

Move Command Stop Conditions - Advanced

The move commands stop conditions have two tabs, Standard and Advanced. This document explains the Advanced tab. It is assumed the reader is familiar with QuickSilver motion commands. See Using Inputs to Stop Motion in user manual for some general background.

Details

Only four inputs are available when using the advanced conditions. The index and I/O lines #1, #2, and #3. Advanced stop is used for situations when stopping on a combination of inputs is required. The advanced method can alter the direction of a move based on an input's starting condition, toggle the final check values accordingly, and perform two ordered checks. Instead of a single number, two complete 16-bit words are passed to the servo, the Input Enable Word, and the Input State Word. A complete table of these words follows the descriptions.

First Check (Used to toggle the starting direction of a motion)

The upper four bits of the Input Enable Word and Input State Word parameters are used to determine the initial direction of a move based on the selected states of the enabled inputs. If any of the input conditions are met when the move begins, the motion will be in the opposite direction of that indicated in the command. There are two more bits, one in each word. These bits cause parameters in the other two Checks to change if First Check has reversed the direction. If the 'Toggle Second Check Conditions' bit is set, all enabled Second Check conditions will be inverted. This allows the servo to look for the opposite edge of a sensor flag if motion begins on the sensor. If the 'Toggle OR States' bit is set all enabled Last Check OR conditions will be inverted. This check is only performed as the motion begins, and the system immediately moves on to the Second Check.

Second Check (Used to do a Two-State input check)

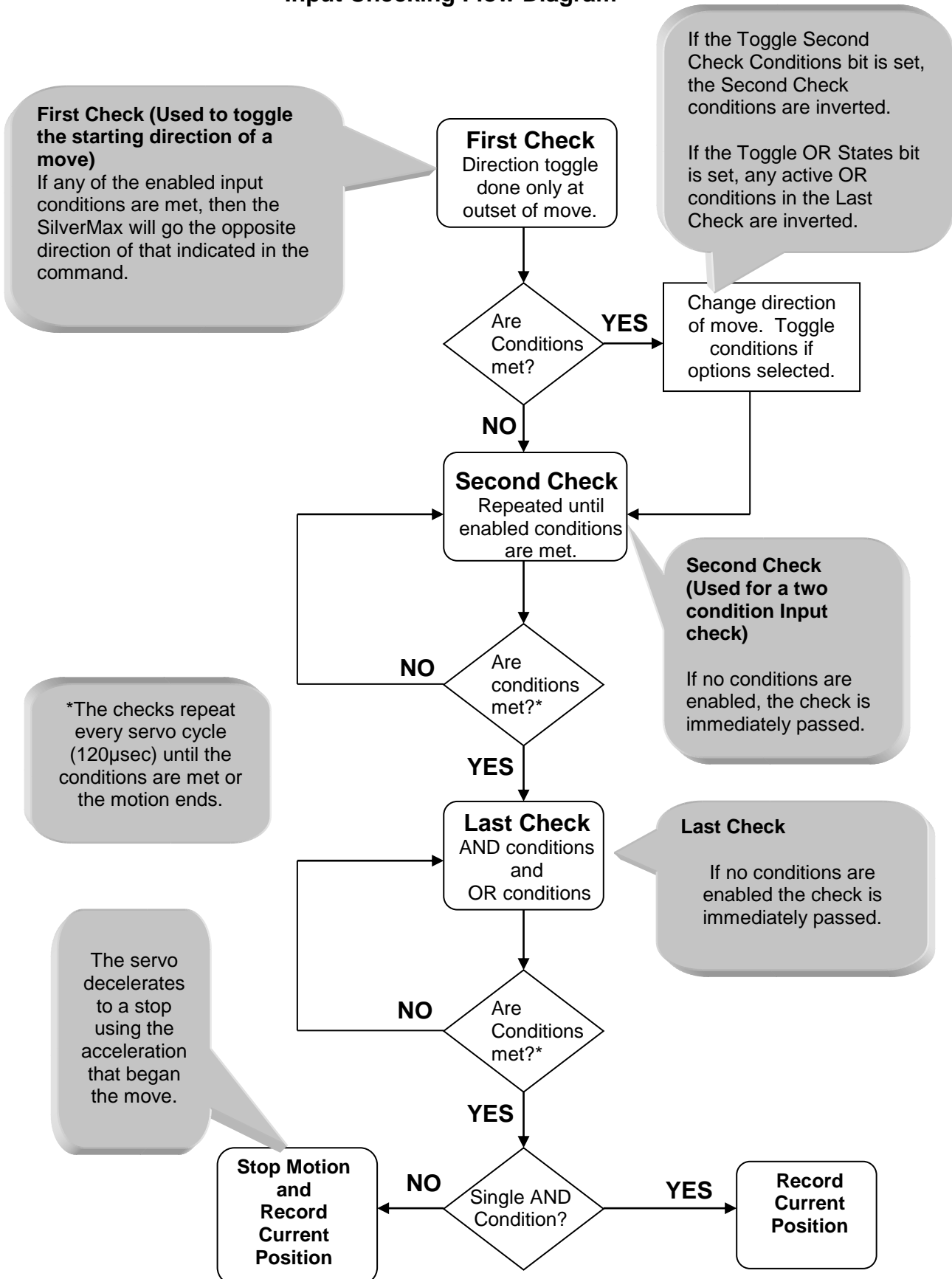
The Second Check does a preliminary test of the inputs. The Second Check conditions must be met for the input checking process to continue. If the conditions are never met, the move will continue until it reaches its programmed end. This, in combination with the Last Check, allows a motion to only stop only on an ordered condition of inputs. This would be used, for example, in a homing routine to first find a sensor and then stop on its far edge. This provides repeatable, highly accurate positioning independent of starting location. The detection of the far edge would occur in the Last Check.

Last Check (This stops the move)

The Last Check has several options based on the AND and OR logical operations.

- OR only – if any of the enabled conditions are met, the motion will stop.
- AND only
 - More than one condition – if all enabled conditions are met, the motion will stop.
 - Only one condition enabled – if the single condition is met, the position will be recorded (as normal), but the motion will not stop.
- AND and OR – both sets of conditions are evaluated, and the logical results are ANDed together. If the net condition is met, the motion will stop.

Input Checking Flow Diagram



Advanced Stop Conditions Table

This table covers the Stop Enable Word and the Stop State Word. Examples of how to use these in native commands follow. Setting a bit in the Stop Enable Word enables monitoring of that input. The corresponding bit in the Stop States Word sets the condition to monitor for.

LAST CHECK PROCESS	BIT #	STOP ENABLE WORD	STOP STATES WORD
First Check			
	Bit 15	0 = use advanced Stop (1=use standard Stop, above)	0 = Reverse direction of commanded motion if First Check Condition is true 1=Reverse direction, and XOR 3 LSB of working copy of this word based on bits 12..14 of the Stop Enable Word if First Check Condition is found true (that is, conditionally complement the OR sense)
First Check Conditions These three bits are used to set the conditions.	Bit 14	Input #3 enabled	Input #3 Sense
	Bit 13	Input #2 enabled	Input #2 Sense
	Bit 12	Input #1 enabled	Input #1 Sense
Second Check			
Second Check Conditions Enabled conditions must be met before moving to Last Check	Bit 11	Index enabled	Index State
	Bit 10	Input #3 enabled	Input #3 State
	Bit 9	Input #2 enabled	Input #2 State
	Bit 8	Input #1 enabled	Input #1 State
The servo moves to its programmed location if the Second Check Conditions are never met.			
Last Check			
AND Conditions All conditions enabled here must be met to stop the servo.	Bit 7	Index enabled	Index State
	Bit 6	Input #3 enabled	Input #3 State
	Bit 5	Input #2 enabled	Input #2 State
	Bit 4	Input #1 enabled	Input #1 State
If both types of conditions are enabled, both sets must be met to stop the servo.			
OR Conditions Any conditions enabled here must be met to stop the servo.	Bit 3	Index enabled	Index State
	Bit 2	Input #3 enabled	Input #3 State
	Bit 1	Input #2 enabled	Input #2 State
	Bit 0	Input #1 enabled	Input #1 State
If the Last Check conditions are met the servo will stop and register 4 is updated.			

Advanced Stop Parameters

The input values that are used as parameters in an advanced stop condition take a little work to create. Inside the servo the values are in binary form. Both the 16-bit words must be specified as part of the command. Each of the bits is evaluated individually to determine how the inputs will be used to control a motion.

The previous table shows the meaning of each bit in the words. The process begins by choosing which bits need to be set and to what value. Setting a bit to 1 in the Stop Enable Word selects that input for use. Setting the corresponding bit to 1 in the Stop States Word sets the condition as logic high (+5 volts on the input). Setting a bit in the Stop States word to 0 sets the desired state value to logic low (0 volts on the input).

Example of Advanced Stop Conditions

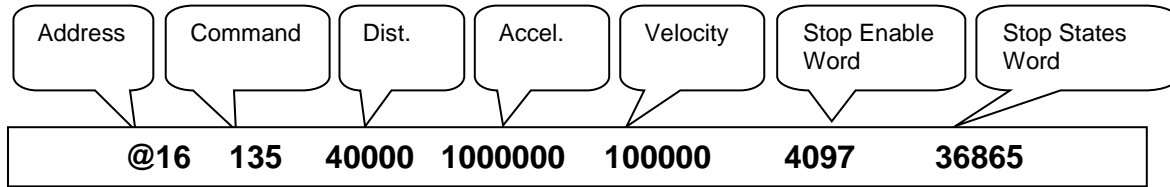
This example shows a Move Relative, Velocity Based (MRV) move that will change the direction of the move based on the beginning condition of input #1, the motion will then be stopped using the same input #1. This is a simple system with a single sensor supplying the signal to I/O #1.

In scenario A, the starting position is off the sensor, the servo will move clockwise to the sensor edge and then stop. The First Check has no impact, as I/O #1 is low when motion begins. Once the sensor is reached, I/O #1 is high and the servo decelerates.

In scenario B, the starting position is on the sensor. In this scenario, the First Check will trigger, because I/O #1 is high. This causes the motion to begin in the opposite direction of that commanded. The Toggle Last Check bit is also set, so the conditions to end the move are inverted. In this case, the servo moving off the sensor—and I/O #1 going low—will stop the motion.

Using this single setup, the final position will always be on the same edge of the sensor

The command example is shown in the 8-bit ASCII protocol.



See User Manual Chapter 2 for the distance, acceleration, and velocity values.

The table below shows how the value of “4097” was derived:

Toggle Second Check Conditions	First Check (Direction Toggle) Enable			Second Check Enable				Last Check AND Inputs Enable				Last Check OR Inputs Enable				
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
1				0				0				1				

Stop Enable Word = 0x1001 in hexadecimal form
Hexadecimal 0x1001 = 4097 decimal

The table below shows how the value of “36865” was derived:

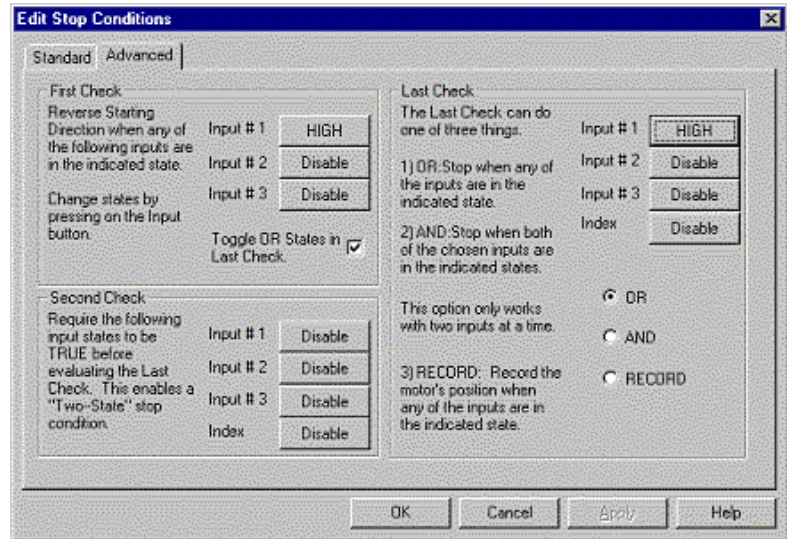
Toggle OR States	First Check (Direction Toggle) State			Second Check State				Last Check AND Inputs State				Last Check OR Inputs State				
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
9				0				0				1				

Stop State Word = 0x9001 in hexadecimal form
Hexadecimal 0x9001 = 36865 decimal

The binary values must be converted to either decimal or hexadecimal (depending on the communication protocol used) for use in commands. See Chapter 9 for more details on protocols, and Appendix for information on converting between binary, decimal, and hex.

Advanced Stop Conditions - QuickControl

Most of the capabilities available in serial mode are also available within QuickControl. To access these options in QuickControl, click the 'Advanced' tab in the 'Edit Stop Conditions' window.



First Check (Direction Toggle)

This check operates in exactly in same way as the serial command. Select the conditions to be ORed, and if the Last Check conditions are to be toggled if the First Check is met. The "Toggle Second Check Conditions" bit is not available within QuickControl.

Second Check

This check functions in exactly the same fashion as under serial communications.

Last Check

Selecting "RECORD" causes the servo to record its position at the time of input trigger, but does not halt. This is used rather than specifically enabling a single condition with "AND". This window also does not allow the use of AND and OR conditions simultaneously.