

Selecting a Bus Analyzer 101

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As avionics buses on military and commercial aircraft become more varied and complex, a bus analyzer has become an important tool for use during integration, validation, deployment, and maintenance of avionics systems. Today's aircraft may contain MIL-STD-1553, ARINC 429, CAN, or ARINC 664 (AFDX) buses as part of the overall system. Choosing an analyzer needs to be a part of the overall system integration and test plan from the earliest phase of the project.

Types of analyzers available

There are, in effect, two types of bus analyzers available on the market today. The first is a standalone type of analyzer, generally known as a box analyzer. Some of these types of analyzers are highly specialized and can be very difficult to use with complex bus traffic scenarios. The controls and commands are sometimes cryptic and tailoring the operation can be challenging.

The second type of analyzer is based on the personal computer. Because the PC is a highly programmable platform, it is much easier for bus information to be presented in a customized and meaningful format. This type of analyzer is generally a graphical user interface (GUI) hosted on the Windows® operating system. The GUI allows the analyzer to present the data in multiple forms from basic message-based display of raw data, to more advanced views with data displayed in engineering units, or graphical formats such as gauges and strip charts. Data can also be readily exported to other available tools, such as Microsoft® Excel®.

Abaco's Intelligent Platforms business offers a variety of Windows-based BusTools analyzer products to complement our line of bus interface cards, available for MIL-STD-1553, ARINC 429, and AFDX protocols. Software and

hardware may be configured to meet specific needs, or a complete package is available as a turnkey BTP system that includes a semi-rugged laptop computer with analyzer software and bus interface hardware pre-installed.

Also available is Abaco's AIL package which enables analysis of AFDX, ARINC 429, and CAN bus activity in a single analyzer.

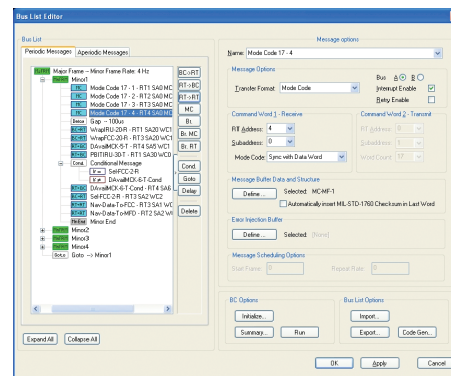


Figure 1 The BusTools/1553 bus list editor enables fast and intuitive management of complex 1553 message lists.

Form factor selection

As part of choosing a product form factor for the underlying analyzer bus interface, the intended use of the analyzer should be considered. During the development, integration, and validation phases of a program, use of an analyzer is often required in a laboratory or controlled environment. In this case, suitable form factors to consider are rack mounted CompactPCI or industrial PC, or a bench oriented desktop computer. Product form factors available for these computing platforms include CompactPCI®, PCI, and PCI Express®.

For in-flight deployment and test of avionics systems, a more portable approach is needed. Available form factors include USB, PCMCIA and ExpressCard™, enabling a laptop to

be the basis for the bus analyzer. This provides the ability to utilize the power and mobility of a fully functional analyzer in off-site labs, on the flight line, or on the aircraft. Abaco has solutions for all of these form factors.

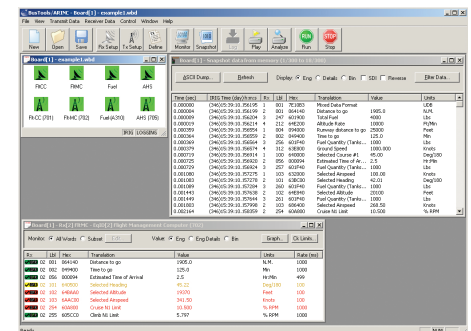


Figure 2 An intuitive GUI means that analysis of ARINC 429 systems is quick and easy.

Functions of a bus analyzer

There are four distinct functions that a bus analyzer needs to perform: simulation, data display, data logging and analysis, and bus traffic playback.

Simulation

Simulation of various hardware components on the bus allows the user to manipulate the external environment of the LRU (line replaceable unit) under test in order to validate operation under a variety of stimuli. A good analyzer needs to be able to generate data of the proper form that can be transmitted on the bus and simulate one or more of the LRUs. A good analyzer also needs to be able to inject error conditions on the bus so that LRU responses can be observed and verified. It is essential that the analyzer software and hardware be able to simulate all aspects of the system.

For MIL-STD-1553, it is necessary for the bus analyzer to be capable of monitoring the bus while simulating both a bus controller and multiple remote terminals. For ARINC 429, an analyzer must have the capacity to monitor all buses while



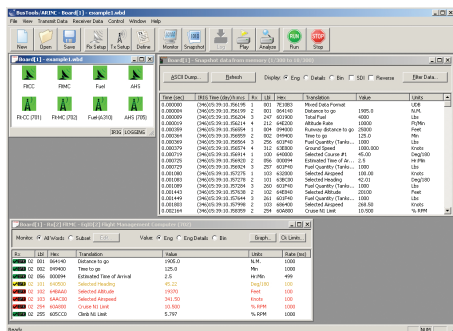


Figure 3 – Abaco provides a broad range of bus analysis solutions, including AFDX.

simulating all transmitting sensors and sources. With AFDX, the analyzer should have the ability to simulate all end systems and virtual links contained therein, while simultaneously monitoring and logging all bus traffic. Abaco's bus analyzers excel in these areas.

Data display

Without being able to easily see bus data in a meaningful format, bus analyzers would not be of much value. The question is: how does the data get displayed?

The BusTools/1553 analyzer, for example, allows users to see the data overlaid upon a drawing of an aircraft, missile, or vehicle. Locations of the various LRUs can be placed where they would be found, making it useful to maintenance personnel.

BusTools/1553 also allows the operator to convert raw data to engineering units and

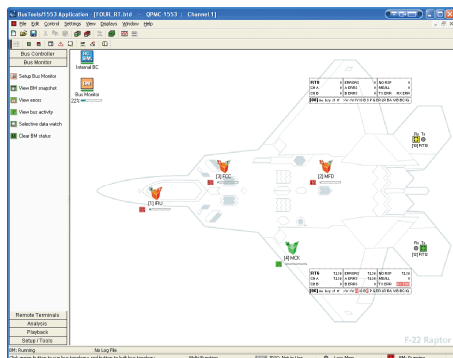


Figure 4 – BusTools/1553 analyzer displays the topology of an aircraft, identifying the various LRUs on the bus.

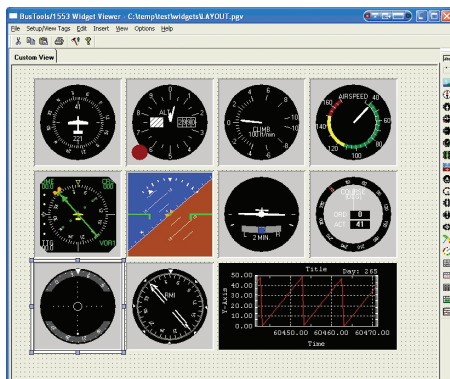


Figure 5 – BusTools/1553 provides a range of widgets to be utilized during active display of bus messages.

display it via a series of gauges, indicators, and charts, much like the indicators found in the cockpit or instrument panel.

Data logging and analysis

Data analysis is fundamental to the development and integration tasks of any avionics system. Do the LRUs behave correctly when they encounter data containing errors? Do the LRUs exhibit any faults on the bus? Does the scheduling and content of messages meet the design criteria of the system specification?

All of these questions and more can be answered with the appropriate bus analyzer. From the highest level, a

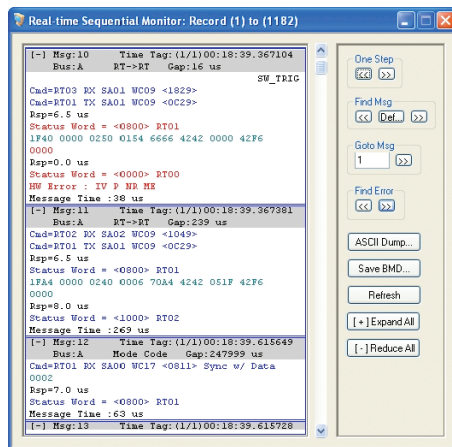


Figure 6 The BusTools analyzers provide multiple flexible traffic viewers that make it easy to quickly analyze large amounts of data and zero in on data of interest.

programmable display of bus operations allows the determination that the LRU is operating properly for the bus protocol and message scenario under test.

The analyzer can detect and display protocol errors present on the bus, as well as allow the user to verify the data transmitted by the LRU meets the criteria of the design specification. Error conditions are flagged and indicated as to the type of error encountered, and advanced views show bus data displayed in engineering units.

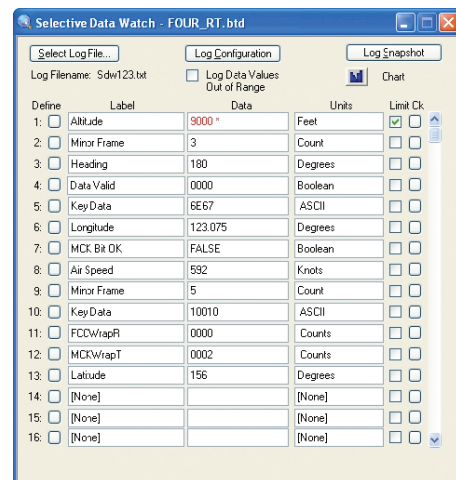


Figure 7 The BusTools analyzers allow the user to filter which data will be displayed, monitored, or recorded to simplify analysis.



Figure 8 All BusTools analyzers simplify traffic analysis by allowing traffic to be displayed in engineering units.

Playback of Data

The playback feature allows users to recreate the message scenario on a bus previously captured under controlled conditions. This means that data from a live LRU on an aircraft can be recorded and transferred to the laboratory for playback with the analyzer software and hardware. Data transmission can be replicated on the bus and the conditions in the deployed system simulated in the lab.

Conclusion

Bus analyzers have a vital role to play in the integration, verification, and deployment of avionics systems. Choosing the right bus analyzer can save significant time, money and effort; reduce program risk; and accelerate time to market. There are many potential bus analyzer candidates, but few companies have Abaco's breadth of product

offering, depth of expertise or extensive experience in designing bus analysis solutions and supporting customer implementation in high profile programs.

For more information, go to:
<http://www.geautomation.com/products/databuses-analyzers-software>
or call 1-877-429-1553.



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