4

DL250 / DL350 / DL450 CPU With T1K–RSSS Remote I/O System

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— Remote Slave (T1K–RSSS) Features
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— Setting the T1K–RSSS Rotary Switches
— Setting the T1K–RSSS DIP Switches
— Examples for Typical Configurations
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— Connecting the Wiring
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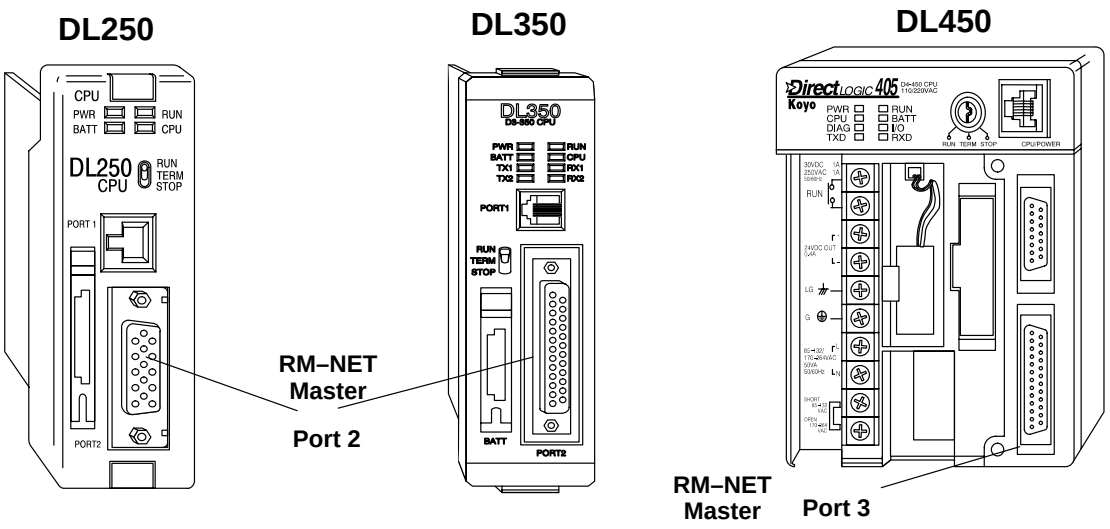
DL250/DL350/DL450 CPU Bottom Port as Remote Master

For the D2–250, D3–350 CPU or D4–450, the most cost-effective way to add remote I/O is to use the bottom port of the CPU as a remote master. The restriction is that it operates in the RM–NET protocol only, which means a maximum of seven slaves at a maximum baud rate of 38.4 kBaud. Also, the slave serial communications port is not active in RM–NET protocol.

This configuration requires some setup programming for the CPU. You can write your program using either a handheld programmer or ***Direct***SOFT Programming Software. The examples that follow will show you how to do this using ***Direct***SOFT.

To get started, launch ***Direct***SOFT and carry out the normal ***Direct***SOFT setup procedures for communicating with your DL250, DL350 or DL450 CPU. If you do not know how to do this, refer to your ***Direct***SOFT User Manual. Your PLC User Manuals have very good coverage of the basic commands available and examples of using the commands to write general ladder logic. We will be showing you in this chapter only those commands that pertain to setting up your remote I/O initialization.

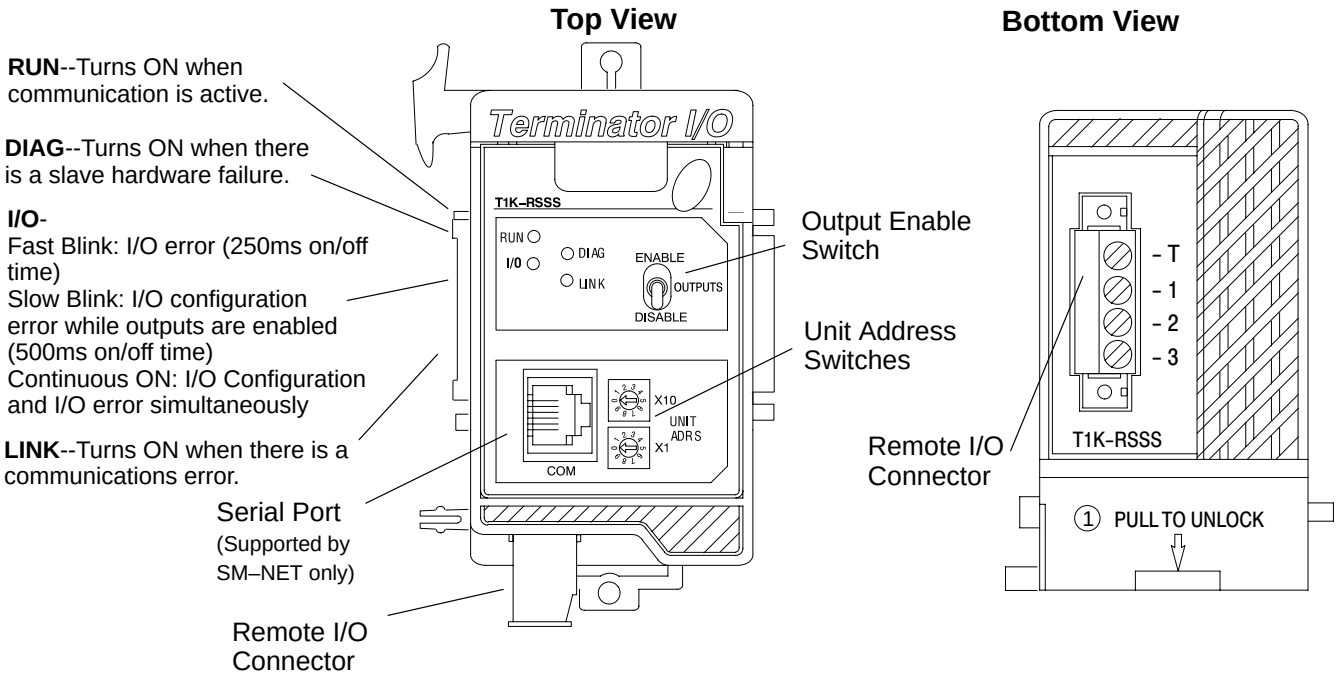
Built In Remote I/O Master Port



Remote I/O Master Functional Specifications	DL250	DL350	DL450
CPU built-in Remote I/O channels	1	1	1
Maximum I/O points supported by each channel	2048*	2048*	2048*
Maximum number of remote I/O slaves per channel	7	7	7
Transmission Distance (max.)	3900 feet (1.2Km)		
Communication Method	Asynchronous (half–duplex)		
X Inputs available for Remote I/O	512	512	1024
Y Outputs available for Remote I/O	512	512	1024
Control Relays available for Remote I/O	1024	1024	2048
V Memory (words) available for Remote I/O	7168	7168	14848

*Requires CPU firmware version: D2–250 version 1.51 or later, D3–350 version 1.30 or later, and D4–450 version (SH)1.460 or (SH)2.460 or later. Earlier firmware version supports 512 I/O points per channel.

Remote Slave (T1K-RSSS) Features



Functional Specifications

Max. # of Slaves per channel	RM–NET 7
Maximum # of I/O Modules per Slave	16 (be sure to check power budget)
Maximum Remote I/O Points per CPU **Note: 8 channel analog modules consume 256 discrete I/O pts. and 16 channel analog modules consume 512 I/O pts.** **V memory addressing is recommended when using analog I/O modules.**	DL250, DL350 and DL450 support a maximum of 2048 points per channel. The actual I/O available is limited by total available references. For example, the DL250 has a total of 512 X inputs and 512 Y outputs. Mapping remote I/O into control relays or V memory of could allow more I/O points for the DL250.
Module Type	Non–intelligent slave
Digital I/O Consumed	Consumes remote I/O points at a rate equal to the number of I/O points configured in each unit.
Communication Baud Rates	RM–NET Selectable: 19.2K baud 38.4k baud
Communication Failure Response	Selectable to clear or hold last state of outputs

The following specifications define the operating characteristics of the T1K–RSSS module.

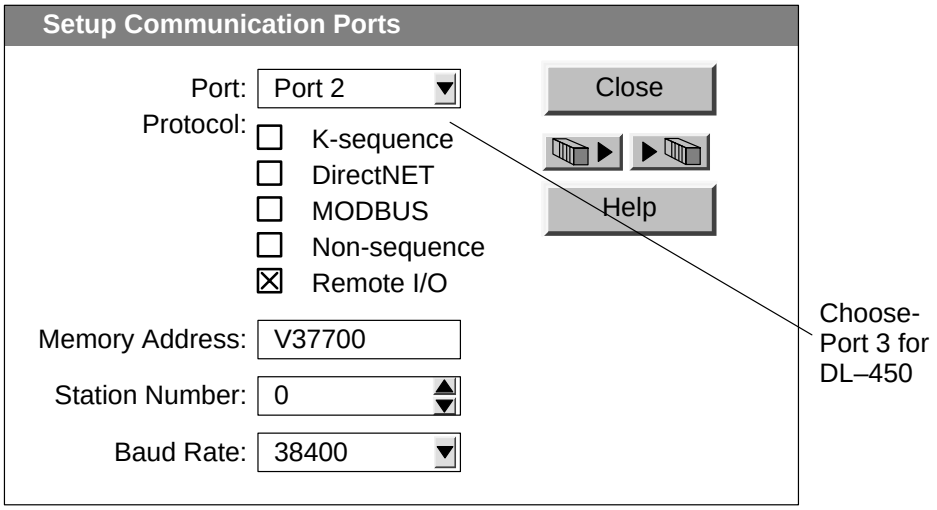
Physical Specifications

Installation Requirements	mount to right of first power supply
Base Power Requirement	250 mA maximum
Communication Cabling	for remote I/O, RS-485 twisted pair, Belden 9841 or equivalent
Slave Serial Communications Port	not active in RM–NET mode
Operating Temperature	32 to 131° F (0 to 55° C)
Storage Temperature	–4 to 158° F (–20 to 70° C)
Relative Humidity	5 to 95% (non-condensing)
Environmental air	No corrosive gases, pollution level = 2 (UL 840)
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3–304 Impulse noise 1us, 1000V FCC class A RFI (144MHz, 430MHz, 10W, 10cm)

Configuring the Bottom Port of the DL250/DL350/DL450 CPU

To configure the port using the Handheld Programmer, use AUX 56 and follow the prompts, making the same choices as indicated below on this page. To configure the port in ***Direct***SOFT, choose the PLC menu, then Setup, then Setup Secondary Comm Port. The port can also be configured using ladder logic code.

- **Port:** From the port number list box at the top, choose "Port 2" for the DL250 and DL350. Choose **"Port 3" for the DL450.**
- **Protocol:** Click the check box to the left of "Remote I/O" (called "M–NET" on the HPP), and then you'll see the dialog box shown below.



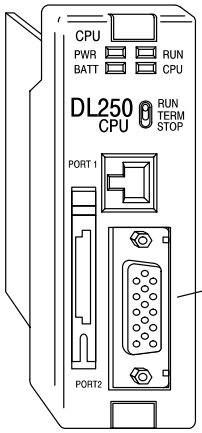
- **Memory Address:** Choose a V-memory address to use as the starting location of a Remote I/O configuration table (V37700 is the default). This table is separate and independent from the table for any Remote Master(s) in the system.
- **Station Number:** Choose "0" as the station number, which makes the DL250, DL350 or DL–450 the master. Station numbers 1–7 are reserved for remote slaves.
- **Baud Rate:** The baud rates 19200 and 38400 baud are available. Choose 38400 initially as the remote I/O baud rate, and revert to 19200 baud if you experience data errors or noise problems on the link. Important: You must configure the baud rate on the Remote Slaves (via DIP switches) to match the baud rate selection for the CPU's Port 2 (DL450 port 3).

Then click the button indicated to send the Port 2 or Port 3 configuration to the CPU, and click Close.

Setting the T1K–RSSS Rotary Switches

The slave has two small rotary switches to set the unit address. They are on the face of the module, with the label “UNIT ADRS” beside it. Adjust the switches by rotating them with a small flathead screwdriver.

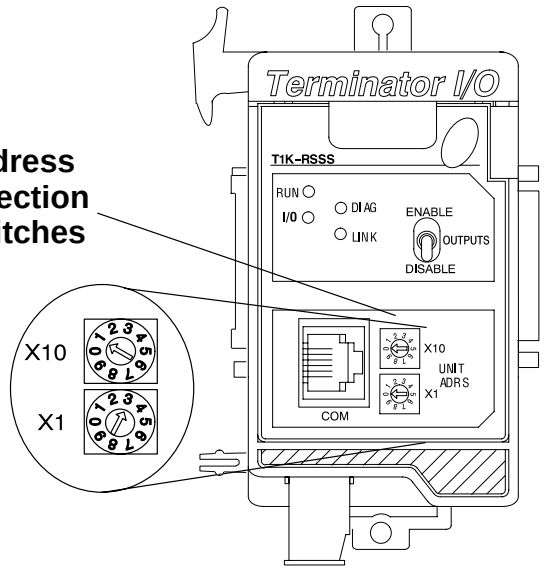
Remote Master (DL250, 350 or 450)



Set Port 2 (Port 3 DL450) Address to 0 using ***Direct***Soft or ladder logic code

Remote Slave

Address Selection Switches

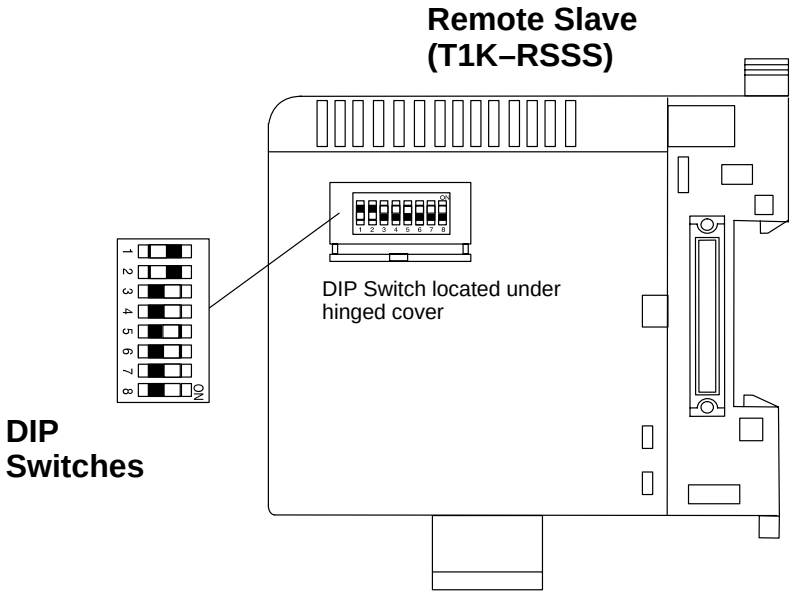


One switch is marked X1 and the other X10. Don’t confuse these with the conventional data type labeling – *these do not refer to inputs* X1 and X10. Instead, these set the address in decimal for each unit. X1 is the “one’s” position and X10 is the “ten’s” position. For example, set address 7 by turning the X10 switch to 0 and the X1 switch to 7.

Set them to any number 1–7 for RM–NET. Two slaves cannot have the same number if they are linked to the same master. **Always use consecutive numbers for slaves, starting with Address 1—don’t skip numbers**.

Setting the T1K–RSSS DIP Switches

The remote slave has an 8–position DIP switch labeled “SW1” that is located on the side of the module under a hinged cover. Set these switches to configure the protocol mode, the baud rate, the output response on communication failure. The slave serial port is not active in RM–NET mode. The word “ON” appears beside the switch to indicate the ON position.



DIP Switch Settings

Module	DIP Position			
	1	2,3,4	5	6,7,8
Slave (T1K–RSSS)	**Mode** OFF=SM–NET ON=RM–NET	**Baud Rate** Switch Position Baud Rate 2 3 4 19.2K O O O 38.4K X O O Note: Higher baud rate are not supported by RM–NET	**Output Default** OFF=Clear ON=Hold	Serial Port not active in RM–NET mode

Mode: DIP switch Position 1 on both the master and slave unit selects the protocol mode for the remote I/O link. Since the CPU port only supports the **RM–NET** protocol**,** Position 1 of the master and all slaves linked to it must be set to the ON position in order to communicate.

Baud Rate: **RM–NET** protocol mode supports either 19.2K or 38.4K baud. In this mode, only switch Position 2 is used to set the baud rate. Be sure to set switches 3 and 4 OFF. All stations on a remote I/O link must have the same baud rate before the communications will operate properly.

Output Default: DIP switch Position 5 on the slave determines the outputs' response to a communications failure. If DIP switch 5 is ON, the outputs in that slave unit will hold their last state upon a communication error. If OFF, the outputs in that slave unit will turn off in response to an error. The setting does not have to be the same for all the slaves on an output channel.

The selection of the output default mode will depend on your application. You must consider the consequences of turning off all the devices in one or all slaves at the same time vs. letting the system run "steady state" while unresponsive to input changes. For example, a conveyor system would typically suffer no harm if the system were shut down all at once. In a way, it is the equivalent of an "E–STOP". On the other hand, for a continuous process such as waste water treatment, holding the last state would allow the current state of the process to continue until the operator can intervene manually .

WARNING: Selecting "HOLD LAST STATE" as the default mode means that outputs in the remote bases will not be under program control in the event of a communications failure. Consider the consequences to process operation carefully before selecting this mode.

Example Program Using Discrete I/O Modules

Example 1:
Using X and Y Addresses as the Remote I/O Memory Types

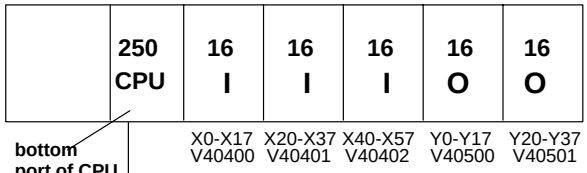
A typical system uses X and Y memory types for the inputs and outputs on the remote I/O channel.

To illustrate the setup program for this configuration, we will use the remote I/O system below, shown with the completed Channel Configuration Worksheet.

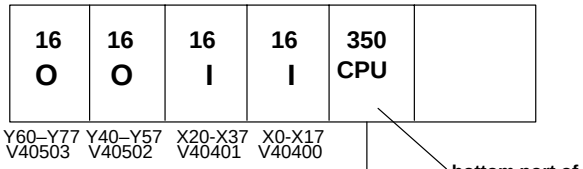
The first block of logic tells the CPU the station number of the port, communication V-memory address, and the baud rate setting. Define the constant value based on these selections (see DL250/DL350/DL450 Reserved Memory Table at the end of this chapter), and then write the value to the reserved V-memory address in the CPU. You can also perform this function interactively with ***Direct***SOFT (see "Configuring the Bottom Port of the CPU", earlier in this chapter).

Write Port Setup Word

DL250 CPU in Main Base



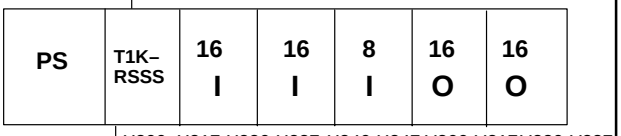
DL350 CPU in Main Base (–1 base addressing)



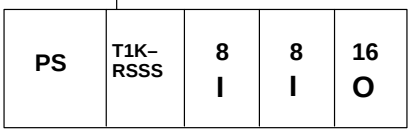
to thoroughly understand addressing conventions and restrictions for the DL350, refer to the DL305 User Manual

the setup program will be identical for either a DL250 or DL350 CPU

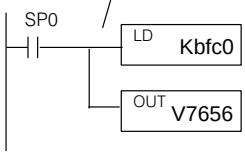
1st Remote



2nd Remote



The port setup ladder code is optional. The port can be setup using ***Direct***Soft



Constant defines station as master, V-memory table at V37700, and baud rate of 38.4 kBaud

V-memory address of setup word **OUT V777 for DL450**

See Port Setup Registers later in this chapter for more information

Channel Configuration Worksheet
DL250/DL350/DL450 CPU Bottom Port

Circle one selection or fill in blank for each parameter

Configuration Parameter	SELECTION
Baud Rate (in KBaud), determined by required distance to last slave	19.2 (38.4)
Remote I/O Configuration table Starting address	V 37700 (V37700 is default)

Slave Station	INPUT		OUTPUT	
	Input Address	No. of Inputs	Output Address	No. of Outputs
1	V40410	48	V40510	32
2	V40413	16	V40512	16
3				
4				
5				
6				
7				

To calculate the input and output addresses and ranges, complete the Remote Slave Worksheets and fill in the V-memory addresses *for each slave*, not just the first one. You can transfer this data to the Channel Configuration Worksheet to condense it, or fill in the Channel Worksheet directly if you choose not to use the Remote Slave Worksheets.

Calculate input and output addresses and ranges for each remote base

1st Remote

PS	T1K–RSSS	16 I	16 I	8 I	16 O	16 O
		X200–X217 V40410	X220-X237 V40411	X240-X247 V40412	Y200-Y217 V40510	Y220-Y237 V40511

2nd Remote

PS	T1K–RSSS	8 I	8 I	16 O
		X260–X267 V40413	X270–X277	Y240–Y257 V40512

Remote Slave Worksheet

Remote Base Address 1 **(Choose 1–7 for RM–NET or 1–31 for SM–NET)**

Slot Number	Module Name	INPUT		OUTPUT	
		Input Address	No. of Inputs	Output Address	No. of Outputs
0	16ND3	X200	16		
1	16ND3	X220	16		
2	08ND3	X240	16 (8 used)		
3	16TD1			Y200	16
4	16TD1			Y220	16
5					
6					
7					

Input Bit Start Address: X200 **V-Memory Address*:V** 40410
Total Input Points 48

Output Bit Start Address: Y200 **V-Memory Address*:V** 40510
Total Output Points 32

* The D2–RMSM automatically assigns I/O addresses in sequence based on Slave # 1's starting addresses. The DL250/DL350/DL450 CPU port setup program requires these addresses for each slave.

Channel Configuration Worksheet

DL250/DL350/DL450 CPU Bottom Port

Circle one selection or fill in blank for each parameter

Configuration Parameter	SELECTION
Baud Rate (in KBaud), determined by required distance to last slave	19.2 (38.4)
Remote I/O Configuration table Starting address	V **37700** (V37700 is def

Slave Station	INPUT		OUTPUT	
	Input Address	No. of Inputs	Output Address	No. of Outputs
1	**V40410**	**48**	**V40510**	**32**
2	**V40413**	**16**	**V40512**	**16**
3				
4				
5				
6				
7				

Remote Slave Worksheet

Remote Base Address 2 **(Choose 1–7 for RM–net or 1–31 for SM–NET)**

Slot Number	Module Name	INPUT		OUTPUT	
		Input Address	No. of Inputs	Output Address	No. of Outputs
0	08ND3	X260	8		
1	08ND3	X270	8		
2	16TD1			Y240	16
3					
4					
5					
6					
7					

Input Bit Start Address: X260 **V-Memory Address*:V** 40413
Total Input Points 16

Output Bit Start Address: Y240 **V-Memory Address*:V** 40512
Total Output Points 16

* The D2–RMSM automatically assigns I/O addresses in sequence based on Slave # 1's starting addresses. The DL250/DL350/DL450 CPU port setup program requires these addresses for each slave.

NOTE: Configuring remote I/O for the DL250, DL350 DL450 CPU port requires *both* the starting addresses and the number of input and output points for each slave. The starting addresses for each slave must be on a 16-point boundary. In this example, this means that X250–X257 in Slave # 1 are unused.

The second block of logic tells the CPU, *for each slave*, the starting V-memory addresses for the inputs and outputs, and the total number of each. The CPU has reserved memory locations, called pointers, that accomplish this task. Use the values from the Remote Slave Worksheets or the Channel Configuration Sheet and the pointer addresses from the DL250/DL350/DL450 Reserved Memory Table to complete this logic.

Write Input and Output Pointers and Ranges for each remote base

DL250/DL350/DL450 Reserved Memory Table

Port Setup Word				V7656
Setup Complete Flag				C740
Slave	Input Address	Number of Input Pts	Output Address	Number of Output Pts
1	V37704	V37705	V37706	V37707
2	V37710	V37711	V37712	V37713
3	V37714	V37715	V37716	V37717
4	V37720	V37721	V37722	V37723
5	V37724	V37725	V37726	V37727
6	V37730	V37731	V37732	V37733
7	V37734	V37735	V37736	V37737

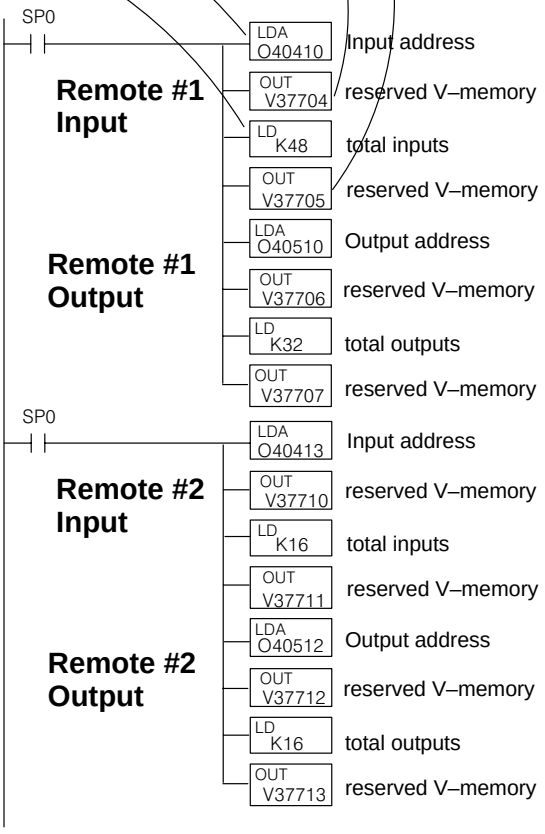
V777 for DL450

Channel Configuration Worksheet
DL250/DL350/DL450 CPU Bottom Port

Circle one selection or fill in blank for each parameter

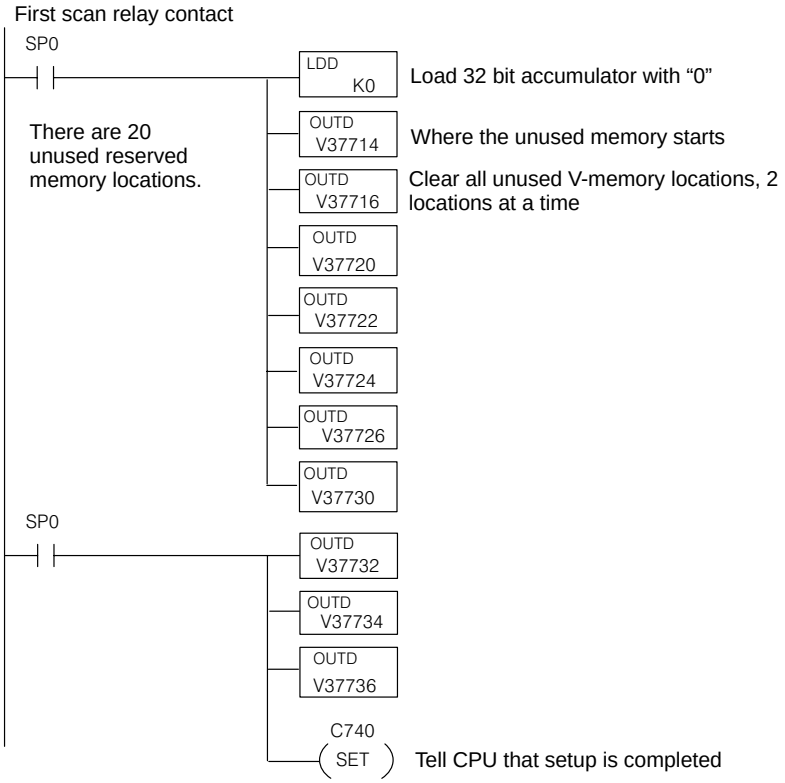
Configuration Parameter	SELECTION
Baud Rate (in KBaud), determined by required distance to last slave	19.2 (38.4)
Remote I/O Configuration table Starting address	V **37700** (V37700 is default)

Slave Station	INPUT		OUTPUT	
	Input Address	No. of Inputs	Output Address	No. of Outputs
1	**V40410**	**48**	**V40510**	**32**
2	**V40413**	**16**	**V40512**	**16**
3				
4				
5				
6				
7				

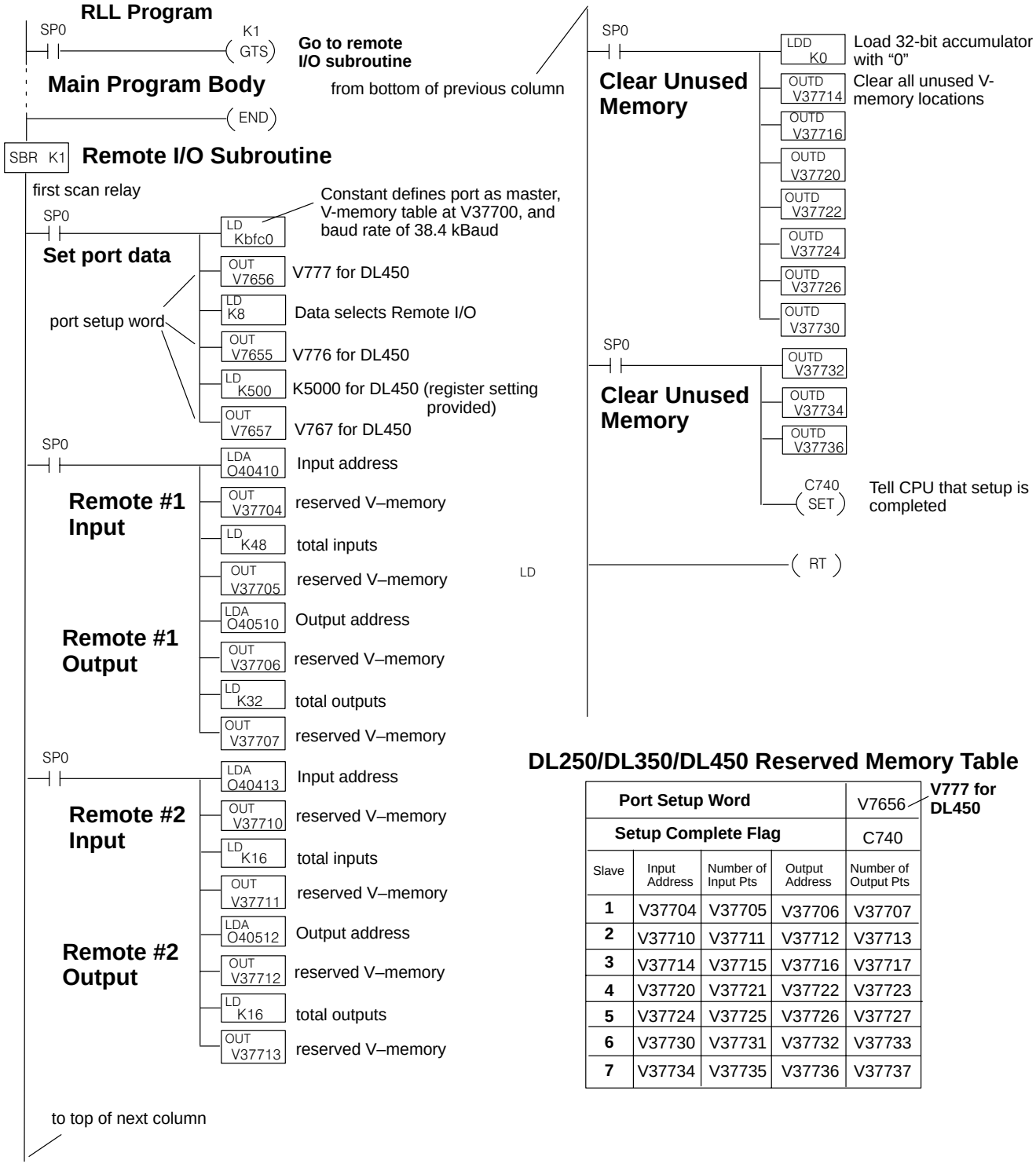


Once you have written all of the logic to map the starting addresses and point totals for each remote base, you have to zero out all of the reserved memory locations you are not going to use and then tell the CPU that you are finished with the setup. If you don't insert zeros in the unused areas, the CPU will assume that every pointer address V37714 through V37736 is pointing to a read or write start address. This could cause problems; you may have garbage in these locations. At the very least, it will take up unnecessary scan time.

The most efficient method for zeroing out the unused memory is to use LDD and OUTD instructions (load and store double) to clear two consecutive memory locations at a time. The following logic shows how to finish the setup program for this example.



Completed Setup Program for DL250/DL350/DL450 as Remote Master using X and Y Memory Addressing



DL250/DL350/DL450 Reserved Memory Table

Port Setup Word				V7656
Setup Complete Flag				C740
Slave	Input Address	Number of Input Pts	Output Address	Number of Output Pts
1	V37704	V37705	V37706	V37707
2	V37710	V37711	V37712	V37713
3	V37714	V37715	V37716	V37717
4	V37720	V37721	V37722	V37723
5	V37724	V37725	V37726	V37727
6	V37730	V37731	V37732	V37733
7	V37734	V37735	V37736	V37737

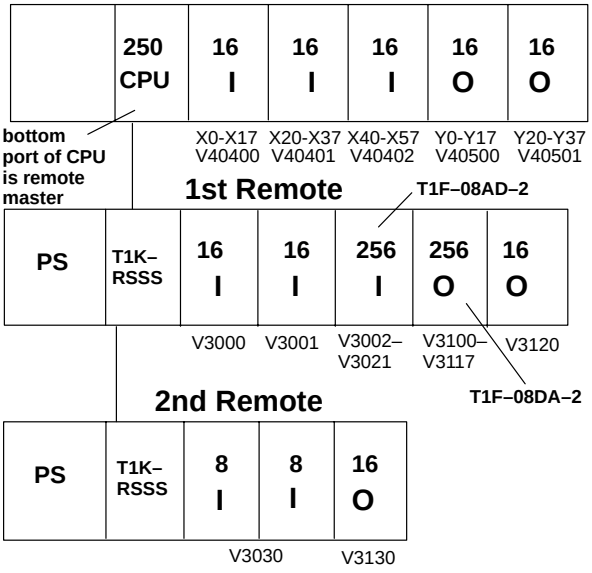
V777 for DL450

Example Program Using Analog I/O Modules

Example 2:
Using V Memory Addresses as the Remote I/O Memory Type

The following example uses Terminator discrete and analog I/O modules. **It is recommended to use V memory addressing when using analog modules since each analog I/O channel uses a double (two) word each.** Thus, an 8 channel analog I/O module uses 256 discrete points and a 16 channel analog I/O module uses 512 discrete points. **Analog output modules are configured using the Module Control Byte** located in the most significant byte of the most significant word of channel 1 of the module. **V memory addressing requires the use of "Bit–of–Word" instructions to address the I/O points.**

DL250 CPU in Main Base



Remote Slave Worksheet

Remote Slave Address 1 **(Choose 1–7 for RM–NET or 1–31 for SM–NET)**

Module Number	Module Name	INPUT		OUTPUT	
		Input Address	No. Inputs	Output Address	No.Outputs
0	16ND3	V3000	16		
1	16ND3	V3001	16		
2	08AD2	V3002	256		
3	08DA2			V3100	256
4	16TD1			V3120	16
5					
6					
7					

Input Bit Start Address: V3000.0 **V-Memory Address*:V** V3000
Total Input Points 288

Output Bit Start Address: V3100.0 **V-Memory Address*:V** V3100
Total Output Points 272

* The D2–RMSM automatically assigns I/O addresses in sequence based on Slave # 1's starting addresses. The DL250/DL350/DL450 CPU port setup program requires these addresses for each slave.

Channel Configuration Worksheet
DL250/DL350/DL450 CPU Bottom Port

Circle one selection or fill in blank for each parameter

Configuration Parameter	SELECTION
Baud Rate (in KBaud), determined by required distance to last slave	19.2 (38.4)
Remote I/O Configuration table Starting address	V **37700** (V37700 is default)

Slave Station	INPUT		OUTPUT	
	Input Address	No. of Inputs	Output Address	No. of Outputs
1	**V3000**	**288**	**V3100**	**272**
2	**V3030**	**16**	**V3130**	**16**
3				
4				
5				
6				
7				

Remote Slave Worksheet

ote Base Address 2 **(Choose 1–7 for RM–net or 1–31 for SM–NET)**

	Module Name	INPUT		OUTPUT	
		Input Address	No. Inputs	Output Address	No.Outputs
	08ND3	V3030	8		
	08ND3	V3030.10	8		
	16TD1			V3130	16

Bit Start Address: V3030.0 **V-Memory Address*:V** V3030
Total Input Points 16

Bit Start Address: V3130.0 **V-Memory Address*:V** V3130
Total Output Points 16

2–RMSM automatically assigns I/O addresses in sequence based on 1's starting addresses. The DL250/DL350/DL450 CPU port setup n requires these addresses for each slave.

This block of logic tells the CPU, *for each slave*, the starting V-memory addresses for the inputs and outputs, and the total number of each. Use the values from the Remote Slave Worksheets or Channel Configuration Worksheet and the pointer addresses from the DL250/DL350/DL450 Reserved Memory Table to complete the logic.

Write Input and Output Pointers and Ranges for each remote base

DL250/DL350DL450 Reserved Memory Table

Port Setup Word				V7656
Setup Complete Flag				C740
Slave	Input Address	Number of Input Pts	Output Address	Number of Output Pts
1	V37704	V37705	V37706	V37707
2	V37710	V37711	V37712	V37713
3	V37714	V37715	V37716	V37717
4	V37720	V37721	V37722	V37723
5	V37724	V37725	V37726	V37727
6	V37730	V37731	V37732	V37733
7	V37734	V37735	V37736	V37737

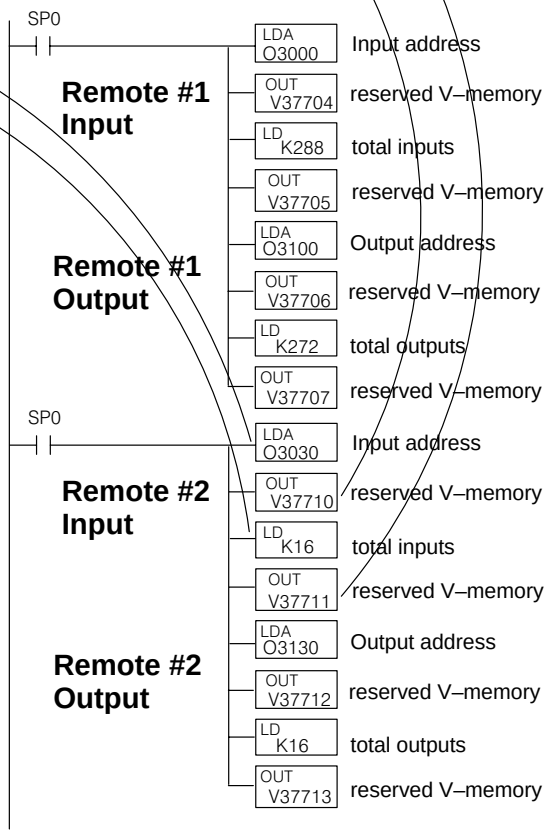
V777 for DL450

Channel Configuration Worksheet
DL250/DL350/DL450 CPU Bottom Port

Circle one selection or fill in blank for each parameter

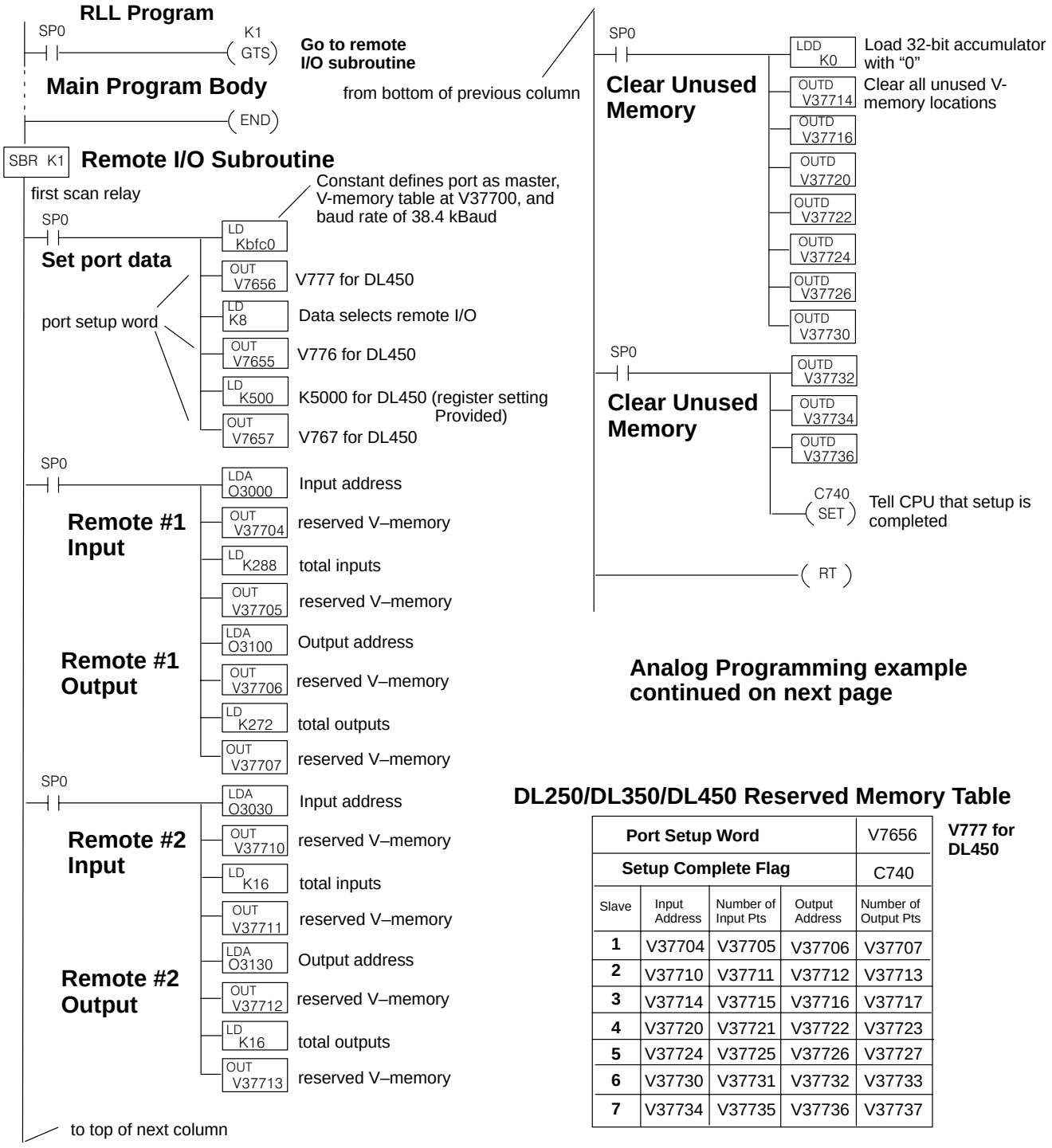
Configuration Parameter	SELECTION
Baud Rate (in KBaud), determined by required distance to last slave	19.2 (38.4)
Remote I/O Configuration table Starting address	V 37700 (V37700 is default)

Slave Station	INPUT		OUTPUT	
	Input Address	No. of Inputs	Output Address	No. of Outputs
1	V3000	288	V3100	272
2	V3030	16	V3130	16
3				
4				
5				
6				
7				



Since the rest of the logic is identical to Example 1, we will now show the completed setup program.

Completed Setup Program for DL250/DL350/DL450 as Remote Master using V Memory Addressing



Analog Programming example continued on next page

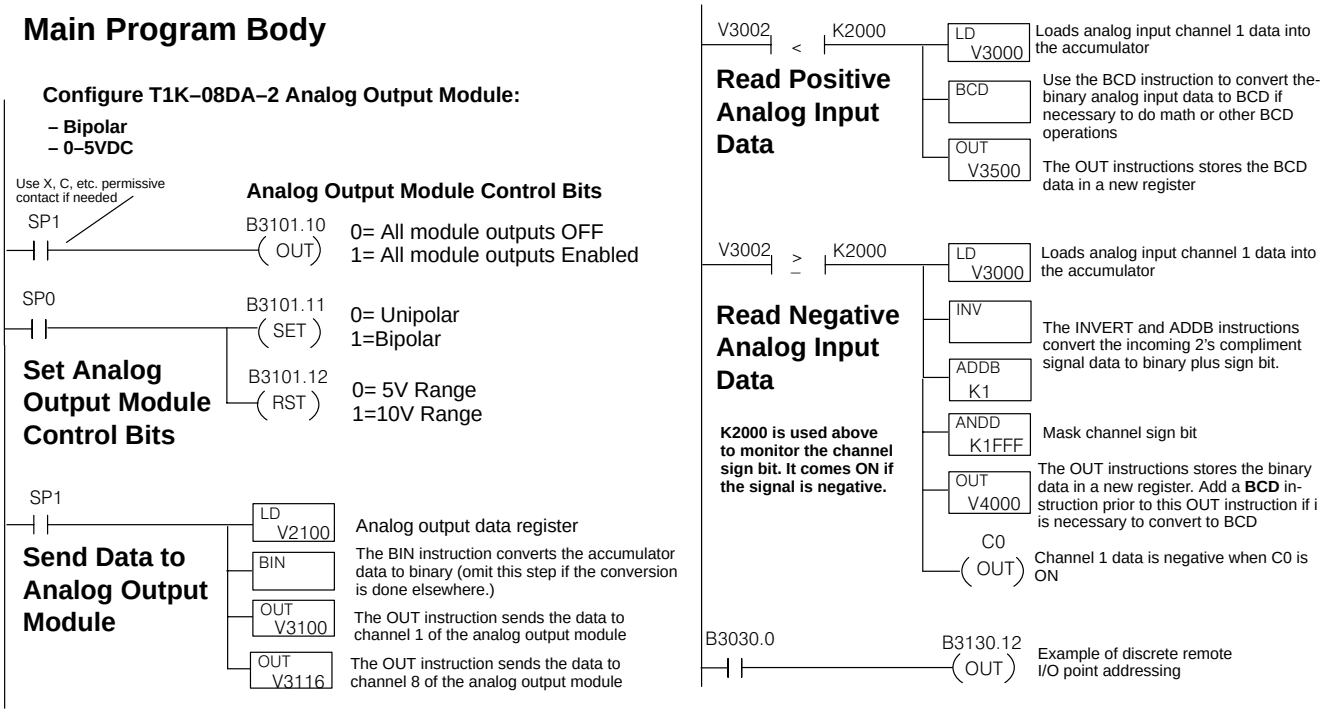
DL250/DL350/DL450 Reserved Memory Table

Port Setup Word				V7656
Setup Complete Flag				C740
Slave	Input Address	Number of Input Pts	Output Address	Number of Output Pts
1	V37704	V37705	V37706	V37707
2	V37710	V37711	V37712	V37713
3	V37714	V37715	V37716	V37717
4	V37720	V37721	V37722	V37723
5	V37724	V37725	V37726	V37727
6	V37730	V37731	V37732	V37733
7	V37734	V37735	V37736	V37737

V777 for DL450

Completed Setup Program for V–Memory Addressing (con't)

Main Program Body



The Control Bits of an Analog Output module are located in the most significant byte of the most significant word of the first output channel (channel 1).

Channel 1 Memory Map of 8&16-Channel Analog Output Module (T1F–08DA, T1F–016DA)									
Decimal Bit	07	06	05	04	03	02	01	00	Size
Octal Bit	07	06	05	04	03	02	01	00	
	Analog Value Channel 1								Write Byte 1
	Analog Value Channel 1								Write Byte 2
	not used								Write Byte 3
	Module Control Byte								Write Byte 4

Module Control Byte of 8&16-Channel Analog Output Module (T1F–08DA, T1F–16DA)									
Decimal Bit	31	30	29	28	27	26	25	24	Read/Write
Octal Bit	37	36	35	34	33	32	31	30	
Bit 24	**Outputs Enable** 0 = All outputs OFF 1 = All outputs Enabled								Write
Bit 25	**Unipolar / Bipolar** 0 = Unipolar selected 1 = Bipolar selected								Write
Bit 26	**5V / 10V Range** 0 = 5V range 1 = 10V range								Write
Bit 27	**0 – 20mA / 4–20mA Range** 0 = 0 – 20mA range 1 = 4 – 20mA range								Write
Bit 28 – 31	Reserved for system use								–

DL250/DL350/DL450 Reserved Memory for Bottom Port as Remote Master

This table provides a listing of the reserved memory addresses in the DL250/ DL350/DL450 CPU to program the pointer addresses and ranges for slaves attached to the bottom port of the CPU.

DL250/DL350/DL450 Reserved Memory Table

Port Setup Word				V7656 V777(DL450)
Setup Complete Flag				C740
Slave	Input Address	Number of Input Points	Output Address	Number of Output Points
Reserved	V37700	V37701	V37702	V37703
1	V37704	V37705	V37706	V37707
2	V37710	V37711	V37712	V37713
3	V37714	V37715	V37716	V37717
4	V37720	V37721	V37722	V37723
5	V37724	V37725	V37726	V37727
6	V37730	V37731	V37732	V37733
7	V37734	V37735	V37736	V37737

This table provides a listing of the control relay flags available for the setup and monitoring of remote I/O attached to the bottom port of the DL250, DL350 and DL450 CPU.

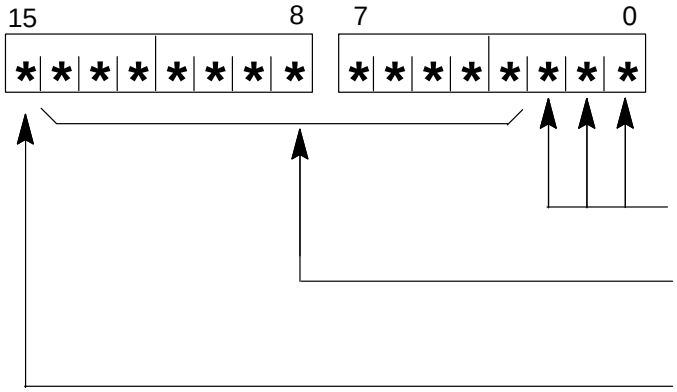
Control Relays Used For Remote I/O

FLAG ADDRESS	FUNCTION	DETAIL
C740	Setup Complete Flag	Set ON to command CPU to read and check parameters loaded into setup memory
C741	Communications Error Response Flag	This flag determines the CPU's response if there is a communications error. Set ON to hold last state of received inputs; set OFF to clear the status of the received inputs.

DL250/DL350/DL450 V Memory Port Setup Registers

When configuring the bottom port of the DL250, DL350 or DL450 CPU via ***Direct***Soft or the Handheld Programmer, you are actually loading a reserved V-memory adddresses with configuration data. The following diagrams define the meaning of the bits in the registers. The previous ladder logic examples include logic in the setup program to set these parameters so they are not lost or accidentally changed.

Remote I/O Communication Port Settings: DL250/DL350 (V7656); DL450 (V777)



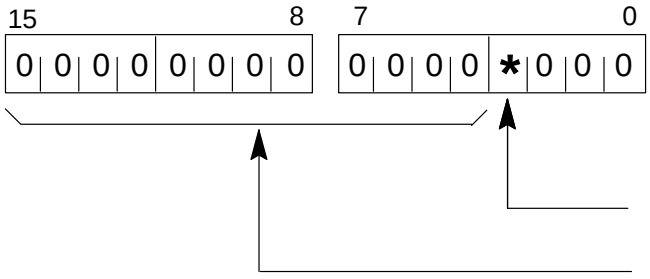
LD Kbfc0 = V37700 as starting address pointer,
OR 38.4k baud and address 0
LD K3fc0 = V37700 as starting address pointer,
19.2k baud and address 0
OUT V7656 (V777 for DL450)

Station number setting
0 = Master station number

Communication V–memory address
(hex equivalent of octal adddress)
default 37700 is starting address of pointer table

Communication baud rate setting
0 = 19.2 kBaud
1 = 38.4 kBaud

Port 2 Protocol Setup: DL250/DL350 (V7655)
Port 3 Protocol Setup: DL450 (V776)



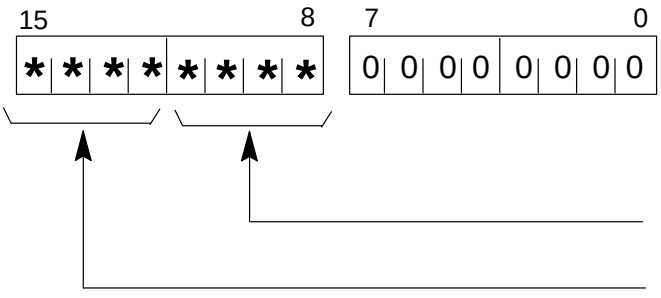
LD K8 = Remote I/O

OUT V7655 (V776 for DL450)

1 = Selects Remote

not used for Remote I/O

Register Set Code: DL250/DL350 (V7657); DL450 (V767)



DL250/DL350:

LD K500 = Port settings provided by user program
OUT V7656

DL450:

LD K5000 = Port settings provided by user program
OUT V767

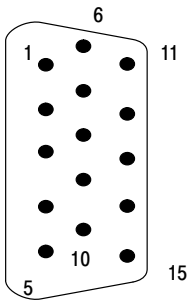
DL250/DL350 Port 2 register set code
0101(5) = register setting provided by user program

DL450 Port 2 register set code
0101(5) = register setting provided by user program

Connecting the Wiring

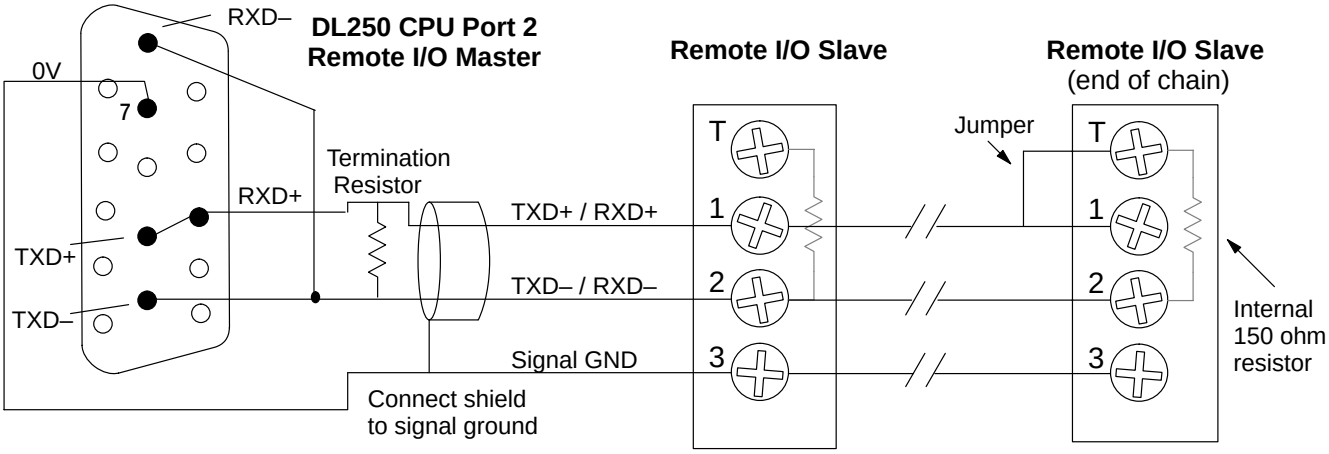
Cabling Between the D2–250 CPU Bottom Port and Slaves

The standard remote I/O link is a 3-wire, half-duplex type. Since Port 2 of the DL250 CPU is a 5-wire full duplex-capable port, we must jumper its transmit and receive lines together as shown below (converts it to 3-wire, half-duplex). The recommended cabling for connecting the master and slaves is the single twisted pair cable, Belden 9841 or equivalent. The diagram also depicts the port pinout for the D2–250 CPU bottom port.

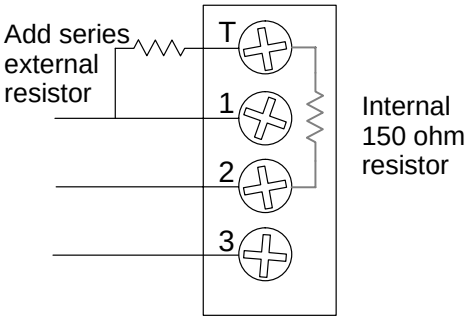


15-pin Female
D Connector

Port 2 Pin Descriptions (DL250 CPU)		
1	5V	5 VDC
2	TXD	Transmit Data (RS232C)
3	RXD	Receive Data (RS232C)
4	RTS	Ready to Send (RS–232C)
5	CTS	Clear to Send (RS–232C)
6	RXD2–	Receive Data – (RS–422)
7	0V	Logic Ground
8	0V	Logic Ground
9	TXD2+	Transmit Data + (RS–422)
10	TXD2 –	Transmit Data – (RS–422)
11	RTS2 +	Request to Send + (RS–422)
12	RTS2 –	Request to Send – (RS–422)
13	RXD2 +	Receive Data + (RS–422)
14	CTS2 +	Clear to Send + (RS422)
15	CTS2 –	Clear to Send – (RS–422)



The twisted/shielded pair connects to the DL250's Port 2 as shown. Be sure to connect the cable shield wire to the signal ground connection. A termination resistor must be added externally to the CPU, as close as possible to the connector pins. Its purpose is to minimize electrical reflections that occur over long cables. Be sure to add the jumper at the last slave to connect the required internal termination resistor. **Ideally, the two termination resistors at the cable's opposite ends and the cable's rated impedance will all three match**. For cable impedances greater than 150 ohms, add a series resistor at the last slave as shown to the right. If less than 150 ohms, parallel a matching resistance across the slave's pins 1 and 2 instead.

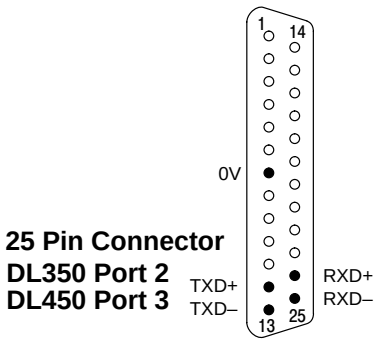


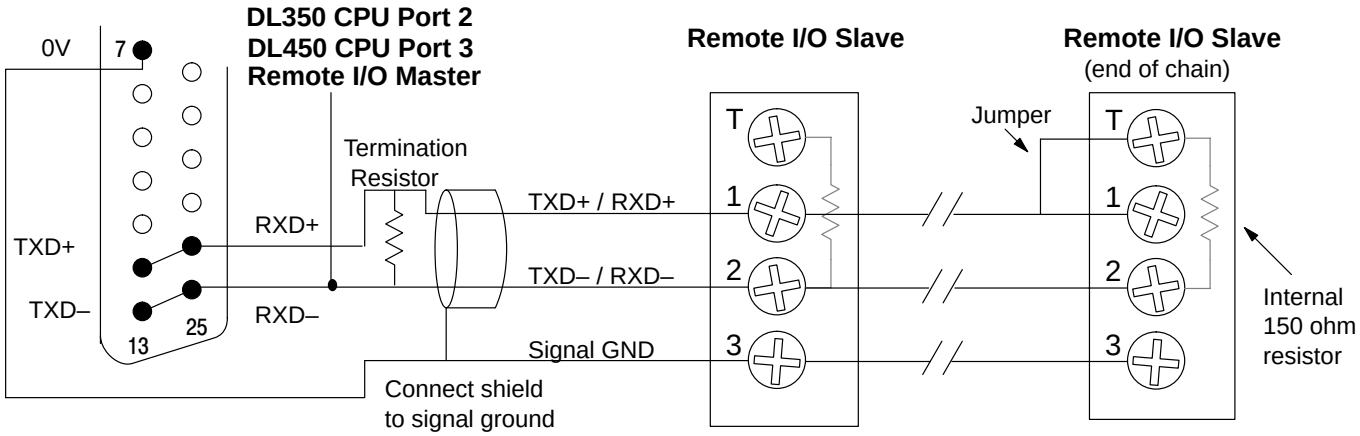
Cabling Between the D3–350/D4–450 CPU Bottom Port and Slaves

The remote I/O link is a 3-wire, half-duplex type. Since Port 2 of the DL350 and Port 3 of the DL450 CPU is a 5-wire full duplex-capable port, we must jumper its transmit and receive lines together as shown below (converts it to 3-wire, half-duplex). The recommended cabling for connecting the master and slaves is the single twisted pair cable, Belden 9841 or equivalent. The diagram depicts the port pinout for the D3–350 and D4–450 CPU bottom port.

The location of Port 2 on the DL350 is on the 25-pin connector , as pictured to the right. The location of Port 3 on the DL450 is on the 25–pin connector, which is also shared by Port 1.

- Pin 7 Signal GND
- Pin 12 TXD+
- Pin 13 TXD–
- Pin 24 RXD+
- Pin 25 RXD–

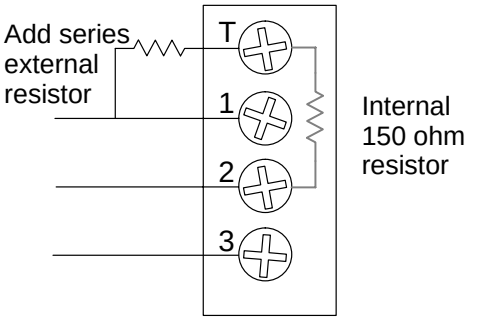




The twisted/shielded pair connects to the DL350/DL450's Port as shown. Be sure to connect the cable shield wire to the signal ground connection. A termination resistor must be added externally to the CPU, as close as possible to the connector pins. Its purpose is to minimize electrical reflections that occur over long cables. Be sure to add the jumper at the last slave to connect the required internal termination resistor.

Ideally, the two termination resistors at the cable's opposite ends and the cable's rated impedance will all three match. For cable impedances greater than 150 ohms, add a series resistor at the last slave as shown to the right. If less than 150 ohms, parallel a matching resistance across the slave's pins 1 and 2 instead.

Remember to size the termination resistor at Port 2 (Port 3 DL450) to match the cable's rated impedance. *The resistance values should be between 100 and 500 ohms.*



Special CPU Memory for Diagnostics

This table provides a listing of the control relay flags available in the DL250/DL350/DL450 for remote I/O troubleshooting.

Remote I/O System Control Relays

FLAG ADDRESS	FUNCTION
C750 to C757	Setup Error– The corresponding relay will be ON if the setup table contains an error (C750 =master, C751 = slave 1.....C757 = slave 7)
C760 to C767	Communications Ready – – The corresponding relay will be ON if the setup table is valid (C760 =master, C751 = slave 1.....C767 = slave 7)