Next-Generation Telemetry Workstation

Global Positioning System (GPS) Metric Tracking

A next-generation telemetry workstation has been developed to replace the one currently used to test and control Range Safety systems. Improving upon the performance of the original system, the new telemetry workstation uses dual-channel telemetry boards for better synchronization of the two uplink telemetry streams. The new workstation also includes an Interrange Instrumentation Group/Global Positioning System (IRIG/GPS) time code receiver board for independent, local time stamping of return-link data. The next-generation system will also record and play back return-link data for postlaunch analysis.

The telemetry workstation software is based on C++ and was designed with the Microsoft Visual Studio 2005 development environment. Display screens were designed with National Instruments LabVIEW professional graphics development tools. The figures show examples of typical LabVIEW display screens. The C++ software sends display data to the LabVIEW software and receives button control commands from the LabVIEW software, using a Transmission Control Protocol/Internet Protocol (TCP/IP) communication scheme. The LabVIEW software does not control any hardware; rather it functions as a slaved smart graphical user interface.

The workstation was designed to support various ongoing NASA and Air Force projects. The workstation can send and receive RS-422 telemetry data at a rate of up to 10 Mb/s over two uplink channels and two downlink channels simultaneously. When configured in record and playback mode, the workstation can record or play back up to four channels simultaneously. It can work with clocked or unclocked data using almost any return-to-zero (RZ) or non–return-to-zero (NRZ) data format. The workstation implements a clock recovery algorithm for unclocked data streams. It performs a software data decommutation operation on the incoming telemetry streams, and the data is processed for display and archiving according to the requirements of the particular telemetry system being supported.

The workstation can encrypt forward-link data, using triple Data Encryption Standard (DES) techniques, as well as encode and decode Reed Solomon error correction codes for forward- and return-link data and perform cyclical redundancy checks on return-link data.

The next phase in the development is to design and conduct comprehensive test procedures for the telemetry workstation. The tests will verify operation of the workstation hardware and the user interface software. Failure modes will be simulated, and the workstation's ability to detect, correct, and recover will be studied. Simulation software will need to be developed, and further software changes and enhancements will probably be necessary, based on the results of these tests. A final certification test will be developed and conducted to validate the workstation.

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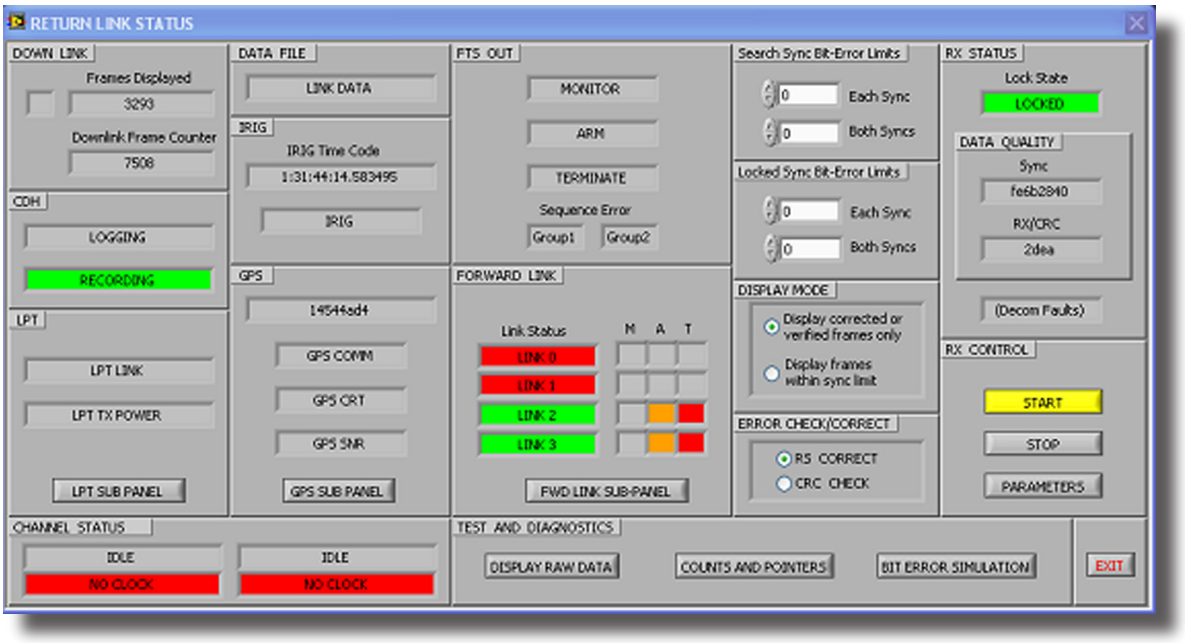
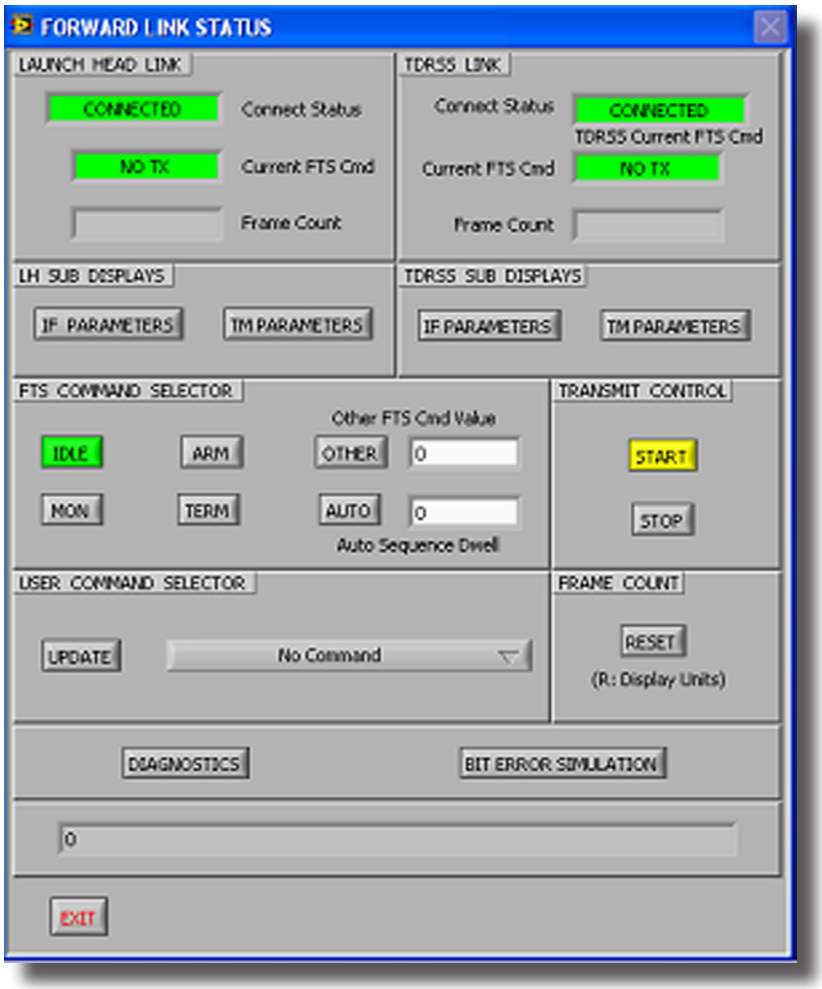


Telemetry workstation return-link status display.



Telemetry workstation forward-link status display.