Operational Reference

M17 Sweeper/Scrubber

Controls Group

Revision Number A

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REVISION HISTORY

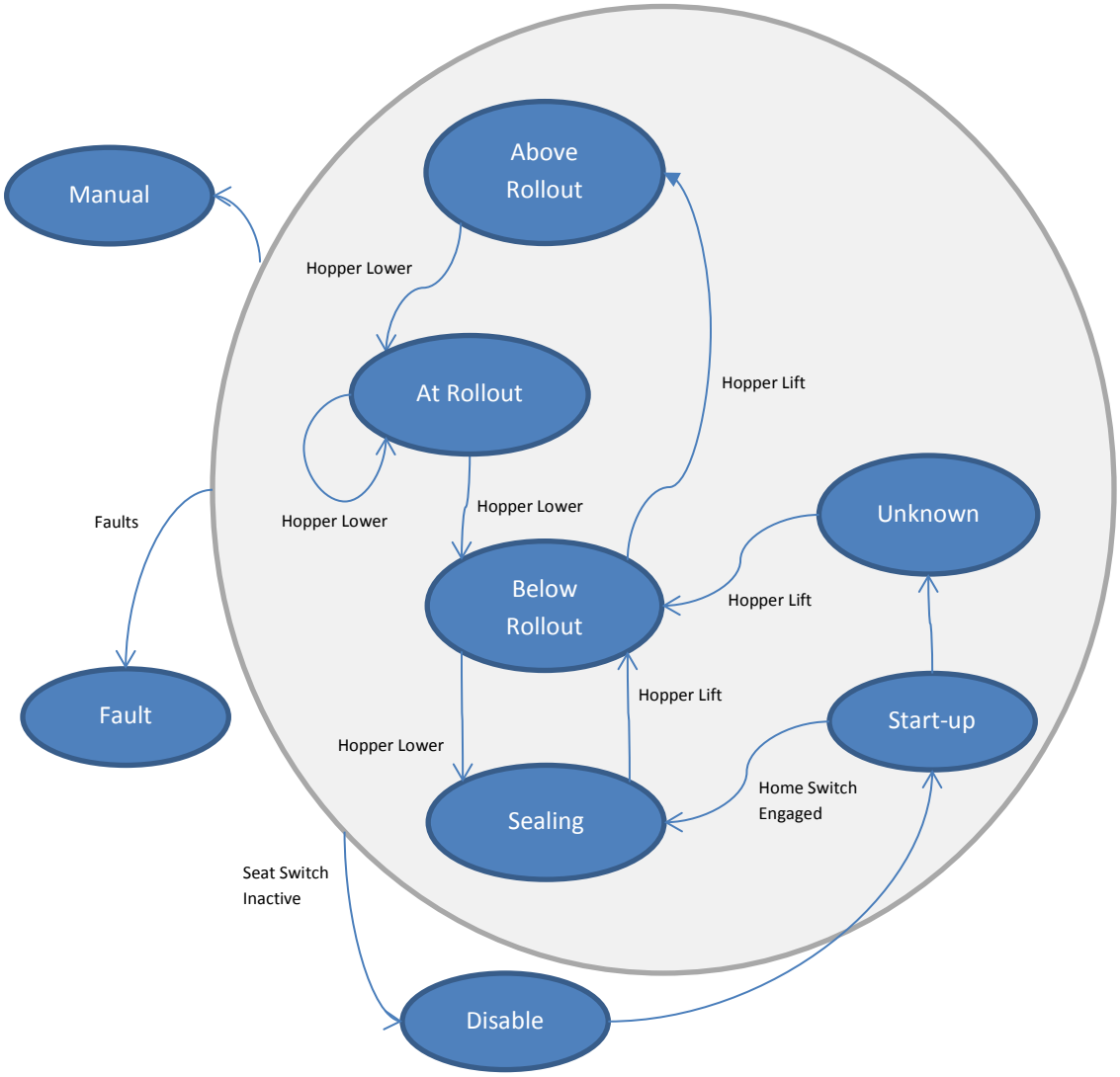
Change #	Description of Change	Source of Change	Date	Author
A	• Initial document.		01/22/16	CS

GENERAL INFORMATION

This document serves as a reference for general module operation and is for internal use only. The terminology in this document may not represent customer terminology.

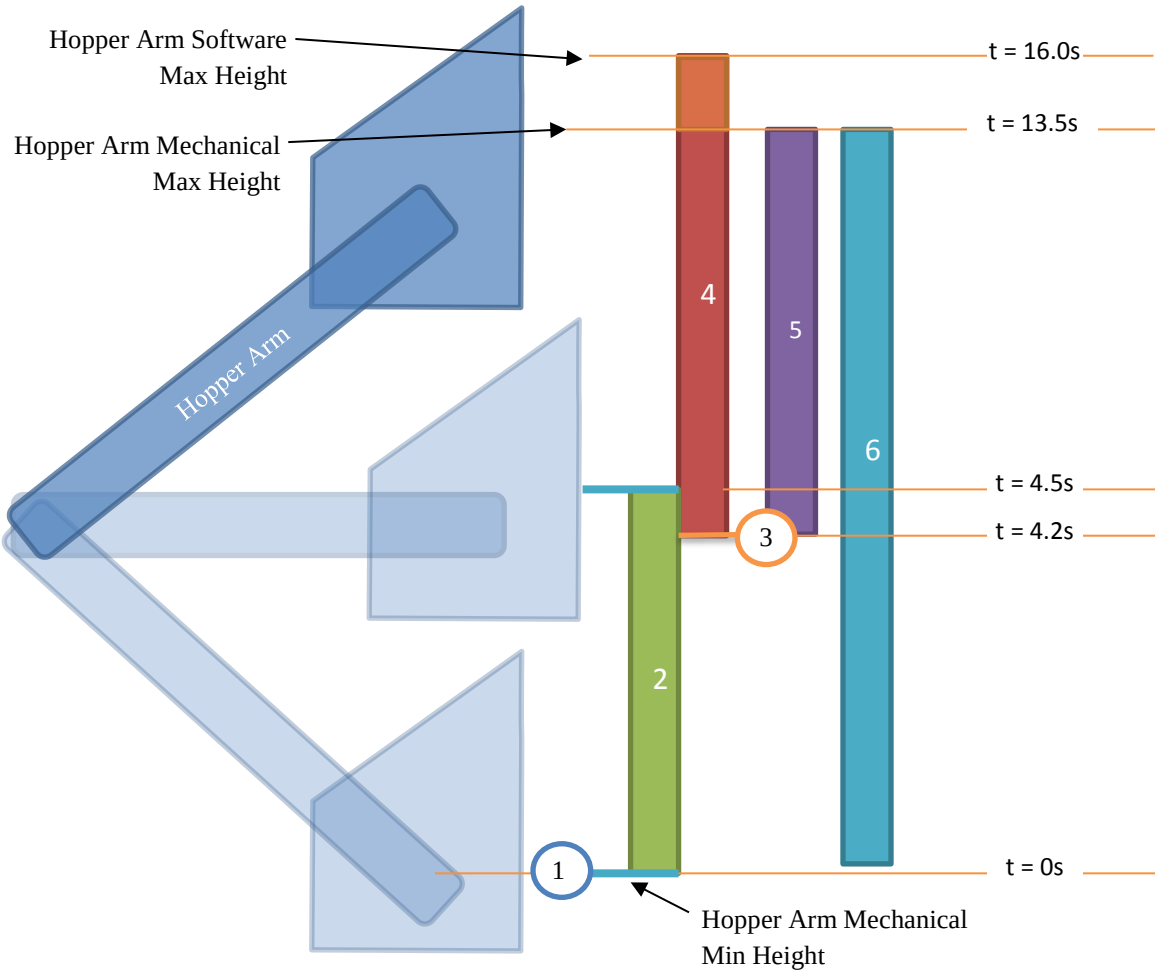
HOPPER CONTROL

SOFTWARE STATE MACHINE



HOPPER LIFT CONTROL

The hopper lift control measures the lift height using run time. The roll out position in the middle is the position under which the hopper will lower at a lower speed. The color-coded states represent the software controlled state machine for hopper control. The height measurement is zeroed at the home switch position (t = 0s). The hopper lift control is explain in detail in the height diagram shown below:

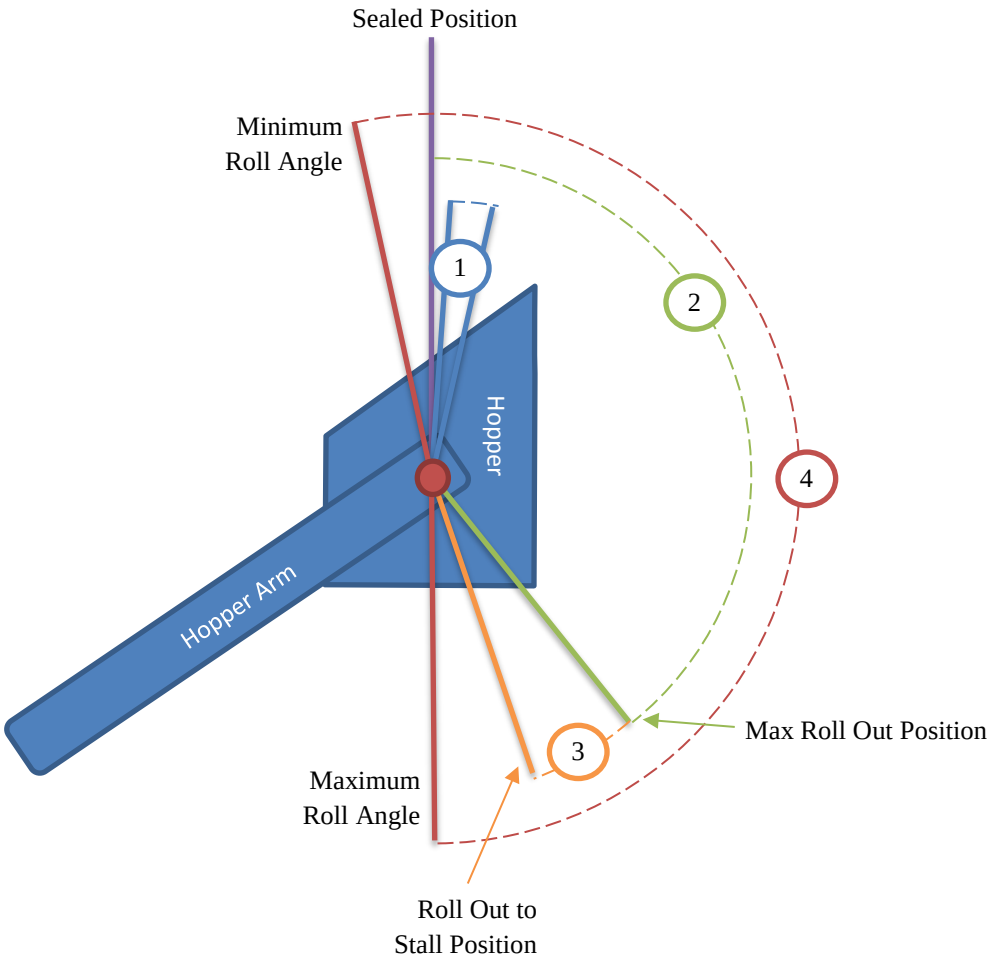


The following table describes the color coded states in the hopper height diagram in detail:

Process Label Number	**Identity** Represents software state machine	**Description**
1	Sealing	In this state, the hopper rolls in to the sealing position automatically when it lowers to this position. The home switch indicates when the hopper arrives at this position. When the hopper is raised, it first rolls out and then goes into state “2”. There is no lift action in this state. The timed based height measurement is reset to zero in this state.
2	Under Roll Out Height	The hopper will raise at high speed in this state and lower at low speed. No roll action is allowed. Raising the hopper far enough will bring it to state “4”. Lowering the hopper will bring it to state “1”.
3	At Roll Out Height	Raising the hopper will bring it to state “4”. Lowering the hopper will cause the hopper to roll to a target angle range. When it reaches this range, it will go to state “2”. There is no lift action in this state.
4	Above Roll Out Height	The hopper will raise and lower at high speed in this state. Roll action is also allowed. The hopper can rise to a max height. It is allowed to rise to the software max height. Upon reaching this position, the height is set to the mechanical max height when lowering the hopper.
5	Passed Roll Out Angle	If the hopper is in state “4” and rolled past the max hopper roll out angle, it will enter this state. No lift action is allowed in this state. Pressing the lift buttons will roll in the hopper. Once the hopper reaches the max hopper roll out angle, it will go back into state “5”. The hopper can roll out until it stalls out against the hopper arm.
6	Unknown	If the measured height less than the roll out height and the hopper home switch is not engaged, the hopper will enter this state. The hopper will roll to a target angle range if commanded to lift or lower. Once the target angle range is reached, it will enter state “2”.

HOPPER ROLL CONTROL

At a high level, the hopper roll control contains several allowable angle ranges that are defined by the operating condition of the hopper. The diagram below depicts how these angle ranges relate to each other.



The following table describes the hopper roll angle ranges in detail:

Process Label Number	**Identity** Does not represent software state machine	**Description**
1	Under Roll Out Height	When the hopper lift height is below the roll out height, this is the allowable angle range that the hopper roll angle can be in. If it is outside this range, the hopper first rolls to this angle range before allowing lifting or lowering. If the hopper is driving to the sealed position, it will leave this angle range and go to the sealed position. There is lift action in this angle range. There is no roll action in this condition other than driving back to the allowable angle range.
2	Above Roll Out Height	When the hopper lift height is above the roll out height, this is the allowable angle range that the hopper roll angle can be in. If the hopper is rolling out, the current limit is lowered. If the hopper is rolled out far enough, it can leave this range for range “3”. Both lift action and roll action are enabled in this angle range.
3	Past Max Roll Out Angle	When the hopper lift height is above the roll out height and the roll angle is past the “Max Roll Out Position”, this is the allowable angle range that the hopper roll angle can be in. The hopper can roll out until it contacts the “Hopper Arm”, where it stalls out. There is no lift action in this angle range. Pressing the lift buttons will roll in the hopper. There is roll action in this angle range.
4	Calibrated Roll Angle Range	This is the physical min and max the hopper roll actuator is capable of rolling the hopper to. These positions are defined by software parameters which are set at the end of line. If the hopper rolls to one of these positions, the software will prevent it from rolling past it but will allow it to roll back from it.