ADLINK
LEADING EDGE COMPUTING



ADLINK EtherCAT Precision Synchronous Control Reduces Damage to Large TFT-LCD Panels During Manufacturing

Use Case

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Overview

The global TFT-LCD display panel market continues to grow as screens become an increasingly common fixture in every part of our lives. The overall TFT-LCD market is expected to grow with a CAGR of 5.2% from 2022 to 2027 and is projected to reach a value of USD 223 billion by 2026. This trend is driven by increasing demand for flat-panel TVs, smartphones, tablets, vehicle computers, and gaming. Large panels, in particular, are drawing attention as the increasing size of panels is challenging the limits of current production technologies.

Large-size panels have been the trend in recent years, and in the manufacturing process, these panels require more motion control axes for handling. However, expanding into multi-axis poses a major challenge to machine control and accuracy as it requires more powerful synchronization to avoid LCD panel cracks and distortions caused by asynchrony during the manufacturing process, affecting the overall quality.

Substandard Synchronization Damages Large TFT-LCD Panels During Manufacturing, Reducing Yield Rate

Synchronization across automated systems and the limitations of legacy systems, often lead to non-optimal yield rates, but have, until recently, served their purpose. Legacy serial control technologies such as MotionNet and High Speed Link are still in common use and continue to be utilized, despite their inability to fully support the demands of updated operating parameters.

As panel sizes continue to get larger, synchronizing multiple gantries becomes necessary to ensure no damage is caused to the panels during manufacturing. Setting up a synchronous multi-axis control system presents a significant challenge as legacy systems use different subsystems to trigger each next action.

Precision manufacturing can easily be the deciding factor in the success and competitiveness of TFT-LCD manufacturers, so they are eager to switch from their hard-to-synchronize controls to a system with precision synchronization capabilities. This switch reduces unintended damage to TFT-LCD panels, increases the overall output, and in turn reduces the cost of production.

ADLINK EtherCAT Reduces Large Panel TFT-LCD Damage With Synchronous Three-gantry Operations

ADLINK's EtherCAT solution has enabled the TFT-LCD manufacturer to switch from a single gantry to synchronous three-gantry operation. As the provider's existing architecture control was based on ADLINK's MotionNet motion control cards and APS Function Library, these programs were mostly reusable, allowing for a complete upgrade in just four weeks.

The TFT-LCD manufacturer achieved a 20% increase in production efficiency and a 30% reduction in production costs, enabling it to ramp up production to meet the growing demand, and providing a signifi-

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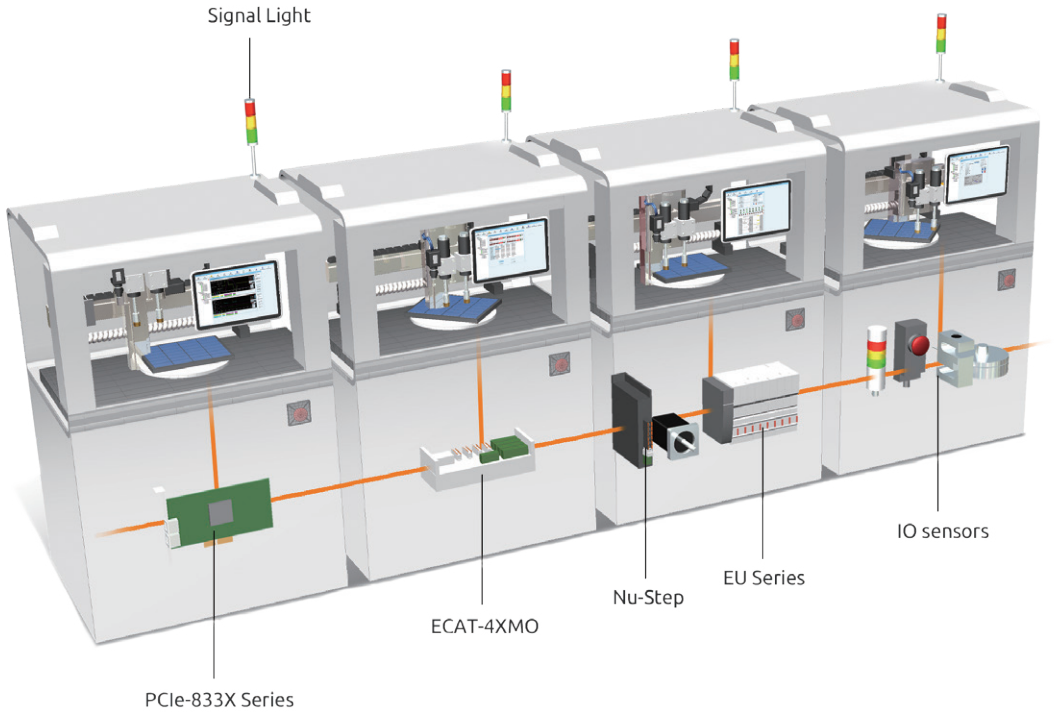
cant boost to its competitiveness. These goals were realized by switching from their legacy asynchronous systems to high synchronized EtherCAT.

Improved synchronization ADLINK EtherCAT enables high-speed trigger and precision synchronization for moving or screen bonding large panels in the TFT-LCD manufacturing process, with ≤ 200 nS latency and 64-axis performance, maximizing throughput.

Simple upgrade APS function library support simplifies the upgrade to EtherCAT-based motion control and provides motion control users with the ADEs, libraries, and drivers to easily upgrade to EtherCAT-based motion control without complicated program modifications or application redevelopment.

Lower TCO ADLINK's EtherCAT solution reduces costs up to 30% over non-EtherCAT motion control. High flexibility for synchronous control on both EtherCAT and non-EtherCAT motors eliminates the need to discard old equipment, reducing TCO across the entire motion control system.

Simplified cabling Now, with EtherCAT, a single Ethernet cable can connect all slaves, eliminating the division of process steps into multiple actions due to hardware limitations and slow, complicated cross-module synchronization.



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ADLINK EtherCAT Solution

ADLINK's EtherCAT solutions offer the hardware and software with superior performance to support highly synchronized control. The PCIe-833X EtherCAT master controller, ECAT-4XMO 4-channel motion control and high-speed trigger slave module for bridging to EtherCAT were used for the TFT-LCD production line.

PCIe-833X EtherCAT Master Controller

PCI Express® x1 EtherCAT motion controller, with 64-axis motion and 10,000 I/O point control, 250μs cycle times, various EtherCAT slave options, and a dedicated emergency stop input. Application-ready function library for easy motion and I/O control included. ADLINK MotionCreatorPro 2 for Microsoft® Windows allows complete EtherCAT motion and I/O configuration and function evaluation as well as compiling program download functions.

ECAT-4XMO 4-Ch Motion Control and High-Speed Trigger EtherCAT Bridge

Four-channel EtherCAT slave module with high-speed position comparison trigger and encoder re-drive function, helping machine and equipment builders to use multiple triggers simultaneously. Supports 4-axis motion control with bridge function between EtherCAT and non-EtherCAT. Advanced motion control functions help machine and equipment builders to increase their motor selection portfolio, like linear, step, servo, direct drive, and AC motors, making it ideal for a variety of automation industry applications.

- 4 table triggers—10 Mhz max w/ FIFO 255 points
- 4 linear triggers—10 Mhz max.
- 4 channel latch response—3 MHz max. w/ 255 points
- Hardware emergency stop interface
- Supports gantry function up to 32 sets with master

ADLINK—The Automation Expert

ADLINK Technology Inc., with years of market-proven expertise in measurement and automation technologies, provides a leading range of industrial automation products empowering motion control, machine vision, data acquisition, I/O control, and intelligent computing platforms. Superior domain know-how and field experience help us meet and exceed customer needs, with a wealth of highly integrated automation solutions enabling real-time I/O and motion control, backed up with reliable one-stop service. ADLINK consistently delivers value by overcoming a wide variety of industrial challenges, with proven platforms optimizing operations, driven by a commitment to long-term sustainability and intelligent manufacturing design.

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