



TRENDS IN ADVANCED INSTRUMENTATION: ENGINE AND MACHINE MONITORING DISPLAYS

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Executive Summary

Engine monitoring displays are designed to continually check the status and health of a vehicle or machine. They are equipped with powerful designs and an innovative range of software platforms and tools created to offer a superior user experience. Utilizing these sophisticated systems necessitates a review of budget, staffing and resources to ensure successful integration. This paper will provide readers with a business case to choose the right engine monitoring display to fit their needs.



Displays provide real-time, critical data to equipment managers and operators, including key engine parameters, warnings and system messages. Multifunction engine monitoring displays offer multiple screens and numerous parameters within each screen. From state-of-the art hardware designed to withstand industry and environmental variants, to powerful and customizable software, engine monitoring displays are adaptable and can be extremely sophisticated. Users will find versatile software systems that often include added instrumentation and process controls, including video input for backup cameras, USB and wireless connectivity, electronic manuals and instructional videos, all designed to deliver a highly flexible and functional system.

While engine monitoring displays provide a wealth of information, well beyond the capability of a traditional gauge cluster format, they are not necessarily considered a “hook up and go” solution. Utilizing an engine monitoring display means you will benefit from a powerful system, but launching these sophisticated tools means understanding the fundamental differences between the various systems and determining your priorities.



KEY DIFFERENCES BETWEEN MONITORING DISPLAYS

As you review engine monitoring displays on the market today, consider first the type of vehicle you're operating. Do you need a straightforward monitoring display that merely will provide you with a snapshot of a vehicle's engine or machine health? Or do you require an advanced, highly technical vehicle control display that incorporates programmable software for added vehicle and implement control? The systems can be further broken down by display architecture.

WEIGHING DISPLAY CHOICES

Engine monitoring display

- Generally microcontroller based
- Fast boot time
- Primarily for displaying instrumentation and machine parameters
- Supports high-end graphics
- Libraries of design tools available
- Generally lower cost

Vehicle control display

- Microprocessor based
- Slower boot time
- Used for a variety of machine functions, including controls and safety
- Supports high-end graphics
- Libraries of design tools available



SOFTWARE DEVELOPMENT OPTIONS

When selecting a display, one of the most important decisions is how to manage software development. If your organization has ample software development resources, you may decide to develop the code in-house and choose a freely programmable option or software development kit. If your organization does not have software development support immediately available, there are other options. One choice is to contract with a third party for software development services. Alternatively, you may choose a device that comes preloaded with configurable software. In this case, you simply select preconfigured parameters which provide customization without the need for a high degree of code development.

Typical Software Development Options

PROS

CONS

Third-party developer

- Few in-house resources needed
- May offer fully customized solutions
- With experience, can reduce development time

- Higher out-of-pocket costs
- Involves extensive documentation of requirements
- Future updates may be slow or expensive

Configurable application

- Few in-house resources needed
- Lower software investment cost
- Quickest development option

- Programming options may be limited

Programmable/Development kit

- Offers full, in-house control
- Can offer fully customized solutions

- Requires in-house software development resources
- Software investment cost



CHOOSING YOUR ENGINE MONITORING DISPLAY



Launching these sophisticated systems requires a commitment to potential budget, staffing and resource requirements. As you examine your needs, start first with function and format:

Equipment function

When you consider an engine or machine monitoring display, begin with job function. For the job your operator is doing, what level of sophistication do you require? There are many applications where you only need the system to show very basic engine performance parameters, such as speed, fuel, voltage or revolutions per minute. Other situations may require a control system with strong processing abilities to communicate information to the vehicle-controlling actuators, adjusting speed, or moving an implement in a designated direction. You also will need to decide whether you want read-only or two-way communication. A system with a configurable display could be a middle ground choice. Engine monitoring displays come pre-loaded with application software, allowing you to select the parameters you need to monitor so you can get up to speed quickly.

Format

Along with function, think also about the format of the engine monitoring display. How would you like to view key vehicle information and what are your boot time requirements? Format factors to consider include:

- How much detailed data do you need to access and how many display screens should be available?
- Would you prefer that all data be available from one fully integrated unit? Or do you require multiple units for tools like the backup camera and other gauges? Keep in mind that if you have separate units, you need to plan for three different products and parts to stock, service and troubleshoot.
- How many discreet LED warning icons do you want to view at one time? Would you prefer that they are integrated into the display perimeter? If they are, they will keep the screen size free so you can maintain your awareness of the vehicle's status. If not, the operator will receive a pop-up message on the display screen that needs to be cleared and could interfere with parameters that need to be continuously monitored.
- How quickly should the system boot up? Would you like the ability to configure the time? Boot time may be a significant consideration when you're monitoring critical engine performance data. Some products boot up as fast as three seconds, while others may take 45 to 60 seconds to load. This means you could be risking engine failure before the system is up and operational. The bottom line? Will your display be ready when the engine is ready?
- Is wireless capability, such as Bluetooth, built into the device to enable remote data dumping, sending diagnostics and monitoring a vehicle remotely?



MOUNTING THE UNIT

Once you've determined your preferred function and format, consider where and how the hardware must be mounted. Do you need a compact unit for mobile machine operations? How many mounting options are available? Does it need to be installed in an open cab or exterior panel where it will be exposed to the environment?



BUDGET

Like many applications, engine monitoring display hardware, and the associated software, varies by initial startup and ongoing maintenance costs. System costs may add up when you upgrade to a machine control system, and also based on the sophistication of the display, the software development kit and possible additional fees for future software updates and technical support. As you weigh the importance of cost versus control, you may find an engine monitoring display with a configuration tool has the least budget impact because it decreases upfront, maintenance and overall cost of ownership.



SKILLS AND STAFFING REQUIREMENTS

Throughout the range of engine monitoring displays available there are an array of highly advanced designs. Remember, the more sophisticated the system, the higher the potential for a time-consuming learning curve. Does the system require you to have advanced software development knowledge, custom programming skills and the ability to write code? Do you have the time and skill to program, configure and support the software long term? Will you have access to technical support from the manufacturer? Or does your team perhaps include software specialists with the advanced knowledge to install and troubleshoot the software in the future? Can this software support team prioritize assistance for the monitoring display ahead of or along with other projects?

Installing an engine monitoring display is only part of the process. Long term, consider how you will update the system. Again, wireless capability may be an important factor. If Bluetooth capability is built into the device, you'll be able to wirelessly receive updates instead of connecting via USB port or flash drive, or possibly removing or unmounting the hardware from the vehicle for updates.

MAXIMATECC'S ENGINE MONITORING DISPLAY: THE MAXAI ADVANTAGE



maximatecc is continually focused on innovative ways to communicate critical vehicle data to equipment managers and operators, and display it using the most comprehensive designs. We offer four versions of our all-in-one maxAI™ engine monitoring display (430, 430i, 430v and 430iv) to fit your budget, and all of them include our unique configuration tool.

The maxAI is the best solution for your budget, staffing and skill requirement needs. You'll find our engine monitoring display to be a quick-to-market, cost-effective choice, because there are no added expenses for programming. We provide configurable application software, which means minimal programming and setup time.

We have made the configuration process simple. You select the parameters you want to display, and the maxAI automatically populates your engine monitoring data. The maxAI offers five informative display screens, and up to 20 discreet, exterior, LED warning icons, all integrated into the outside perimeter of the maxAI display. This means no pop-up messages that need to be closed and no interference with the vehicle operator's view of the TFT display space. It also simplifies the dashboard by eliminating the external light bank. In addition, the display has a flat screen, dead front, black-lens format to ensure better visibility, compared to soft icons. Along with the LED warning icons, the maxAI integrates the backup camera and gauges right on the display screen, making it a true three-in-one solution. Boot time is exceptional. Operators are up and running in three seconds.

There is a perception that the control you gain with a software development kit is vital. However, with the maxAI, you still can control all the features you need to monitor. In addition, you can use our integrated Bluetooth capability to wirelessly receive updates to the system, without removing or unmounting the device from the vehicle.

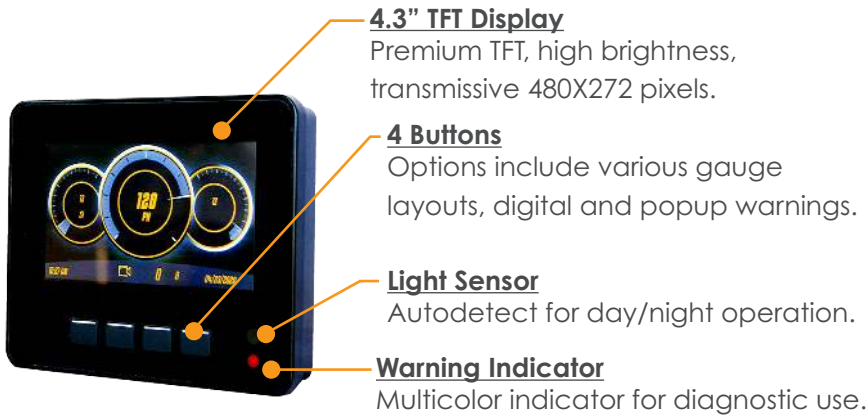
With the maxAI, you'll find our configuration tool is constantly being updated in form and function. Upgrading is always an option, allowing you to make changes to the software and add features. maximatecc will soon be coming to market with a software development kit solution, to provide you with an even higher level of flexibility and control. Our team will work with you to determine the best application to fit your needs.



maxAI 430 Series

Advanced Instrumentation Engine Monitoring System

Information is power. That's why maximatecc continually looks for innovative ways to bring critical vehicle data to operators and to display it in the brightest, clearest, smartest designs possible. The maxAI 430 series of engine monitoring systems offer a rugged, all-in-one instrumentation display for vehicles put to the test every day in the world's most demanding applications — from small construction equipment to large specialty vehicles.



Video Connection
Analog PAL/NTSC (for rear backup cameras).

Mounting
3 different options to mount the device for your best fit – vertical bracket, horizontal bracket or RAM mount.



USB Connection
USB 2.0 slave (Bootloader and SW configuration support).

Connectors
1- Deutsch DT06-08SA Connector.
1- Deutsch DT06-6S Connector.

Learn more about what the maxAI can do for you.

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About the author: In his 18-year career with maximatecc, Dave Moffett has held various roles in engineering, plant management, supply chain and product management. In his current role as product line director, he oversees the life cycle of all new and existing products, from design to production, as well as marketing, sales and quality, ensuring that they meet the needs of maximatecc's customers.

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maximatecc specializes in operator-machine interface solutions for critical environments. We support industrial machinery OEMs and partners globally with a broad portfolio of products and services. Through technology, engineering expertise and operational excellence, we make machines smart, safe and productive. maximatecc is part of the CentroMotion organization, a privately held, growing portfolio of highly respected global brands that add value through innovative motion, actuation and control technologies. Our skilled subject matter experts develop solutions that enable our global customers' products to be smarter, safer and more productive, while also creating value for our investors. Learn more about CentroMotion.