

Secondary Video Monitor Display

Product Design Specifications

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Date Last Updated: April 26, 2006

Abstract: The Welch Allyn Propaq Monitor (Model #206 - EL) is used to record a patient's vital signs (EKG, pulse oximetry, BP) during an emergency transport by helicopter. Med-Flight team technicians rely on the monitor's output during flight transportation while attempting to stabilize the patient. Currently, the monitor lies on the helicopter floor causing the attention of the Med-Flight team members to be split between their work on the patient and the output of Propaq Monitor. Because of this, output information displayed by the monitor must be reproduced on a readily accessible secondary screen. Acceptable reproduction methods include a small video screen such as those found in vehicle entertainment centers, or preferably, in the form of a wearable CRT. This latter approach projects an image in the user's peripheral vision.

Function: The expected device must reproduce the output of the Welch Allyn Propaq Monitor on a readily accessible secondary display monitor.

Client Requirements:

- Device must not interfere with output of Propaq Monitor
- Preferred method of visual reproduction would be in the form of a wearable CRT
- Device must be portable since Propaq Monitor will be transported along with patient
- Any loose wires/material must be kept to a minimum in order to prevent tangling with other medical equipment and allow for maximum portability
- Secondary monitor must provide its own power source
- Total product cost must not exceed that of the Propaq Monitor from which output is originally produced

Design Requirements:

1. Physical and Operational Characteristics

- a. *Performance requirements:* The device will be used in a medical helicopter in emergency situations. Thus, any controls on the device must be easy to find and easy to operate to minimize time wastage. The device could potentially be used several times daily. It needs to be sturdy in case it is dropped, and must be resilient when exposed to water or bodily fluids.

b. *Safety*: The device must comply with the same safety standards as the Propaq, such as: all relevant AAMI, IEC, EN, CSA and UL standards, USAF approval for rotary, small and large bodied fixed wing aircraft.

c. *Accuracy and Reliability*: The Propaq Encore is one of the leaders in its vital signs monitoring, providing very accurate vital signs monitoring. If the secondary display is to be successful, it must be just as precise as the primary display. Additionally, there must not be a noticeable lag between the two displays.

d. *Life in Service*: The secondary display's battery life should be comparable to that of the primary display - approximately 5 hours. Propaq monitors are kept in service for several years, thus the secondary display unit must also be functional for this amount of time.

e. *Shelf Life*: While the secondary display unit is being stored, it will be kept in either a dry storage room or in a helicopter unit prepared for dispatch. The unit will be kept in a dry 25°C facility while in storage. While in the helicopter, the unit will be protected from weather elements. The batteries of the unit should be rechargeable but last approximately 6 hours between recharges.

f. *Operating Environment*: During operation, the unit will be in the helicopter with the Med-Flight team and the patient. Significant activity could occur during use, causing disturbances to the unit. The unit could be temporarily exposed to climate changes such as rain, snow or heat, although these conditions would be momentary. The vibrations from the helicopter must be considered as well. If Bluetooth technology is used, it must not interfere with the radio frequency used by the helicopter pilot. The unit must be secured so that it is not easily thrown from its position in the case of sudden movements within the helicopter.

g. *Ergonomics*: The unit must have as few wires as possible, if any. The wires may interfere with the Med-Flight team's interaction with the patient. The unit should be able to be kept on a knee board of one of the team members for easy access.

h. *Size*: The unit should be relatively small, but large enough to convey all of the necessary information from the Propaq Encore. The unit should be portable to be handed from one Med-Flight team member to another. It should be compact for easy storage and use within a limited space such as a helicopter.

i. *Weight*: Since the device is to be portable, the weight should be no more than half the current weight of the Propaq Encore for easy maneuverability. If the image is to be displayed on an LCD monitor, the weight should be light enough so that the display can be mounted onto the inside of the helicopter without complications.

j. *Materials*: No electronics may be embedded into the prototype that would interfere with certain frequency signals on the helicopter.

k. *Aesthetics, Appearance, and Finish*: The prototype should have no loose material and not be considered bulky by any means. An ideal design will incorporate a single wire connecting the project to a secondary monitor, of which may be chosen at the client's discretion.

2. Production Characteristics

a. *Quantity*: One sufficient prototype is required.

b. *Target Product Cost*: The cost of the final product should be considerably less than an actual Propaq Encore which has costs estimated in the thousands of dollars.

3. Miscellaneous

a. *Standards & Specifications*: Any device must not interfere with frequencies utilized by helicopter electronics and/or frequency signals.

b. *Customer*: Preferred method of video display is wearable CRT with image projected in user's peripheral vision.

c. *Patient Related Concerns*: Any incorporated design must not interfere with the output (BP, pulse oximetry, EKG) of the Propaq Monitor. Design must not be cumbersome as it will need to be transported along with primary monitor when transferring the patient from the helicopter.

d. *Competition*: A patent search yields Patents: 5,751,341; 6,558,321; 6,633,658 describing comparable devices. Each of these patents describes a device which, in one form or another, unscrambles, reconstructs, or reproduces images on a secondary screen.