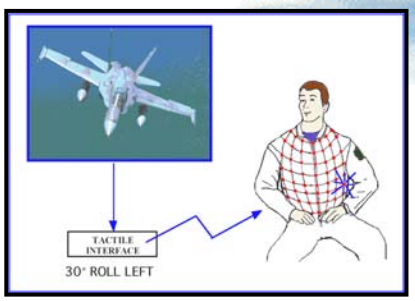
VIBROTACTILE TRANSDUCERS & DISPLAYS

EAI's C-1 and C-2 Tactors† are miniature tactile drivers that can be mounted on/in a seat or within a garment. The tactor creates a strong *localized* sensation on the body. Multiple tactors can be strategically located on the body and activated individually, sequentially or in groups to convey a specific sensation, or provide intuitive "tactile" instruction.

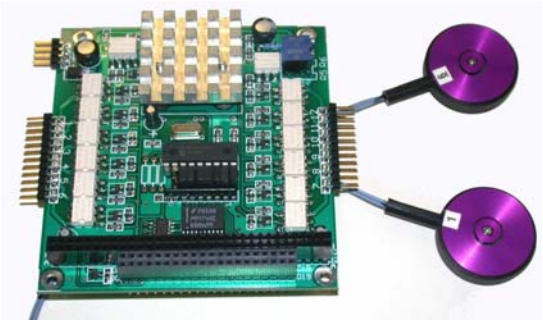
†Patent pending

←C-2 Tactor, actual size

VIBROTACTILE TRANSDUCERS: The sense of feel is not typically used as a man-machine communication channel, however it is every bit as acute as the senses of sight and sound. Using an intuitive body-referenced organization of vibrotactile stimuli, information can be "displayed" to a person. In military applications, tactile displays have been shown to provide improved situation awareness to operators of high performance weapon platforms, and to improve their ability to spatially track targets and sources of information. Tactile displays can reduce perceived workload by its easy-to-interpret, intuitive nature, and can convey information without diverting the user's attention away from the operational task at hand.



The key to successful implementation of tactile displays lies in the ability to convey a strong vibrotactile sensation to the body with compact, lightweight devices that can be comfortably incorporated in the user's workspace, or clothing, without impairing movement. These devices must be safe and reliable in harsh environments, and drive circuitry should be compatible with standard digital communication protocols. EAI has satisfied these requirements with the development of C-1 and C-2 electromechanical vibrotactile transducers (tactors).



INTERFACE/CONTROLLERS: EAI offers various driver/interface boards to allow simple integration with a variety of processors. Currently, boards driving up to 12 tactors are available with serial or parallel interfaces, and in a PC104 format. USB and PCI compatible boards will be available in early 2003. All EAI's driver/interface boards incorporate an on-board processor which can be pre-programmed to provide a variety of tactile outputs, or "patterns", in response to simple processor commands. Thus tactile displays, incorporating multiple tactors, can be easily implemented for a variety of military and commercial applications.

Please contact EAI for price and availability of tactors and driver/interface boards.
Let us help you configure a tactor system to add the sense of feel to your application.

www.eaiinfo.com

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APPLICATIONS

Military Aviation:

Spatial disorientation is a tri-service aviation problem that costs DoD in excess of $300 million annually in lost aircraft. In aviation, spatial disorientation occurs when pilots incorrectly perceive the attitude, altitude, or motion of their aircraft, and mishap occurs when the visual system is compromised due to temporary distractions or increased workload. Tactile Situational Awareness Systems (TSAS) can be interfaced to the avionics system to supplement the conventional displays, and provide the pilot with an intuitive, non-visual display of the aircraft's position. Similarly, threat and target information can be incorporated so that the pilot can "feel" the position and nature of the threat, or the aircraft orientation relative to the target, and take the necessary action without diverting attention from the flight instrumentation.

Underwater Operations: The underwater environment severely limits the use of visual and audible communications. Guidance and communication cues can be a crucial element to mission success, particularly for Special Forces who often operate in darkness and in hostile areas. EAI has developed tactors capable of being fitted inside a wetsuit and working underwater, and has demonstrated the effectiveness of tactile displays for underwater operations.

SPECIFICATIONS

C-2 TACTOR

Physical Description:	1.2" diameter by 0.31" high.
Weight:	17 grams.
Exposed Material:	anodized aluminum, polyurethane.
Electrical Wiring:	Flexible, insulated, #24 AWG.
Skin Contactor:	0.3" diameter, pre-loaded on skin.
Electrical Characteristics:	7.0 ohms nominal.
Insulation Resistance:	50 megohm minimum at 25 Vdc, leads to housing.
Response Time:	33 ms max.
Transducer Linearity:	+/- 1 dB from sensory threshold to 0.04" peak displacement.
Recommended Drive:	Sine wave tone bursts 250Hz at 0.25A rms nominal, 0.5 A rms max. short duration.
Recommended Driver:	Bipolar, linear or switching amplifier, 2 V rms, 0.5 A rms min.

(Specifications subject to change without notice)

Training and Simulation: Virtual reality and motion based simulators have become an essential part of training the modern soldier. Computer generated graphics and sound can submerse the user in a very realistic environment, however the sense of feel is typically absent. In some VR environments, a user can actually move limbs though solid objects, and can only use visual cues to determine his proximity to objects, even if touching them. Tactile displays can add the sense of feel and provide a more realistic physical response in training situations. Tactors can also provide alternative, intuitive means to communicate directional cues to participants.

Land Forces: Modern land forces have to integrate a variety of sensor and communication channels to be effective in the battle space. As the amount of information increases, conventional man-machine interfacing will become a limiting factor, and information overload may become a new risk factor. Lightweight and portable tactile displays can be integrated in clothing and interfaced with a "wearable" computer allowing guidance and threat information to be continuously provided to the soldier. Tactile displays also present some unique opportunities as a silent communication channel for covert operations.

Space Exploration: Spatial disorientation is a serious problem for personnel involved in extravehicular activities in near zero gravity conditions. TSAS offers the opportunity to provide continuous orientation information that can be easily interpreted in a high workload condition.

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