THE UNIVERSAL DISPLAY PANEL

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INTRODUCTION

The purpose of this paper is to present the latest technology in the development of backlighted animated display panels. By using new industrial components, the design of animated display panels has produced a new breed of programmable training devices. The new Universal Display Panel provides a programmed animated panel with both flexibility and simplicity of operation, which has not been obtained before. The new Universal Panel actually increases training effectiveness, and provides student participation, at reduced training costs.

The Universal Display Panel is a backlighted vertical panel that can light up any section of an attached illustration (see figure 1). The attached illustration is made to appear to operate by an internal programmer that controls the lights behind the illustration. Almost any illustration can be presented on the face of the panel, such as, electrical, electronic, hydraulic, system block diagrams, and Pert charts. The internal programmer is removable and changeable (see figures 3 and 4). The programmer can be controlled from the device control panel, remote control, from the face of the illustration and from a cassette recorder.

A unique feature of the Universal Panel, is that the training illustration and the device operation program can be developed by the using activity, with minimum effort and cost. Another unique feature, is that the training illustration and device operational program can be changed in less than five minutes. As this device is a preprogrammed operating device, a cassette recorder can be used to control the Universal panel and at the same time provide complete lecture material.

The Universal Panel was conceived and designed at the Naval Training Device Center for the Bureau of Naval Personnel. The first Universal Display Panel is being used by the U.S. Mine Warfare School in Charleston South Carolina. The Mine School is presently using three overlay systems with the Universal Panel. Fifteen additional overlay systems will be delivered to the Mine school in September 1971.

PROBLEMS WITH THE NON-UNIVERSAL DISPLAY PANELS

A typical non-universal backlighted display panel is custom built. The illustration is painted on the permanently attached translucent plastic sheet. The background is painted opaque, and the illustration a transparent color. Behind each section of the illustration, such as, logic block or line segment, a light cell is constructed. Each light cell will have one or more lamps. Near each section of the illustration to be controlled is usually a control switch. This illustrates the specialized construction for each of these non-universal display panels.

The illustration usually represents operation equipment in the form of an electrical, electronic or hydraulic diagram. As the operational equipment is modified, so is the training device illustration in order to keep the training current.

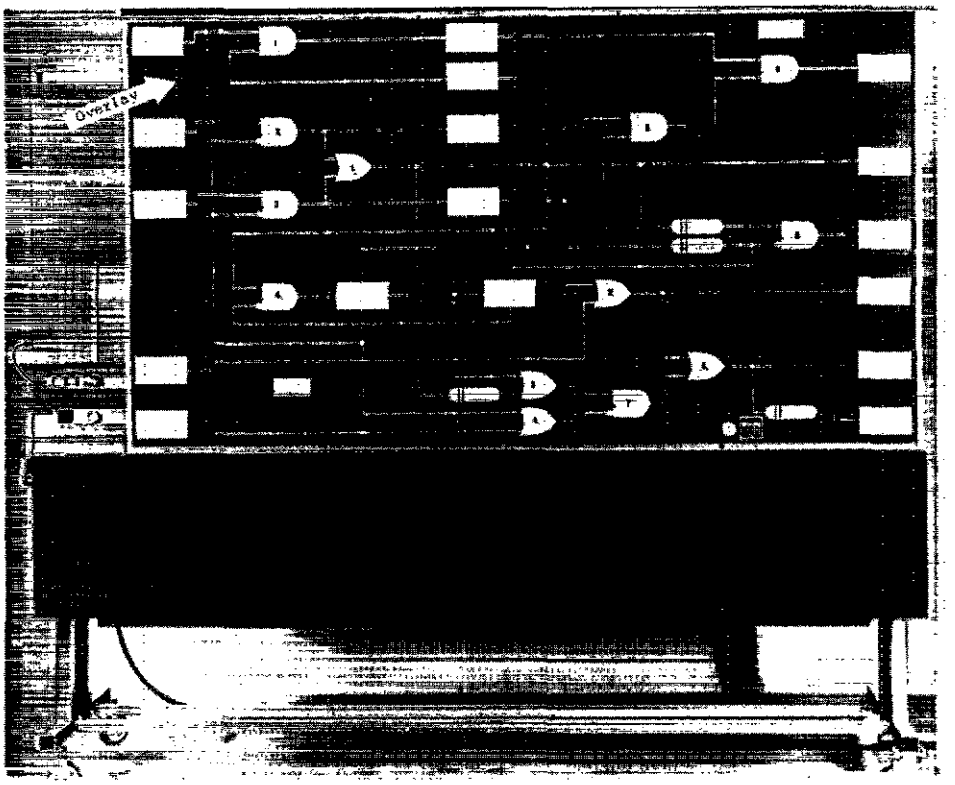

Figure 1. Universal Display Panel with Overlay

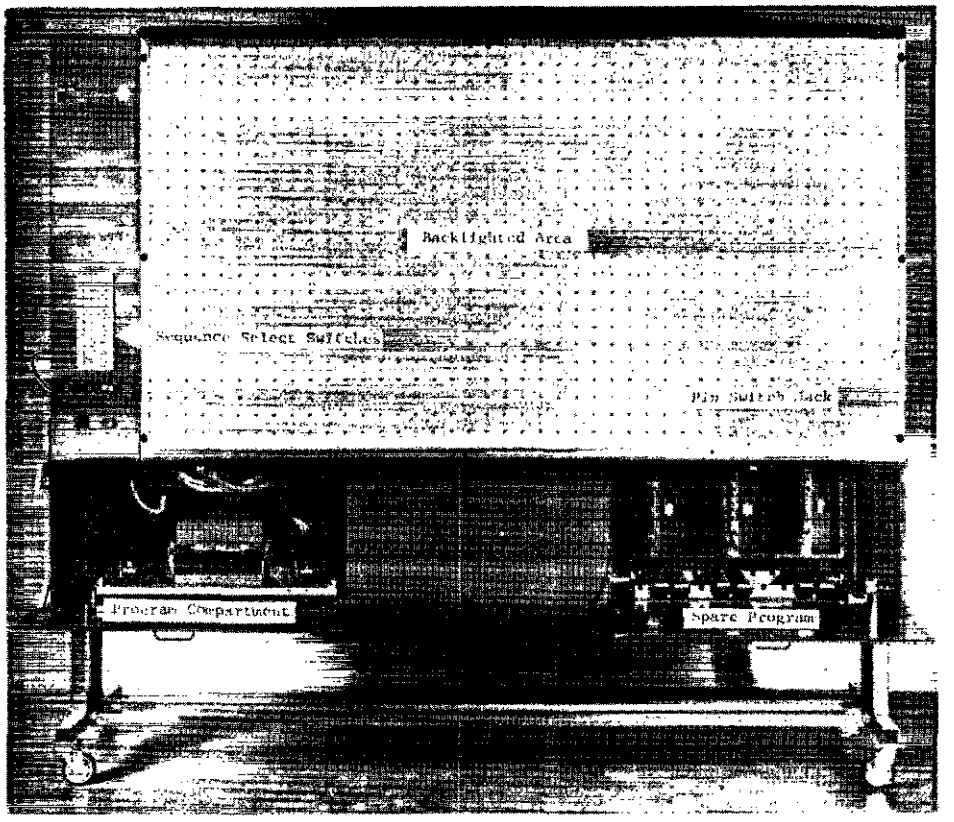

Figure 2. Universal Panel without Overlay

The problems in modifying a custom built device are many. To modify, new lamp cells are added, wiring of lamps and switches added, more power may be required, and the fixed illustration changed. The usual conclusion is that because of the custom fabrication technique, the device is not sufficiently flexible to permit easy and economical incorporation of changes. The end result is a device with a short usuage time, and the generation of another device.

DISCUSSION OF THE UNIVERSAL DISPLAY PANEL

The primary design objective was to provide the Bureau of Naval Personnel with a universal backlighted animated display panel that would provide flexibility for changing the displayed illustration, and provide the instructor and student with an automatic programmed presentation. A secondary objective was simplicity in design, operation, programming, and development of illustrated overlays. Simplicity in design, with reliable hardware, provides the user with a device he can understand and will use as intended.

The Universal Display Panel is adjustable in height and provides storage of three overlays. Compartments are provided for the storage of the program system, spare program components, the power supply and spare parts.

The four foot high by seven foot wide backlighted area has 966 two-inch square compartments, with each containing a lamp (see figures 2 and 4). The overlay can contain any type of illustration which can be delineated on a 23 by 42, 2-inch grid scale. The system capability is limited to 118 control grounds and simultaneous operation of 500 lamps, which has proven quite adequate. The programming of these lamps, as required for each overlay, is accomplished by use of a removable patchboard and two removable program drums (see figure 3). The patchboard selects the lamps to be operated, and the program drums activate the selected lamps in accordance with a preprogrammed sequence (see figure 4).

The two removable program drums are used to provide 118 separate switching grounds to control the backlighted area lamps, selected by the patchboard. The program drum system can be stepped to any of 60 preprogrammed training sequences. The removable drum contains movable actuators in order to change the desired program without difficulty. To provide flexible program capability, either one or two program drums may be used simultaneously. This provides either 59 or 118 control grounds for operating the lamps.

The control panel, to the left of the backlighted area, is used to control the operational program for each overlay. For operation, the overlay is attached to the front of the backlighted area and the associated patchboard and program drums are plugged into their receivers in the lower left compartment. By depressing any of the 60 sequence select switches on the control panel, the program drum will step to the selected training sequence and operate the programmed lamps to light up the overlay sections. The program system may also be single stepped to the desired training sequence from the control panel. The illumination of one or a group of lights, as required for progression and continuity of information depicted on the overlay, will then be indicated through the transparent area of the overlay. Flowing lights and blinking lights can be programmed for the overlay. The instructor also has the option to control the programming sequence remotely, from a distance up to 25 feet, using a hand held pendent switch.

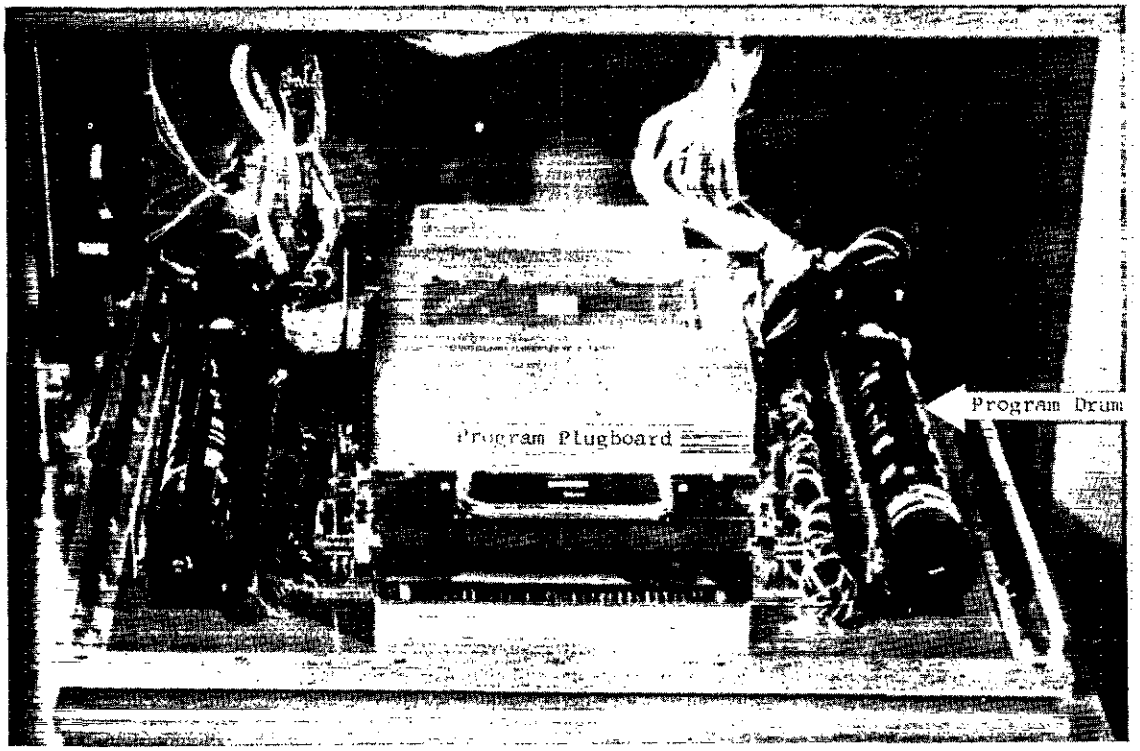

Figure 3. Program Plugboard and Program Drum

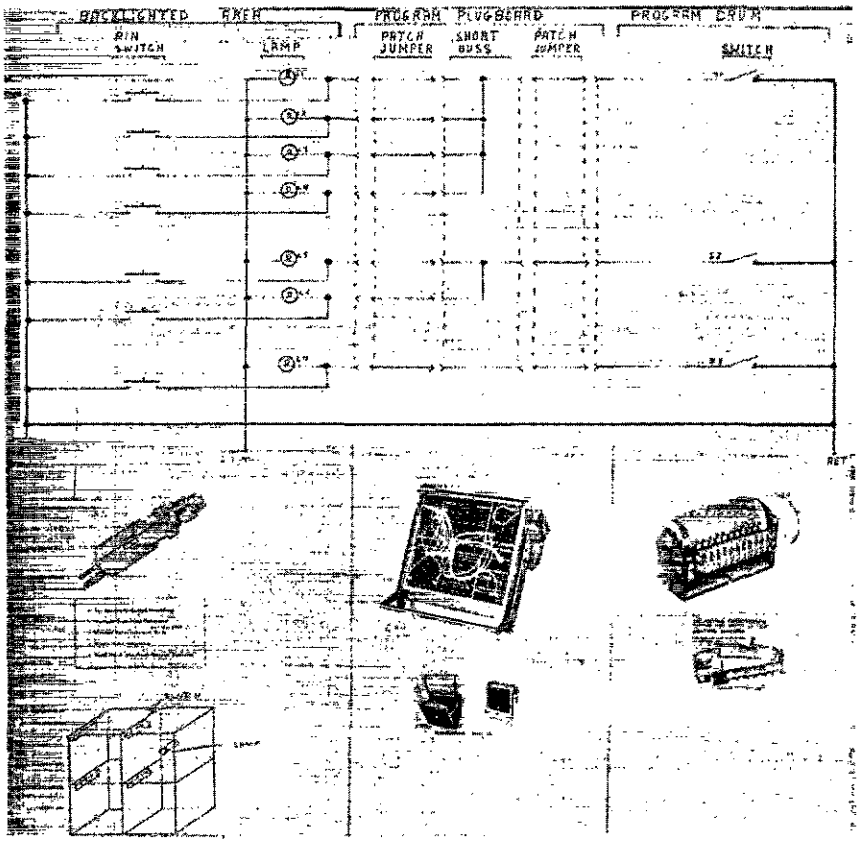

Figure 4. Programming Schematic and Hardware

The device has means for student participation. An open circuit two pole jack is placed in each window of the backlighted area, which will coincide, with a hole in the information area of the overlay (see figure 2). By placing an actuator pin through this hole into the two pole jack, the backlighted area will light (see figure 4). After the operation of the illustrated circuit has been taught, the instructor can have the student repeat the same operation by using the pin control from the face of the overlay. This method provides the important student feedback to the instructor.

The device has means for testing the operation circuits associated with each overlay prior to each training period. By activating sequence number 60 in the control panel, all lamps will light for any given illustration. In addition, a maintenance patchboard and program drum is used to activate all the lamps in the backlighted area to allow periodic testing of all circuits.

DISCUSSION OF THE OVERLAY SYSTEM

The overlay system, Device 3C128 series, consists of a four foot by seven foot transparent or translucent plastic sheet that is 1/8" thick. The illustration is transparent with the background being opaque. Each overlay has associated with it one plugboard and one or two program drums.

The overlay plastic sheets are mounted on the front of Universal Display Panel (See figure 1). The plugboard and program drums are placed in their respective receivers under the backlighted areas of the display panel (see figure 3). The holes, that are located at each backlighted section, allow a shorting pin to penetrate the overlay and mate with the required jack in the Universal Panel.

Any 3C128 overlay system will operate in any 3C127 Universal Display Panel. Thus, only one universal panel is needed per classroom with any number of overlay systems.

ADVANTAGES OF A UNIVERSAL DISPLAY PANEL

Some of the typical comments you will hear, from the user of a typical non-universal animated display panel are as follows:

a. "We don't use the device because it isn't current to our training."
b. "It takes too long to learn how to use the device effectively."
c. "We don't have room in our classrooms for any more display panels."

It becomes clear that training activities desire something better than they now have. The advent of the Universal Display Panel has solved many of these problems.

The advantages of the Universal Display Panel system over the typical non-universal backlighted display panel include the following:

a. Reduce the number of display panels required at a training activity.
b. Reduce the storage area for training devices.
c. Reduce instructor's device learning time.
d. Increase the instructor's training effectiveness by better understanding the device and by faster device operation.

e. Provide student feedback to instructor.
f. Reduce modification cost by permitting the school to modify illustration or make new illustrations and programs.
g. Reduce procurement time and costs per device, illustration and associated program equipment, due to commonality of design.

Specialized Universal Panels have been developed with almost all the advantages of the Universal Panel. For example, a Universal Panel with the addition of the actual equipment control panel. In this case, the backlighted panel will function from either the actual equipment control panel, or from the universal control panel.

CONCLUSION

The use of modern hardware in a unique manner has provided a training device, that can be used in many classrooms, for teaching a wide variety of technical subjects. Progress has been made in reducing training device obsolescence, thus reducing the overall training cost. Further improvements in cost reduction and improved devices are in the system now and will be seen in the classroom within a year.

REAL-TIME PROJECTED DISPLAYS

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INTRODUCTION

There has long been a need for a real-time dynamic projected display for large screen applications involving group viewing. The majority of the present systems utilize a form of slide projection or an oil film light valve. Slide projection makes use of silver film, Kalvar film, or a coated glass slide. These systems provide the brightness required and are near real-time. The film systems suffer from the problems associated with chemical development, film transport, and consumable costs if the system is frequently updated for real-time operation. Coated glass slides are utilized in a system where the image is scribed onto the slide in the projection gate. This provides the capability for continuously updating the current position on a given frame. A new frame must be generated when the viewer wishes to change the display content, for relocation of target tags, and when the historical data grows to the magnitude which tends to confuse rather than aid the viewing audience. Several modulated oil film light valve systems have been developed and are in use. Because of the nature of the modulation mechanism, it is necessary that these systems be operated in a scanned mode, thus limiting their application to those where scan or television type data is readily available, or can be made readily available. Most of the systems operate at a 525 line television standard,