Application Note #56:
Testing Inputs

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Functional Description

Skeleton Code Name: Testing an Input to Execute a Desired Action

Software: Q Programmer

Hardware: ST10-Q Stepper Drive

Hardware Compatibility: Q Program Capable Drives Only

Reference: Host Command Reference Manual

- Commands
  - TI - Test Input
  - QJ - Queue Jump
  - NO - No Operation
  - QG – Queue Go

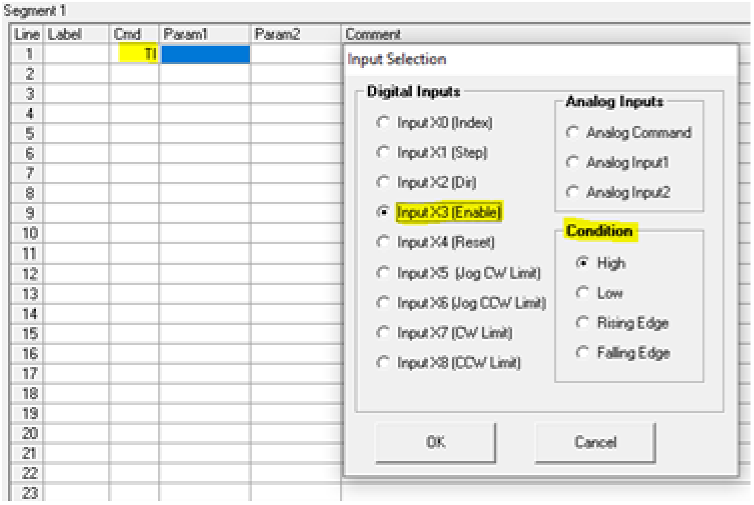
Notes:

- Q Programmer does NOT accept empty command lines, so NO is used in lieu of that.
- NO commands can help segment code for readability.
- If inputs are used for purposes other than their default purpose, they should be set to General Purpose during driver configuration.

Goals

Goal 1: How to command the driver to test an input

a. Using the Test Input (TI) command to command the driver to test desired input, its Param1 value must equal the desired input number and the condition to test for. This test will yield a TRUE or FALSE value.



Segment 1

Line	Label	Cmd	Param1	Param2	Comment
1		TI			
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					

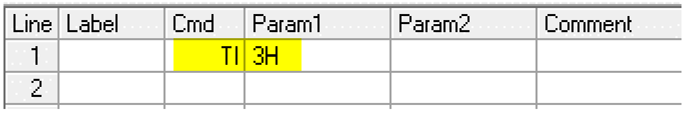
Input Selection

Digital Inputs
○ Input X0 (Index)
○ Input X1 (Step)
○ Input X2 (Dir)
● Input X3 (Enable)
○ Input X4 (Reset)
○ Input X5 (Jog CW Limit)
○ Input X6 (Jog CCW Limit)
○ Input X7 (CW Limit)
○ Input X8 (CCW Limit)

Analog Inputs
○ Analog Command
○ Analog Input1
○ Analog Input2

Condition
● High
○ Low
○ Rising Edge
○ Falling Edge

b. The final command should look as follows, which tests Input 3 for HIGH (Open) state:



Line	Label	Cmd	Param1	Param2	Comment
1		TI	3H		
2					

Goal 2: Making sure tested condition affects program execution

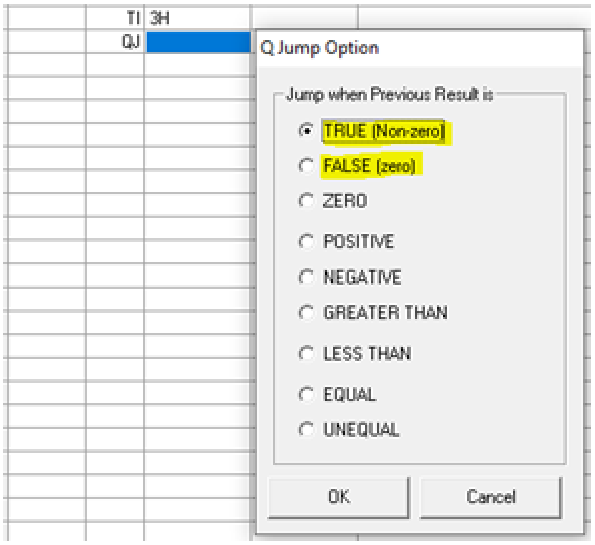
a. Using TI alone is not enough for our purposes. TI tells the driver to read for the desired condition at an input. What we want, based on whether a condition is met (TRUE/FALSE), is to change the program flow to execute a specific action outside of the normal program flow. To do that, we command the driver to *jump* to the desired action when the desired state (TRUE/FALSE) of the tested input condition is met.

    i. NOTE: If we do not command the driver to jump, the program will keep running sequentially, executing the lines directly.

b. To jump to a desired action, use the Queue Jump (QJ) command after TI. For its Param1, it accepts the desired TRUE/FALSE state of tested condition. For its Param2, it accepts the line number at which the code to be executed begins at.

    i. NOTE: Once a line number is assigned, Q Programmer automatically assigns a label to that line. Let Q Programmer assign the labels as it can dynamically change them for you as needed.

    ii. For example, if you tested the driver for Input 3 High (3H), but you only want the driver to act if the condition was FALSE, the set up would be as follows. Here, we jump to Line 6 to execute our 'code':

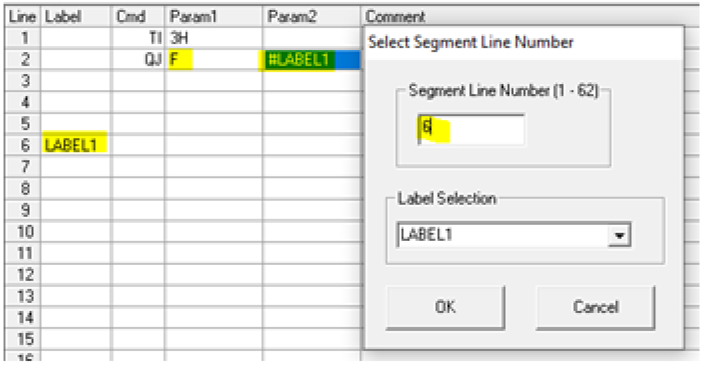


TI 3H
QJ

Q Jump Option

Jump when Previous Result is

● TRUE (Non-zero)
○ FALSE (zero)
○ ZERO
○ POSITIVE
○ NEGATIVE
○ GREATER THAN
○ LESS THAN
○ EQUAL
○ UNEQUAL

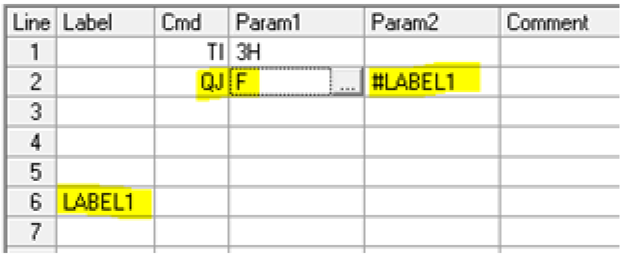


Line	Label	Cmd	Param1	Param2	Comment
1		TI	3H		
2		QJ	F	#LABEL1	
3					
4					
5					
6	LABEL1				
7					
8					
9					
10					
11					
12					
13					
14					
15					

Select Segment Line Number

Segment Line Number (1 - 62): 6

Label Selection: LABEL1



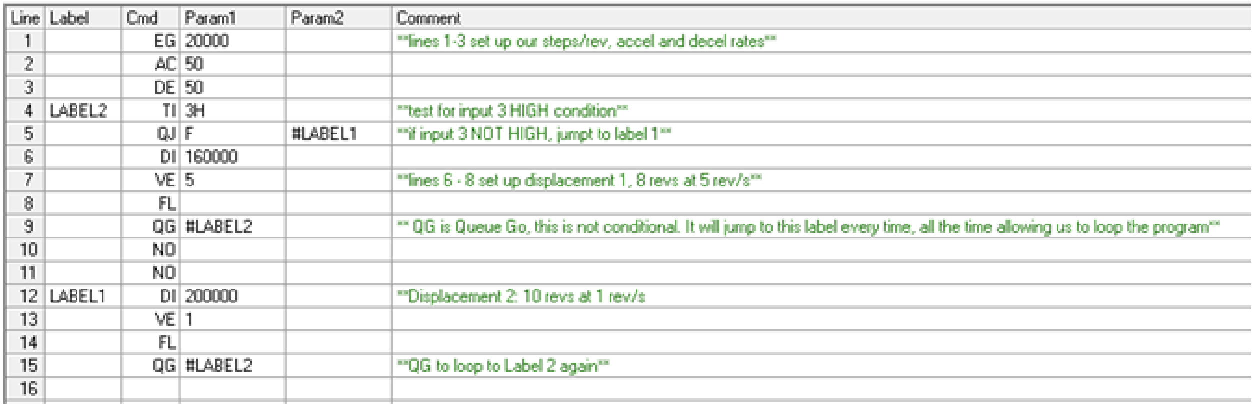
Line	Label	Cmd	Param1	Param2	Comment
1		TI	3H		
2		QJ	F	#LABEL1	
3					
4					
5					
6	LABEL1				
7					

iii. If Input 3 is HIGH, the program continues to Line 4. If Input 3 is LOW, then the program jumps to Line 6.

iv. If Param1 for the QJ command were to be changed to True (T), the logic would have to be switched. Meaning, if Input 3 is HIGH, the program would jump to Line 6. If Input 3 is LOW, then the program continues to Line 4.

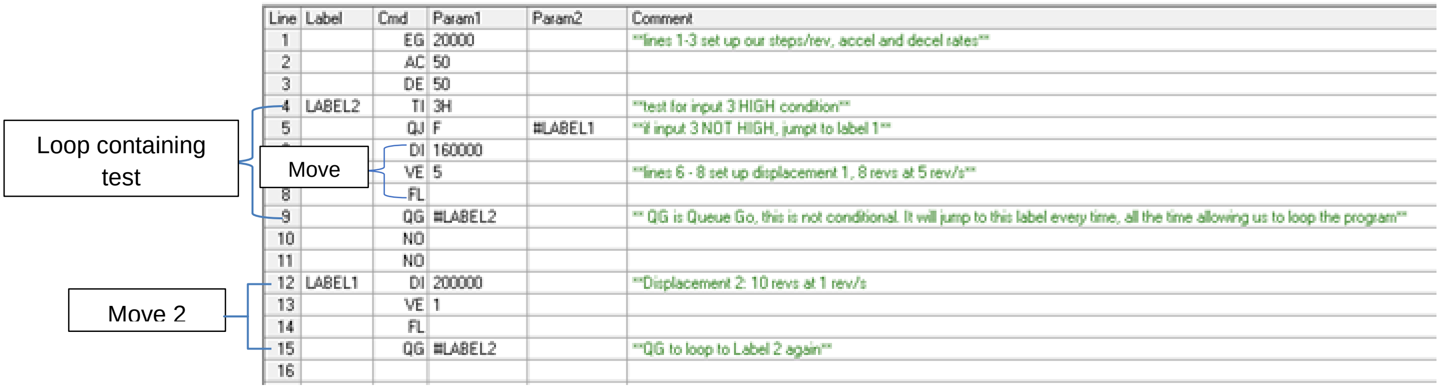
Goal 3: By using the first two goals, execute a simple relative motion program that executes one of two displacements based on an input

a. The following code snippet can execute one of two moves. Using TI 3H as our test, move 1 will occur if Input 3 is HIGH and move 2 will *only* occur if Input 3 is LOW. For testing purposes, the program will loop continually to test for 3H (Input 3 = HIGH). Focus on Lines 4-9 and 12-15. Lines 1-3 simply configure some parameters.



Line	Label	Cmd	Param1	Param2	Comment
1		EG	20000		""lines 1-3 set up our steps/rev, accel and decel rates""
2		AC	50		
3		DE	50		
4	LABEL2	TI	3H		""test for input 3 HIGH condition""
5		QJ	F	#LABEL1	""if input 3 NOT HIGH, jumpt to label 1""
6		DI	160000		
7		VE	5		""lines 6 - 8 set up displacement 1, 8 revs at 5 rev/s""
8		FL			
9		QG	#LABEL2		"" QG is Queue Go, this is not conditional. It will jump to this label every time, all the time allowing us to loop the program""
10		NO			
11		NO			
12	LABEL1	DI	200000		""Displacement 2: 10 revs at 1 rev/s
13		VE	1		
14		FL			
15		QG	#LABEL2		""QG to loop to Label 2 again""
16					

b. Note how Label 1 is *outside* of the loop (Lines 4-9) that contains the test condition. If it were kept inside the loop, or if it followed the code ending at Line 8, and before the QG command at Line 9, the code at Label 1 would be executed regardless of whether 3H is HIGH or LOW.



Line	Label	Cmd	Param1	Param2	Comment
1		EG	20000		""lines 1-3 set up our steps/rev, accel and decel rates""
2		AC	50		
3		DE	50		
4	LABEL2	TI	3H		""test for input 3 HIGH condition""
5		QJ	F	#LABEL1	""if input 3 NOT HIGH, jumpt to label 1""
6		DI	160000		
		VE	5		""lines 6 - 8 set up displacement 1, 8 revs at 5 rev/s""
8		FL			
9		QG	#LABEL2		"" QG is Queue Go, this is not conditional. It will jump to this label every time, all the time allowing us to loop the program""
10		NO			
11		NO			
12	LABEL1	DI	200000		""Displacement 2: 10 revs at 1 rev/s
13		VE	1		
14		FL			
15		QG	#LABEL2		""QG to loop to Label 2 again""
16					

Click here for the Sample Code.

Try it out today!
If you have questions about this or any other application, please reach out to our Apps Engineering Group for any assistance at 1-800-525-1609 or support@applied-motion.com.