HSSub-6120 AS5643 Mil-FireWire

High Performance & High Density PXI Express Instrument for Mil-FireWire Applications

The HSSub-6120 is a high-density, high-performance instrument, focused on the requirements of industry standard SAE AS5643 Mil-FireWire broadly employed in F-35 and other recent avionics platforms. HSSub-6120 can be used as an individual instrument, or as part of an integrated Teradyne High-Speed Subsystem (HSSub). The instrument can address both legacy tests and emerging data-rich tests that require multiple concurrently executing instruments. The HSSub-6120 is reconfigurable to address immediate and future requirements, and to avoid the high cost of obsolescence.

FEATURES

- *Highest density capability available in an AS5643 3U PXI Express, single-slot instrument with (4) FireWire nodes, each with (3) ports*
- *Member of the Teradyne High Speed Subsystem (HSSub) family, providing rapid configurability, application flexibility, low latency, high performance, and optimized production throughput*
- *Teradyne-supplied HSSub Apps provide high-level (AS5643) and low-level (1394) access, while accommodating end-user customization*

BENEFITS

- Performance and flexibility allows replacement of ageing or unsupportable hardware
- Customization capabilities avoid cost of future obsolescence
- Capable and flexible programming minimizes TPS development and support costs
- High production throughput minimizes equipment and labor costs
- Long-term product and service support minimizes logistics and TPS support costs over the platform lifecycle

Background

The HSSub-6120 Mil-FireWire instrument is a modernized descendant of the Teradyne VXI Bi-420, which has provided factory and product acceptance test capability for the F-35 Multi-Role Fighter at the numerous avionics manufacturers for over a decade.

F-35 FireWire was formulated early in the design stages of F-35 avionics, and consists of enhancements to standard IEEE 1394b FireWire that provide additional redundancy, reliability, safety, and predictability. This protocol is being used to provide deterministic, real-time data within and between avionics modules supplied by numerous F-35 suppliers. SAE AS5643, also known as Mil-FireWire, is an International standard based on F-35 FireWire. AS5643 provides a robust Upper Level Protocol to meet these avionics requirements, built on top of the proven 1394b Lower-Level Protocol. In addition to F-35, AS5643 has been designed into various other new platforms or avionics upgrades to planes, UAVs, helicopters, and missiles.

Architecture

The HSSub-6120 AS5643 Mil-FireWire instrument employs a Three-Tier Architecture consisting of: low-level ***I/O Protocol Processing*** (Tier 1), ***Real-Time Computing*** (Tier 2), and ***PC-based Resource Management*** (Tier 3).

The 1394b Lower Level Protocol is provided by a proven dedicated chipset at Tier 1. The AS5643 Upper Level Protocol is implemented by an FPGA with a Real-Time Processor at Tier 2. The PC controlling the PXI chassis manages the TPS-level operation of HSSub-6120 and other instruments. Locating all lower and upper level protocols (Tiers 1 & 2) within the instrument avoids PC bottlenecks and unpredictable latency, and allows any number of the instruments to operate concurrently for large FireWire node count applications.

The HSSub-6120 is configured at runtime by a TPS – it is a ***Runtime Defined instrument***. The configuration is performed by ***HSSub Apps***, which are invoked by the TPS. Within seconds, the Teradyne-supplied SAE AS5643 HSSub App configures the Tier 1 chipset, loads the instrument-based FPGA and Real-Time Processor Tier 2 code, and provides the TPS with a conventional ANSI C AS5643 programing interface (API) at the Tier 3 PC level. The advantage of this approach is that there can be multiple HSSub apps that provide various functions. Unanticipated requirements can typically be addressed by new HSSub Apps, without changing existing ones to ensure compatibility. While Teradyne

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supplies the necessary AS5643 HSSub App, the open architecture allows end-users or third-party developers to create HSSub Apps that address variations from the standard or other customizations.

Summary

The HSSub-6120 can address AS5643 Mil-FireWire testing at various stages of a product's lifecycle. One instrument in a laboratory can support design verification or test development. Multiple instruments and the HSSub support infrastructure can test, control, or monitor any number of concurrent AS5643 ports. F-35 applications formerly addressed by other instruments, including the Teradyne Bi-420, can be compatibly replaced by the HSSub-6120. While most deployed avionics operate at 400 Mbps (S400), HSSub-6120 also has the bandwidth to support 800 Mbps (S800). Finally, the HSSub-6120 optimizes long-term supportability with the combination of proven Teradyne support, and the customization provided by the HSSub architecture.

Specifications

Front Panel Connector	Samtec SEARAY SEAF-30-01-L-06
Optional Virginia Panel Receiver Module	VTAC connectors with both i2 MX cable and G20 ITA capability
PXI backplane power draw	38W total per instrument
IEEE 1394b Nodes	4 independent nodes
IEEE 1394b Ports	3 ports per node
Performance	S100, S200, S400, S800 transfer rates
Bandwidth	Support all Nodes operating concurrently at 800 Mbps
Port Coupling	Independent transformer coupling for each port
Port Isolation	Independent relay isolation for each port (Bi-420 compatibility)
PXI Triggers	8 standard PXI backplane triggers
Front Panel Trigger	4 bidirectional triggers
Power for external 1394b devices	None
Local Instrument Memory	4 GB DDR3 SDRAM
Tier 1: I/O Protocol Processing	Industry standard Texas Instruments IEEE 1394b Chipset
Tier 2: RT Computing (firmware-based)	Zync FPGA for timestamp and trigger management
Tier 2: RT Computing (processor-based)	Dual-Core ARM Cortex A9 running Wind River VxWorks RTOS
Tier 3: PC Resource Management	Requires Microsoft Windows 64-bit Edition
TPS Programming	ANSI C (typical), C++/C#/LabVIEW
Supplied HSSub Apps	Teradyne developed and supported SAE AS5643 HSSub App
Alternate operating mode	OHCI v1.1 compliance (using Windows FireWire stack)

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1-20-16

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