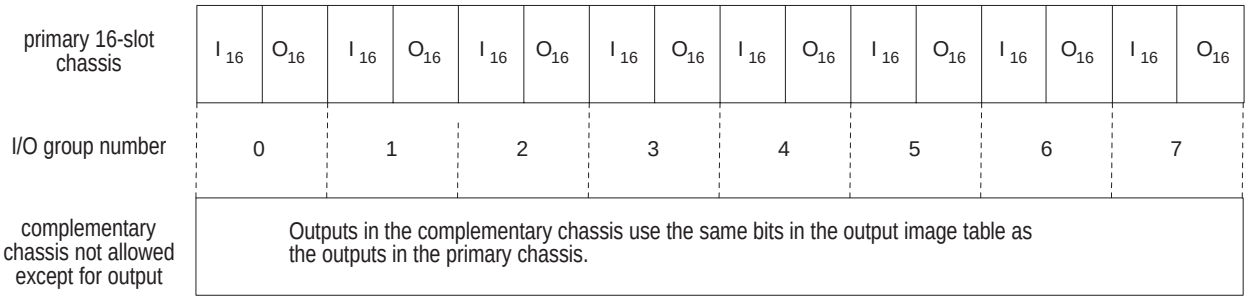
Figure 1 shows the possible module placement for complementary I/O using 2-slot addressing.

Figure 1
Complementary I/O using 2-slot addressing

example A



example B



I = input module
O = output module
BT = block-transfer module
8 = 8-point I/O module
16 = 16-point I/O module

① Output modules use the same output image transfer bits
② Can be an 8-point input or output module or a single-slot block-transfer module
③ Must be empty if the corresponding primary slot is a block-transfer module because a block-transfer module uses both 8 inputs and 8 outputs for communications

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Placing complementary I/O modules with 1-slot addressing

Follow these guidelines when you configure complementary I/O with 1-slot addressing.

- Use 8-point or 16-point I/O modules.
- Place input modules opposite output modules; place output modules opposite input modules.
- You can place an output module opposite another output module. Both output modules will use the same bits in the output image table.

You can use block-transfer modules in a complementary I/O chassis using 1-slot addressing, with the restrictions:

- When you use double-slot block-transfer modules in a primary chassis:
  - the left slot of the complementary I/O group must be empty.
  - in the right slot of the two corresponding complementary I/O groups, you can only place an input module, an output module, or a single-slot block transfer module. The input or output module can be an 8-point or 16-point module.
- When you use single slot block-transfer modules in a primary chassis, the corresponding I/O group in the complementary chassis must be empty.

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Figure 2 shows the possible module placement for complementary I/O using 1-slot addressing.

Figure 2
Complementary I/O using 1-slot addressing

example A

primary 16-slot chassis	I	I	O	O	I	O	O ①	BT	double-slot BT		O	I	I	I	O	O
I/O group number	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
complementary 16-slot chassis	O	O	I	I	O	I	O ①	EMPTY ③	EMPTY ③	I, O, BT ②	I	O	O	O	I	I

example B

primary 16-slot chassis	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
I/O group number	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
complementary 16-slot chassis	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

I = input module (8-point or 16-point)
O = output module (8-point or 16-point)
BT = block-transfer module

① Output modules use the same output image transfer bits
② Can be an input or output module (8-point or 16-point) or a single-slot block-transfer module
③ Must be empty if the corresponding primary slot is a block-transfer module because a block-transfer module uses both 8 inputs and 8 outputs for communications

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Placing complementary I/O modules with 1/2-slot addressing

Follow these guidelines when you configure complementary I/O with 1/2-slot addressing.

- Use 8-point, 16-point, or 32-point I/O modules.
- Place input modules opposite output modules; place output modules opposite input modules.
- You can place an output module opposite another output module. Both output modules will use the same bits in the output image table.

You can use block-transfer modules in a complementary I/O chassis using 1/2-slot addressing, with the restrictions:

- When you use double-slot block-transfer modules in a primary chassis:
  - the left slot of the two complementary I/O slots must be empty.
  - you can place any single-slot I/O module in the right slot of the two corresponding I/O slots of the complementary chassis.
- When you use single slot block-transfer modules in a primary chassis, the corresponding I/O slot in the complementary chassis must be empty.

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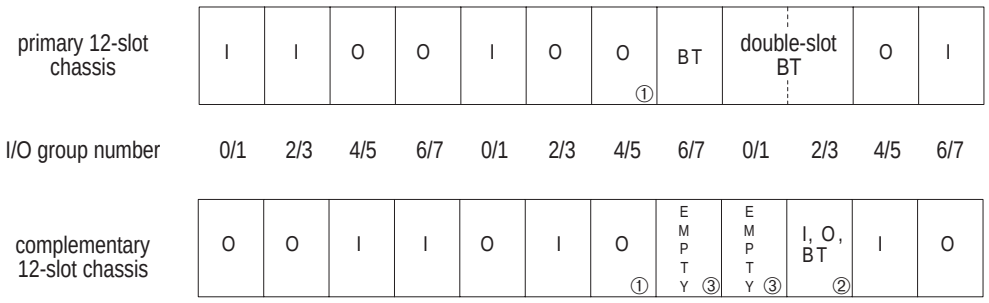
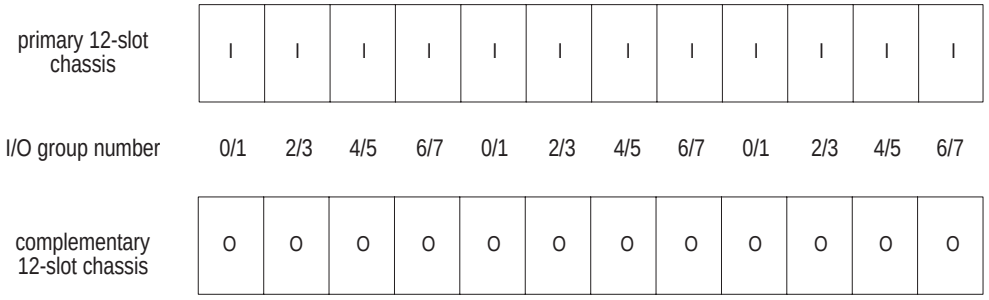
Figure 3 shows the possible module placement for complementary I/O using 1/2-slot addressing.

Figure 3
Complementary I/O using 1/2-slot addressing

example A



example B



I = input module (8-point, 16-point, or 32-point)
O = output module (8-point, 16-point, or 32-point)
BT = block-transfer module

① Output modules use the same output image transfer bits
② Can be an input or output module (8-point, 16-point, or 32-point) or a single-slot block-transfer module
③ Must be empty if the corresponding primary slot is a block-transfer module because a block-transfer module uses both 8 inputs and 8 outputs for communications

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