This Application note applies to the Mentor MP & Quantum MP family

Basic Set Up of the Mentor MP Brake Controller

This application note will describe how to utilize the Mentor MP DC drive to control an electro-mechanical brake via the drive digital I/O. This guide assumes you are starting with a drive which has already been set up for operation. CTAN350, available on our website, gives a quick start guide for setting up a Mentor MP.

As noted in the Mentor MP User Guide there are two important considerations to be aware of before setting up the brake controller. First the brake control functions are provided to allow well-coordinated operation of an external brake with the drive. While both hardware and software are designed to high standards of quality and robustness, they are not intended for use as safety functions, i.e. where a fault or failure would result in a risk of injury. In any application where the incorrect operation of the brake release mechanism could result in injury, independent protection devices of proven integrity must also be incorporated. Second the control terminal relay can be selected as an output to release a brake. If a drive is set up in this manner and a drive replacement takes place, prior to programming the drive on initial power up, the brake may be released. When drive terminals are programmed to non-default settings the result of incorrect or delayed programming must be considered. The use of a SMARTCARD in boot mode or an SM-Applications module can ensure drive parameters are immediately programmed to avoid this situation.

Enabling the Brake Controller

The brake controller can be enabled by setting Pr 12.41 (Brake Controller Enable). The USA factory default is for the brake controller to be disabled with the value for this parameter set to 0 (dis). When this parameter is changed from a non-zero value to a 0 value the following parameters are set to 0: Pr 2.03 (Ramp Hold), and Pr 6.08 (Hold Zero Speed). If Pr 12.49 (Brake Release Action) = 1 then Pr 13.04 (Position Controller Reference Source) and Pr 13.10 (Position Controller Mode) are also set to 0. Parameter values of 1 (rel), 2 (d IO), or 3 (User) each enable the brake controller but have different effects on the default I/O as noted below. Before changing Pr 12.41 it is advisable to check the current values of the parameters your intended selection is going to affect, as an example both values 1 and 2 will reassign digital I/O 2 (T25) which is the default I/O for Drive Reset.

Setting Pr 12.41 to a value of 1 or rel does the following. The brake controller is enabled. The I/O is set up to control the brake via the relay output T51/T52 meaning parameter 8.27 (Relay / Source) is set to Pr 12.40 (Brake Release). Drive OK is re-routed to digital I/O 2 (T25). Parameter 8.22 (T25 Digital I/O 2 Source/Destination) is set to 10.01 (Drive OK). The related parameters of Pr 8.12 (T25 Digital I/O 2 Invert) and Pr 8.17 (T51, T52, T53 Relay Invert) are set to 0 while Pr 8.32 (T25 Digital I/O 2 Output Select) is set to 1.

Setting Pr 12.41 to a value of 2 or d IO does the following. The brake controller is enabled. The I/O is set up to control the brake via digital I/O 2 (T25). This will set three parameters: Pr 8.22 is set to Pr 12.40, Pr 8.12 is set to 0, and Pr 8.32 is set to 1. If Pr 12.41 is set to 2 from a previous value of 1 then two additional parameters are set: Pr 8.27 is set to Pr 10.01, while Pr 8.17 is set to 0.

Setting Pr 12.41 to a value of 3 or User does the following. The brake controller is enabled. No parameters are set to select the brake output. You will need to assign Pr 12.40 as the value of the digital output of your choice. When Pr 12.41 is set to 3 from the previous value of 1 then Pr 8.22 is set to Pr 6.39 (Sequencing Bit: Not-Stop), Pr 8.27 is set to Pr 10.01, and Pr 8.12, Pr 8.32, and Pr 8.17 are all set to 0. When Pr 12.41 is set to 3 from the previous setting of 2 then Pr 8.22 is set to Pr 10.33 (Drive Reset), and both Pr 8.12 and 8.32 are set to 0.

These automatic parameter changes occur after a drive reset when Pr 12.41 has been changed. The changes are done in two stages: the first stage restores the I/O used by the initial setting of Pr 12.41 and the second stage sets up the I/O as defined by the new setting of Pr 12.41. These changes are shown on the following table.

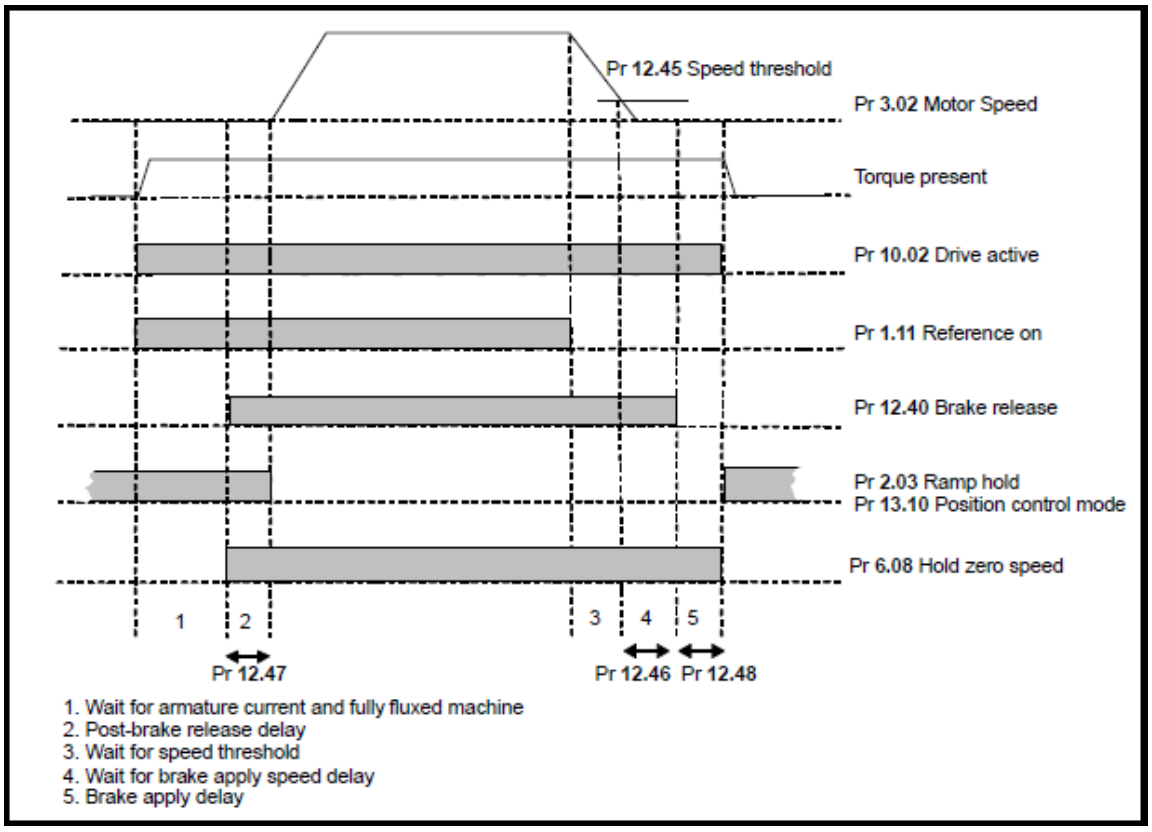
Old value of Pr 12.41	New value of Pr 12.41	Pr 8.12	Pr 8.22	Pr 8.32	Pr 8.17	Pr 8.27
		Drive OK output			Brake release output	
Any	1	0	Pr **10.01**	1	0	Pr **12.40**
		Brake release output				
Not 1	2	0	Pr **12.40**	1	No change	No change
		Brake release output			Drive OK output	
1	2	0	Pr **12.40**	1	0	Pr **10.01**
		Not stop			Drive OK output	
1	0 or 3	0	Pr **6.39**	0	0	Pr **10.01**
		Reset				
2	0 or 3	0	Pr **10.33**	0	No change	No change

The Brake Sequence

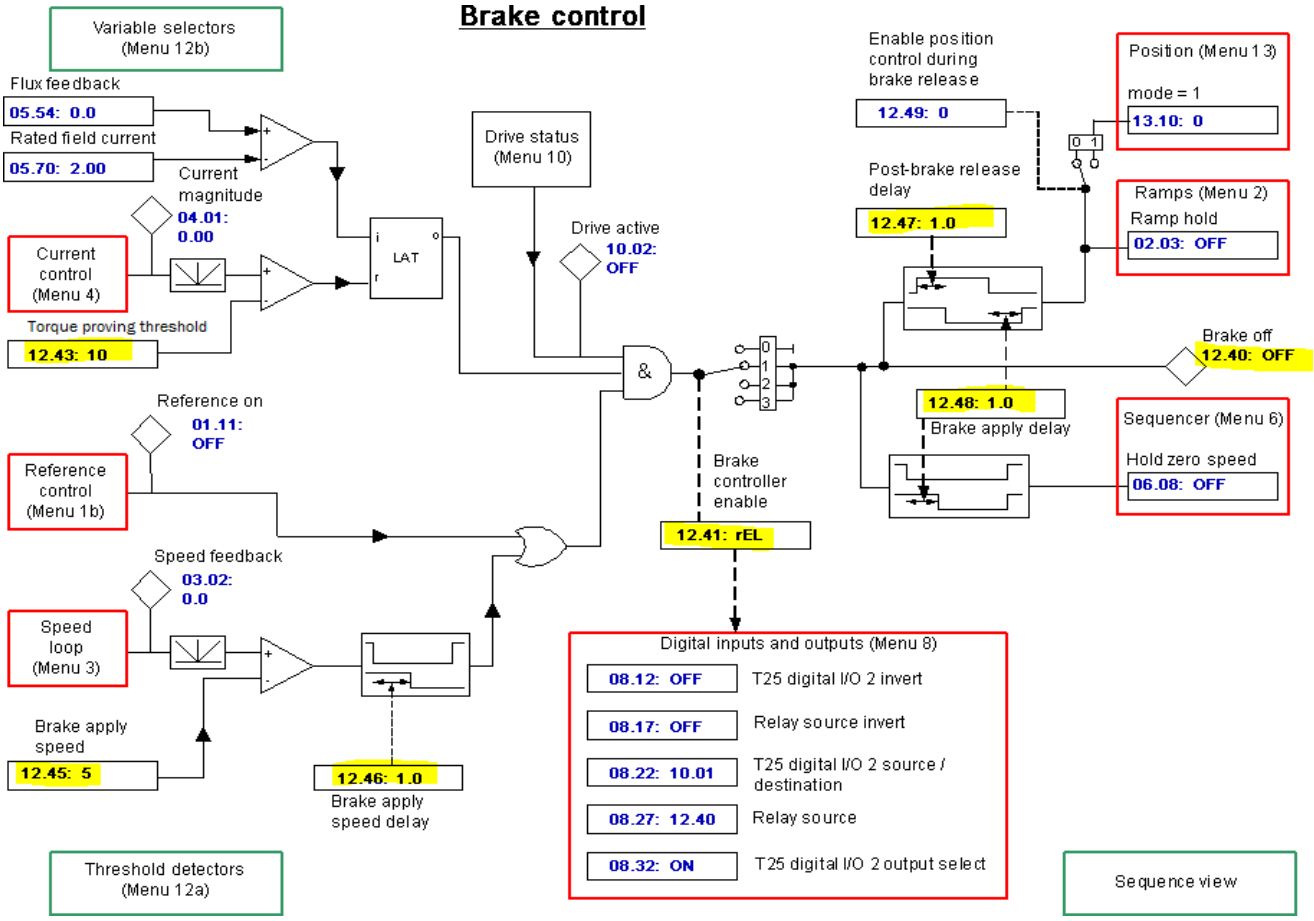
The brake controller follows a set sequence when in operation. Before releasing the brake the controller first waits for armature current and a fully fluxed machine. Pr 12.43 (Torque Proving Speed) governs the torque level the controller will wait for before releasing the brake. Pr 12.52 (Flux Present Threshold) controls the amount of flux required before the torque proving latch can be set. Next the brake release is given (Pr 12.40) and this starts the post-brake release delay which can be set in Pr 12.47. Once that time has passed the brake actually releases.

Before engaging the break the controller waits for the speed to fall below the level set in Pr 12.45 (Brake Apply Speed) for the amount of time set in Pr 12.46 (Brake Apply Speed Delay). Once the time called out in Pr 12.46 has passed then Pr 12.40 is removed and Pr 12.48 (Brake Apply Delay) starts. Pr 12.48 defines the length of time Hold Zero Speed parameter (Pr 6.08) is set to 1 allowing a delay for the brake to be applied while the motor is held stationary.

The below table summarizes the brake controller sequence.



The control logic used by the brake controller is given on the below chart with the pertinent parameters highlighted.



One consideration not found on the above control logic is whether Pr 1.10 (Bipolar Reference Enable) is needed. For applications that include running the motor in reverse negative torque will not satisfy the needed torque level set in Pr 12.43 unless Pr 1.10 is set to value 1 (on).

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