

System Functions

In This Appendix...

System Functions	В-2
Write All Registers (IBoxes)	В-З
Write All Registers (DL-PLC)	B-4
Write One Register (IBoxes)	B-5
Write One Register (DL-PLC)	В-б
Read All Registers (IBoxes)	В-7
Read All Registers (DL-PLC)	В-8
Read One Register (IBoxes)	В-9
Read One Register (DL-PLC)	В-10
Read Error Code (IBoxes)	В-11
Read Error Code (DL-PLC)	В-12
System Functions Examples Overview	В-13
Single Channel Simulating Retentive Quad Counter	В-14
Dual Channel Simulating Retentive Quad Counters	В-17
Reading CTRIO Internal Registers	В-20

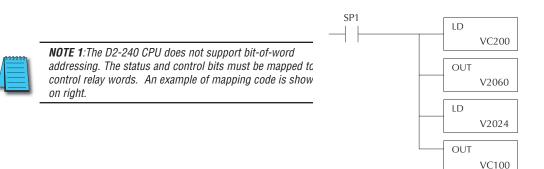
System Functions

System Functions Commands are primarily used to read from and write to the CTRIO(2) module's internal registers.

The CTRIO(2) module's internal current count register can be read from or written \checkmark Win to if the input is configured for a Counter or Quadrature Counter. Timer values \checkmark NI are not accessible.

The CTRIO(2) module's internal current output pulse count can be read from or written to only if the pulse output is running Dynamic Velocity or Dynamic Positioning profiles.

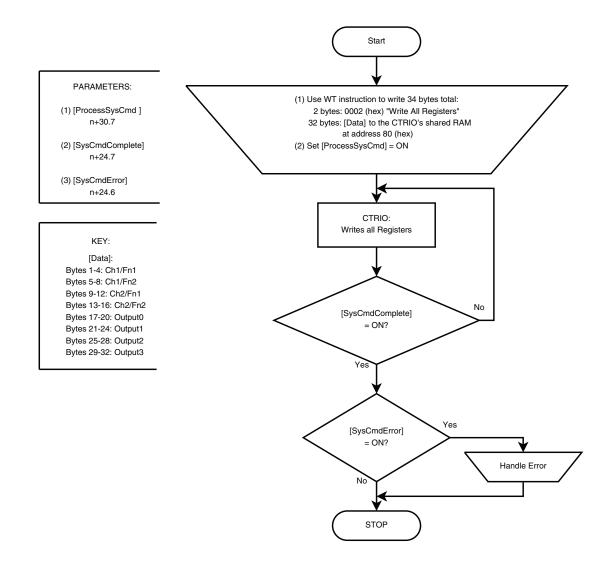
Steps	Name	PLC Control Outputs Base Addr = V2030 (Bit-of-Word)	Addr = V2000	PLC Control Outputs Base Addr = V2030 (Control Relay) D2-240	PLC Status Inputs Base Addr = V2000 (Control Relay) D2-240	Action
1	Command Code	User Specified to use with RD/WT Instruction		User Specified to use with RD/WT Instruction		1 Hex: Read All Registers 2 Hex: Write All Registers 4 Hex: Write One Register 5 Hex: Write Reset Value
2	System Command Error		V2024.6		C106	ON if Command or Parameters are invalid
3	System Command Complete		V2024.7		C107	When ON, command has been accepted, clear Process Command bit
6	Process Command	V2060.7		C207		Turn ON Command Complete status bit is returned



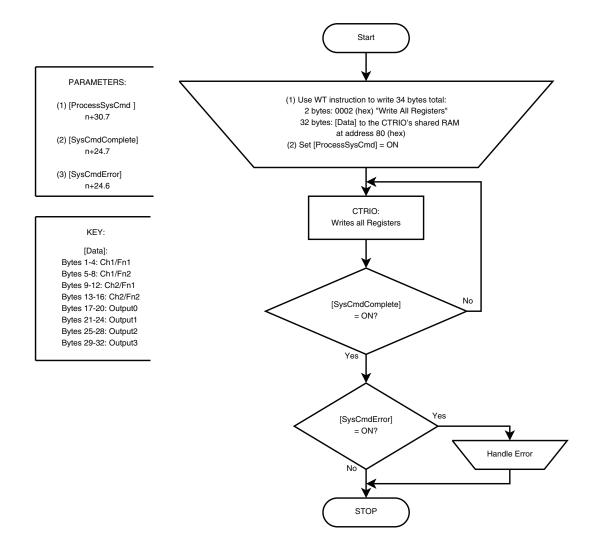


NOTE 2: For example, **Direct**SOFT uses B2020.1 in the ladder code to indicate that you are addressing the second bit of V-memory register V2020. The "B" prefix indicates bit-of-word addressing.

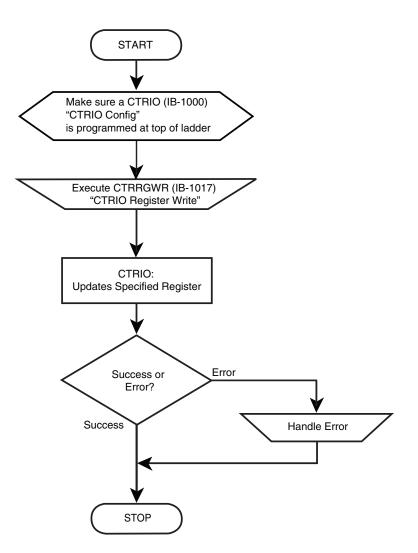
Write All Registers (IBoxes)



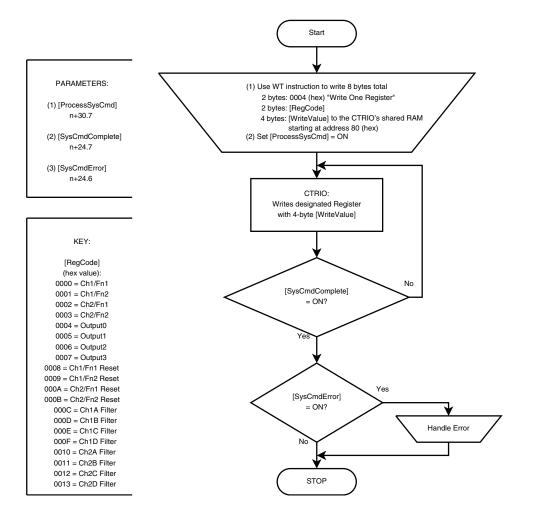
Write All Registers (DL-PLC)



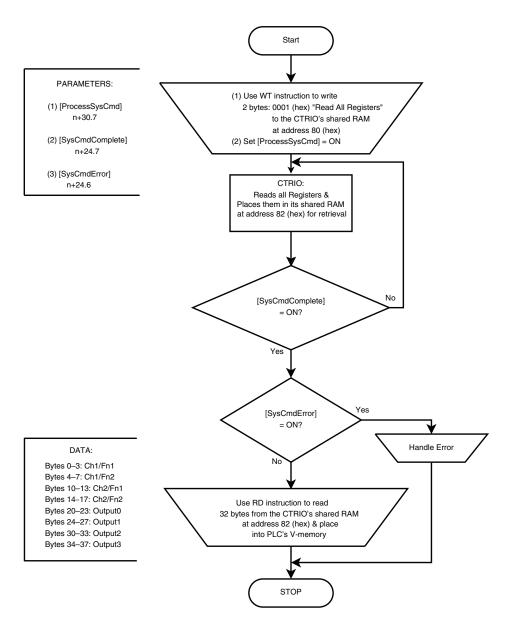
Write One Register (IBoxes)



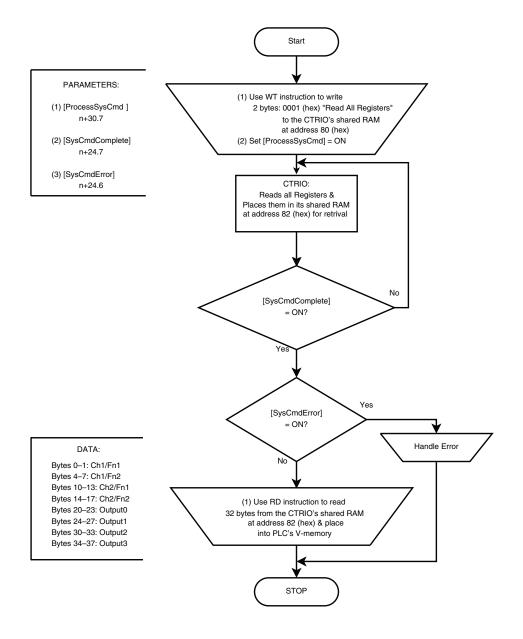
Write One Register (DL-PLC)



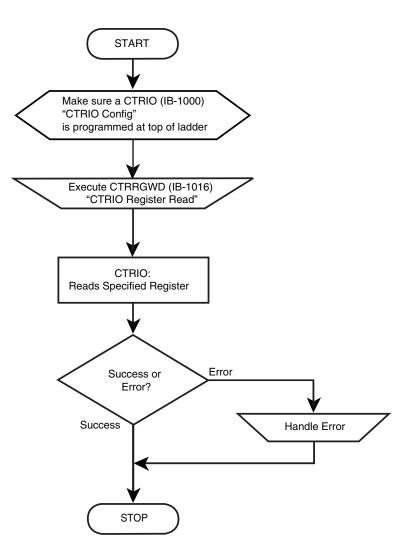
Read All Registers (IBoxes)



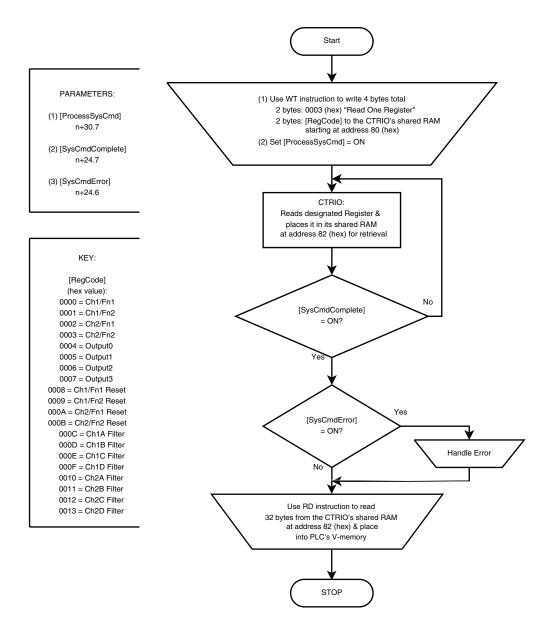
Read All Registers (DL-PLC)



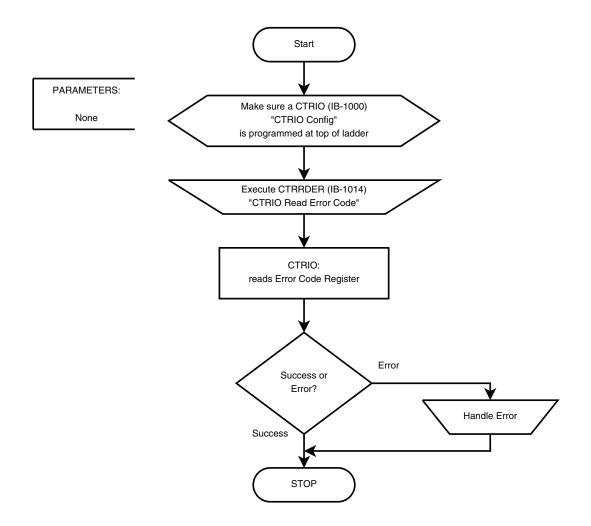
Read One Register (IBoxes)



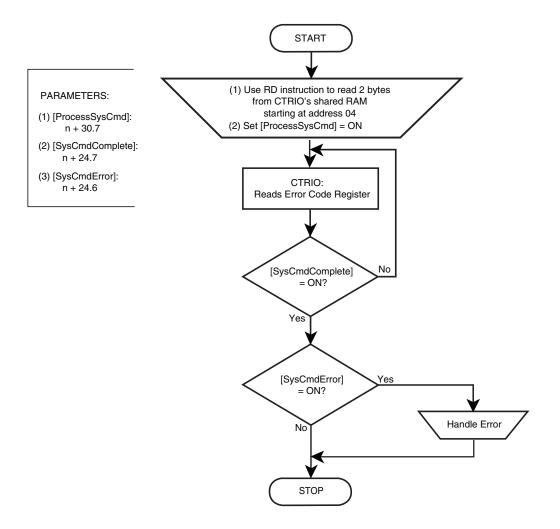
Read One Register (DL-PLC)



Read Error Code (IBoxes)



Read Error Code (DL-PLC)



System Functions Examples Overview



NOTE: System Functions are supported only when the CTRIO module is installed in the same base as the DirectLOGIC CPU.

The Systems Functions examples on the following pages use the *Direct*LOGIC Write to Intelligent Module (WT) and/or Read from Intelligent Module (RD) instructions to write to or read from the CTRIO's internal registers.

Reading From CTRIO Internal Memory

Reading the CTRIO's internal memory consists of several steps. Step one is using the WT instruction to send a Systems Function's command to the CTRIO telling it to put its internal register values into the CTRIO's "shared RAM". Step two is processing the request for the internal register values using the Process Command bit. Step three is using the RD instruction to read the values from the CTRIO's "shared RAM" memory into PLC V-memory.

Steps 1 and 2: WT instruction and Process Command PLC V-memory ==> CTRIO's Shared RAM CTRIO's Shared RAM ==> Process Command to internal processor CTRIO's Shared RAM <== Internal data values

Step 3: RD instruction PLC V-memory <== CTRIO's Shared RAM

Writing to CTRIO Internal Memory

Writing to the CTRIO's internal registers is basically a two step process. Step one is using the WT instruction to send a System Function command and the desired data values to the CTRIO's "Shared RAM". Step two is using the Process Command bit to tell the CTRIO to process the command and data values that are in the CTRIO's Shared RAM. This moves the data values from the Shared RAM into the CTRIO's internal registers.

Steps 1 and 2: WT instruction (command and data) and Process Command Bit: PLC V-memory ==> CTRIO Shared RAM CTRIO Shared RAM ==> Process Command to internal processor CTRIO Shared RAM ==> internal data registers



NOTE: This function is not available when the CTRIO module is installed in an EBC expansion base.

Single Channel Simulating Retentive Quad Counter

This example program will simulate a retentive count register in the CTRIO. It will store the current count from the CTRIO in the PLC's retentive memory, then on a powerup, it will write the stored count back into the CTRIOs current count register.

The example assumes the use of standard I/O mapping based off V2000 for Inputs, and V2030 for Outputs. Adjust according to your CTRIO Config I/O map.

V2100-2103 is just an address range, it can be altered by the user if desired. But all the associated addresses in the locations need to be altered to match.

The raw count from the CTRIO is part of the standard published I/O data from the CTRIO. In this case the scaled value is a DWORD at V2000, the raw count is a DWORD at V2002.

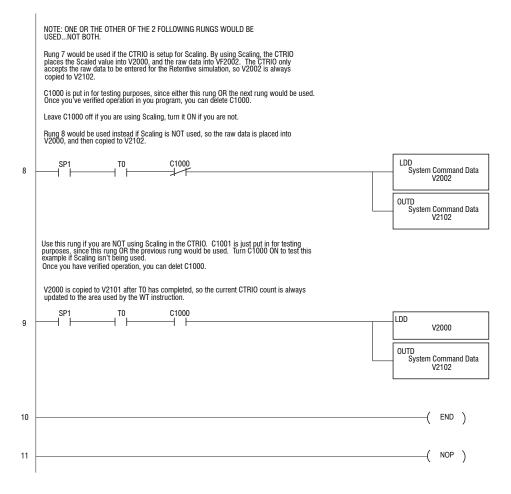
The CTRIO only accepts the raw count as the retentive value. On every scan after T0 completes, the raw count at V2002 is copied to V2102. (V2000 needs to be copied if Scaling is not used; see last rungs).

Example RLL for Single Channel Simulation of Retentive Quad Counter

	RLL continued on next page	OUT System Command Resource V2101
		 LD KO
		 V2100
		OUT User selected address that will contain the System Command Data "4"
3	SP0	LD K4
	V2102 & V2103 already contain the data to be written (copied from the CTRIO location by the last rung).	
	V2101 is the destination register, in our example it's 0.	
	V2100 is the command code. We'll be using command code 04 (Write One Register).	
	V2100 through V2103 are set as retentive in the PLC. This set of V-memory locations are used to perform the write-back to the CTRIO. All common V-memory locations are set by default as Retentive, but it won't hurt to check.	
2		(NOP)
	0 = Ch1/Fn1 (Ch 1 Quad Counter or Ch1A Counter) 1 = Ch1/Fn2 (Ch 1B Counter - only available if Ch1 is NOT a Quad Counter)	
	The following info relates to the value in the second LD box in the rung below. Verify your CTRIO Config I/O to see how you have the inputs configured.	
1		 (NOP)
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	A WT command is use to write the data to the CTRIO. Details are in Chapter 5 for WT setup. CTRIO is in Slot 2, so the first LD loads a constant of slot 3 would be K3, etc.	
	A total of 8 bytes (4 byte command at V2100 7 V2101, 4 byte value at V2102 & V2103). So the second LD loads a constant of 8.	
	Offset 80 (hex) is the beginning of the command frame in the module's shared RAM. So the third LD loads a constant of 80.	
	The offset of 80 hex is specific to the CTRIO, just use that value.	
	The WT uses the K8 and loads 8 bytes of data from V2100 to the CTRIO.	
	SPO	
4		LD K2
		LD
		K8
		LD
		K80
		WT User selected address that will contain the SysCmdCod value of "4"
		V2100
	In PGM-to-RUN situations, this timer allows the CTRIO enough time to initialize before you ask it to restore the current count register.	
	In power up situations, this timer isn't necessary as the CTRIO will be initialized before the CPU gets to RUN mode.	
5	SP1E/F	TMBF
Ŭ		то К5
	What you did on rung 5 was to write a command to the CTRIO. Now turning on the ProcessSysCmd bit will cause the CTRIO to perform the command you just entered.	
		Process System
6	то Г	Command B2060.7 (SET)
0		
	Once you get the feedback bits for SysCommandError and SysCommandComplete, you can reset the ProcessSysCmd bit.	
	System Command System Command Error Complete	Process System Command
7	B2024.6 B2024.7	B2060.7 (RST)

RLL continued on next page



Dual Channel Simulating Retentive Quad Counters

This example program will simulate a retentive count register in the CTRIO for both channels. It will store the current count from the CTRIO in the PLC's retentive memory, then on a powerup, it will write the stored count back into the CTRIOs current count register.

The example assumes the use of standard I/O mapping based off V2000 for Inputs, and V2030 for Outputs. Adjust according to your CTRIO Config I/O map.

V2100-2120 is just an address range, it can be altered by the user if desired. But all the associated addresses in the locations need to be altered to match.

The raw count from the CTRIO is part of the standard published I/O data from the CTRIO. In this case the scaled value is a DWORD at V2000, the raw count is a DWORD at V2002.

The CTRIO only accepts the raw count as the retentive value. On every scan after T0 completes, the raw count at V2002 is copied to V2101. (V2000 needs to be copied if Scaling is not used... see last rungs).

Example RLL for Dual Channel Simulating a Retentive Quad Counter

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RLL continued on following page

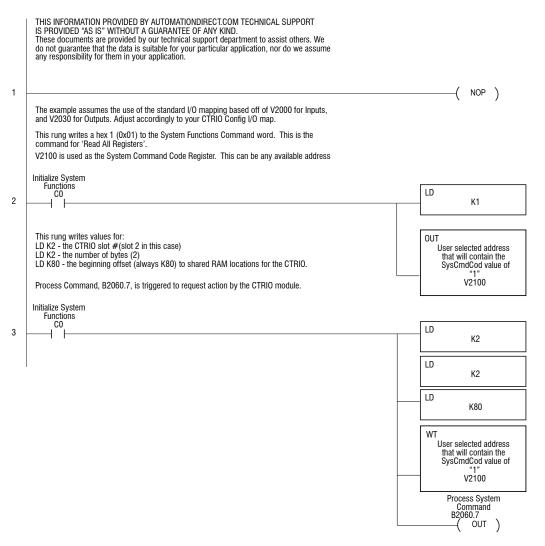
NOP) 2 This section below is setup to make BOTH quadrature channels of the CTRIO be retentive on power cycle. Mapping for the CTRIO needs to start at V2000 for the inputs and V2030 for the outputs. CTRIOs can only be made retentive if they are located in the local base with the CPU. This first rung writes a hex 2 to the command word, This is the command for 'write all'. SPO LD 3 K2 OUT User selected address that will contain the SysCmdCod value of "2" V2100 This rung writes values for: LD K2 - the CTRIO slot # (slot 2 in this case) LD K34 - the number of bytes (34) LD K80 -the beginning offset (always k80) to shared RAM locations for the CTRIO. V2100-V2120 range is changeable, just make sure to change ALL the references that are contained in this range. Using "Replace" feature of DirectSoft is recommended. In lower rungs, the current CTRIO counts are copied to the V2100 range, so they can be retrieved after power-up or PGM>Run transition. SPO LD 4 K2 ID K34 ID K80 WT User selected address that will contain the SysCmdCod value of "2" V2100 In PGM-to-RUN situations, this timer allows the CTRIO enough time to initialize before you ask it to restore the current count register. In power up situations, this timer isn't necessary as the CTRIO will be initialized before the CPU gets to RUN mode. SP1 E/R TMRF 5 Τ0 K5 **RLL** continued on following page

What you did on rung 5 was to write a command to the CTRIO. Now turning on the ProcessSysCmd bit will cause the CTRIO to perform the command you just entered. Process System Command B2060.7 то - Г SET) 6 Once you get the feedback bits for SysCommandError and SysCommandComplete, you can reset the ProcessSysCmd bit. System Command System Command Process System Error B2024.6 Complete B2024.7 Command B2060.7 RST) 7 11 -H After 0.18 seconds, the comparative contact will go True, and the values from Ch1 and Ch2 of the CTRIO will be copied to V2101 and V2105 constantly. This is what provides the Retained data for this entire procedure. Note this rung assumes the CTRIO is using Scaling, which puts the raw counts into V2002 and V2012. If your setup does NOT use Scaling, then change V2002 to V2000 and V2012 to V2010. The CTRIO places raw counts into V2000 and V2010 if Scaling isn't used, and raw counts are what must be sent to the CTRIO for the Retentive action to work. LDD TA0 K18 8 Current Raw Count 1≥⊦ V2002 OUTD System Command Data "Ch1Fn1" V2101 LDD Channel 2 count V2012 OUTD System Command Data "Ch2Fn1" V2105 END) 9 NOP) 10

Reading CTRIO Internal Registers

The following Systems Functions example uses the Write to Intelligent Module (WT) and Read from Intelligent Module (RD) instructions to read all of the CTRIO's internal registers every 900ms and place the data starting at V2200.

Example RLL for Reading CTRIO Internal Registers



RLL continued on next page

	ored in a block of memory starting at V2	2200.	
nitialize System Functions	System Command Error	System Command Complete	
C0	B2024.6	B2024.7	LD K2
			LD K32
			LD
			K82
			V2200
			Initialize Systen Functions C0 (RST
This self-running timer	, T0, controls how often the internal regi	sters are Read (RD) from	
he CTRIO.	TO, controls how often the internal regine sequence every 900ms.	sters are Read (RD) from	
he CTRIO.	, , , , , , , , , , , , , , , , , , ,	. /	<u>E/R</u> TMR TO
he CTRIO. This timer will trigger tl TO	ne sequence every 900ms.	. /	
he CTRIO. This timer will trigger th	ne sequence every 900ms.	. /	TO K9 Initialize System
the CTRIO.	re sequence every 900ms.		<u>сы.</u> К9