EMBEDDED VIDEO TRANSMISSION IN A CAIS DATA ACQUISITION SYSTEM

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ABSTRACT

Acquiring real-time video data, during flight testing, has become an integral component in aircraft design and performance evaluation. This unique data acquisition capability has been successfully integrated into the JSF (Joint Strike Fighter), CAIS compliant, FTIDAS (Flight Test Instrumentation Data Acquisition System) developed by L-3 Communications Telemetry-East.

KEYWORDS

Video Compression, Video Transmission, CAIS (Common Airborne Instrumentation System)

INTRODUCTION

Part of the overall system integration effort for the Lockheed JSF CDA (Concept Demonstration Aircraft) was to incorporate a cost effective, high performance video capture, compression, and transmission system for real-time monitoring of HUD (Heads-up Display) video data during flight-testing. The ability to visually monitor HUD data on the ground during test flights allows for more flexibility in managing flight test maneuvers in real-time. This application of COTS (common of the shelf) technology has been successfully integrated into a large, high performance CAIS data acquisition system using standard L-3 Communications Telemetry-East products. The primary functional components of this video telemetry system are the video compression/encoder and a serial data capture module, a signal conditioning component of a standard CAIS compliant DAU (data acquisition unit). A block diagram of this system is shown below:

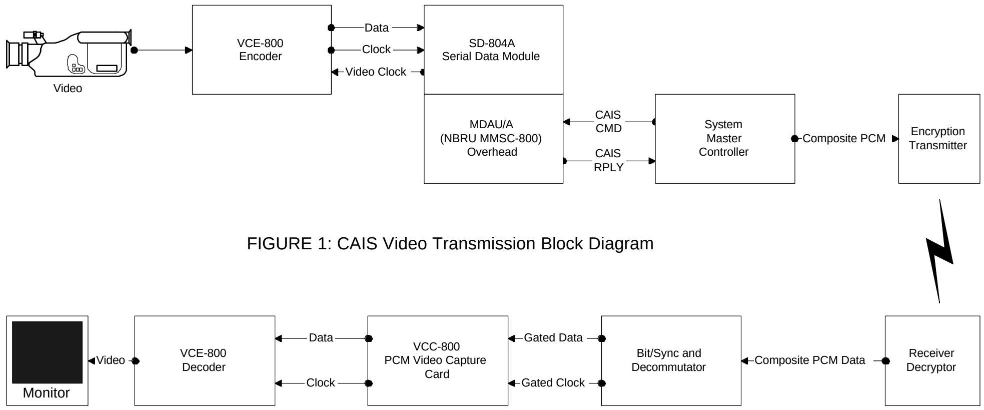

FIGURE 1: CAIS Video Transmission Block Diagram

VIDEO DATA ACQUISITION

The video (NTSC Composite or S-Video) source is captured, digitized and compressed using the H.261 compression algorithm in video compression/encoder. The H.261 compression algorithm increases data compression by using inter-frame coding to remove redundancies in data between consecutive video frames. The resultant serial data is clocked out from the serial data signal conditioning module installed on the DAU stack on the CAIS bus. The serial data module transmits a bursted clock of one half the word size (either 6 or 8 clock pulses) at the full 5 MBPS operating data rate of the CAIS bus. The incoming bursted clock and data is sampled in accordance with the CAIS System Controller PCM format and is placed onto the DAU back-plane bus for transmission over the CAIS bus via overhead modules. Serial data collection is selectable for both 12 and 16 bits per word operations.

EMBEDDED VIDEO

The CAIS Bus System Master Controller Format then encodes the sampled digitized video data from the DAU remote unit. The sampling algorithm needs to provide sufficient data at the video-decoding end of the system to allow an updating rate of video frames to match the video performance desired at the ground end of the system. To accommodate smooth updating of each video frame on the ground monitor, the PCM Format in the CAIS System Controller should evenly acquire the sampled data. The video data is then embedded into the composite transmitter output PCM stream along with all of the other sampled transducer and sensor data.

VIDEO TRANSMISSION

The Composite PCM output from the System Controller can then be encrypted and transmitted to the ground station, during flight, where it would be received and decrypted prior to Video reconstruction.

VIDEO RECONSTRUCTION

After the transmitted data is received by the ground station, it is decrypted, as necessary, to reproduce the original composite PCM data stream. This data stream is then bit-synchronized and decommutated. After decommutation, the selected video data words are routed through an asynchronous decommutator output to the PCM video capture card. The single ended serial clock and data from the PCM video capture card is then fed into a video decompression/decoder, which would then decompress the data and convert it to the proper video signals needed to drive either an NTSC composite or S-video monitor.

CONCLUSION

By successfully integrating a high performance video data acquisition sub-system into a large scale CAIS Flight Test Instrumentation System L-3 Communications Telemetry-East has continued to meet the changing needs of the Flight Test Community and demonstrate their ability to meet real world challenges with real world hardware. This application of technology adds to the many types of data requiring measurement and acquisition during flight-testing and evaluation.

ACKNOWLEDGEMENTS

REFERENCES

1. Thom, G. and Snyder, E.; “Digital Video Telemetry System”, Technical Paper 9603 Presented at ITC/USA/’96, San Diego, CA.

NOMENCLATURE

APPENDIX