

INTRODUCTION TO THE CTRIO MODULE



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CTRIO Version 2 and Workbench Version 2 New Features

Below is a list of the new features that were added to H0/H2/H4/T1H-CTRIO and Workbench version 2. **Module firmware version 2 requires CTRIO Workbench version 2 for proper configuration.** Firmware versions and CTRIO Workbench can be downloaded from www.automationdirect.com.

CTRIO version 2 / Workbench version 2 new features:

1. added H0-CTRIO, H4-CTRIO and T1H-CTRIO support.
2. added 5 user configurable Home Search Profiles.
3. added I/O mapping details for all PLC/Controller interface modules.
4. status of CTRIO onboard outputs are now part of the I/O map.
5. added System Functions (to Monitor I/O and through I/O map) that allow you to read and write to the CTRIOs internal registers. Doing this **expanded the I/O map by 32 input bits and 32 output bits**. This gives you the ability to write a stored value into the current count register to simulate retentive counts memory. It also gives you the ability to read the current pulse count. You can also change the 'reset to' value without reconfiguring the CTRIO.
6. added Dynamic Velocity profile, similar to straight velocity but adds accel/decel between velocity changes and determines direction from the input velocity value.
7. added offline configuration options for all CPU/Controllers.
8. can configure the CTRIO outputs as Raw (simple discrete outputs).
9. added Timeout feature for Timer Functions and Suspend Output feature for pulse outputs.

Expanded I/O Map Implications

DL205 DirectLogic Users (Does not apply to DL05/405 and Terminator I/O Users)

If you have a H2-CTRIO configuration created in version 1 with the outputs mapped immediately following the inputs, you will need to adjust the V-memory assignments in your PLC program if you intend to use CTRIO/Workbench version 2.

For example, if your existing CTRIO map uses V2000-V2023 for inputs and V2024-V2053 for outputs, you will need to adjust the output V-memory starting address by 32 bits to make room for the additional input memory usage (V2000-V2025 for the inputs and V2026-V2057 for the outputs). Also, if you are presently using any of the four V-memory locations immediately following the output memory map (V2053-V2057), those V-memory locations will also be adjusted due to the expanded I/O memory usage.

H2-PBC Users

The H2-PBC requires an updated .GSD file for use with Workbench version 2. This can be downloaded from www.automationdirect.com.

H2-WinPLC, H2/H4-EBC, T1K-DEVNETS, T1K-MODBUS and T1H-PBC Users

These controllers are not impacted by the expanded I/O map in version 2.

Using CTRIO/Workbench Version 1

If you prefer to continue using CTRIO version 1 and Workbench version 1, you will need to use the “update Firmware” function within Workbench to load version 1.0.1 firmware into the CTRIO module. Version 2 features will not be accessible when using version 1 firmware.

CTRIO Module Overview

The H0-CTRIO, H2-CTRIO, H4-CTRIO and T1H-CTRIO Counter I/O (CTRIO) modules are designed to accept high-speed pulse-type input signals for counting or timing applications and designed to provide high-speed pulse-type output signals for servo/stepper motor control, monitoring, alarm or other discrete control functions.

All CTRIO modules offer great flexibility for applications which call for precise counting or timing, based on input events or for high speed control output applications. The CTRIO can be used for applications that call for a combination of both high-speed input and high-speed output control functions.

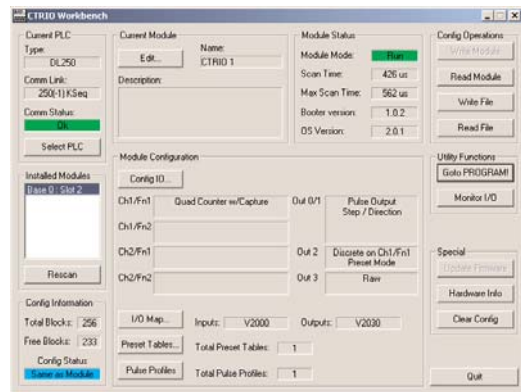


For ease of documentation purposes, CTRIO will be used to designate all four CTRIO modules (H0-CTRIO, H2-CTRIO, H4-CTRIO and T1H-CTRIO) when the functionality and/or description applies to all four modules.

The CTRIO module has its own microprocessor and operates asynchronously with respect to the CPU. The response time of on-board outputs is based on the module's scan time, not the CPU's scan time.

CTRIO Workbench

All module configuration is done via a software utility, eliminating the need for ladder programming to configure the module. The software utility is called CTRIO Workbench.



CTRIO Functions

The CTRIO module supports five primary input functions: Counter, Quad Counter, Pulse Catch, Edge Timer, and Dual Edge Timer.

Three secondary input functions are also supported. These functions, Reset, Capture, and Inhibit, each modify the primary input functions in some way. Information is available about each of the primary and secondary functions in chapter 4.

The CTRIO module supports three primary output functions: Pulse train output for servo/stepper motor control, configurable for CW/CCW or step and direction, discrete output functions assigned to Counter/Timer input functions, and raw output control directly from the CPU interface program. Information is available about each of the output functions in chapter 5.

Typical Counter Applications:

- High-speed cut to length operations using encoder input
- Pick-and-place or indexing functions controlling a stepper drive
- Dynamic registration for web material control
- Accurate frequency counting for speed control with onboard scaling
- positioning (e.g. flying punch)
- PLS - programmable limit switch functions for packaging, gluing or labeling
- stepper motor drive control
- valve control
- rate monitoring for speed and/or flow

Support Systems for the CTRIO Modules

The CTRIO modules are compatible with several CPU-slot interfaces. Consideration must be given to the firmware versions of the CPU-slot interfaces to assure their compatibility with the CTRIO. (See Chapter 2 for CPU/CTRIO compatibility listings). Multiple CTRIO modules can reside in the same base provided that the backplane power budget is adequate.

Support Systems for the H0-CTRIO:

You can use the H0-CTRIO module in:

- *DirectLogic* 05/06 PLC systems

Support Systems for the H2-CTRIO:

You can use the H2-CTRIO module in:

- *DirectLogic* 205 PLC systems (D2-240, D2-250-1 or D2-260)
- DL205 WinPLC systems (H2-WPLCx-xx)
- PC-based control strategies using the H2-EBC interface module
- Hx-ERM networks using the H2-EBC interface module
- Profibus systems using the H2-PBC slave interface module

Support Systems for the H4-CTRIO:

You can use the H4-CTRIO module in:

- *DirectLogic* 405 PLC systems (D4-450 only)
- PC-based control strategies using the H4-EBC interface module
- Hx-ERM networks using the H4-EBC interface module

Support Systems for the T1H-CTRIO:

You can use the T1H-CTRIO module in:

- PC-based control strategies using the T1H-EBC interface module
- Profibus systems using the T1H-PBC slave interface module
- Hx-ERM networks using the T1H-EBC interface module
- Modbus systems using the T1K-MODBUS slave interface module
- DeviceNet systems using the T1K-DEVNETS slave interface module

CTRIO Specifications

General	
Module Type	Intelligent
Modules Per Base	Limited only by power consumption
I/O Points Used	None, I/O map directly in PLC V-memory or PC control access
Field Wiring Connector	Standard removable terminal block
Internal Power Consumption	400mA Max at +5V from Base Power Supply (H2, H4, T1H-CTRIO) 250mA at +5V from Base Power Supply (H0-CTRIO) (All I/O in ON State at Max Voltage/Current)
Operating Environment	32°F to 140°F (0°C to 60°C), Humidity (non-condensing) 5% to 95%
Manufacturer	Host Automation Products, LLC
Isolation	2500V I/O to Logic, 1000V among Input Channels and All Outputs

CTRIO Input Specifications	
Inputs (H2, H4, T1H-CTRIO)	8 pts. sink/source 100K Hz Max
Inputs (H0-CTRIO)	4 pts. sink/source 100K Hz Max
Minimum Pulse Width	5 μ sec
Input Voltage Range	9-30VDC
Maximum Voltage	30VDC
Input Voltage Protection	Zener Clamped at 33VDC
Rated Input Current	8mA typical 12mA maximum
Minimum ON Voltage	9.0VDC
Maximum OFF Voltage	2.0VDC
Minimum ON Current	5.0mA (9VDC required to guarantee ON state)
Maximum OFF Current	2.0mA
OFF to ON Response	Less than 3 μ sec
ON to OFF Response	Less than 3 μ sec

CTRIO Input Resources	
Counter/Timer (H2, H4, T1H-CTRIO)	4, (2 per each 4 input channel group); supports 2 quadrature counters max.
Counter/Timer (H0-CTRIO)	2, (2 per single 4 input channel); supports 1 quadrature counter max.
Resource Options	1X, 2X, or 4X Quadrature, Up or Down Counter, Edge Timer, Dual Edge Timer, Input Pulse Catch, Reset, Inhibit, Capture
Timer Range/ Resolution	\pm 4.2 billion (32 bits); 1 μ sec
Counter Range	\pm 2.1 billion (32 bits or 31 bits + sign bit)

CTRIO Specifications

CTRIO Output Specifications	
Outputs (H2, H4, T1H-CTRIO)	4 pts, independently isolated, current sourcing or sinking FET Outputs: open drain and source with floating gate drive
Outputs (H0-CTRIO)	2 pts, isolated, either both current sourcing or both current sourcing FET Outputs: open drain and source with floating gate drive
Voltage range	5VDC - 36VDC
Maximum voltage	36VDC
Output clamp voltage	60VDC
Maximum load current	1.0A
Maximum load voltage	36VDC
Maximum leakage current	100 μ A
Inrush current	5A for 20ms
OFF to ON response	less than 3 μ sec
ON to OFF response	less than 3 μ sec
ON state V drop	\leq 0.3V
External power supply	for loop power only, not required for internal module function*
Overcurrent protection	15A max
Thermal shutdown	T _{junction} = 150°C
Overtemperature reset	T _{junction} = 130°C
Duty cycle range	1% to 99% in 1% increments (default = 50%)
Configurable Presets a) single b) multiple	a) each output can be assigned one preset, or b) each output can be assigned one table of presets, one table can contain max. 128 presets, max. predefined tables = 255

* User supplied power source required for stepper drive configurations

CTRIO Output Resources	
Pulse output / Discrete outputs (H2, H4, T1H-CTRIO)	Pulse outputs: 2 channels (2 outputs per each channel) Discrete outputs: 4 pts.
Pulse output / Discrete outputs (H0-CTRIO)	Pulse outputs: 1 channel (2 outputs per single channel) Discrete outputs: 2 pts.
Resource Options	Pulse outputs: pulse/direction or cw/ccw; Profiles: Trapezoid, S-Curve, Symmetrical S-Curve, Dynamic Position, Dynamic Velocity, Home Search, Velocity Mode, Run to Limit Mode, Run to Position Mode Discrete outputs: configurable for set, reset, pulse on, pulse off, toggle, reset count functions (assigned to respond to Timer/Count input functions). Raw mode: Direct access to discrete outputs from user application program
Target Position Range	\pm 2.1 billion (32 bits or 31 bits + sign bit)

H0-CTRIO LED Indicators

H0-CTRIO LED Descriptions	
OK	Module OK
ERR	User Program Error
A	Ch1 F1 Resource State
B	Ch1 F2 Resource State
Y0 - Y1	Output Status



H0-CTRIO LED Diagnostic Definitions		
OK	ERR	Description
ON	OFF	All is well - RUN Mode
ON	ON	Hardware Failure
Blinking	Blinking	Boot Mode - Used for Field OS Upgrades
Blinking	OFF	Program Mode
OFF	Blinking	Module Self-diagnostic Failure
OFF	ON	Module Error Due to Watchdog Timeout
OFF	OFF	No Power to Module

H0-CTRIO LED Diagnostic Definitions	
A	Blinks when Channel 1 Function 1 is counting or timing
B	Blinks when Channel 1 Function 2 is counting or timing
Y0 - Y1	Follow actual output state; ON = output is passing current

H2-CTRIO LED Indicators

H2-CTRIO LED Descriptions	
OK	Module OK
ER	User Program Error
1A	Channel 1 Status
2A	Channel 2 Status
0 - 3	Output Status



H2-CTRIO LED Diagnostic Definitions		
OK	ER	Description
ON	OFF	All is well - RUN Mode
ON	ON	Hardware Failure
Blinking	Blinking	Boot Mode - Used for Field OS Upgrades
Blinking	OFF	Program Mode
OFF	Blinking	Module Self-diagnostic Failure
OFF	ON	Module Error Due to Watchdog Timeout
OFF	OFF	No Power to Module

H2-CTRIO LED Diagnostic Definitions	
1A /2A	
Blinking 7 times per second	Input is Configured as Counter and is Changing
Following State of Input	Input is not Configured as Counter
0 - 3	
Follow actual output state; ON = output is passing current	

H4-CTRIO LED Indicators

H4-CTRIO LED Descriptions	
OK	Module OK
ER	User Program Error
1A - 1D	Ch1A - Ch1D Input Status
2A - 2D	Ch2A - Ch2D Input Status
(Ch1) F1 - F2	Ch1 Resource State
(Ch2) F1 - F2	Ch2 Resource State
Y0 - Y3	Output Status



H4-CTRIO LED Diagnostic Definitions		
OK	ER	Description
ON	OFF	All is well - RUN Mode
Blinking	Blinking	Boot Mode - Used for Field OS Upgrades
Blinking	OFF	Program Mode
OFF	Blinking	Module Self-diagnostic Failure
OFF	ON	Module Error Due to Watchdog Timeout
OFF	OFF	No Power to Module
TB		User Terminal Block is not Properly Installed

H4-CTRIO LED Diagnostic Definition	
1A - 1D	Follow actual input state / Ch1
2A - 2D	Follow actual input state / Ch2
(Ch1) F1	blinks when Channel 1 Function 1 is counting or timing
(Ch1) F2	blinks when Channel 1 Function 2 is counting or timing
(Ch2) F1	blinks when Channel 2 Function 1 is counting or timing
(Ch2) F2	blinks when Channel 2 Function 2 is counting or timing
Y0 - Y3	Follow actual output state; ON = output is passing current



Due to the multiplexed design of the DL405 LED matrix, OFF state LEDs may appear to blink ON slightly. This is to be expected and does not necessarily indicate a transient condition of the function corresponding to the LED.

T1H-CTRIO LED Indicators

T1H-CTRIO LED Descriptions	
OK	Module OK
ER	User Program Error
CH1	Channel 1 Status
CH2	Channel 2 Status
1A - 1D	Channel 1 A-D Input Status
2A - 2D	Channel 2 A-D Input Status
Y0 - Y3	Output Status



T1H-CTRIO LED Diagnostic Definitions		
OK	ER	Description
ON	OFF	All is well - RUN Mode
ON	ON	Hardware Failure
Blinking	Blinking	Boot Mode - Used for Field OS Upgrades
Blinking	OFF	Program Mode
OFF	Blinking	Module Self-diagnostic Failure
OFF	ON	Module Error Due to Watchdog Timeout
OFF	OFF	No Power to Module

T1H-CTRIO LED Diagnostic Definitions	
CH1	Blinks when Channel 1 Function 1 is counting or timing
CH2	Blinks when Channel 2 Function 1 is counting or timing
Y0 - Y3	Follow actual output state; ON = output is passing current