The primary purpose of the 1553 data bus is to provide a common medium for the exchange of data between systems and sub-systems on the 1553 data bus in the form of message transmissions. The 1553 standard defines different types of message transmission formats based on three word types: command words, data words, and status words. The 1553 standard also defines the criteria for the validation of message transmissions, such as valid sync, Manchester encoding, number of bits, odd parity, *etc.* The 1553 standard, however, does not validate the data being transmitted, which is the responsibility of each of the sub-systems connected to the 1553 data bus.

This responsibility may be provided by data guards that lie directly between an endpoint of a 1553 data bus system and the other sub-systems on the 1553 data bus system. However, if a data guard is always active for a remote terminal, this will create latency concerns in the 1553 data bus system (because of the additional response time required for a remote terminal to transmit its status word in response to a command word from a BC) and may be too restrictive for normal operations and only considered acceptable in the presence of known or suspected threats. Accordingly, there is a need for a data guard compatible with a 1553 data bus system that can be initialized and activated at any point in its operational lifecycle and that may be deactivated and reactivated at will by an operator of the 1553 data bus system.

SUMMARY

An aspect of the disclosure provides a data guard system for use with a MIL-STD-1553 data bus. The data guard system includes a first coupler, a second coupler, a third coupler, a first switch, a second switch, a guarded bus, and a data guard. The guarded bus is in signal communication with the second coupler and the second switch. The data guard includes a first 1553 controller, a filter, a plurality of memory blocks, and a microprocessor. The first 1553 controller is in signal communication with the second coupler. The filter includes a

plurality of pre-defined data rule sets configured to be applied to data traffic messages received from the MIL-STD-1553 data bus. The plurality of memory blocks are directly accessible to the first 1553 controller. The microprocessor is in signal communication with the first switch, the second switch, the first 1553 controller, and the filter. A plurality of data traffic messages from a remote terminal (RT) connected to the second switch is, when the data guard system is in an active mode, directed by the second switch onto the guarded bus and then to the second coupler. A data traffic message of the plurality of data traffic messages is compared against the pre-defined data rule sets to determine if the data traffic message matches at least one data rule of the pre-defined data rule sets.

Another aspect of the disclosure provides a method of validating data traffic on an MIL-STD-1553 data bus with a data guard toggleable into an active mode and a passive mode. The method includes receiving data traffic comprising 1553 messages from the MIL-STD-1553 data bus in signal communication with the data guard, and directing the received data traffic onto a transparent bus or a guarded bus of the data guard using a first switch and a second switch. If the received data traffic has been directed onto the guarded bus, the method includes accessing a data rule set from a computer file stored on a computer-readable medium stored on a data guard system, wherein the data rule set includes a plurality of pre-defined sub-rules, comparing the received data traffic from the MIL-STD-1553 data bus against each of the pre-defined sub-rules of the data rule set, and determining if the received data traffic matches any one of the pre-defined sub-rules of the data rule set.

Another aspect of the present disclosure provides a data guard configured to evaluate and authenticate data traffic on an MIL-STD-1553 data bus. The data guard includes a first coupler, a second coupler, a third coupler, a first switch, a second switch, a guarded bus, a

first 1553 controller, a filter a plurality of memory blocks, and a microprocessor. The guarded bus is in signal communication with the second coupler and the second switch. The first 1553 controller is in signal communication with the second coupler. The filter includes a plurality of pre-defined data rule sets configured to be applied to data traffic messages received from the MIL-STD-1553 data bus. The plurality of memory blocks are directly accessible to the first 1553 controller. The microprocessor is in signal communication with first switch, the second switch, the first 1553 controller, and the filter. A plurality of data traffic messages are from a remote terminal in signal communication with the second switch, when the data guard in an active mode, is directed by the second switch onto the guarded bus and then to the second coupler. A data traffic message of the plurality of data traffic messages is compared against the plurality of pre-defined data rule sets to determine if the data traffic message matches at least one of the pre-defined data rule sets.

A data guard system for use with an MIL-STD-1553 data bus ("1553 data bus") is disclosed. The data guard system includes two switches, three couplers, a transparent bus, a guarded bus, and a data guard device, wherein the data guard device may be connected to the main bus of the 1553 data bus through the transparent bus and the guarded bus using the couplers. Using the two switches, the data guard system may be toggled between a passive mode and an active mode.