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## Robot FSU Range Limit Tips

### Introduction

When a Robot Functional Safety Unit (FSU) Range Limit is active during playback the controller makes many calculations based on axis coasting values, speed, the look ahead function during motion, plus an additional % to ensure safety. The higher the speed, the greater the coasting value will be. When the robot is headed towards or near a range limit, these factors combined can generate the e-stop condition even if the actual path trajectory will not invade the set range limit. This document provides some tips to pre-plan and avoid these situations. There are also a few examples of this shown in the Robot Range Limit section of the [YRC1000 FSU Manual](#), all of our manuals are available at our [website](#).

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## Use a Slow Down Plane

One option is to create a ‘slow down plane’ using a planar robot range limit to activate a speed limit file in the problem areas, shown below.

### – Main Zone

- Create a robot range file for the zone you want the robot to stay within.

### –Slow Down Plane

- Create a second file using a plane coordinate.
- You will want this wall to be close to the current wall you are approaching. Designate which output signal you want to use. Here we are using FS-OUT1.

### –Under Speed Limit

- Create a file under Speed Limit. Enter the desired speed and Detection Delay time.
- Create your safety logic file using the logic tied to your robot range and speed limit file.
- Adjust the X-Y plane as needed. This will allow you to run at full speed until it crosses the plane, then it will slow down to the speed you allocated in your Speed Limit File without an alarm.

The screenshots show the configuration of a robot range limit and a speed limit. The 'ROBOT RANGE LIMIT' screen for 'MAIN FRAME' shows a PRISM shape with points at (1500, -1500) and (-1500, -1500). The 'PLANE(X-Y)' screen shows points at (-300, 500) and (1500, 500) and an output signal of FS-OUT01. The 'SPEED LIMIT (STOP MONITOR)' screen shows a limit speed of 300.0 mm/sec and a detection delay time of 0.50 sec. The 'SAFETY LOGIC CIRCUIT' table is as follows:

NO.	INPUT	LOGIC	OUTPUT	TIME
001	FS-OUT01		MS-OUT02	
002				
003				
004				
005				
006				
007				
008				
009				
010				
011				
012				

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## Approach Warning Buzzer

A second option more helpful for path planning, is to increase the default distance the warning buzzer will alert you when the robot is near a range limit. Setting this distance to a large enough value can help mitigate the unexpected e-stop you may encounter to full speed play mode.

The screenshot displays two adjacent windows in the Yaskawa robot control software. The left window is titled 'ROBOT RANGE LIMIT' and shows a table of range limit settings for 12 robots. The right window is titled 'APPROACH WARNING BUZZER' and shows settings for two robots, R1 and R2.

FILE	GROUP	STATUS	TOTAL	LOAD	COMMENT
1	RT	INVALID(SIGNAL)	0 %	0 %	
2	RT	SETTING	---	---	
3	RT	SETTING	---	---	
4	RT	SETTING	---	---	
5	RT	SETTING	---	---	
6	RT	SETTING	---	---	
7	RT	SETTING	---	---	
8	RT	SETTING	---	---	
9	RT	SETTING	---	---	
10	RT	SETTING	---	---	
11	RT	SETTING	---	---	
12	RT	SETTING	---	---	

  

ROBOT	BUZZER DIST.	UNIV-OUT NO.
R1	50 mm	OT# 1234
R2	50 mm	OT# *****

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## 3D Graphics Display

Another helpful tool is the 3D Graphics Display feature which can display the robot model, tool interference model, and robot range limit. For detailed instruction on this function please review the [YRC1000 General Operators Manual](#).

