Sunlight readability matters in off-highway vehicles

In agriculture, construction, and other off-highway vehicles, operators don't work in controlled conditions. Their cabs face bright sun, dust, vibration, rain, and constant exposure to the elements. Today's equipment relies on digital interfaces, demanding clear, real-time visibility of data, diagnostics, and video feeds. This makes sunlight readability a critical factor in display selection for OEMs.

Operators depend on displays to interact with equipment controls, respond to diagnostic alerts, and monitor machine performance. Under direct sunlight or glare, however, traditional TFT displays can wash out, making it difficult to read critical information. Reduced visibility doesn't just create inconvenience; it poses real risks:

- Safety concerns if fault indicators or warnings go unseen.
- Productivity losses as operators stop working to shield displays or wait for better conditions.
- Increased fatigue when operators must strain to read dim or low-contrast screens.

The In-Plane Switching (IPS) LCD technology addresses these challenges. Unlike legacy TFT screens, IPS displays maintain consistent brightness and color accuracy across wide viewing angles. The IPS technology creates a contrast that is almost independent of the viewing angle. So, no matter if you look at the display directly from the front or rather from the left or top, the contrast remains constant. This means that IPS displays can be read well from all sides. IPS displays achieve a viewing angle of up to 85° in all four directions compared to 45° to 55° for classic TFT displays. This ensures that whether operators are leaning forward, viewing from the side, or quickly glancing while controlling equipment, the display remains legible. IPS technology also provides sharper graphics and improved perceived clarity, making gauges, video feeds, and diagnostic alerts clearer in bright sunlight. When combined with optical bonding and anti-glare coatings, the result is a display that stays visible and dependable in the harshest conditions.

Grayhill has refreshed the 5-inch 3D50 display and the 7-inch 3D70 display with color transmissive IPS LCDs, replacing the legacy TFT technology. This brings several benefits to operators and OEMs:

- Wider viewing angles: Operators get consistent visibility from nearly any cab position.
- Reduced reflections: Optical bonding of the LCD, touchscreen, and cover glass minimizes internal glare.
- Durable clarity: Scratch-resistant, anti-glare glass ensures long-term performance in rugged conditions.

The CAN-connectable displays from Grayhill implement 800-MHz processors and 512 MiB of RAM (read memory), leading to fast boot times. They can be programmed by software tools (e.g., VUI Builder for J1939 displays). Other tool options are Qt and Codesys. The displays provide two CAN interfaces, featuring J1939 or

(Source: Grayhill)

CANopen protocol stacks. USB and Ethernet connectivity is supported, too. There are also local I/O ports.

The products are available in different versions and can be integrated in dashboards, armrests, and other places in mobile machinery. Typical applications include tractors, when operators need constant visibility of sprayer rates, yield monitors, and GPS guidance, often under midday sun. A bright display reduces the risk of misapplication or data errors caused by unreadable screens. Excavator and crane operators rely on displays for diagnostics, camera feeds, and fault codes. A washed-out screen can slow down work or compromise safety. IPS LCDs ensure that critical alerts stay visible. From mining to forestry, rugged environments demand displays that remain legible in dust, glare, and vibration. IPS-equipped displays meet this need while providing the flexibility to integrate video, gauges, and service reminders into one unit. ◀

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Brief news: CANopen TFT displays

- ***Raystar:*** The Taiwanese company offers 5-inch IPS TFT displays, featuring CANopen connectivity. The default bit rate is 250 kbit/s.
- ***Winstar:*** The TFT displays by the Taiwanese company provide CANopen interfaces. They are available in different sizes.
- ***GMS:*** The IPS TFT displays from the German company come optionally with CANopen interfaces. The size ranges from 3,5 inch to 10,1 inch.

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