

To: T10 Membership
From: Lawrence J. Lamers, Ron Roberts, Adaptec, Inc.
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1. Margin Control U320 Mode

Adjustment of driver and receiver parameters are required during domain validation sequence when implementing the U320 mode of operation defined in the SPI-4 Standard. Various parameters are adjusted to determine the limits of the performance margin that the physical interface signals contain. This provides the system integrator a means to determine the integrity of the interface. It is recommended that all parameters be adjusted to their nominal setting when a bus free phase occurs.

In U320 mode the Initiator and target shall only implement Packet Protocol, as specified in SPI-4. Therefore, Margin Control shall be initiated using SPI information units. The devices shall follow the normal Packet Protocol and report statuses as defined in the SPI-4 standard. The maximum packet size shall be specified in the INQUIRY command response.

Table x2 defines the parameters that may be margined.

Table x2 - Margin Parameter

Value 7,6,5,4	Margin Parameter
0000b	Reserved
0001b	Signal Ground Bias
0010b	Driver Pre-comp
0011b	Reserved
0100b	Driver Strength
0101b	Slew Rate
0110b	Terminator Impedance
0111b-1101b	Reserved
1110b	General Purpose
1111b	Experimental Test

The signal ground bias cancellation is disabled when the margin parameter offset is 001b and enabled when the margin parameter offset is 100b.

The terminator impedance parameter allows for adjusting the impedance of terminators to reduce reflections. The steps are recommended to be in 5-ohm increments.

The experimental test parameter is for use in developing margin tests. It shall not be used on a permanent basis; useful margin test parameters should be encoded into the reserved fields via a request to the T10 committee.

The general purpose parameter is used in lieu of the five specific parameters. It indicates that the receiving device should adjust its margin parameters on transmitters to according to its algorithm for margining.

The remaining margin parameters are self-explanatory based on their titles. The exact adjustment to the parameter is defined by the vendor since it is closely tied the implementation.

Table x3 defines the amount of adjustment of the selected margin parameter

Table x3 - Margin Parameter Offset Adjustment

Value 3,2,1,0	Offset Adjustment
0111b	Offset three steps in negative direction
0110b	Offset two steps in negative direction
0101b	Offset one step in negative direction
0100b	Nominal Setting
0000b	Not changed
0001b	Offset one step in positive direction
0010b	Offset two steps in positive direction
0011b	Offset three steps in positive direction
1000-1111b	Reserved

The margin parameter offset adjustment field allows for three steps in each direction from nominal settings, a return to nominal settings (default) and an unchanged option. This allows margin parameters to be tested in various combinations for maximum flexibility.

2. Margin Control, Information Units

When the Initiator determines that a margin control function is to be implemented it negotiates for a PPR and begins the Selection phase without Attention. The target detects this condition and moves into Packet Protocol.

The Initiator issues SPI L_Q information units in the sequence identified in the SPI-4 standard. The TYPE field of the SPI L_Q information unit shall be set to 02h.

If Byte 1 of the first SPI L_Q information unit is non-zero the Target shall obtain the Margin Parameters and desired Offset from Byte 1. When the SPI Command information unit is received the target shall check the command to insure that a READ BUFFER or WRITE BUFFER command, with echo buffer mode set, is being requested and the direction of the data flow. If the command is not a READ BUFFER or WRITE BFFER, with echo buffer mode set, the target shall not implement any margin offset and shall remain in the nominal mode.

The Target will margin its drivers when a READ DATA is issued and direction of the data flow is form Target to Initiator. The Initiator margins its Drivers when the direction of data flow is from Initiator to Target.

During the second L_Q packet the TYPE field is set to 04h indicating that data is to be transferred to or from the Target. This data is used to validate the margin variations. The data transfer for a READ BUFFER or WRITE BUFFER command in echo buffer mode shall be made as a single packet with an interval count of zero. The maximum burst length shall be ignored for these commands.

Because each Target will have various parameter control implementations the Initiator may issue a Parameter and an Offset that is out of the range of the Target. If the Target detects an out of range condition it shall not reject the command but will place its capability in the Sense data returned in the STATUS information unit. The Target shall remain in the nominal condition.

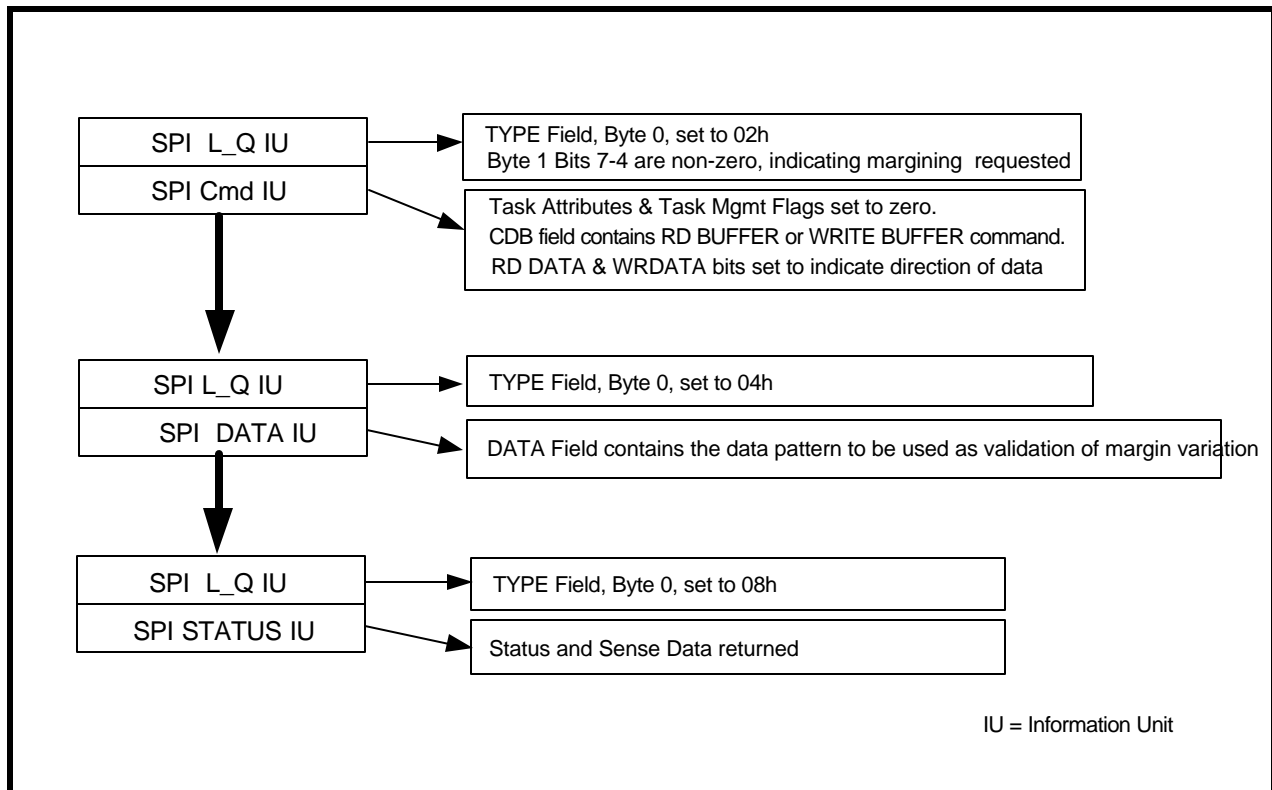


Figure 1 – API Information units for Margin Control