Manipulating the RT Status Word using Alta 1553 Products

A common misconception with Mil-Std-1553 is that the Remote Terminal will respond with the Message Error (ME) bit set in the status word if there was an error in the message – THIS IS NOT TRUE.

If the RT detects an error in a message, it will not respond with a status word at all - a "no response" indicates that the RT saw an error. Internally the RT sets the ME bit but does not send the status word. If the BC then sends Mode Code 2 (transmit status) or Mode Code 18 (transmit last command) then the RT will respond with a status word, if the RT detected an error in the previous message then the ME bit will be set in the status word. Any other command (other than Mode Code 2 or 18) clears the RT status word (clearing the ME bit).

If the RT implements the Illegal Command option, then if the BC sends a command that is illegal for the RT the RT will respond with the ME bit set in the status word and (for transmit commands) the RT will not send data words.

The cases described above are the ONLY valid cases where you will see the RT respond with the ME bit set in the status word.

The RT Status Response word can be changed in a minimal fashion using Alta 1553 products.

To set any additional bits other than the normal RT Address bits, one can use the Alta API function

ADT_L1_1553_RT_StatusWrite(Devid, rtAddr, stsWord)

but you cannot set these bits:
RT Addr (bits 11-15)
Message Error (ME) (bit 10)
The ME bit is strictly defined by the MIL-STD-1553 specification and is controlled by the Alta Protocol Engine.

ERRORS can be injected in the RT status word using
ADT_L1_1553_RT_InjStsWordError ().
This function allows the user to inject **allowed errors** on the RT Status Response word. The allowed errors are **Sync Error, Manchester Encoding Error, and Parity Error ONLY**.
Note: These are protocol-type errors and DO NOT set any additional bits in the Status Response Word.

The Message Error (ME) bit is unique in that the RT cannot directly set this bit. There is a lengthy discussion in both the MIL-STD-1553 and the MIL- HDBK-1553A about the ME bit.

The following bulleted paragraphs from MIL-STD-1553 will help to understand how the ME bit is used and when the bit is set.

The Mil-Std-1553 manual and the MIL-HDBK-1553A are each available for download on the Alta Data web site and are distributed in the manual set of installed Alta drivers for Windows.

4.3.3.5.3.3 Message error bit

The status word bit at bit time nine (see Figure 3) shall be utilized to indicate that one or more of the data words associated with the preceding receive command word from the bus controller has failed to pass the RT's validity tests as specified in 4.4.1.1. The bit shall also be set under the conditions specified in 4.4.1.2., 4.4.3.4 and 4.4.3.6. A logic one shall indicate the presence of a message error, and a logic zero shall show its absence. All RT's shall implement the message error bit.

4.4.1.1 Word validation

The terminal shall insure that each word conforms to the following minimum criteria:
a. The word begins with valid sync field.

b. The bits are in a valid Manchester II code.

c. The information field has 16 bits plus parity.

d. The word parity is odd.

When a word fails to conform to the preceding criteria, the word shall be considered invalid.

4.4.1.2 Transmission continuity

The terminal shall verify that the message is contiguous as defined in 4.3.3.6. Improperly timed data syncs shall be considered a message error.

4.4.3.4 Illegal command

An illegal command is a valid command as specified in 4.4.3.1, where the bits in the subaddress/mode field, data word count/mode code field, and the T/R bit indicate a mode command, subaddress, or word count that has not been implemented in the RT. It is the responsibility of the bus controller to assure that no illegal commands are sent out. The RT designer has the option of monitoring for illegal commands. If an RT that is designed with this option detects an illegal command and the proper number of contiguous valid data words as specified by the illegal command word, it shall respond with a status word only, setting the message error bit, and not use the information received.

4.4.3.6 Invalid data reception

Any data word(s) associated with a valid receive command that does not meet the criteria specified in 4.4.1.1 and 4.4.1.2 or an error in the data word count shall cause the remote terminal to set the message error bit in the status word to a logic one and suppress the transmission of the status word. If a message error has occurred, then the entire message shall be considered invalid.

Summary from the MIL-HDBK-1553A dated 1 November 1988

The key to understanding the message error (ME) bit lies in 4.4.3.6. First, the command word must be valid and have the RT's assigned address. Then, if there is a data word validity problem or any words are not contiguous, the ME bit is set to a logic 1 in the status word but the status word is not transmitted. The ME bit can be obtained by using either of the two mode commands: transmit status or transmit last command. The only time the ME bit is set and the status word is transmitted in response to valid receive or transmit commands is per the illegal command detection response of 4.4.3.4.

As mentioned in the paragraph above, the only way to "set" the ME bit in an RT Status word when performing RT functions is to illegalize either a valid command or Mode Code. As stated in paragraph 4.4.3.4 above, an illegal command received with perfecly valid data words (in the case of a BC-RT command) will result in the RT responding with the ME bit set in the status word, but will do nothing with the associated received data words. In the case of a transmit command (RT-BC message), the RT will respond ONLY with it's Status Word with the ME bit set and send no data as requested by the Command Word received.

The API functions
ADT_L1_1553_RT_SA_LegalizationWrite() and
ADT_L1_1553_RT_MC_LegalizationWrite()
can be used to illegalize a command word (RT-t?r-SA-WC) or mode code, respectively. Refer to the AltaAPI Users Manual for details on using these functions.

(Even though these can be used to "set" the ME bit in the RT Status Response Word, this is normally only used for testing purposes as it it still up to the BC implementation to not include any illegal commands in the bus list.)