Teletronics Technology Corporation
Total System Solutions

Encoders & Data Acquisition Systems

TTC designs and manufactures signal conditioning systems, data multiplexing systems and PCM data encoder systems for use in airborne, aviation, missile and aerospace applications.
ENCODERS & DATA ACQUISITION SYSTEMS

Teletronics Technology Corporation designs and manufactures signal conditioning, data multiplexing and PCM data encoder systems for use in airborne, aviation, missile and aerospace applications.

Teletronics Technology Corporation means quality and excellence in flight-test instrumentation. We are the world’s premier supplier of airborne data acquisition encoders and multiplexers for flight test and aircraft certification.

As a major supplier to the flight test and aerospace community, Teletronics Technology Corporation furnishes data acquisition systems that are tailored to meet specific government, industrial and commercial applications requirements. Our systems range from small, individual data acquisition units operating at up to 20 Mbps to large distributed systems with multiple data acquisition encoders operating at up to 2 Gbps.

Transducers, signal conditioners, encoders, transmitters, receivers, recorders, PCs and software are combined into a system that exactly fits a specific flight test need.

Our customers appreciate our dedication to quality. TTC has been building data acquisition instrumentation solutions for over 10 years and has provided top quality and reliable systems for the largest flight test programs in the world.

TTC's customers include all of the US prime aircraft suppliers, the US Air Force, Navy, Army, NASA and many other customers in countries around the world.

We develop and deliver our systems with customer needs firmly in mind. Our success is based on individual attention to customer’s requirements during every step of the sales, development and support cycles.

It is very important that customer investments in data acquisition systems are protected. TTC systems are fully compatible and compliant with IRIG 106 standards, and all of our legacy systems are protected. TTC builds its data acquisition systems on the principles of data acquisition topologies that meet any set of requirements.

TTC data acquisition systems can be implemented in various configurations including: standalone, master, remote or in combination. Available topologies include standalone, star, daisy chain, star/daisy chain hybrid or 100BASE-T Ethernet.

Data acquisition system components communicate with each other using a CAN (Common Airborne Instrumentation System) bus, the Ethernet or TTC’s proprietary E-bus. Data rates between modules in a PCM system are determined by the master unit throughout speed, up to 5 Mbps or up to 20 Mbps. Distributed systems with multiple wideband data acquisition units can reach rates up to 2 Gbps. Our distributed data acquisition systems include wideband and narrowband units, a system controller unit for PCM systems, and multiplexer and recorder systems.

Distributed systems allow single-point programming, time coherency on a system-wide basis and the flexibility to add and modify system components. Data acquisition system performance is superior in a distributed system because remote units are deployed close to sensors and transducers, resulting in shorter wiring runs.

Distributed systems also support placement of ruggedized remote units in areas of the vehicle where the environments are extremely harsh. Flexible wiring options result in the ability to design data acquisition topologies that meet any set of requirements.

TTC builds its data acquisition systems on the principles of data sampling coherency and system-wide simultaneous sampling. Our systems are extremely deterministic and repeatable, so that when a channel is sampled, its relation to any other channel, to the system frame signal and to system time is evident.

TTC means quality and excellence in the flight-test instrumentation industry. We are the premier supplier of airborne data acquisition encoders and multiplexers for flight test and aircraft certification in the world.

Other systems that depend upon isochronous data sampling cannot determine when channels are sampled or if artifact frequencies are introduced by the acquisition system.

TTC data acquisition systems interface with many sensors and transducers, including thermocouples, RTDs, accelerometers, bridges, pressure and acoustic sensors, L/RWTDs, Synchro/Resolvers, voice input, video input (MPEG-2, MPEG-4, H.261 and JPEG-2000), GPS sources and analog and digital data.

We also interface with data buses and have provisions for data selection and 100% data recording. These interfaces include MIL-STD-1553 (monitor, RT or controller), ARINC-429, ARINC-629, ARINC-654, IEEE 1394, Fibre Channel (electrical and optical), Ethernet (electrical and optical), the F-22 FOTR Bus, CAN bus, Link-4, Link-11, Link-16, RS-232/422/485, the F-15 HO09, the F-16 Weapon Bus, SDLC, Cross Channel Data Link, PCM and other proprietary serial bus data.

TTC is experienced, successful and well-respected in the data acquisition market. We provide turnkey solutions that reduce integration and program costs for programs including the Eclipse-550, Gulfstream G450/550, Citation, BeechCraft, Airbus A320, Boeing 787, F-15, F-16, F-18E/F/G, F-22, F-35, T-45, X-31, T-90, M-346, F-111, AS-332, U2, SH-2G, RH-47, AH-1W, Bell 427, Bell-609, V-22, Bell Eagle Eye, UH-1Y, C-130, C-5, B-1-B, Engine Testing (GE and PANDWIC), Pegasus, FireScout, Space Shuttle (USA) and various missile programs.

> ENCODERS AND DATA ACQUISITION SYSTEMS

AVIONICS DATA ACQUISITION

FLIGHT TEST INSTRUMENTATION

AIR AND LAND VEHICLE TEST AND CERTIFICATION

CAIS AND NETWORK-BASED APPLICATIONS

> TTC

> F-16

> ALL F-16 TEST PROGRAMS USE OUR DATA ACQUISITION UNITS AND PCM CONTROLLERS TO ACQUIRE, RECORD, AND TRANSMIT SENSOR AND AVIONICS BUS DATA. OUR SYSTEMS ARE CRITICAL COMPONENTS OF THE TEST FLIGHTS OF THE MANY F-16 CONFIGURATIONS USED BY THE US AIR FORCE AND FOREIGN COUNTRIES.
**NARROWBAND DATA ACQUISITION**

TTC collects narrowband avionic data using hundreds of available interfaces at up to 417 KSPS or 5 MBps per unit. Sensor and avionic data is conditioned, acquired and multiplexed for insertion into the PCM data stream. These units operate standalone, as remotes, as controllers or in a remote/controller combination. The largest has a 16-slot I/O capacity and the modular stackable units and miniature units support up to 30 I/O cards. Any of the narrowband units are made network-capable by inserting an appropriate controller overhead card or cards.

**WIDEBAND DATA ACQUISITION**

High-speed wideband signal conditioning cards, available for large fixed-volume and miniature stackable data acquisition units, acquire, condition and multiplex high-speed sensor data for PCM output at up to 1.25 MSPS or 20 MBps per unit. The PCM controller communicates safety-of-flight data conforming to the CAIS bus interface standard, and wideband data acquisition products are network-capable with an appropriate controller overhead card or cards.

**PCM CONTROLLER AND DATA ACQUISITION**

PCM controllers manage distributed PCM-based data acquisition systems by issuing multiple data streams for recording, transmission and use by other peripherals. Controllers configured with multiple CAIS buses communicate with and collect data from multiple remote data acquisition units. Controller PCM rates range from 5 MBps to 20 MBps and most systems can be configured as a data acquisition remote unit and as a system controller. The controller ensures that all data acquired is 100% coherent and deterministic between sensor channels and acquisition units.

**IRIG 106 CHAPTER 10 MULTIPLEXERS AND RECORDERS**

IRIG 106 Chapter 10 multiplexers and recorders collect and record data from avionic buses, video and audio sources, PCM streams and Ethernet networks compliant to the IRIG 106 Chapter 10 standard. The recording media is solid-state and can be integrated or external to the unit, and data is recorded at speeds from 20 to 160 MBps. Some multiplexers can control remote data acquisition units and retrieve specific bus parameters while simultaneously recording all incoming data.

**PCM RECORDERS**

PCM recorders collect all of the data from a test vehicle as a single PCM data stream at up to 20 MBps. PCM recorders have built-in frame correlation and IRIG B time code readers for data time-tagging and operate in a pass-through (bypass frame correlator) mode for recording NRFZ (Non-Return to Zero) data, including compressed video and encrypted data.

**COCKPIT UNITS**

Cockpit instrumentation data, including TM, flutter, TSIP and video, is controlled and activated by the pilot. Any interaction between the pilot and the aircraft controls can be fed back to the instrumentation system, collected by cockpit units, and recorded and transmitted for display and analysis. Multifunction cockpit display visualizations.

**TRANSMITTERS**

Telemetry transmitters send test data to a ground or airborne receiving site. TTC offers a full line of video, PCM and FM, and SOQPSK transmitters at power output levels from one to 20 W. Transmitters are available with video, analog or digital inputs at up to 20 Mbps and the new SOQPSK transmitters have a bandwidth efficiency improvement of 3:1. TTC transmitters are some of the smallest available and are primarily used for weapons applications.
ENCODERS & DATA ACQUISITION SYSTEMS: SHORT CATALOG

REMOTE ACQUISITION SYSTEMS
TTC data acquisition systems are available in standard and miniature models and support analog, temperature, pressure, video and digital data from ARINC and MIL-STD avionic buses. Miniature data acquisition units support up to 31 data acquisition modules and large units up to 16 signal-conditioning boards. There are over 300 signal-conditioning and digital modules available. Wideband acquisition units operating as remote units send selected data to PCM controllers over the CAIS bus at up to 20 MBps for recording. Other acquisition units output IRIG 106 Chapter 8-compliant data at up to 12 MBps PCM from up to eight MIL-STD-1553 buses or from up to 64 ARINC-429 buses. Realtime engineering unit processing and parameter data display.

ACQUISITION PCM CONTROLLERS
TTC offers many controller models that are optionally also data acquisition units. Controllers are available in stackable miniature units that are smaller than three cubic inches and operate at 5 MBps and as larger form factors with throughput of up to 20 MBps. Both controller sizes include eight-format map storage, format-switching capability, system-wide simultaneous sampling calibration mode assertion and a built-in data trap for quick data viewing through an RS-232 port. Controllers communicate with remote acquisition units using a CAIS or TTC proprietary bus and can include programmable PCM (DAC) modules, real-time BIT modules, and MIL-STD-1553 RT and controller modules for sensor data output.

STANDALONE ACQUISITION SYSTEMS
Most of the remote acquisition products TTC offers also function as standalone units, aggregating sensor and digital data and sending the multiplexed and encoded data using PCM. Miniature high-speed standalone data acquisition encoder units include from 20 to 40 analog, bi-level and multiple serial input channels, including SDLC (Synchronous Data Link Control) and video.

Suggested products
- CDAU-2004/08/10/12/16 5 MBps CAIS master and remote DAU
- CDAU-2004/08/10/12/16 5 MBps CAIS master and remote DAU
- EDAU-2008/10/12/16 20 MBps E-bus instrumentation controller and remote DAU
- WDAU-2008/10/12/16 20 MBps wideband with CAIS remote interface
- MCDAU-2000 Miniature CAIS remote DAU
- MEDAU-2000 Miniature E-bus remote DAU
- PMCMDAU-2000 Pluggable mini CAIS remote DAU
- MWDAU-2000 Miniature 30 MBps wideband with CAIS remote interface
- SCDAU-2000 Miniature single-module CAIS remote DAU

EMBEDDED RECORDER SYSTEMS
Embedded recorders are used in large TTC acquisition units or installed at the end of miniature stackable units. The large plug-in recorder uses two PCMCIA solid-state memory cards with up to 64 GB of storage each and occupies two slots in the chassis. There are two stackable miniature recorders. The first uses two PCMCIA cards and the second uses up to two CompactFlash cards. Either miniature recorder is available with up to 64 GB of solid-state media and records PCM signaling at up to 48 MBps.

Suggested products
- SSR-100L/W PCMCIA-based embedded recorder for CDAU controllers
- SSR-2015SA PCMCIA-based embedded recorder for CDAU/MWDAU/EDAU
- MMSM-100C/L-ST PCMCIA-based embedded recorder for MCDAU/MWDAU
- SMS-400 Solid-state recorder with removable memory cartridges
- MSSR-2010SA Miniature IRIG 106 chapter 10 multiplexer with solid-state recorder

COMMON AIRBORNE INSTRUMENTATION SYSTEM (CAIS)
The Common Airborne Instrumentation System (CAIS) is a Time Division Multiplexed (TDM) digital data acquisition specification for a star/daisy chain hybrid data bus that connects distributed data acquisition units (DAUs) with a CAIS bus controller. The CAIS bus is a full-duplex communications network: it communicates commands from the system controller to the DAUs and data from the DAUs to the controller for output to data storage devices and transmission. The U.S. government originally funded the development of the CAIS standard for Department of Defense programs to reduce costs by increasing hardware supportability and interoperability. It defines the electrical, physical and protocol aspects of the CAIS bus so that any equipment on the bus will interoperate. The CAIS incorporates growth by allowing for additional DAUs or multiple CAIS buses. Each CAIS bus is capable of 5 MBps of bandwidth and up to 60 DAUs.