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AUTHOR	Boucher, Brian G.; And Others
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ABSTRACT

A system is presented which facilitates the selection of training media and devices based on the requirements of specific learning objectives. The system consists of the use of a set of descriptive parameters which are common to both learning objectives and media. The system allows the essential intent of learning objectives to be analyzed in terms of these parameters covering manner of presentation, instructional strategy, and desired mode of response. A profile of the requirements is matched with the characteristic/capability profile of generic media types. The generic media types include both custom engineered devices and commercially available media such as television, programed texts, models, films, audiotapes, and teaching machines. When the process leads to commercially available training devices, comparisons can be made among over 450 devices described in this report. Appendixes list the devices and give the addresses of manufacturers. (Author/JY)

GRUMMAN AEROSPACE CORPORATION
BETHPAGE, NEW YORK 11714

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BRIAN G. BOUCHER
CUSTOMER TRAINING
PRODUCT SUPPORT DEPARTMENT 516 575-9930

BRIAN G. BOUCHER
MERRILL J. GOTTLIEB
MARTIN L. MORGANLANDER

A SELECTION SYSTEM AND CATALOG
FOR INSTRUCTIONAL MEDIA AND DEVICES

UNITED STATES NAVY F-14 PROJECT
AND
NAVAL AIR SYSTEMS COMMAND
WEAPONS TRAINING DIVISION
UNDER CONTRACT NUMBER
N00156-71-A-0129
TASK ORDER 002

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PREFACE

The study presented herein has been conducted as part of the F-14 Fleet Replacement Aviation Maintenance Personnel (FRAMP) Training Program. It is designed, however, to provide a systematic approach to instructional media selection for any requirement of the Navy or other interested user. It is usable wherever the training requirements are detailed in specific learning objectives.

In subsequent reports under this contract, the F-14 FRAMP learning objectives will be processed and specific instructional media requirements for that program will be determined.

The information contained in this report has been collected from literature and personal contact with device manufacturers and their agents. Neither Grumman nor the U. S. Navy certify the accuracy of the data. Views or conclusions contained in the report or arrived at through its use do not necessarily reflect the opinion or policy of Grumman Aerospace Corporation or the United States Navy. Particular caution should be exercised with regard to pricing data. Price information, as supplied by manufacturer, is subject to change without notice.

Grateful acknowledgement is made to Alfred T. Mazza and Hector W. Hill of Grumman for assistance with the manuscript. Technical monitoring of the study was by the Naval Air Systems Command Weapons Training Branch (AIR-4132).

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I. INTRODUCTION

In 1967, the senior author of this study, along with several representatives of the industrial and educational communities, began work on a matrix approach to instructional media selection as the media task group of Project ARISTOTLE. In succeeding years this basic approach has been followed by many researchers and authors for military, industrial and educational applications. However, the state of the art of learning technology has been developing with such rapidity that many catagorical statements about instructional media have become obsolescent as quickly as they were published.

In early 1970, Grumman began an intensive survey of Naval Aviation Weapons System training with the determination that the F-14 fighter aircraft would have the best possible training support. Among the results of the survey was a task to produce a three phase media study which would (1) provide a system for selection of instructional media, (2) apply the system to the F-14 Fleet Replacement Aviation Maintenance Personnel (FRAMP) Training Program, and (3) recommend a cost-effective mix of training media for that program.

As originally proposed, the first phase of the F-14 media study would provide a standardized evaluation of generic types of media with regard to their suitability for the accomplishment of generalized

learning objective categories. These categories were to be

- Memorization tasks
- Perceptual discriminations
- Comprehension
- Manipulation skills
- Procedural sequences

Coincident with the first phase of the media study, learning objectives for the F-14 FRAMP training program were to be developed and also sorted according to these five categories.

Early in the study, it became obvious that such a categorization was not sufficient for the purpose. Other taxonomies were investigated but found inappropriate for the particular task at hand. Eventually, a set of 24 parameters was developed which pilot studies showed could be applied to both media categorization and the accomplishment of specific learning objectives. These parameters included presentation, response and learning strategy descriptors.

Similarly, early hopes for convenient media categories yielded to the realization that a vast number of devices incorporated features that defied broad categorization. Reluctantly, it was concluded that individual devices had to be analyzed and the features cataloged. The hoped for 15 - 20 categories thus grew to a total of over 450 devices with feature counts ranging from 12 to 53. A total of approximately

20,000 bits of information were cataloged exclusive of cost data.

The handling of this volume of data, combined with the possibility that these bits of information might be exercised for some 5,000 learning objective statements forced the requirement for electronic data processing. Careful selection of symbols currently has kept this requirement to a simple punch card sorting scheme while allowing for growth to a more sophisticated computerized decision making model should future conditions warrant it. At the same time, formats were selected which permit manual access to data in keeping with the intent of the original proposal.

II MEDIA SELECTION

The selection of training media is one element of the total learning system. The selection process must relate to the specific learning objectives in a way that assures that media is selected solely for the purpose of aiding in the achievement of those objectives. To accomplish this requires some means for expressing objective requirements in terms which relate to media capabilities. The simplest approach is a set of descriptive parameters common to both. To develop these parameters requires some reconsideration of the nature of learning objectives.

Learning objective statements are comprised of three characteristics, i.e., behavior, condition, and standard. These reflect both essential and arbitrary elements. For example, the statement

> When the trainee completes this lesson, he will be able to isolate the cause of an instructor-inserted trouble in the transmitter section of the AN/SCR-99 receiver using the equipment manual. Must use 6-step logical trouble-shooting procedure. Time limit: to be announced by instructor. Procedures must be correct.[1]

contains the essential element that the student demonstrate knowledge or the application of the "6-step logical trouble-shooting procedure"

[1] From NAVPERS 93510-2 Handbook for Writing Learning Objectives

using the equipment manual and the arbitrary element that the trouble be instructor-inserted in the actual equipment. Similarly,

> The student will label the turbine section components on a given illustration.[2]

contains the essential element of demonstrating knowledge of component nomenclature and the arbitrary element that this be demonstrated by labeling on a given illustration rather than stating the names of actual components, or pointing to components and naming them on a chart, mockup, etc.

It can readily be seen that the essential elements reflect the purpose of the learning objective while the arbitrary elements are influenced by available media and the learning environment. In using this catalog to select media from learning objectives, the training specialist must analyze the objective to extract the essential element. In developing a complete new training unit, media selection can be integrated with the generation of learning objectives as soon as the essential element has been identified.

1.0 Generic Media Selection

The essential element of the learning objectives are analyzed regarding the information to be provided the trainee and the behavior

[2] From NAMTRAGRUINST 1540.2B Preparing and Updating Training Plans and Associated Software Components, procedures for.

expected from him. This information is further analyzed with regard to the sense modality desired for the presentation of the material to be learned (Visual, Auditory, Tactile, Kinesthetic, or combinations there-of) and various subcategories such as motion, color, dimensionality, texture, etc. Learner behavior is then analyzed with regard to the modality of response (performance, or verbal/symbolic) and various subcategories such as indication, recognition, manipulation, gross body movements, etc. Finally, the instructional strategy is analyzed with regard to such factors as repetition, knowledge of results and various types of interaction. The worksheets for use in this analysis of learning objectives are structured to facilitate immediate comparison with a Media Capability Matrix.(see page 7).

The specific definitions of the parameters as used in the matrix are as follows:

PRESENTATION PARAMETERS

Visual

Plane (2D) Material can be presented in two dimensions such as by print, drawings or photographs including two dimensional representations of three dimensional objects.

Solid (3D) Material requires direct perception of three dimensionality. This presumes the ability to shift the viewing point and perceive aspect changes.

MEDIA CAPABILITIES MATRIX

	PRESENTATION												INSTRU STRA	
	VISUAL						AUDI-TORY		TACTILE					
	PLANE (2D)	SOLID (3D)	LOCALITY (3D)	MOTION, FULL	MOTION, LIMITED	COLOR	QUALITY	LOCALITY	SIZE/SHAPE/TEXTURE	TEMPERATURE	MOTION	KINESTHETIC CUES	REPETITION	KNOWLEDGE OF RESULTS
OVERHEAD TRANSPARENCIES	S	O	O	O	b	S	c	O	O	O	O	O	S	c
2 X 2 SLIDES	S	O	O	O	a	S	c	O	O	O	O	O	S	c
FILM STRIPS	S	O	O	O	*	S	c	O	O	O	O	O	*	c
MICROFORM	S	O	O	O	O	S	c	O	O	O	O	O	S	c
MOTION PICTURES	S	O	O	S	S	S	c	O	O	O	O	O	-	c
AUDIO TAPES	O	O	O	O	O	O	S	*	O	O	O	O	-	-
SOUND-SLIDES	S	O	O	O	a	S	S	O	O	O	O	O	-	-
SOUND FILMSTRIPS	S	O	O	*	*	S	S	O	O	O	O	O	-	-
SOUND MOTION PICTURES	S	O	O	S	S	S	S	O	O	O	O	O	-	-
VIDEO RECORDING	S	O	O	S	S	-	S	O	O	O	O	O	-	-
CLOSED CIRCUIT TV	S	O	O	S	S	-	S	O	O	O	O	O	O	-
SLOW SCAN TV	S	O	O	O	-	O	S	O	O	O	O	O	-	-
PRINTED MATERIAL	S	O	O	O	a	S	O	O	O	O	O	O	S	-
PROGRAMMED TEXT	S	O	O	O	a	S	O	O	O	O	O	O	-	S
PAPER SIMULATIONS	S	O	O	O	O	S	O	O	O	O	O	O	-	S
CHARTS	S	O	O	O	O	S	c	O	O	O	O	O	c	c
DISPLAY BOARDS	S	O	O	O	-	S	c	O	O	O	O	O	S	-
MODELS/MOCKUPS	/	S	S	S	S	S	S	S	S	O	S	O	S	S
BACK LIGHTED PANELS	S	e	O	O	e	S	c	O	e	O	e	O	S	S
ANIMATED PANELS	S	e	O	O	S	S	c	O	e	O	e	O	S	S
SIMULATORS	/	S	S	S	S	S	S	S	S	S	S	S	S	S
REALIA	/	S	S	S	S	S	S	S	S	S	S	S	S	S
TEACHING MACHINES	S	O	O	*	*	*	*	O	O	O	O	O	*	S
COMPUTER ASSISTED INSTRUCTION	S	O	O	S	S	S	S	O	O	O	O	O	S	S
MAINTENANCE TRAINING UNITS	/	S	*	O	S	S	O	O	S	S	S	O	S	S
EC II	S	O	O	O	O	S	S	O	O	O	O	O	S	S
AUDI/POINTER	S	O	O	O	S	S	S	O	O	O	O	O	S	S
CPS 48	S	O	O	S	b	S	S	O	O	O	O	O	S	-
UNIVERSAL PROCESS TRAINER	S	O	O	O	O	S	c	O	O	O	O	O	S	S

TRUCTIONAL STRATEGY			STUDENT RESPONSE					
INTERACTION			VERBAL/ SYMBOLIC			PERFORMANCE		
LINEAR	BRANCHING	ADAPTIVE	SELECTION	SPECIFIC	CREATED	INDICATION	MANIPULATION	GROSS BODY MOVEMENT
c	c	c	h	h	h	0	0	0
c	g	c	h	h	h	0	0	0
c	0	0	h	h	h	0	0	0
c	g	c	h	h	h	0	0	0
c	g	0	h	h	h	0	0	0
c	*	0	h	h	h	0	0	0
c	0	0	h	h	h	0	0	0
c	0	0	h	h	h	0	0	0
c	0	0	h	h	h	0	0	0
c	0	0	h	h	h	0	0	0
c	0	0	h	h	h	0	0	0
0	0	0	h	h	h	0	0	0
S	S	0	S	S	-	0	0	0
S	S	0	S	S	-	0	0	0
c	c	0	h	h	h	0	0	0
c	c	0	h	h	h	0	0	0
-	c	0	h	h	h	S	S	S
S	S	0	h	h	h	S	S	0
S	-	0	h	h	h	S	S	0
S	S	c	c	c	c	S	S	S
S	S	c	c	c	c	S	S	S
S	S	0	S	*	0	0	0	0
S	S	S	S	S	0	*	*	*
S	S	c	c	c	c	S	S	*
S	S	c	S	S	h	S	0	0
S	S	0	S	h	h	S	0	0
c	c	c	h	h	h	0	0	0
c	c	c	h	h	h	S	0	0

KEY

- 0 Not applicable, unsuitable
- S Suitable
- \- Suited, but less than fully effective
- / Suited, but generally uneconomical
- * Suitable, but only on some devices in this category
- a Suitable combined with visual motion adapters
- b Suitable combined with visual motion adapters or projectable two dimensional working models
- c Capability exists when used in conjunction with live instruction
- e May contain certain three dimensional components such as real or oversize operating controls
- g Suitable combined with visual random access devices
- h Suitable combined with separate responders

Locality (3D) A special case of three dimensionality in which the viewing point is inside the material. This presumes the ability to locate material above and below, in front and in back, and to the sides of the observer.

Motion, Full Material requires perception of changes in relative position of viewed objects. Full motion presumes the ability to follow an object through all movements including changes in position, relationship, and place.

Motion, Limited Material requires perception of certain changes in relative positions of viewed objects. These can include: movements which are cyclical (repeated changes in position or relationship without changes in place); flow illusions where cyclical changes in portions of the material create the illusion of changes in place; changes in place within a limited field such as movement of a cursor or pointer: Bi-stable changes such as flashing; or animated buildup sequences where additional material is included in the visual.

Color Material requires perception of differences in hue and saturation.

Auditory

Quality — Material requires perception of differences in pitch, loudness and timbre.

Locality — The auditory equivalent of visual locality (see above).

Tactile

Size/Shape/Texture — Material requires perception of size, shape or texture through the sense of touch.

Temperature — Material requires perception of temperature of objects or environment.

Motion — Material requires tactile perception of physical movements.

Kinesthetic Cues

Material requires perception of positions, motions and accelerations through sense organs inside the body.

INSTRUCTIONAL STRATEGY PARAMETERS

Repetition — Strategy requires the ability to repeat various sized segments of the material for drill and practice.

Knowledge of Results — Strategy requires instantaneous feedback to the learner of the results of his behavior.

Interaction Strategy requires a two-way communication between the learner and the material, that is to say that the presentation of material is affected by learner behavior.

Linear Presentation rate is learner controlled. A fixed sequence of instructional units is presented one at a time with mastery of one unit being a precondition of presentation of the next unit in the sequence.

Branching Presentation sequence and rate is learner controlled. Material includes corrective units which are presented as a result of student indication of incorrect or incomplete understanding of previously presented material.

Adaptive Instructional strategy itself can be varied as a result of both current and past learner performance.

STUDENT RESPONSE PARAMETERS

Verbal/Symbolic Responses which are expressed in words, symbols, diagrams, pictorials, etc.

Selection A recognition task which requires selection of a correct response from a group of alternatives presented to the learner. This is the "Multiple-choice" type task.

Specific A recall task which requires the learner to construct a specific or particular response. This is the "fill-in-the-

blank" type task.

Created — A recall task which requires the learner to construct a response using his own choice of words.

Performance — Responses which are expressed by actual performance of a sensory-motor skill.

Indication — A recognition task which requires the learner to signify the location of physical objects by pointing.

Manipulation — A performance task which is limited to manual skills.

Gross Body Movement — A performance task involving use of the limbs or in which the environmental context is essential to the task.

The Media Capabilities Matrix provides cross-ratings between the factors used in analyzing the objectives and various generic media categories, accessory categories and certain one-of-a-kind devices. Ratings entered in the matrix include:

- Not applicable, unsuitable
- Suitable
- Suited but less than fully effective
- Suited but generally uneconomical
- Suitable only on some devices in this category
- Suited when combined with additional accessories, devices,

or live instruction. Footnotes identify the required additions.

The data from the learning objectives analysis worksheets is compared (either visually or using electronic data processing) with the entries in the Media Capabilities Matrix. This will yield a set of generic media condidates for each objective. (In practice, objectives with similar requirements can be pre-grouped to substantially reduce the processing effort.) The candidate listing will include all media categories which meet the requirements regardless of their additional capabilities and will also contain the rating information.

2.0 Specific Device Selection

After the generic media type candidates have been selected the Generic Media Section (Section III) of the catalog is consulted. Here, each media type is described and the features available on these devices are described and are categorized. The desired features selected for the media categories of interest are compared (either visually or using electronic data processing) with the entries found on the Data Grouping Sheets (Appendix I), for each media type.

The Data Grouping Sheets contain the following information:

17025	01010001001100011010010	0	0000190
machine number	feature listing	flag	price code

machine number — the first two digits identify the data group (filmstrip, portable video recording system, etc.) while the last three digits identify the specific device within the group. A cross index is provided which identifies the manufacturer and model designation, (Appendix II).

feature listing — these digits identify the presence or absence (by 1 or 0 respectively) of each feature or capability as listed in the data group heading. Each data group has its own set of features.

price code flag — the inclusion of options or accessories in the stated price is identified by a "1" in the "flag" position.

price code — these digits give actual price quotations as given by manufacturers or distributors literature or agents. They are intended as a general guide only and are subject to change without notice, negotiation and discount. In general, the price indicated includes all options which are available and indicated in the feature listing.

Manual selection of a training device incorporating those features desired can be accomplished with the aid of a blank card or the enclosed Data Locator. The card is placed on the Data Group Sheet heading and moved down the sheet while placing a vertical mark on the card edge in line with the asterisk for each desired feature. The

product of this procedure will be a card coded to flag those features desired. This card can be moved down the list of machines and those machine numbers containing that particular combination of features noted. In the event that no one machine contains all the desired features the least important features should be eliminated and the data again inspected. Should more than one device be selected trade-offs by pricing and other feature capabilities contained in the device will resolve device selection. In this manner it will be possible to have the exact devices identified that will best satisfy training requirements. If the data locator is used, the feature number may be obtained from the right hand column and the data searched for entries corresponding to the feature numbers on the locator edge, (see illustration on page 15).

DEVICE CODE [redacted] PRICE CODE [redacted]

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CUSTOMER TRAINING

DATA LOCATOR

SECTION III GENERIC MEDIA DESCRIPTION

1.0 OVERHEAD TRANSPARENCY PROJECTION DEVICES

Overhead projection devices enable the projection of images transcribed on a clear acetate base as well as silhouettes of real world objects. The usual format is 8-1/2" x 11" transparencies; however 3-1/4" x 4", 7" x 7" and 10" x 10" sized transparencies are used, in addition certain overhead projectors may be adapted to show 2 x 2 slides. Conventional slide adaptation techniques involve a series of lenses and a single slide holder placed between the stage and the optical head. This method enables the slide image to be projected but precludes the full usage of overhead projection capabilities by preventing the projection of stage operations, i.e., pointing or writing. However, one dual-media overhead projector exists that enables simultaneous slide/transparency projection, and full usage of overhead projection capabilities with a 36 slide magazine.

Presentations involve manual positioning of the transparencies serially on the projector stage and proximity of the lecturer or an assistant to the projector (one unit has a motorized douser/transparency changer with a two transparency capacity). Micro switch dousing of the projector lamp each time a transparency is removed helps to reducing viewer eye fatigue. Operator eye strain can be reduced via a light shield accessory. The lens system of overhead projectors are designed so that the projector can be placed in the front of a room, the availability of wide angle lenses enabling a very short projection distance. High intensity lamps are available on certain units where higher ambient light or long projection distances are anticipated.

Where projector locations are fixed increased flexibility can be introduced by using a 360° rotation swivel head machine which enables projection to different screen locations from a single source. To eliminate possible Keystoning effects projection screens should be tilted slightly towards the audience. Projectors should be placed as low as possible to ensure that the body of the unit doesn't interfere with the line of vision of the audience.

Overhead projectors have the following advantages which can be capitalized upon:

- The speaker or instructor can operate the unit from the front of the room while facing the audience.
- The transparency placed face up on the machine top is completely legible to the speaker and may serve as his notes.
- The speaker can point to item on the transparency and have this outlining appear silhouetted on the screen.
- The speaker can write on the transparencies to outline a point and can later remove it.
- When equipped with a roll of transparent sheeting the unit can serve as a projected blackboard. Material written on sheeting may be stored and a clean section rolled into position.
- By superimposing transparencies or real world objects, models may be built or disassembled to better illustrate a point. In addition, two dimensional working models can be cast on the screen.

- Limited illusion of motion is also possible through use of special slides and polarizing spinner apparatus, or through Moiré pattern producing gratings.
- Programs are easily modifiable by the deletion or insertion of transparencies.

The disadvantages of an overhead projector are:

- The unit does not readily lend itself to rear projection since it requires proximity of lecturer and machine for most effective usage.
- Transparencies are large and present a storage problem.
- Location of previous segments of a presentation is difficult and time consuming.
- Transparencies are easily marred or destroyed.
- Overhead projectors are large and cumbersome.
- A response and scoring capability is not inherent in or readily adaptable to the medium.

Overhead projection devices are categorized in data group 07 and have been evaluated with respect to the following features:

Lens Type

Single Fixed Lens

Assorted Lenses Available

Wide Angle Lens

Illumination

High Intensity Lamp Available

Microswitch Lamp Dowser

Motorized Dowser/Changer (changing mechanism shuts off lamp between transparency shifts)

Operating Characteristics

Remote Focus

Portable

Polarizing Spinner Accessory for Limited Motion Techniques

360° Rotation Swivel Head

Simultaneous Slide/Transparency Superimposition & Projection

At Least 10" x 10" - Stage Aperture

2 x 2 Slide Projection Adapter

2.0 2 x 2 SLIDE PROJECTION DEVICES

Slide projection devices enable the projection of a series of still pictures in color or black and white. The most typical slide used is a 2 x 2 transparency made from a strip of 35mm film which can be mounted in cardboard, metal or glass. The capacity of slide projectors varies considerably as does the method of slide storage. Stack loading as well as rectangular and circular slide trays are used with the circular being most popular.

Audio is incorporated into a slide presentation by synchronization of integral tape recording units with the presentation. The synchronization of tape cartridge or tape cassettes is accomplished using inaudible tone cues on a separate audio track. Two systems exist which use a special method of synchronizing the audio to the slide. In these units each slide package contains a separate miniature tape cassette or disc, enabling a limited audio capability. These accompanying sound tracks are recorded after the processing of the slides and can be erased easily with new information recorded in its place. Non audio slide projection devices offer a wider selection in numbers than audio incorporating devices but are essentially equivalent in features, and most can be used in conjunction with tape sound synchronizers to incorporate audio into a presentation.

Slide projectors have the following advantages as a training medium:

- Skills can be partially learned by observing procedures and mentally performing the task even though the equipment is not present.

- Stop action demonstrations from just the right aspect angle or distance may be presented.
- Tests may be incorporated into the medium.
- The sequence of the slides can be altered to meet specific needs.
- Update of program is easily accomplished without extensive changes or expensive equipment.
- Slides are easily made with any 35mm camera, enabling amateur productions.
- Individual pictures can be held on the screen for class discussion for as long as desired.
- Small size of slides permits ease of storing.
- Audio-sight systems are not limited by the reading capabilities of the audience.

The disadvantages of this medium are as follows:

- Continuity of action is disrupted, only stop action demonstrations are possible.
- Lack of tactile experience with the procedure or task.
- Lack or response and scoring capability.
- Fixed time dimension-all viewers must receive information at a predetermined rate.

Slide projection devices are categorized in data group 01. In addition to this data grouping slide projection capabilities exist on certain overhead projection devices, random access systems and in certain teaching machines (data groups 07, 06 and 12, respectively). In addition,

still visual capabilities exist on certain filmstrip and sound filmstrip devices, 16mm projectors and 8mm projectors (data groups 04, 05, 02, 03 respectively).

Slide projection devices have been evaluated with respect to the following features:

Lens Type

Zoom

Single Fixed Lens

Assorted Lenses Available

Audio Characteristics

Reel to Reel Audio Tape Loading

Cassette Audio Tape Loading

Special Audio Synchronization Technique Enabling Reverse Synchronization

Inaudible Synchronization Signal

Projection Technique

Front Projection

Built-in Rear Projection

Illumination

Conventional Lamp

Hi-Intensity (designed for front projection in lighted rooms)

Operating Characteristics

Automatic Operation (slides advance automatically in a timed sequence)

Remote Control of Operations (varies from simple slide advance to both forward & reverse with remote focus)

Built-in Programming Capability (enabling the generation of tone cues for synchronization)

Built-in Audio Record Capability

Filmstrip Capability

Slide Previewer (enables operator to see each slide immediately prior to its being projected)

Portable

Machine Capacity

Up to 12 Slides

Up to 38 Slides

Up to 48 Slides

Up to 50 Slides

Up to 80 Slides

Up to 96 Slides

Up to 100 Slides

Up to 120 Slides

Up to 140 Slides

3.0 FILMSTRIP AND SOUND FILMSTRIP DEVICES

Filmstrip projection devices enable the projection of a series of still pictures in color or black and white, using both front and rear projection techniques. Filmstrip projection devices are available to handle 35mm filmstrips, 35mm continuous loops, 8mm and 16mm continuous loops, as well as double frame filmstrips. Each picture on a filmstrip is called a frame and each frame of a 35mm filmstrip is one-half the size of a 35mm slide. Continuous loop filmstrips (8mm & 16mm) have the same frame size as in motion picture film, while double frame filmstrips have the same frame size as 2 x 2 slides.

Audio is incorporated into a filmstrip presentation by synchronization of record disks or magnetic tape with the filmstrip. Synchronization is accomplished via inaudible or audible signals inserted into the audio presentation. Filmstrip advance, can be by manual rotation of a dial in response to an audible signal, or by servo advance to audible or inaudible signals. These accompanying sound tracks are most easily recorded after the processing of the film. Magnetic tape sound tracks can be easily erased and new information recorded. Disk carried sound track modifications would require complete re-recording of the programs and special equipment.

Non-audio filmstrip projectors are quite similar to each other in features offering very little choice of options; a few may be combined with tape sound synchronizers to incorporate audio into a presentation.

Filmstrip projectors have the following advantages as a training medium:

- The sequence of pictures is always the same and ensures that the material will be presented in the desired order.

- Individual pictures may be held on the screen for class discussion for as long as desired.
- The small size of the filmstrip permits easy storage and handling.
- Filmstrip equipment is relatively inexpensive, light weight, small and easy to operate.
- Skills can be partially learned by observing procedures and mentally performing the task even though the equipment is not present.
- Stop action demonstrations from just the right aspect angle or distance may be presented.
- Some devices offer the possibility of motion sequences.
- Animation is possible using devices with fast pull down rates
- It is less expensive to print a series of pictures on a strip of film than to print, cut, and mount the same series in a set of slides.

The disadvantages of this medium are:

- The fixed sequence does not permit easy modification of the program. Either updating or re-ordering involves extensive operations and special equipment.
- Filmstrip production requires special equipment.

Filmstrip projection devices are categorized in data groups 04 and 05 (the latter being sound filmstrip devices). In addition to these data groups, filmstrip projection capability exists on certain slide projectors, (data group 01) and on single frame motion picture projectors (data groups 02 and 03).

Filmstrip projection devices have been evaluated with respect to the following features:

Lens Type

Zoom

Single Fixed Lens

Assorted Lenses Available

Projection Technique

Front Projection

Built-In Rear Projection

Operating Characteristics

Remote Control of Operations (varies from only forward to both forward and reverse operation)

Battery Operation

Continuous Loop 35mm Filmstrip Capability

2 x 2 Slide Capability

Double Frame Filmstrip Capability

Built-In Pointer

Sound filmstrip projectors have been evaluated with respect to the following features:

Lens

Single Fixed Lens

Assorted Lenses Available

Audio Characteristics

Record Disk Speed

Magnetic Tape Speed

Recording Capability

Built-In Speaker

Remote Speaker

Operating Characteristics

Automatic Operation

Remote Control of Operations (varies from only forward to both forward and reverse operation)

2 x 2 Slide Capability

Double Frame Filmstrip Capability

16mm Filmstrip

8mm Filmstrip

35mm Filmstrip

Continuous Loop Capability

4.0 MICROFORM

A prime consideration in any library or facility is storage space. To minimize storage space, information is photographed, optically reduced and stored on film. The format of the optically reduced material is quite varied existing in roll microfilm, microfiche, aperture cards and com fiche format. Roll microfilm can be either 35mm or 16mm and may also be magazine loading. Microfiche can have 96 images (NMA) or 60 images (COSATI) on a plate. Combinations of micro data and normal size data are available on various sized aperture cards and computer outputs can be directly put on roll microfilm or microfiche. The production as well as update of roll microfilm and microfiche requires specialized highly complex equipment, but does enable the storage and accessing of great numbers of pictorial or symbolic verbal information with a minimum of space.

Microform devices use both rear projection and front projection techniques to 'blow back' the reduced image to its original size. The majority of devices use only one method but some devices are available that do both and some also give paper copy if desired.

The desired magnification capability of a device is interdependent with the original size of the information and the reduction rate used. Devices are available with variable magnification, (achieved by multiple lenses or lens substitution) as well as with a zoom capability. Proper usage of these options greatly increases the versatility of a specific machine.

Of prime concern in the retrieval of data is locating it on a roll or fiche card. This is accomplished on roll microfilm with a elapsed footage counter or via bar coding. Footage counters are not accurate locating devices and the film frame may require repositioning. Bar coding in which a solid bar appears and moves down the screen to an index mark enables high speed search for data but also will require repositioning of film for single frame locating. Optimum location techniques enabling random access of any frame of roll microfilm are available in a system which uses binary coding of each frame. Location of information on fiche cards is accomplished through manual X-Y positioning of the card with respect to the lens. A more effective locating technique involves stylus indexing, in which a pencil like stylus is placed on the corresponding point of an index card causing the corresponding frame of fiche to be projected on the screen.

Microform devices are categorized in data group 08 and have been evaluated with respect to the following features:

Data Storage

Microfilm

Microfiche (a sheet or plate containing a number of separate minute images)

Aperture Cards

COM Fiche (computer output directly reduced and put on fiche cards)

16mm Roll Film

35mm Roll Film

Micro Jackets (clear carrier holders for loose strips or single film images)

Projection Technique

Front Projection

Rear Screen Projection

Fixed Size Screen

Optional Screen Sizes

Variable Magnification

Fixed Magnification

Zoom Capability

Operating Characteristics

Battery Powered

117 VAC Powered

Portable

Bar Code Indexing

Stylus Indexing

Counter Indexing

Manual Search Indexing

Magazine Loading

Random Accessing of Information

5.0 MOTION PICTURE DEVICES

A motion picture or movie is comprised of a series of still pictures in rapid succession in either a 16mm, single 8 or super 8 format. When projected at a rate of 16 frames/sec or above an illusion of movement is achieved.

There are four types of motion picture projectors: 16mm, 8mm, Super 8mm, and Dual 8. Sixteen mm projectors are the most expensive, offering highest scene illumination and the best resolution, but do not have the flexibility of Super 8 projectors. Dual 8 projectors will show either 8mm or Super 8mm films while 8mm and Super 8 projectors are restricted to only one film format. Super 8 as a format is characterized by a film picture area 50 percent larger than 8mm film and offers higher scene illumination with better resolution capabilities.

Conventional storage of films is on reels with self contained cartridge storage possible. Cartridge loading which requires no threading as well as the use of self threading machines greatly simplifies the use of motion pictures. Continuous loop loading of cartridges and machines allows repetitive showing of materials. Automatic threading features are a definite asset when they work, but are among the more poorly engineered components of many projectors.

Control of forward, reverse, and stop action modes of operation is available remotely for some machines. However, the majority of devices have remote control of only forward operations. Stop action or single frame capabilities are available on most projectors. This is usually accomplished by mechanically stopping the film advance and shutter and

interposing a heat filter, thus limiting the time a single frame may be shown and decreasing scene illumination. A further difficulty exists in alignment of the frame within the projector, causing focus shifts and frame separations to sometimes be visible, requiring subsequent alignment by the operator. Qualitative judgment must be exercised regarding these capabilities in specific devices with relation to illumination, flicker and focus problems.

A few more sophisticated devices are capable of generating full brightness stills, but a focusing problem can still remain. Single frame capability becomes a further problem when sound motion systems are used. Continuing the audio while holding a single frame is only possible on devices which synchronize a separate magnetic sound track with the film.

Sound films are projected at 24 frames per second while silent films are projected at 18 frames per second. Audio capability is achieved with either a magnetic or an optical sound track on one edge of the film. However, a separate cassette of magnetic tape is employed by some devices. Optical sound tracks are printed directly on the film stock when the film is processed, changes in this audio part of the medium are not feasible, except by reprocessing the entire film. Magnetic sound tracks are recorded after the processing of the film and can be easily erased and new sound recorded in its place. However, the length of time for sound recording is physically constrained by the length of the film segment. Some devices with separate audio cassettes give the most flexibility in production and update.

Films have several advantages as a training medium and should be used in ways which capitalize upon them:

- Films help overcome intellectual barriers by depending very little on reading skills.
- Films provide a continuity of action, showing action exactly as it occurs.
- Films provide "front seats" for many experiences. Demonstrations by experts can be performed, using all necessary equipment showing all essential steps, from just the right angle or aspect and at just the right speed for best analysis and learning.
- Films may be useful in testing. Because of the motion pictures flexibility it may be stopped partially shown, or have tests inserted into the film.
- Time lapse photography can enable the presentation of long term actions in moments. Conversely, slow motion and stop action capabilities permit analysis of intricate real time events.
- Films can provide a model for guided mental practice. Skills can be partially learned by watching a procedure on film and mentally performing the task even through the equipment is not available.

On the other hand, the disadvantages of film presentations are:

- Lack of tactile experience with the procedure or task.
- Lack of response and scoring capability.
- Necessity for a controlled presentation environment, darkness is required for most presentations - this precludes note taking.

- Fixed time dimension-films must run at an established rate and all viewers must receive information at that rate.
- Fairly expensive to produce, cost varies dependent upon film type, color vs. black & white and if audio is included.
- Update is relatively complex and expensive.

Motion picture projectors are categorized in data groups 02 and 03 which are 16mm and 8mm devices respectively. In addition to these data groupings, motion visual capabilities exist in certain filmstrip machines, data group 04 & 05, certain TEACHING MACHINES, data group 12, and among certain video recorders and playback units, portable video recording systems, and T.V. projectors and monitors. (data groups 9, 10 & 13)

16mm projectors have been evaluated with respect to the following features:

Lens Type

Zoom

Single Fixed Lens

Assorted Lenses Available

Audio Characteristics

Optical Sound Track

Magnetic Sound Track

Recording Capability

Built-In Speaker

Remote Speaker

Separate amplifier required

No Speaker Available (requires seperate amplifier)

Projection Technique

Front Projection

Built-In Rear Projection

Illumination

Conventional Lamp

Hi-Intensity Lamp (designed for front projection in lighted rooms)

Operating Characteristics

Automatic Threading Capability

Remote Control of Operations (varies from forward only to forward and reverse as well as film speed and focus)

Silent Speed (18 fps) Capability

Sound Speed (24 fps) Capability

Slow Motion

Single Frame/Still Picture Capability

Reel to Reel Loading

Continuous Loop Cartridge Loading

Machine Capacity

≤800 ft.

≤1000 ft.

≤1200 ft.

≤1600 ft.

≤2000 ft.

≤2200 ft.

≤2400 ft.

≦4000 ft.

≦5000 ft.

≦7000 ft.

All 8mm projection devices utilize conventional illumination and are portable. They have been evaluated with respect to the following additional features:

Lens Type

Zoom

Single Fixed Lens

Assorted Lenses Available

Audio Characteristics

Optical Sound Track

Magnetic Sound Track

Cassette Magnetic Tape Sound Track

Recording Capability

Built-In Speaker

Remote Speaker

Projection Technique

Front Projection

Built-In Rear Projection

Operating Characteristics

Automatic Threading Capability

Remote Control of Operations

Silent Speed Capability (18 fps)

Sound Speed Capability (24 fps)

Variable Speed Slow Motion

8 fps Slow Motion

6 fps Slow Motion

Single Frame/Still Picture Capability

Mixed Motion/Stop Capability (enables projection of motion and single frame sequences in any combination under manual or automatic control)

Reel to Reel Loading

Continuous Loop Cartridge Loading

Film Format

Super 8mm

Regular 8mm

Machine Capacity

≤50 ft.

≤100 ft.

≤200 ft.

≤300 ft.

≤400 ft.

≤600 ft.

≤800 ft.

≤1200 ft.

6.0 AUDIO TAPE DEVICES

Tape recorders and playback units enable the recording and subsequent playback of training sessions or lessons. Audio information is recorded on magnetic tape loaded on reels, in cassettes or in continuous loop cartridges. The development of tape cassettes and cartridges has greatly simplified the loading and storage of taped material but reel loading is preferable when an editing capability is desired.

Audio information may be recorded utilizing the full width of the magnetic tape or only a portion. Monaural full, half or quarter track units are available, the full track units offering better sound fidelity, but requiring more tape per program. Multi-track monaural systems consisting of ganged 8 track cartridges or many tracks on one wide band of tape offer the greatest storage capacity. Stero 2, 4 or 8 track units, which of course may be used monaurally, have high storage capacity and the best sound fidelity dependent on the magnetic tape width used. A further consideration in program length and fidelity is tape speed. This can be varied to enable presentations of different length with a minimum of tape length. As a rule, the faster the tape speed, the better the quality of the sound. For speech 1-7/8 IPS or 3-3/4 IPS is adequate, but 7-1/2 IPS or 15 IPS is recommended for high quality reproduction of tones or music and for master tapes.

Audio tape device controls are straight forward and easily understood enabling efficient usage of the devices. Certain devices offer remote control of playback or record operations, most units offer pause controls

to assist during program recording. Audio tape devices may incorporate the speaker within the unit or require an external speaker or headset.

Accessing of recorded information on reels, cassettes or cartridges is accomplished by tape counters. This method of data location is not precise due to slippage within the counter and tape stretching. More precise locations of program segments is achieved by a few devices with random access capability.

Audio presentations have the following advantages as a training medium:

- tapes help overcome intellectual barriers by depending very little on reading skills
- tapes permit the rearrangement of sound materials through editing thus enabling the juxtaposition of material for comparison
- tape playback units can be small and portable
- the auditory component or conditions of actual tasks may be preserved for future reference and analysis
- tests may be inserted into the presentations
- easy and economical duplication and editing of original presentations
- student constructed response is possible for later analysis and interpretation
- exact timing of presentations is possible - tape recorders run at pre-set speeds and the time to play a certain program may be computed in advance with accuracy

- audio can be added to a silent visual presentation with the aid of integrating devices
- pulse cue signals may be recorded to operate additional devices
- limited branching capability is possible when utilizing stero devices or random access audio tape recorders
- tapes may be erased and re-used.

The disadvantages of audio tapes as a training medium are:

- lack of visual or tactile contact with a procedure or sequence
- fixed time dimension - tapes running at pre-determined rate cause all students to receive information at that rate

Magnetic tape audio devices are categorized in data group 11. In addition to this data grouping, audio record and playback capabilities exist in certain audio visual integrating systems, data group 14. Audio record and playback capabilities in combination with visual displays exist on certain 8mm and 16mm projectors, sound filmstrips and slide projectors (data groups 03, 02, 05, and 01).

Magnetic tape audio devices have been evaluated with respect to the following features:

Tape Loading

Reel to Reel

Cassette (a sealed reel to reel transport mechanism, originaly developed by Norelco and available from a number of manufacturers)

Cartridge (a continuous loop magazine of audio tape)

Audio Format

- Monaural
  - Half Track
  - Quarter Track
  - Full Track
  - Multi Track
- Stero
  - 2 Track
  - 4 Track
  - 8 Track

Operating Characteristics

- Recording Capability
- Playback Capability
- Separate Student Record Track
- Portable
- Tape Speed (1-7/8, 3-3/4, 7-1/2, or 15 IPS)
- Battery Powered
- 117 VAC Powered
- Full Remote Control (enables control of all machine functions - i.e. Play, Record, Fast, Forward, Reverse)
- Remote Pause Via Mike
- Remote Pause Via Foot Control
- Automatic Shutoff
- Internal Speaker
- Requires External Speaker/Headset
- Random Accessing of Information

Machine Output

Speaker/Headset

Machine Input

Microphone

Radio/Phonograph

7.0 TELEVISION

By definition "Television" is an electronic system of transmitting still and moving pictures with sound via transmission line or through space. The system consists of equipment that converts light and sound into electrical energy and then reconverts that energy back into visible light and audible sound. Broadcasting is the most common type of transmission where programs are radiated to viewers within the range of a given station. Closed circuit television (CCTV) is another type of system and is frequently found in school and training centers. A CCTV system limits the distribution of its signal to only those receivers which are directly connected by transmission lines, or Microwave link.

A basic CCTV system would consist of a camera, a microphone, audio-video mixing electronics and a TV monitor. This type of basic system is used for real-time monitoring of an event or program. The real-time capability of viewing and hearing an event is unique and peculiar to CCTV. If the event being monitored were to be retained for later viewing a TV recorder would be added to the system. Utilizing the camera as the signal source, the recorder will "store" both video and audio information on magnetic tape which, at some later time, can be played back, either with no further processing or with editing to "tighten up" the material. When used to record a "staged" occurrence

the instant replay allows for immediate reviewing of the recorded information. An unsatisfactory recording can be remade at minimal additional cost. This sharply contrasts with the high operating cost and time constraints of using conventional motion picture equipment.

Further expansion of the system to include a TV projector provides the capability of large image projections for group viewing. By deriving its input information from varied sources such as, magnetic tape recorders, broadcast receivers, film chains and TV cameras this type of projector proves to be a versatile training device.

If the event to be recorded was far removed from the electrical sources required to operate convention studio equipment and if space or geographical constraints dictated the need for small easily handled equipment a portable TV recording system would be required.

Training Objectives Met By Television

- o Understanding of Principles and Relationships
  - show small parts in motion by use of close up techniques
- o Learning Identification
  - use superimposures to present simultaneously or at various times two or more things which have to be learned
- o Learning Procedural Sequences
  - the subject matter is presented and demonstrated to the trainee

Advantages of Television

- o Close-ups
  - excellent for presenting small objects, obscure objects or events to dangerous for direct observation
- o Economical
  - large numbers of trainees may be presented the same material simultaneously

Disadvantages

- o Does not allow practice when procedural tasks are taught

7.1 PORTABLE VIDEO RECORDING SYSTEMS

A portable video tape recording system comprises a video camera, battery pack, microphone and a recording unit consisting of a tape transport and required operating electronics. Existing systems weigh from 20 to 33 pounds, including the battery pack, making them portable.

The combined features of self-contained power, light weight and instant replay make this type of VTR system a dynamic and versatile training tool. However, not all of the Portable VTR system features are positive in nature. The non-existence of a relatively inexpensive color camera (nothing below $13,000 in production at this time) limits

the application to monchrome recording. It should be noted that a considerable amount of care must be exercised when handling and operating portable VTR equipment. The camera contains, in addition to a lens, a light sensitive vidicon tube which is mechanically fragile. Rough handling or high intensity light inputs will damage the tube.

Battery operation time ranges from a low of 40 minutes to a high of 80 minutes before recharging is required. All manufacturers offer a battery charging unit as an optional accessory if the capability to "recharge" is not built into the recorder unit. The additional feature of system usage during battery charging time is included in most designs and implemented through the use of A.C. adaptors. One system is unique in its power requirements, it is restricted to A.C. This feature severely impairs the freedom of being portable. Power considerations are therefore threefold,

- Battery operation, with the limitation of no use while batteries are charging
- Battery and 117 VAC operation, with the capability of use simultaneous with battery charge
- 117 VAC operation, with the limitation of the line cord operation

Manufacturers have not as yet standardized the tape size, tape loading or recording format. Presently, most systems are designed for

1/2 inch tape. However, there are two systems (both made by the same company), which use 1/4 inch tape. The popular method of tape loading is on conventional 5" reel with most manufacturers looking into the development of cassette or cartridge systems. Recording formats vary from Type 1 international standard to individual manufacturers format which are peculiar to each system. It should be noted that there is a trend toward the use of Type 1. To date there are no two portable VTR systems that are compatible.

Systems vary in capability. To be completely self contained, a system must be able to record, play back and display using its internal power source. Not all systems could meet these specifications.

Portable video recording systems are categorized in data group 10 and have been evaluated with respect to the following features:

General Capabilities

- Record
- Playback
- Built-in Monitor
- Monochrome Recording
- Color Recording
- R. F. Output Signal
- Video Output Signal
- Record from TV Receiver

- Electronic Viewfinder
- Mechanical Viewfinder

Special Capabilities

- Stop Action
- Auto Search
- Sound Dub
- Video Edit
- Tape Counter
- Video Signal Meter
- Audio Signal Meter
- Slow Motion
- Automatic Shut Off
- Elapsed Time Counter

Recording Format and Speed

- Type 1 International Standard
- Manufacturers Format
- 7.5 inches per second
- 7.9 inches per second
- 11.25 inches per second

Tape Size and Loading

- 1/4 inch tape
- 1/2 inch tape

- Reel to Reel
- Cassette

Maximum Recording Time

- 60 minute record
- 40 minute record
- 38 minute record
- 30 minute record
- 25 minute record
- 20 minute record

System Weight

- 33 pounds
- 25 pounds
- Less than 20 pounds

System Power

- 117 VAC
- Battery
- Battery Usage 80 minutes
- Battery Usage 60 minutes
- Battery Usage 40 minutes

Lenses

- "C" Mount Lens

- o Zoom Lens
- o Fixed Lens

7.2 RECORDERS AND PLAYBACK UNITS

TV recorders may be purchased with either a color or monochrome only recording capability. Some manufacturers offer conversion kits for adapting monochrome units to color. Both color and monochrome recorders are available for recording 1 inch as well as 1/2 inch magnetic tape.

Slow motion, the capability of a recorder to play back at a rate slower than the recording rate, is a feature which is offered. It may be obtained as a fixed rate control or with a variable speed control. Not all manufacturers offer both options in the same unit. Slow motion play back should not be confused with time lapse recording. Time lapse recording is the capability of a unit to record events at a reduced time rate. For example, one unit studied records at 7-1/2 inches per second for one hour of conventional mode operation, and records at 1-1/16 inches per second for 7 hours of time lapse operation. Accordingly, when events recorded in time lapse operation are played back in conventional mode the resulting effect is 7 hours of information viewed in one hour of real time.

By obtaining a recorder with variable motion time lapse recording and stop action (freezing a single frame of action into a still

picture for as long as desired) features an instructor would be able to do a complete motion analysis or time sequence analysis of events for student learning.

Electronic editing is a desired feature. Units having this capability contain electronic circuits, which, during the edit mode of operation, match incoming and previously-recorded video to eliminate "roll-over" and horizontal "break-up". This produces distortion free editing and the smoothest possible tapes for professional appearance and reproduction.

In addition to recorders which have a playback capability, there are units which are manufactured with only a playback capability. It is interesting to note that not all video players use magnetic video tape as their information source. One manufactureer uses 8.75mm film as the information carrying medium. The buyer should realize that, when purchasing this type of playback device, there are serious restrictions to be considered. No other manufacturer's tape or film can be played by the unit, all existing magnetic video tapes would have to be converted to the 8.75mm format and editing for update requires the manufacturer of a new film.

Video recorders and playback units are categorized in data group 09 and have been evaluated with respect to the following features.

General Capabilities

- o Record & Play
- o Record Only
- o Maximum Recording Time
- o Play Only
- o Monochrome
- o Color
- o Number of Record Heads 1, 2, 4
- o Number of Video Inputs
- o Number of Video Outputs
- o Number of Audio Inputs
- o Number of Audio Outputs
- o Suitcase Packaging

Special Capabilities

- o Color Adaptor Available
- o Slow Motion
- o Variable Motion
- o Stop Action
- o Remote Control
- o Electronic Edit
- o FCC Standard Electronic Edit

Recording Format and Speed

- o Manufacturers Format
- o Type-1 Format
- o Recording Speed in Inches Per Second

  9.6

  8.57

  7.8

  7.5

  1-1/6

Tape Size and Loeding

- o 1 Inch Tape
- o 1/2 Inch Tape
- o 10-1/2 Inch Reel
- o 9-3/4 Inch Reel
- o 8-1/2 Inch Reel
- o 7 Inch Reel

7.3 MONITORS AND PROJECTORS

Television monitors are best used for small group viewing. Monitors are built in two configurations, as CCTV units and as combination CCTV/Receivers. The CCTV models must be hardwired to a single source such as a TV camera or video player. The combination unit has the added features of receiving UHF and VHF transmissions. Available in

various CRT sizes, the viewing areas range from 37 to 295 square inches. Both monochrome and color sets are built of solid state electronics, with one manufacturer offering a battery powered monochrome unit. To satisfy studio requirements rack mounted single or multi-display monochrome units are available. Special features such as external horizontal and vertical synch inputs are included in some monitors for users requiring total external synchronization. Convenience features such as a standby circuit, instant turn-on (no waiting for warm-up), and an extension speaker jack are also offered.

The TV projector may be used for either front or rear screen projection in monochrome or color. Designed for large audience viewing these units project images up to 15 x 20 feet under comfortable ambient lighting conditions, with larger screen capabilities under theater lighting conditions. UHF and VHF tuners are integral to some units, while other projectors are dependent on accessories for broadcast signal conversion or are restricted to CCTV inputs.

The TV monitors and projectors are categorized in data group 13 and have been evaluated with respect to the following features:

General Capabilities

- Monitor
- Projector

- o Color
- o Monochrome
- o Solid State
- o R. F. Reception
- o UHF Reception
- o VHF Reception
- o CCTV Input

Special Capabilities

- o Audio Input Jack
- o Audio Output Jack
- o Video Input Jack
- o Video Output Jack
- o External Vertical Sync Input
- o External Horizontal Sync Input
- o Extension Speaker Jack
- o Rack Mounted
- o Multi-Display
- o Stand-By Circuit

Power Requirements

- o 117 VAC 60 Hz
- o 320 VAC 50 Hz
- o Battery Power

CRT Size and Viewing Area

- CRT in Inches

  5

  9

  10

  12

  16

  19

  23

  25

- Viewing Area in Square Inches

  37

  44

  71

  88

  125

  172

  270

  282

  295

3.3 PRINTED MATERIALS

Printed materials convey information to the reader regarding a particular subject. The format of this printed material can be in pamphlets, textbooks, workbooks, or single copy sheets. Information may be conveyed in cartoon or pictorial format or completely by the printed words themselves.

Printed materials have the following advantages:

- Individualization of instruction - each person can proceed at a rate determined by his particular abilities and interests.
- Materials may be scanned and essential points extracted without having to sit through an entire presentation.
- Self directed learning - different subjects or areas may be studied at the same time, and repeated, restudied, or referenced by the student as often as necessary at convenient times.
- Portability - learning may be accomplished at any convenient time or place.
- Organization and sequencing of information - material can be organized and sequenced in the most advantageous manner for presentation and assimilation.
- Materials may be outlined and underlined by the student flagging points and areas of interest.

- No elaborate or expensive equipment is needed to convey the information.
- Visuals (i.e. photographs, diagrams, overlays) may be incorporated with text illustrating concepts or points and increasing interests.
- Economy - actual cost per student is quite low. High volume printing of materials that are stable and unchanging yield costs that are much lower than the production costs of audio visuals.
- Ease of Update - as new information becomes available supplement sections may be written and incorporated into textbooks and new pamphlets or fly sheets generated.
- Workbooks may accompany texts or a lecture series, keyed to facilitate learning, by requiring the student to recall and sometimes integrate the information previously presented.
- When printed materials are used in conjunction with an instructor they enable a standardiazation of information - each student is exposed to the same basic information which then can be explained and added to by the instructor. In addition, this material supplements the technical knowledge of the instructor.

The disadvantages of printed materials are:

- Printed materials rely heavily on the reading ability of

students. For poor readers special versions may be necessary.

- Textbooks may treat certain subjects too sketchily and provide insufficient knowledge of a subject to stimulate enthusiasm to persue it further.
- Printed materials especially textbooks written on highly advanced technical areas which is constantly changing may become outdated quickly - as a result of the lead time necessary to produce texts, information contained is often not "state-of-the-art" at publication, necessitating frequent revisions and supplements. Due to the cost of replacing these comparatively new texts, and the logistics problem of reaching everyone who has a particular version of a text outdated texts may continue to be used thereby denying students new information.
- Low Learning Level and Rate - lack of reinforcement and step by step guidance yields less than optimal learning.

4.0 PROGRAMMED INSTRUCTION TEXT

Programmed instruction is a system of learning in which the subject matter is systematically organized into logical sequence and then broken down into small, discrete steps, each one building on the preceding step. A learner can progress through the sequence at his own rate and is reinforced by being given the correct response immediately after making his response.

There are two chief types of programming. The first and most frequently used is the linear format. This type requires the learner to construct his own response to all questions in the program. The linear program has a single learning path. All students taking a linear program will receive the same information. There are no branches or detours which allow faster progress for the more capable student, nor does it provide more help for the less capable student. Linear programs are based on a learning model which emphasizes a schedule of rewards for "correct behavior".

The second type of programming is the branched type (sometimes called Intrinsic Programming). In the branched program the learner is presented a single, coherent idea or piece of information and then tested by multiple choice questions. If he understands, he proceeds on to the next idea. If his response is incorrect, he is given new

material designed to correct his deficiency. Each segment of remedial material is specifically designed to correct the misunderstanding he has exhibited by his choice of response. He is then queried again. If he now understands the original idea he goes on to new information. If he still does not understand, he is instructed again. Branched programs are based on a learning model which emphasizes the two-way communications of a tutorial situation.

Variations exist on these two basic types, such as the use of multiple choice type questions in otherwise linear format and "Fast Track" branches through linear programs, (sometimes called "Forward Gating"). Linear and branched programs as well as their variations can be presented effectively in a textbook format.

Programmed instructional texts have the following advantages:

- Individualization of instruction - each person proceeds at a rate determined by his particular abilities and interests.
- Self directed learning - subjects of interest may be studied at any time, and repeated or restudied as often as necessary at convenient times.
- Portability - learning may be accomplished at any convenient place.

- Organization and sequencing of information - the subject matter is, as a result of the programming development process, organized and sequenced in an advantageous manner for learning. Small discrete steps of either questions or instructions are used, each building on the preceeding steps and directed toward specific learning objectives.
- Stylization - the difficulty and conceptual level of the material may be adapted to varying student populations. Both content and writing style can be simplified for poor readers or for students with low intelligence levels.
- Visuals may be presented better illustrating concepts and increasing student interest.
- Economy - cost per student is quite low, if used for stable subjects in high volume.
- Although workbooks may accompany program instruction texts, the programming format itself requires the student to demonstrate his subject knowledge and integration ability.
- The student is given the correct response and reinforcement immediately after each response.
- When Programmed Instruction Texts are used in conjunction with an instructor they enable a standardization of information - each student is exposed to the same basic information which then can be explained and added to by the instructor. In addition, these texts can supplement the technical knowledge of the instructor.

The disadvantages of Programmed Instruction texts are:

- Programmed instruction text books written on highly advanced and changing technical subjects may become outdated quickly - as a result of the lead time necessary to produce program instruction texts, information may be outdated at publication. Due to the cost of replacing comparatively new texts and the logistics problem of reaching everyone who has a particular version of a text, these outdated texts may continue to be used.
- High initial cost of programming - it takes longer to write material in programmed instruction format and perform the validation trials thus raising the initial cost of programmed instruction texts.
- It is difficult to use a programmed instruction text for reference. The format does not lend itself to easy accessing of information.
- Branched texts are awkward to use because of constant searching for different pages.
- Linear texts are frustrating for students who are forced to go through sequences covering material they already know.
- The presentation of material in logical predigested form relieves the learner of much of his need to think, organize and arrive independently at conclusions. This may cause higher level students to loose interest.

- Programmed instruction texts relay heavily on the reading ability of the student. For poor readers special versions may be necessary.

10.0 PAPER SIMULATION

Paper simulations are symbolic representations of actual processes with which, the learner can interact. In a more abstract task such as business management, they are often called "games".

In technical training, paper simulations often take the form of schematic or functional diagrams. A malfunction is conceived and test results which could be found under conditions of such malfunction are entered on the diagram in such manner as not to be immediately visable to the learner. The learner "troubleshoots the malfunction by determining what tests he wishes to make and then uncovering the results of these tests. This is done one at a time so the learner can develop his strategy as he goes along. Scoring of the exercises is accomplished by penalties attached to each unnecessary test "performed".

Paper simulations are essentially static and hence do not permit the learner to simulate tests which require making adjustments and then noting results. (Computer simulations have this capability, see description of ECII on page ____)

Paper simulations share with other simulators the advantages of safety and economy. They share with other printed materials the advantages of mass producibility and portability. They provide a record of the troubleshooting process for later critique.

In addition to the limitation noted above, paper simulations have the disadvantage of requiring considerably more intellectualization than is required by the task being simulated. However, quite often, such intellectualization is also itself an objective of the learning.

11.0 CHARTS, DISPLAY BOARDS, AND TRAINING PANELS

Charts are two dimensional static presentations containing photographs, symbols or printed material. They are one of the most commonly used training aids usually accompanying a lecture presentation. Charts are effective in presenting large bodies of data concisely and in the summarization of previously presented information.

Charts may be used to depict systems and/or their components, teaching nomenclature and location of parts as well as illustrating organizational elements, functional relationships and the flow of a process. Movements can be depicted on charts by showing the same component in several positions.

Charts advantages as training aids are their relative simplicity, low cost and flexibility. However, charts have little value when dynamic aspects are being taught which require the observation of motion or if dimensionality is a essential cue. Similiarly, if perceptual discriminations or performance of skilled acts are required charts would not be an appropriate medium.

An improvement on the basic wallchart adding a dimension of movement and ease of change are the group of devices called Display Boards. This category includes in it, all bulletin board type presentations that are symbolic in nature. Via flannel, magnetic, adhesive or hook and loop mechanisms; words and shapes are arranged to form charts. These display boards can perform the same function as wallcharts while allowing the user to manually re-configure the presentation.

System components and their relationships can be depicted by the use of Animated Panels and Back Lighted Panels. Animated panels are displays on which systems and their components may be depicted pictorially and/or by simple semifunctioning models. They may be constructed of plastic, metal or plywood and may show interior or exterior views of the system and its parts. Back lighted panels differ from animated panels in that they do not incorporate functioning models but rather rely on transluminated flow charting to illustrate system functions or the consequences of system faults. Both displays usually incorporate a control center, often utilizing the actual system controls, upon which inputs to the system are made and the results observed either on the functioning models or illuminated flow charted panel. These devices should be utilized when the system being taught can assume various states. In this situation ordinary graphic devices such as charts or display boards are not adequate for the demonstration of the relationships. In cases where many of the relationships would be concealed by the structure or location of the operational equipment, animated panels and back-lighted panels can be superior to the actual equipment in demonstrating these relationships. In addition to their role in learning identifications and understanding the principles and relationships of systems, these panels are quite valuable in clarifying relationships. When the operation of a complex system is to be taught a trainee, the actual operational equipment often would only confuse him. With the use of an animated panel or back lighted panel only those components essential to his understanding need be represented. Movement can be slowed to facilitate understanding and color added to aid in differentiation.

In addition, the system components can be depicted larger or smaller than actuality dependent on their importance in the system.

12.0 MOCK-UPS/MODELS

Mock-ups or models are three dimensional representations which may or may not use actual equipment components. They may be divided conveniently into 3 categories, operating mock-ups, non-operating mock-ups and cutaway mock-ups. Operating mock-ups use actual system components or substitute components of either less expensive or transparent material, assembled so as to function similar to operational conditions. A similar arrangement of either system components or replicas without moving parts are non-operational mock-ups. When actual components are used and partially dissected to reveal internal appearance and functioning a cut-away mock-up results.

Mock-ups are used to support classroom lectures allowing students to familiarize themselves with major equipment items and the functional relationship between components. The relatively inexpensive realistic equipment presentation is motivating and quite effective in preparing him to deal with actual equipment at a later time and may be used to augment presentations using charts and transparencies. One of the most important features of mock-ups is the access it provides to all important system components. Mock-ups can be built to any scale. A reduced scale would enable versatility and portability while enlarged scale mock-ups would facilitate access to components. Mock-ups may be used to teach equipment identifications, present the principles of equipment operation and fulfill certain simulator functions by allowing procedural sequence and limited problem solving (trouble shooting) practice.

The expense of mock-ups varies considerably, with operating mock-ups being the most costly. However, it is possible to construct mock-ups at very little expense dependent on the materials and training situation.

13.0 SIMULATORS

A simulator is a relatively complex electromechanical device which reproduces those systems aspects of concern. Usually they are physical duplicates of much of the operational equipments and are functional duplicates of all subsystem and systems required to operate the system itself. Simulators are custom designed and may be designed to assist in the training of any task from piloting aircraft to driving cars or operating steel mills. Total operational sequences such as complete flight missions, plant shut down or start up, etc can be rehearsed.

Simulators are useful in training individuals or full crews transitioning from one aircraft to another. Both military and commercial pilots spend significant time in simulators learning new flight characteristics, procedures, and instrument/control locations. Full flights or missions may be rehearsed and critiqued in the simulators. Periodically, pilots are required to return to the simulator for refresher training ensuring their competency in emergency and highly complex procedures.

Simulators can serve a dual purpose, they may be used for training as well as for proficiency tests of trained personnel. In the training phase they enable the student to integrate various concepts and skills learned into a job situation. Practicing the integration of skills in the actual job situation is not always possible due to considerations of safety, cost or interference with ongoing system usage. This capability is the principle advantage of simulators.

Simulators most effective learning area is in the making of decisions, learning procedural sequences and in the understanding of principles and relationships. Principles and relationships are learned by the cause and effects relationships occurring during the operation of the simulated systems. Simulator usage can serve to reinforce identification of system components. However, simulators do not represent the most economical approach to training in identifications, being one of the most costly training devices.

14.0 REALIA

Realia is any actual object which is used during training about the object. It can range from a simple hand tool to a complete operational aircraft. It is the basic medium for on-the-job-training. Training with realia obviously offers the best chance for maximum "transfer-of-learning" to the job situation although it must be recognized that training with realia does not necessary take place in the same physical or emotional environment as the actual job.

Potential disadvantages to training with realia are initial expense and possible safety hazards to persons and equipment. In military applications, realia used for training often has a prime operational mission which can cause scheduling conflicts.

15.0 TEACHING MACHINES

Teaching machines are devices which can present information, query and have provisions for an overt response. They range in complexity from simple hand-held devices to complex digital computers used in computer assisted instruction (CAI). Teaching machines serve to mechanize linear, branched or adaptive programmed instruction. (See programmed instruction texts for definition of linear and branched programs.) An adaptive program incorporates all the characteristics of a branched program in addition to having a more sophisticated decision-making process for remedial branching. Adaptive programs will branch the learner based on "history of performance" in addition to each individual response. Because of the complexity of branching based on "history of performance" computers or computer like devices are used for mechanization of this type of programmed instruction.

Teaching machines present information via some audio, visual or audio/visual unit which is integral to, or controlled by, the device. Generally, teaching machines employ a "multiple choice" type of test. The user is required to indicate, by pressing a response button, a single choice correct answer from a field of four or five possible answers. However, only a limited number of teaching machines employ branching type programs. In most cases pressing a "wrong answer" button only results in a "try again" direction to the learner. Two

devices studied were compatible with a written constructed response. Most teaching machines do not, however, utilize constructual responses in linear programs.

When film is the visual medium, 16mm and 35mm formats are usually used for still displays with either 8mm or 16mm formats used for motion. Some devices use printed paper tape as the information carrier, in this case both the text and pictorials are contained within the medium. In more sophisticated devices, such as multimedia carrels or C.A.I. installations, T.V. type displays are used with text and sometimes pictorials appearing on the viewing surface.

Audio information is contained on either magnetic tape or pressed dis[illegible]. In machines using a combination of audio and visual units there is need for the synchronization of media. This is accomplished, during normal modes of operation, by recorded inaudible tones or by electrical or mechanical linkage of media to response controls.

A typical sequence of events during man-machine interaction would be as follows. The teaching machine presents a "frame" of information to the user. This may be either an audio, visual or combination audio/visual presentation. The "frame" contains instructional subject matter information and directives for proceeding with the program. As for example, "when you have completed reading the text, answer the following question by selecting the most correct answer

from a choice of four". The user then presses one of four buttons which correspond to the answer choices. If the selection is correct, the machine operation which follows might be that the device

a. advances the program to the next frame

b. exposes the correct answer for student reinforcement and then advance the program to the next frame

If the selection is incorrect the device could

a. do nothing until the correct response is chosen and then proceed to next frame

b. branch into a remedial loop using audio visual

c. present a wrong answer message, and provide the user with additional technical information, then instruct the user to make another selection

The sequence of events is then repeated for the duration of the program.

Reinforcement, an indication by the teaching machine that the student has responded correctly is a feature frequently included in machine design. This is accomplished by the illumination of a color coded lamp; the flashing of a "Correct Response" indicator; an audio tone or audio message; or a displayed printed message.

The recording of learner performance is accomplished by counting correct or incorrect responses utilizing electrical or mechanical counters or by a "punch card" device which may use cards that are computer compatible.

To expand the versatility of the teaching machine some manufacturers have included the capability to control external media. This is accomplished by external media switches or direct electrical link to response switches.

In the most common mode of operation all machines that were studied were student-paced when operated. However, several machines had an optional testing mode where there is the provision to machine pace the program using a fixed or variable timer, where the device may control the time allowed to respond. An additional utilization for machine pacing is in drill type exercises.

Teaching machines are categorized in data group 12 and have been evaluated with respect to the following features:

General Features

- o Individual Student Unit
- o Hand Portable Configuration
- o Desk Top Configuration
- o Student Self Pacing

- o Reinforcement
- o Customized Program Required
- o Self Contained Programming Capability
- o Manufacturers Format
- o Machine Pacing Option
- o Modularized System
- o Carrel Configuration
- o Computer Compatible

Media & Media Control

- o Response Controlled Media
- o Manual Control of Media
- o Will Control External Media
- o 16mm Film
- o Film Strip
- o Magnetic Audio Tape
- o Audio Pressed Disc
- o Motion Visual
- o Still Visual
- o Audio
- o Cassette
- o Cartridge

Response & Response Processing

- o Multiple Choice Response

- Constructed Response
- Response Counter
- Permanent Record of Response

Type of Program

- Linear
- Branched
- Adaptive

16.0 COMPUTER ASSISTED INSTRUCTION (C.A.I.)

The computer in eductation performs two major functions. It individualizes instruction and provides data about how students learn. The great advantage to the computer is that is possesses both memory and logic. The computer can be programmed to,

- present instructional material
- question for understanding
- remember all responses
- classify responses
- analyze responses
- adapt an instructional sequence based on the cummulative trend of a students responses

Through the use of time-sharing and tele-processing, C.A.I. can accomodate many students at many different locations.

C.A.I. can perform its functions with less error and greater efficiency than a human instructor. The computer never gets tired, distracted, angry, or impatient, and it never forgets.

Computerized instruction can take many forms. In its most basic configuration the learner usually interacts with the computer via a keyboard console similar to a typewriter, and a cathode ray tube for display of information. Learner-machine interaction is limited to elementary sequences without evaluation or variation on the part of the computer. The computer presents nearly all the

instructions and records the student responses. Student performance scoring is accomplished automatically with the computer storing the data.

As C.A.I. configurations grow in complexity a more diverse array of input-output devices are utilized. Some types of information presentation devices are

- rear screan motion picture projectors
- rear screen 2 x 2" slide projectors
- video tape players
- random access motion and still film projectors
- microfilm projectors
- tape recorders for audio information, both random access and conventional

In addition to the popular keyboard console the learner now has the 'light' pen to use as a response device. The student can react to a picture on the cathode ray tube by puting a 'light' pen at specific places and his answer will be picked up by the computer and evaluated.

Although the application of the computer to the learning experience is an exciting occurance it is not one which is free of problems. Computers are expensive. There have been claims regarding low cost per student hour. However, the fact remains that the initial investment in the purchase of equipment, the training of personnel, the development of programs and the maintenance add substantially to the cost. Further considerations are

- Scheduling - complex daily schedules due to individual nature of the instruction

° Logistics - location of equipment - configuration of learning areas

The majority of C.A.I. activities are centered in major universities, military training facilities and private industry. They use off-the-shelf C.A.I. systems modified in many cases to fit unique needs. A few schools are using C.A.I. to teach regularly. Many public and private organizations are experimenting with a variety of subjects.

Presently, there is a limited number of validated programs available. As more programs are produced and implemented C.A.I. will become a more prevelant mode of instruction.

17.0 MAINTENANCE TRAINING UNITS

Maintenance training units are used when concepts to be learned are too complex to be absorbed easily from verbal descriptions and when the principles to be used in task performance can best be illustrated and practiced by physical objects and real actions. The individual who must troubleshoot a complex system locating malfunctions must learn a set of rules and have understandings which are recalled and applied when he is faced with a particular set of symptoms or test instrument readings. This ability can be developed utilizing a maintenance training unit.

Maintenance training units vary, being highly specific to the system to be maintained. They can be all electrical, electro-mechanical or purely mechanical in nature. Training units may be designed with the capability to program in pre-determined faults for isolation or may utilize existing faulty parts as training problems. In either case, the faults must be consistent with the learning objectives. The salvaging of non-repairable components for use as illustrative faults in maintenance training units rarely is compatible with these objectives and can be actually misleading resulting in negative training.

The design of maintenance training units involves a trade-off between realism of component location for maximum transfer of training versus convenience of location for ease in demonstration.

In general, maintenance training units are a combination of realia (see page 72) and functional simulation of interfacing units.

18.1 E.C.II Programmable Simulator

The Model ECII is a training device designed primarily for teaching the proper trouble-shooting technique required in the testing and repair of a system or piece of equipment. By using the following programmable components, the ECII can be utilized for instruction on system or equipment.

1. Pictorial/schematic display overlay - This assembly is mounted on the ECII directly in front of the student and provides the pictorial and/or schematic representation of the system to be taught. It contains up to 96 surface messages, switches, and indicator lamps and provides the means by which the student performs simulated tests and component replacements.
2. 35mm slides - These slides provide instructions, questions, waveforms, machine part pictures, or diagrams to the student. Each program can accommodate up to 100 slides.
3. Magnetic tape cassette - Control signals are programmed into this unit for the malfunctions, tests, and replacements which are to be simulated. Control of the 35mm slides projected to the student is also a function of the taped program.
4. Meter scale - If applicable, this scale provides simulated instrument readings to the student.

Program activation is accomplished at the instructor's panel of the Model ECII. At the push of a button the system is "bugged" with one or more of 25 programmed malfunctions. From this point on, the student interacts with the device to perform the simulated tests and component

replacements required to locate and correct the malfunction. As a function of student responses and the control programming of the magnetic tape cassette, visual displays are provided as instant feedback to the student to let him see the simulated result of his actions. A timer and two counters on the instructor's panel are used to measure student proficiency.

Major advantages of the ECII are:

1. Actual equipment is not required for training.
2. Minimal instructor services required - There is no need to bug or debug equipment, nor is instructor required while student is proceeding with the exercise.
3. Student receives immediate feedback concerning his actions.
4. Student proficiency is measured.
5. Device application is not limited to one equipment or system.

18.2 Audipointer

The Audi-Pointer Learning System is a portable audio-visual, console device which provides a means of presenting recorded lectures to individual students or small groups of students. It incorporates a viewing screen which can accommodate standard graphic materials up to 11" x 17" and a unique program controlled pointer light which automatically high-lights the exact section of the drawing under discussion.

The pointer light appears in the drawing as a 1/8" disc. It can be controlled to blink, move back and forth to underscore, and trace circuits or outlines. One channel of a standard stereo cassette provides the pointer control signals. The other channel contains the lecture narrative. Headphones permit complete privacy for the student if desired. An additional audio jack allows instructor monitoring or the use of an external speaker.

Student interaction with the device is accomplished with an "answer pen". At appropriate times during the lecture, the student is asked a question based on the previous discussion. The tape program is automatically paused and will not resume operation until the answer pen is positioned to the proper point on the viewing screen or the "play" control is operated.

Major advantages to the Audi-Pointer Learning System are:

1. Self paced learning - Controls enable the student to pause, rewind, go backwards or forward as required.
2. Standard graphic materials - The console can accommodate engineering drawings, blueprints, schematics and printed half

tones. Students can make notes on these graphics and retain for future reference.

3. Easily programmed - One model of the Audi-Pointer Learning System incorporates the necessary components required for recording the narration and the pointer light programming onto the stereo tape cassette.

4. Minimal instructor time required.- Simple operating controls permit student to operate device without instructor assistance.

18.3 MOBILE TRAINING AND BRIEFING CONSOLE -CPS 48

This device employs folded optics combined with rear projection in a console unit enabling substantial space savings. It accommodates within its console a motion picture projector (with or without sound), 2 x 2 slide projector, tape recorder, and a 8" x 10" overhead projector. Control of built-in devices is provided via a remote control unit. The following features are controllable providing they have been built into the projectors by their manufacturer:

Motion Picture Projector - on-off, Reverse, forward

2 x 2 slides - on-off, Forward, Reverse Focus

Overhead Projector - On-Off

Tape Recorder - On-Off, Start Stop

Changes from one medium to another are accomplished via a selector switch on the remote control.

An optional superimposing system makes it possible to insert a 2 x 2 slide into the lamp housing of the transparency projection system. The slide image will show on the screen and at the same time an enlarged image is visible on the transparency stage. By use of a pencil or pointer details can be singled out, the shadow of the pointer appearing on the screen. Using a sheet of clear acetate and a grease pencil one can write, underline or encircle items. Blocking of portions of images can be accomplished by placing opaque masks on the stage plate. In addition, transparency images may also be superimposed on slide images.

The physical dimensions of this unit are 91" high by 74" length by 31-1/2" deep when a 36" x 48" screen is used. It weighs approximately

600 lbs. The user can specify the motion and slide projectors as well as the tape recording system desirable.

18.4 UNIVERSAL PROCESS TRAINER (UPT)

The Carmody UPT is a training device which can be used to simulate the flow and control of various complex processes (i.e. petroleum refinement, chemical synthesis, food processing, etc.). It is suitable for use during initial familiarization training of inexperienced trainees as well as follow-up proficiency training of experienced process control personnel. It consists of the following major parts:

- o Display board
- o Program board
- o Control console

Display Board: The top portion of the display board is used to graphically portray the process by means of magnetically attached symbols and flow lines. During initial training sessions of new operators, knowledge of equipment locations, equipment relationships, and flow of the process can be readily taught. As training progresses to actual operating exercises and problems,the graphical display of the process provides a convenient visual reference of process configuration and flow to assist trainee decision making.

The lower portion of the display board provides the simulated instrumentation and controls of the process (as would be found in the "control room"). A standard complement of 24 interchangeable instrument modules and a fixed multi-point indicator are used. Controlled manually from the

control console or automatically by the program board, the instruments can depict normal readings and relationships as well as readings that are indicative of a malfunction or emergency. The instrument modules also contain the operating controls of the process. Trainees learn through actual "doing" as they set up the controls and monitor the instruments. They also learn through simulated problem analysis as training exercises progress from normal operations to malfunction or emergency problems.

Program Board: Automatic control of instrument readings to signify normal operations, malfunctions, or emergencies is accomplished through the patch board wiring of the program board. It is claimed by the manufacturer that the ability to program this unit can be mastered in one or two practice sessions and that with the help of brief notes the program board can be quickly reprogrammed.

Control Console: Through various switches and potentiometers on the control console, the instructor can control the instrument modules of the display board and set up normal or emergency process conditions. By observing trainee's reaction and response time, the instructor can regulate the training for maximum effectiveness.

Main advantages of the Carmody Universal Process Trainer:

- Programming flexibility - All major parts of the trainer can be easily set up to depict any process.
- Active student "doing" - Students are required to manipulate controls, monitor instruments, and perform problem analysis as would be required in the process control room.

19.1 AUDIO VISUAL INTEGRATORS

Audio visual integrating devices enable the user to combine sound with a visual presentation medium as well as to program the point in the presentation that the device or devices will operate. The usual control method is to incorporate signaling pulses on adjacent tracks of stereo audio tape, although monaural single track machines are also used. Tapes may be loaded on reels, cassettes or cartridges cueing any remotely controlled projector. Inaudible tone signal pulses of specific frequencies or durations as well as mechanical tape marking techniques (i.e. pencil marks) are used to code control functions. The script audio may be incorporated on the same tape with the signaling pulses or the control tape may run other tape recorders. It is possible to integrate and synchronize slide projectors, filmstrips projectors, tape recorders and motion picture projectors. Devices may be turned on and off, advanced or shifted into an automatic stop response mode, stopping on coded signals and not advancing until manually directed to do so. Integrators with this feature will also accept response devices and can be used in automated teaching programs. Production of control tapes may be accomplished by reading script directly into the tape recorder and then entering code pulses on replay. Most devices incorporate program recording and pulse coding in one unit but a few devices require separate tone generating and programming devices, which can be bulky, complicated and expensive. Integrating devices are available that integrate any tape recorder into the controlling system enabling the use of in-inventory equipment and a cost savings.

Reasonably priced devices exist to integrate as many as three machines at once or to control three operations of a single machine. Reverse synchronization enabling back tracking during a presentation is not usually possible, all systems reviewed except one are thrown out of synchronization by reverse operation and require restarting from the beginning. The utilization of integrating devices enables the combination of existing equipment to yield remote and automatic control of audio-visual presentations with a minimum of cost.

Audio-visual integrators are categorized in data group 14. In addition to this data grouping audio-visual integration is accomplished by certain sound filmstrip machines, sound slide machines, 8mm motion picture devices, and teaching machines systems, data groupes 05, 01, 03, and 12 respectively.

Audio visual integrators have been evaluated with respect to the following features:

Audio/Control Tape Characteristics

Reel to Reel Loading

Cassette Loading

Continuous Loop Cartridge

Separate Reel to Reel Tape Recorder Required

Separate Tape Recorder Required

Control Method

Signal Pulse

Pencil Mark

Operating Characteristics

Built-in Programming Capability (enabling the generation of tone cues for synchronization)

Special Programming Device Required

Built-in Audio Record Capability

Remote Control Feature (usually limited to stop/start)

Automatic Stop Feature

Reverse Synchronization Capability

19.2 VISUAL RANDOM ACCESS DEVICES

During the course of training sessions it often becomes necessary to refer to information already presented. This situation can exist both for a lecturer as well as an individual student viewing a training program. To back track through every slide or through a whole roll of film, or to start completely over from the beginning is time consuming and tends to reduce attention and motivation. The capability to select frames of information at random makes it possible to incorporate branched programmed learning techniques into training sessions.

Through random access equipment, the desired portion of a program may be selected without viewing intervening frames. Random access systems are composed of slide projectors, movie projectors or filmstrip projectors in combination with digital servo units for the addressing and accessing of projection frames. Multiple remote control of one projector or control of dual projectors from one station is possible. Accessing of information requires the manual positioning of remote dials, thumbwheels, or pushbuttons to the appropriate frame number. The capability exists in random access systems to handle as many as one hundred slides or 30,000 frames of film with or without computer assist. Systems may include special projectors or may incorporate standard projection devices. Units are available that attach directly to standard slide projectors with no modifications, offering a substantial cost savings by utilizing in-inventory projectors.

Random access devices are categorized in data group 06. The data regarding the time each device takes to locate frames has been organized to enable the user to indicated the amount of time available in his planned

presentation; all devices capable of meeting this requirement are flagged by a 1. In addition to this data grouping,random access capabilities exist in certain audio tape recorders and micro-devices, data groups 06 and 08 respectively.

Random access devices have been evaluated with respect to the following features:

Lens Type

Zoom

Assorted Lenses Available

Illumination

Conventional Lamp

Hi-Intensity Lamp (designed for front projection in lighted rooms)

Visual Display

2 x 2 Slides

Super 8mm film

16mm film

35mm loop

Presentation Characteristics

Limiting Search Interval (Maximum time available during a presentation for search)

3.5 seconds

4.0 seconds

4.5 seconds

5.5 seconds

6.0 seconds

7.0 seconds

8.3 seconds

9 minutes

13.3 minutes

Average Search Interval (Average search time available during a presentation)

up to 2.0 seconds

2.3 seconds

2.5 seconds

3.0 seconds

4.1 seconds

5.0 seconds

6.1 seconds

Operating Characteristics

Dual Projector Control

Multiple Control of Projector

Remote Control of Operations (varies from only frame selection to include Forward, Reverse On-Off as well as Focus)

Portable

Machine Capacity

up to 48 frames

80 frames

96 frames

100 frames

140 frames

500 frames

30,000 frames

19.3 VISUAL MOTION ADAPTERS

Motion may be incorporated into presentations by utilizing motion picture cameras and projectors or by using animation techniques on filmstrip projection devices. In these cases actual motion is created. Simulated motion can also be created by use of the Technamation or Visionetics approach outlined as follows.

TECHNAMATION

Technamation is a technique which creates simulated motion in slides, transparencies and other visual communications media. This is achieved by the control of variably orientated polarized light. The technique is limited to in-place movements, such as wheels turning on a vehicle, a person performing simple arm movements or material flow. The illusion of linear (forward, stopping and reversing) motion, velocity, blinking, radiation, turbulence, and rotary actions is possible. The motion simulated is repetitive, an arrow or material flow moves again and again in the same direction. Motion from one place to another and then stopping, or a person or vehicle moving across the screen is not possible.

Technamation is a custom technique. Although a kit is available for amateur production of simulated motion transparencies, sophisticated devices are required to produce high quality training slides and transparencies. The Technamation process starts with conventional 35mm slides or transparencies which are photographs of artwork or other original subjects. Special artwork is then prepared for the portions of the image that are to "move" and then, special materials are added to the basic slide or transparency. These materials polarize projected light in one or more planes.

When projected in normal fashion, the screen image is unchanged from the original. If a motion adapter is added to the projector, a rotating disk of polarized material alternately stops and transmits the polarized light coming through the "motion" parts of the slide or transparency thus producing the illusion of movement.

The cost of technamating customer supplied artwork is fairly expensive for the first slide with succeeding copy slides running much cheaper. Overhead transparencies can be technamated in small quantities for approximately half the first slide cost. Motion adaptors are available to fit all slide projectors and overhead projectors in both bargain units and a deluxe model with the capability of speed control. (Adjusting the speed of the rotating disk adjusts the speed of the simulated motion.)

VISIONETICS

"Motion" effects can be created in all printed media (i.e. text books, workbooks, study cards and reference material) and in projected media (i.e. overhead transparencies). "Motion" is created for overhead transparencies and printed pages by a moving grid arrangement. For 2 x 2 slides a spinning polarized disk technique is employed.

The graphics necessary to cause the illusion of movement are introduced by Visionetics on customer supplied art and illustrations without altering them. These "controlled grid" graphics are capable of being printed in either black and white or multi-color. Printing techniques may be offset, silk screen or diazo dependent upon the medium and number of units required. The artwork when finished appears to have many minute parallel lines enscribed upon it and may be utilized by itself. When a grid is moved across these figures, shifting Moiré patterns give the

impression of movement. When the artwork is used in texts the user manually moves the grid across the illustration. A motor driven actuator grid is available for use with overhead transparencies. The stage containing the actuator grid can be affixed to any standard overhead projector. Normal transparencies may be projected without any interference. Linear motion forward, backward and stopping as well as radiation, turbulence, blinking and rotary actions are possible. Similar to the technamation method, only repetitive effects are possible - a person or vehicle may not be made to "move" across the screen.

19.4 TELESTRATOR

The Telestrator introduces an element of flexibility into televised presentation allowing instructional material to be adapted in accordance with the audience requirements. Information can be added, notes and translations inserted and diagrams and pictures drawn directly into the presentation as with overhead projection techniques.

This device enables the operator to print, draw, diagram, pictorialize, analyze and annotate right into any televised picture. The composite picture produced is viewed immediately by both the operator and the audience, as it is written. Using a stylus the user writes on a hard transparent position sensitive surface which lies over the televised image on his monitor. By selection of switches on the control panel, solid lines, dashes, dotted lines and circles in several choices of width is possible. The written graphics are available in shades of black and white, colors or even in plaid or polka dot patterns, and may be made to flash at a desired rate for emphasis. These graphics may be stored and recorded on simple audio cartridges and recalled to appear on the screen at any time on command and in registry over any background visual. When combining the device with a second T.V. camera, a live picture can be brushed into any scene with the stylus. This insert can be a cameo shot of an individual, a point of interest or the new visual can be painted over the entire picture.

19.5 RESPONDERS

Student responders serve to complete the student-teacher communication loop by enabling the acquisition of real-time or delayed response data. Responders provide the ability to test each students comprehension during or after a lecture and evaluate the performance of each student or student group.

The category "Responders" can be divided into three separate groups. The first group is comprised of individualized response devices or methods which do not have media control. It should be noted that individualized devices having media control were subsumed under the category "Teaching Machines". The second consists of student group response systems which are manually operated and have no media control. The third is comprised of student group response systems that have the capability to control media and have an automated mode of operation.

Individualized response methods such as the written, oral or practical test are best suited to elicit a constructed response. The oral or written response may be either specific or created. The instructors preference should be stated in the test question. Demonstration as a constructed response is the most time consumming to evaluate, each student in a group must be evaluated separately. It is also costly to implement, since realia must always be available. An oral test, such as a "quiz for understanding" question during a lecture, might be responded to through the use of a hand held answer cube or answer card. The cube or card has printed surfaces which state multiple choice answers such as TRUE, FALSE, NEITHER, BOTH, A, B, C, D, DON'T UNDERSTAND or REPEAT.

This type of responder will insure total class participation during a quiz but, its use is limiated due to reduced visability with greater distance caused by large groups. The individualized response devices studied are characterized as follows:

- Small enough to be hand held
- Self contained
- Employ multiple choice response

Test cards are quickly graded, using an overlay grading key

In addition, some devices are designed to accept standard data processing cards which are "hole punched" each time a response is made. This type of response card is suitable for "batch" data processing. Once device has the unique capability of advancing after each response and can be adjusted for a 2, 3, or 4 choice answer code.

Large groups requirements are satisfied through the use of a multi position response system. Consisting of an instructor unit, and student responders, a basic group response system is an easy to operate mechanized communication system between the instructor and his students. The instructor unit consists of sets of indicator lamps for each student position in the system. The students responder has a set of four switches which will correspond to correct answer choices during multiple choice testing. When the instructor has completed asking or displaying a multiple choice question, the student is directed to respond by selecting the switch that corresponds to his choice of correct answer.

By monitoring the lamp display on his console, the instructor can see which of the students are responding and their choice of answer. To provide student reinforcement, a correct answer light is added to the student responder with a corresponding control switch at the instructors station which can be operated by the instructor each time a student answers correctly. Using more sophisticated systems the teacher can assign a point value to each question. As questions are asked and responses given, students responding correctly are credited electronically, with the assigned point value. The accumulated scores are totaled and displayed by console mounted counters. Some systems monitor group performance through the use of meters. Each meter indicates the percentage of the class that selected one of the multiple choice answers. At a glance, the teachers can evaluate the effectiveness of his presentation to the entire group by checking the meters. Another method for displaying answer distribution is the light bar display. As the students make their answer choices, the answer distribution light bars show the proportion of the class that selects each of the possible multiple choice answers. As answers are changed, the light bars immediately register any change in proportional distribution.

Data printers are available for hard copy printout of the following student response information (which varies with system design):

- Course identification
- Student identification
- Question number
- Specific student response choice
- No answer indicator
- Assigned response weight
- Number of students responding
- The percent of students responsing A, B, C and D
- The total score for each student

Another type of permanent record is the Group Profile Recorder, which provides on a single sheet of paper, a printed record of the responses made by the entire class. A printed chart record is geometrically arranged so that individual students and the class as a group may be evaluated with ease. The recorder has two operating modes:

1. Record only the response of students who have answered correctly
2. Record all correct and incorrect answers of all students

Student group response systems having multimedia control and the capability of automated operation are the most sophisticated systems in this category.

Manual or automatic remote control of devices which can be operated electrically, such as video tape players, motion or still picture projectors and room lighting, is characteristic of these large group systems.

Automated operation is accomplished by a digital control program recorded on magnetic tape. The program controls the presentation and the processing of student responses.

In typical use, an instructional unit is presented using either a motion picture or still projector or both, together with audio from the motion film sound track or tape. After the lecture portion of the instructional unit has been presented, a tape command would cause a display of questions and possible answers. The next program operation would be to record the response of each student.

Some systems are modular in design. This allows the user to build his system to satisfy immediate needs and still have the capability to expand. Modular systems can be expanded to meet increased student loading and the requirement for more complex operations.

Responders are categorized in data group 15 and have been evaluated with respect to the following features:

Displays:

Displayed group response per question in percentage

Displayed group response per question

Displayed student cummulative score

Displayed student cummulative score in percentage

Displayed weight and answer per question

Displayed student identification by name

Displayed manual student

Displayed response distribution, remote

Recording Capability:

Records right answer indication

Records specific wrong answer

- Records no answer indication
- Records raw score per question
- Records student identification by number
- Records student total raw score
- Records student percent score
- Records student identification by name

Maximum Student Load Capability:

- Student load up to 1000
- Student load up to 240
- Student load up to 150
- Student load up to 100
- Student load up to 60
- Student load up to 50
- Student load up to 30
- Student load up to 15
- Student load up to 10

Type of Computer Compatibility:

- Punched Card
- Punched tape
- Magnetic tape
- Electrical

Type of Response:

- Multiple Choice
- Constructed, written
- Constructed, spoken
- Constructed, demonstrated

Type of Response freeze control:

- Automated
- Manual
- Timer

General Features:

- Self contained programming capability
- Confidential responder
- Automated operation, audio/visual
- Automated operation, question and answer
- Student reinforcement capability
- Manual media control
- Response weighting
- Single student application
- Modular system

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APPENDIX I

This Section is composed of Computer printouts which are to be found in the enclosed envelope with the data locator.

APPENDIX II

(01) SLIDE PROJECTORS

NUMBER	MODEL	MANUFACTURER
01001	Bauer S1 Autofocus	Allied Impex Corp
01002	1200 Carousel	A.V.E. Corp
01003	Bergen-Atlantic 450	Bergen Expo Systems, Inc.
01004	Lightning-600	Bergen Expo Systems, Inc.
01005	O-R-1000	Bergen Expo Systems, Inc.
01006	1406-144 Fleetwood	Brumberger Co., Inc.
01007	1422-144 Riviera	Brumberger Co., Inc.
01008	Hi-Lite 820-800	Buhl Optical Co.
01009	Cine-Slide 325	Busch Film & Equipment Co.
01010	6-240SS	Busch Film & Equipment Co.
01011	Carobeam	Decision Systems, Inc.
01012	Kodak Ektagraphic ~~AP~~	Eastman Kodak, Co.
01013	Kodak Ektagraphic ~~AP~~ ARC	Eastman Kodak, Co.
01014	Kodak Ektagraphic ~~AP~~ B	Eastman Kodak, Co.
91015	Kodak Ektagraphic ~~AP~~ E	Eastman Kodak, Co.
01016	Mor-Lite	Fortune Audio Visual
01017	970 A/V	GAF Corp
01018	Executive	Graflex, Singer Co.
01019	Traveler	Graflex, Singer Co.
01020	ENTRY DELETED	
01021	Preview, AVII, 6694	Honeywell Inc., Photographic Products Division
01022	P-2	Hoppmann Corp.
01023	Prima HPI #345	Hudson Photographic Ind., Inc.

(01) SLIDE PROJECTORS

NUMBER	MODEL	MANUFACTURER
01024	Caralite Mark 3	International Audio Visual, Inc.
01025	RPT-300 Rear Projection Theatera-ma one system	Motiva, Ltd.
01026	70 Highlight	Presentation Tech. Aids, Inc.
01027	Super Light 1000	Realist, Inc.
01028	Selectroslide SLM1200	Spindler and Sauppe, Inc.
01029	Selectroslide SLM-1200A	Spindler and Sauppe, Inc.
01030	Dual Selectroslide SLD-1200A	Spindler and Sauppe, Inc.
01031	Junior Selectroslide 321	Spindler and Sauppe, Inc.
01032	12	Tel-A-Story, Inc.
01033	TMC Showmatic 2007S	TM Visual Industries, Inc.
01034	Perkeo Automat S250	Zeiss Ikon
01035	Sound Cine-Slide 325 SS	Busch Film and Equipment Co.
01036	CV-411 Record Audio and Playback only (Auto)	Colorado Visual Aids Supply Co.
01037	Coxco Sound/Slide RP100	Cox Communications, Inc.
01038	CinemaSound 750	Creatron, Inc.
01039	CinemaSound 750	Creatron, Inc.
01040	Sonomatic RP	Harwald Co.
01041	Teleshow I NP-34SRP	Hoppmann
01042	Teleshow II H34-S	Hoppmann
01043	Kalavox, Model 392	Kalart Victor Corp.

(01) SLIDE PROJECTORS

NUMBER	MODEL	MANUFACTURER
01044	525 Sound-On-Slide Sys	3M Co., Visual Products Division
01045	ENTRY DELETED	
01046	ENTRY DELETED	
01047	Robot RA-110	Pro-Grammo, Inc.
01048	Synchromedia	Setco Audio-Visual, Inc.
01049	TMC Synchromatic	TM Visual Industries, Inc.
	AV 2000	
01050	TD201	Teaching Dynamics, Inc.

(02) 16MM PROJECTORS

NUMBER	MODEL	MANUFACTURER
02001	Bauer P6 Automatic Model M152	Allied Impex Corp.
02002	Bauer P6 Auto. 300 Model L	Allied Impex Corp.
02003	Bauer Selection II-O Type SL3/1600	Allied Impex Corp.
02004	Bauer Selection Studio Single System	Allied Impex Corp.
02005	Canary	A.V.E. Corporation
02006	Professional X-300 Xenon	A.V.E. Corporation
02007	X-300	A.V.E. Corporation
02008	614 CE Commercial JAN	Bell and Howell Company
02009	8302L	Bell and Howell Company
02010	566T Specialist Auto-load Filmosound	Bell and Howell Company
02011	1552 Specialist Auto-load Filmosound	Bell and Howell Company
02012	O-R-1000	Bergen Expo Systems, Inc.
02013	XE-600	Bergen Expo Systems, Inc.
02014	Cine-Educator 6240 MP	Busch Film and Equipment Company
02015	Cinesalesman 3	Busch Film and Equipment Company
02016	Cinesalesman 4A	Busch Film and Equipment Company

(02) 16MM PROJECTORS

NUMBER	MODEL	MANUFACTURER
02017	Two-Way 6A	Busch Film and Equipment Company
02018	BFN900-51E, Xenolite	Christie Electronics Corp., Xenolite Division
02019	BFN900-256E, Xenolite	Christie Electronics, Corp., Xenolite Division
02020	BFP900-614E, Xenolite	Christie Electronics Corp., Xenolite Division
02021	Kodak Pageant Arc Proj.	Eastman Kodak Co.
02022	Kodak Pageant Sound AV-12E6	Eastman Kodak Co.
02023	Kodak Pageant Sound AV-105-M	Eastman Kodak Co.
02024	Kodak Pageant Sound AV-126-TR	Eastman Kodak Co.
02025	Model 0815	Graflex Division, Singer Co.
02026	Model 920R	Graflex Division, Singer Co.
02027	Model 1015	Graflex Division, Singer Co.
02028	Model 1040	Graflex Division, Singer Co.
02029	Model 1050	Graflex Division, Singer Co.
02030	Insta-Load Model 115	Graflex Division, Singer Co.
02031	Cinematic	Harwald Co.
02032	Elmo Self-threading 16MM Filmatic 16-SS	Honeywell, Inc., Photographic Products Division

(02) 16MM PROJECTORS

NUMBER	MODEL	MANUFACTURER
02033	Elmo FS16-1000S	Honeywell, Inc., Photographic Products Division
02034	DaMaster Mark IV	Hoover Brothers, Inc.
02035	Teleshow I-NP34M	Hoppmann Corporation
02036	Premier EX1510	International Audio Visual, Inc.
02037	Royal M-O	International Audio Visual, Inc.
02038	Royal M-3	International Audio Visual, Inc.
02039	Royal ST-OH	International Audio Visual, Inc.
02040	Royal ST-OH-CAK	International Audio Visual, Inc.
02041	Royal ST-3H	International Audio Visual, Inc.
02042	Supreme EX-5000	International Audio Visual, Inc.
02043	Duolite ST-18	Karlart Victor Corporation
02044	Modular Moviematic Mark IV	Karlart Victor Corporation
02045	Movie STM-3C Custom	Karlart Victor Corporation
02046	Moviematic STM-18	Karlart Victor Corporation
02047	70-15	Karlart Victor Corporation
02048	70-25	Karlart Victor Corporation
02049	75-15	Karlart Victor Corporation
02050	75-15 MC3	Karlart Victor Corporation
02051	75-25	Karlart Victor Corporation
02052	82-25 MPR	Karlart Victor Corporation
02053	PJ-16	Magna-Tech Electronic Company, Inc.

(02) 16MM PROJECTORS

NUMBER	MODEL	MANUFACTURER
02054	Bolex S-321	Paillard, Inc.
02055	Tel-JANX9-CE	Telepro Industries, Inc.
02056	5-1200	Triangle Projectors, Inc.
02057	Cinesound 16	Viewlex
02058	JAN 2	Viewlex
02059	JAN-4	Viewlex
02060	MI-35043-AT20	Viewlex
02061	AAP 30 Motion Analyzer	Lafayette Instrument Co.

(03) 8MM MOTION PICTURE PROJECTORS

NUMBER	MODEL	MANUFACTURER
03001	Bauer T30	Allied Impex Corporation
03002	Institor	Bohn Benton, Inc.
03003	Noris Norimat	Braun Electric Canada, Ltd.
03004	Model 60	A.B. Dick Co.
03005	28A8	Dukane Corporation
03006	Kodak Ektagraphic MFS-8	Eastman Kodak Company
03007	Ektagraphic	Eastman Kodak Company
03008	Ektagraphic 120 Movie	Eastman Kodak Company
03009	Instamatic M100A	Eastman Kodak Company
03010	Mark S-709	Eumig (USA), Inc.
03011	Mark-S-712	Eumig (USA), Inc.
03012	Mark IV-S	Fairchild Camera & Instrument Corp.
03013	711	Fairchild Camera & Instrument Corp.
03014	Seventy-21	Fairchild Camera & Instrument Corp.
03015	Seventy-31	Fairchild Camera & Instrument Corp.
03016	Seventy-41	Fairchild Camera & Instrument Corp.
02017	1788Z	GAF Corporation
03018	Norimat S	Karl Heitz Inc.
03019	Heurtier Dual S-8	Hervic Corporation/Cinema Beaulieu
03020	Heurtier Dual Super 8 with Sound Module	Hervic Corporation/Cinema Beaulieu
03021	Elmo ST8MO	Honeywell Inc., Photographic Prod. Div.

(03) 8MM MOTION PICTURE PROJECTORS

NUMBER	MODEL	MANUFACTURER
03022	AMC	Jayark Instruments Corporation
03023	Instant-View 510A	McClure Projectors, Inc.
03024	Super 8 Sound Motion Picture	MPO Videotronic Projector Corporation
03025	Norelco PIP Audio-Visual Cass. System (Model TE 2020)	North American Philips Corp.
03026	Bolex SM-8	Paillard, Inc.
03027	Bolex 18-5	Paillard, Inc.
03028	SP169	The Synchronex Corporation
03029	SP-500	The Synchronex Corporation
03030	SRP-500	The Synchronex Corporation
03031	510	Technicolor, Inc., Commercial & Ed. Division
03032	610 Movie-Vision Console	Technicolor, Inc.
03033	810A	Technicolor, Inc.
03034	1000B	Technicolor, Inc.
03035	1300	Technicolor, Inc.
03036	U-193	Viewlex Inc.
03037	Pulsar	DeJur AMSCO Corp.
03038	862R	DeJur AMSCO Corp.

(04) FILMSTRIP PROJECTORS

NUMBER	MODEL	MANUFACTURER
04001	745-C Specialist	Bell and Howell Co., Audio Visual Div.
04002	28A6A	Dukane Corporation
04003	Ektagraphic Filmstrip Adapter	Eastman Kodak Co.
04004	SM-1000	Graflex Division, Singer Co.
04005	School Master 500	Graflex Division, Singer Co.
04006	School Master 750	Graflex Division, Singer Co.
04007	Prima HPI #340	Hudson Photographic Industries, Inc.
04008	Victor-Soundview PhD	Karlart Victor Corporation
04009	Victor-Soundview PS-65	Karlart Victor Corporation
04010	333	Standard Projector & Equipment Co.,Inc.
04011	333-RC	Standard Projector & Equipment Co.,Inc.
04012	444 Dual	Standard Projector & Equipment Co.,Inc.
04013	500-CZ	Standard Projector & Equipment Co.,Inc.
04014	500-FS	Standard Projector & Equipment Co.,Inc.
04015	500-RR	Standard Projector & Equipment Co.,Inc.
04016	750-AB	Standard Projector & Equipment Co.,Inc.
04017	750-C	Standard Projector & Equipment Co.,Inc.
04018	1000-C	Standard Projector & Equipment Co.,Inc.
04019	TMC Showoff 2010	TM Visual Industries, Inc.
04020	Model B	Viewlex, Inc.
04021	V-1 Mini-Giant	Viewlex, Inc.
04022	V-8	Viewlex, Inc.

(04) FILMSTRIP PROJECTORS

NUMBER	MODEL	MANUFACTURER
04023	V-8R	Viewlex, Inc.
04024	V-25	Viewlex, Inc.
04025	V-25R	Viewlex, Inc.
04026	V-45	Viewlex, Inc.
04027	V-85	Viewlex, Inc.
04028	V-500	Viewlex, Inc.
04029	V-1200 Magnum	Viewlex, Inc.
04030	Braun D7	Braun Electric Canada, Ltd.
04031	Study Mate II	Graflex Division, Singer Co.
04032	Examiner	Graflex Division, Singer Co.
04033	E-Z Viewer	Graflex Division, Singer Co.
04034	Prima HPI #330	Hudson Photographic Industries, Inc.
04035	201	Standard Projector
04036	777	Standard Projector
04037	999	Standard Projector
04038	1491	Standard Projector
04039	1495	Standard Projector
04040	1995	Standard Projector
04041	Previewer Junior #1	Viewlex, Inc.
04042	Previewer Senior	Viewlex, Inc.
04043	FS-1000	Whitehouse Products, Inc.

(05) SOUND FILMSTRIP PROJECTORS

NUMBER	MODEL	MANUFACTURER
05001	CSM	Audiscan Inc.
05002	1151-B Attache 35	Bell and Howell Co.
05003	505, 33000	Charles Beseler Co.
05004	Salesmate 8500 MII	Charles Beseler Co.
05005	14A285F	Dukane Corp.
05006	14A335 F	Dukane Corp.
05007	14A395C	Dukane Corp.
05008	14A500E	Dukane Corp.
05009	14A543D	Dukane Corp.
05010	14A650B	Dukane Corp.
05011	28A11A	Dukane Corp.
05012	28A12	Dukane Corp.
05013	28A15A Micromatic	Dukane Corp.
05014	28A25	Dukane Corp.
05015	A-1000	General Learning Corp., Media Division
05016	Audio-Master Executive	H-R Productions, Inc.
05017	Audio-Master Special I	H-R Productions, Inc.
05018	Victor-Soundview SAT-65D	Karlart Victor Corp.
05019	Courier I	LaBelle Industries, Inc.
05020	Courier 16	LaBelle Industries, Inc.
05021	Sentinel 16	LaBelle Industries, Inc.

(35) SOUND FILMSTRIP PROJECTORS

NUMBER	MODEL	MANUFACTURER
05022	Sentinel 35	Labelle Industries, Inc.
05023	Tutor 16	Labelle Industries, Inc.
05024	66	McClure Projectors, Inc.
05025	CSA-A/50	McClure Projectors, Inc.
05026	CSM-A Cassette-Strip	McClure Projectors, Inc.
05027	Picturephone 400	McClure Projectors, Inc.
05028	Mastermatic I 35MM	Optisonics Corp.
05029	RCS MODule System Model MS. AV Set	Retention Communications Systems, Inc.
05030	RCS MODule System, Model MS-11, Show Set	Retention Communications Systems, Inc.
05031	40, Combination 1	Standard Projector & Equipment Co., Inc.
05032	Combination 50/750 AB	Standard Projector & Equipment Co., Inc.
05033	60, Combination 11	Standard Projector & Equipment Co., Inc.
05034	60A, Combination 17	Standard Projector & Equipment Co., Inc.
05035	600, Combination 31	Standard Projector & Equipment Co., Inc.
05036	Showoff/Soundoff 865	TM Visual Industries, Inc.
05037	Showtalk V-8R	Viewlex, Inc.
05038	Showtalk Cassette Series V-8R	Viewlex, Inc.
05039	SSA Sight n Sound Teaching Station	Viewlex, Inc.

[illegible] SOUND FILMSTRIP PROJECTORS

NUMBER	MODEL	MANUFACTURER
05040	SOAC Sight n Sound Teaching Station	Viewlex, Inc.
05041	Viewtalk VHA Series	Viewlex, Inc.
05042	Viewtalk Cassette Series VHAC 3	Viewlex, Inc.
05043	Viewtalk VTA-22 R	Viewlex, Inc.
05044	FS-250	Whitehouse Products, Inc.
05045	Audio Study Mate	Graflex Division, Singer Co.
05046	V-136	Viewlex, Inc.
05047	V-192	Viewlex, Inc.

06. RANDOM ACCESS DEVICES

NUMBER	MODEL	MANUFACTURER
06001	SFL-50-46 Xenolite with Kodak Ektagraphic	Christie Electric Corp., Xenolite Div.
06002	DSI Model 80 RA	Decision Systems Inc.
06003	Kodak Ektagraphic RA-960	Eastman Kodak Company
06004	970 AV plus Slide Seeker	GAF Corporation
06005	RA80 Random Access Module for Carousel Proj.	Hoppmann Corporation
06006	138-6 Multiple Control System	Mast Development Co.
06007	RAC-1	National Electro-Mechanical Systems, Inc. (NEMS)
06008	Selectroslide SLS-750B	Spindler and Sauppe, Inc.
06009	Selectroslide SLX-750B	Spindler and Sauppe, Inc.
06010	RA-100	Telepro Industries, Inc.
06011	RA-500	Telepro Industries, Inc.
06012	GAF 1000	GAF Corporation
06013	Carobeam B	Decision Systems Corporation
06014	Mor Lite R.A.	Fortune Audio Visual
06015	132B	MAST Development Co.

[illegible] OVERHEAD TRANSPARENCY PROJECTORS

NUMBER	MODEL	MANUFACTURER
07001	3750 Standard	American Optical Corporation
07002	3651 Apollo 6	American Optical Corporation
07003	301 Specialist	Bell and Howell
07004	360 Specialist	Bell and Howell
07005	15700DYST PortaScribe	Charles Beseler Co.
07006	PortaScribe 15710DYST-CC	Charles Beseler Co.
07007	PortaScribe Wide, 17628-AA	Charles Beseler Co.
07008	PortaScribe Wide, 17628-SS	Charles Beseler Co.
07009	PortaScribe Wide Wide 17627-SS	Charles Beseler Co.
07010	7750TH-VuGraph	Charles Beseler Co.
07011	Vu Graph Century VGC614	Charles Beseler Co.
07012	6600 Master Vu Graph	Charles Beseler Co.
07013	80/14	Buhl Optical Co.
07014	6000	Buhl Optical Co.
07015	Gakken 428	Deltek Business Machines
07016	485 AV	GAF Corporation
07017	GMI 44	Gregory Magnetic
07018	Elmo HP-250, 2930	Honeywell, Inc. Photographic Products Division
07019	CP-2 Multi-Media Proj.	Hoppmann Corp.
07020	Professional, Series 85	Hoppmann Corp.

[illegible] OVERHEAD TRANSPARENCY PROJECTORS

NUMBER	MODEL	MANUFACTURER
07021	560	IM Company
07022	5-560 Desk Top	IM Company
07023	567 Glare Free	IM Company
07024	Resolute 21105	Projection Optics Company
07025	Transpaque Auto-level 20400	Projection Optics Company
07026	Transpaque 20/20, 21400	Projection Optics Company
07027	TMC Carri-Vue	TM Visual Industries, Inc.
07028	Tecnifax 10 x 10	Scott Education Division
07029	2200 B	H. Wilson Corporation
07030	Executive 2200 E	H. Wilson Corporation

(08) MICRO DEVICES

NUMBER	MODEL	MANUFACTURER
08001	PMR/50	DASA Corporation
08002	COM 1	Dioptrix, Inc.
08003	27A5	Dukane Corporation
08004	Omit	
08005	Exp 14	Dukane Corporation
08006	Standard	Realist Inc.
08007	Vista	Realist Inc.
08008	Vantage	Realist Inc.
08009	Book Size Module	Microdisplays Systems, Inc.
08010	300	T. M. Visual, Inc.
08011	Robot L-36	Karl Heitz, Inc.
08012	2240	University Microfilms
08013	27/18	University Microfilms
08014	Motor Matic	Eastman Kodak
08015	Easa-Matic	Eastman Kodak
08016	Micro Star	Eastman Kodak
08017	P.V.M.	Eastman Kodak
08018	Mira Code	Eastman Kodak

(09) VIDEO TAPE RECORDERS & PLAYERS

NUMBER	MODEL	MANUFACTURER
09001	VP-4500	Ampex Corp.
09002	VPR-5200	Ampex Corp.
09003	VPR-5800	Ampex Corp.
09004	VPR-7900	Ampex Corp.
09005	VR-5100	Ampex Corp.
09006	PVR-707	Audiotronics Corp. (Video Sys. Div.)
09007	VTR-800	Concord Electronics Corp.
09008	VTR-1000	Concord Electronics Corp.
09009	VTR-3000	Concord Electronics Corp.
09010	DP-2	Diamond Power Electronics
09011	DP-3	Diamond Power Electronics
09012	4TD1B1	GBC Closed Circuit TV Corp.
09013	X400	Javelin Electronics Corp.
09014	700	JFD Systems, Div. of Riker Commun.
09015	SV-510	Shibaden Corp. of Am.
09016	SV-700UC	Shibaden Corp. of Am.
09017	AV-5000	Sony Corp. of Am.
09018	DV-310	Sony Corp. of Am.
09019	EV-320	Sony Corp. of Am.
09020	EVR Teleplayer	Motorola Systems, Inc.

(10) PORTABLE VIDEO TAPE RECORDING SYSTEMS

NUMBER	MODEL	MANUFACTURER
10001	VTR-450T	Concord Electronics Corp.
10002	LDL-1000	Norelco - Philips Broadcasting Equipment Corp.
10003	SV-707U.FP-707	Shibaden, Corp. of Am.
10004	VTS-110DX	AKAI Corp. of Am.
10005	INSTAVIDEO	Ampex Corp.
10006	AV-3400/AVC-3400	Sony Corp. of Am.
10007	NV-3080/WV-8080	Panasonic Corp.

(11) TAPE RECORDERS/PLAYERS

NUMBER	MODEL	MANUFACTURER
11001	AX 300	Ampex Corp.
11002	Ar-tik 414	Arion Corp.
11003	ATC-110A	Audiotronics
11004	ATC-110L	Audiotronics
11005	202A	Electronic Futures Inc.
11006	TP-88	M.P. Audio Corp.
11007	AVTM-73	Newcomb Audio Products Co.
11008	EDTM-73	Newcomb Audio Products Co.
11009	A77	Revox Corp.
11010	70TC	Rheem Califone Div.
11011	74TC	Rheem Califone Div.
11012	RD-708	Sharp Electronics Corp.
11013	106-AV	Sony/SuperScope Inc.
11014	1522SL	Tandberg of America
11015	7T-20	Teaching Technology Corp.
11016	230	Telex Communications Div.
11017	RP9511	Visual Educom Inc.
11018	742AV	VM Corp.
11019	TR16	White Electronic Dev. Corp.
11020	6020AV	Wollensak/3M Co.
11021	6200	Wollensak/3M Co.
11022	Acousti-Player 700	Acoutsifone Corp.
11023	Acousti-Corder 700	Acoutsifone Corp.

(11) TAPE RECORDERS/PLAYERS

NUMBER	MODEL	MANUFACTURER
11024	Micro 9	Ampex Corp.
11025	Micro 14	Ampex Corp.
11026	360	Audion Div. of Columbia Scientific Ind.
11027	ATC-1302	Audiotronics
11028	294D	Bell & Howell, Audio Visual Div.
11029	406	Bell & Howell, Audio Visual Div.
11030	Casset Tutor 414	Educational Technology Inc.
11031	150 Carry Corder	North American Philips Corp.
11032	AV80	Rheem Califone Div.
11033	CR-5	Rheem Califone Div.
11034	RD-403	Sharp Electronics Corp.
11035	180-AV	Sony/Superscope, Inc.
11036	650	Standard Projector & Equipment Co.
11037	CP-2	Viewlex, Inc.
11038	CR-6	Viewlex, Inc.
11039	709AV	V.M. Corp.
11040	762AV	V.M. Corp.
11041		
11042	2510AV	Wollensak/3M Co.
11043	2530AV	Wollensak/3M Co.
11044	2540AV Remote Control	Wollensak/3M Co.
11045	4300	Wollensak/3M Co.
11046	310	Audion Div. of Columbia Scientific Ind.

(11) TAPE RECORDERS/PLAYERS

NUMBER	MODEL	MANUFACTURER
11047	204	Electronic Futures, Inc.
11048	APR-20	Mackenzie Labs, Inc.
11049	RTD 350	Delmar Industries

(12) TEACHING MACHINE MANUFACTURERS

NUMBER	MODEL	MANUFACTURER
12001	APT A/V Tutor	Gemco, Inc.
12002	Telor	Enrich Corp.
12003	Autotutor	Sargent-Welch Scientific Co.
12004	Mast Learning System Model 1700	Mast Development Co.
12005	Honor	Honor Products Co.
12006	Dorsett M-86	Dorsett Ed. System Inc.
12007	System 80	Borg-Warner Educational Systems
12008	AVS-10	CBS Labs/Viewlex
12009	Modec Multimode 311	Modec Inc.
12010	Maxi-Mode Carrel 311C	Modec Inc.
12011	L-250	Link Education System
12012	Coxco	Cox Communications Inc.
12013	Self Development Computer	Self Development Inc.
12014	Avidesk	Avid Corp.
12015	Min/Max	R.H. Hintley Co.
12016	Responder with Sound-O-Matic III	Optisonics Corp.
12017	The Didactor	Didactics Corp.
12018	Speed Model 2000	McMahon Elect
12019	Speed Model 2150	McMahon Elect
12020	Mark III 520	Humac Inc.

(12) TEACHING MACHINE MANUFACTURERS

NUMBER	MODEL	MANUFACTURER
12021	Audio Vision MK-10	Ken Cook Transnational
12022	C.A.I.	Hypertech Corp.
12023	Series 70	Hoppman Corp.
12024	Test Mate Responder with A/V Unit	Instructive Devices

(13) T.V. MONITORS & PROJECTORS

NUMBER	MODEL	MANUFACTURER
13001	12VM205	Javelin Electronics
13002	TM9	Javelin Electronics
13003	TM16	Javelin Electronics
13004	TM23	Javelin Electronics
13005	T-980	Magnavox
13006	T-5916	Magnavox
13007	T-5905	Magnavox
13008	5M916RM3	Setchell Carlson
13009	6M912	Setchell Carlson
13010	9M912	Setchell Carlson
13011	3M912S	Setchell Carlson
13012	9M912R	Setchell Carlson
13013	3ER2100	Setchell Carlson
13014	5EC904	Setchell Carlson
13015	10M915RL	Setchell Carlson
13016	10M915RT	Setchell Carlson
13017	9MC914	Setchell Carlson
13018	9MC914R	Setchell Carlson
13019	5MC914	Setchell Carlson
13020	MMA16	Audio Tronics
13021	MMA19	Audio Tronics
13022	MMA10	Audio Tronics
13023	MMR23	Audio Tronics

(13) T.V. MONITORS & PROJECTORS

NUMBER	MODEL	MANUFACTURER
13024	AN-69V	Panasonic
13025	TR-413V	Panasonic
13026	TN-932	Panasonic
13027	TN-952	Panasonic
13028	CT-25V	Panasonic
13029	AN-236V	Panasonic
13030	TR-910M	Panasonic
13031	TR-910V	Panasonic
13032	200A	Amphicon Systems
	270	Amphicon Systems
13033	1000E	Amphicon Systems
13034	UP-1	GBC Closed Circuit TV, Inc.
13035	Tele-Beam A912 ACP	Kalart Victor
13036	PJ700	General Electric
13037	PJ400	General Electric

(13) T.V. MONITORS & PROJECTORS

NUMBER	MODEL	MANUFACTURER
13024	AN-69V	Panasonic
13025	TR-413V	Panasonic
13026	TN-932	Panasonic
13027	TN-952	Panasonic
13028	CT-25V	Panasonic
13029	AN-236V	Panasonic
13030	TR-910M	Panasonic
13031	TR-910V	Panasonic
13032	200A	Amphicon Systems, New York
	270	Amphicon Systems, New York
13033	1000E	Amphicon Systems, New York
13034	UP-1	GBC Closed Circuit T.V., Inc. N.Y.
13035	Tele-Beam A912 ACP	Kalart Victor Plainville, Conn.
13036	PJ700	General Electric Syracuse, N. Y.
13037	PJ400	General Electric

(14) AUDIO VISUAL INTEGRATORS

NUMBER	MODEL	MANUFACTURER
14001	AVS-700	Audio Visual Systems, Inc.
14002	Coxco Municator Series Y	Cox Communications, Inc.
14003	SRR-2	General Techniques, Inc.
14004	Cue Slide	The Klitten Co., Inc.
14005	Pla-Matic 83	LaBelle Industries
14006	Norelco LCH 1000 PR	North American Phillips Corp.
14007	Norelco Synchroplayer (TE821)	North American Phillips Corp.
14008	Norelco Synchrotutor (TE822)	North American Phillips Corp.
14009	Sound-O-Matic III	Optisonics Corp.
14010	Caro Vox CVP 100	Programo
14011	SSP-1	Saunders Associates, Inc.
14012	SUB-2	Saunders Associates, Inc.
14013	TR-1 Pacer	Saunders Associates, Inc.
14014	Record-O-Sync	T.M. Visual Industries, Inc.
14015	Tri-Tone I	Mackenzie Laboratories, Inc.
14016	Super Sync	Instructomatic, Inc.
14017	Audio Mate 600	Montage Productions, Inc.
14018	Narrator 1000	Montage Productions, Inc.
14019	TD 301	Teaching Dynamics, Inc.
14020	Audio Link	Link Educational Laboratories

(14) AUDIO VISUAL INTEGRATORS

NUMBER	MODEL	MANUFACTURER
14021	V.M. 703 AV	V. M. Corporation
14022	System 240C	Saunders Associates, Inc.

(15) RESPONDERS

NUMBER	MODEL	MANUFACTURER
15001	Educom Validator	Visual Educom
15002	Edex 300 Series Communicator	Visual Educom
15003	Edex Media Master Series 650A	Visual Educom
15004	AIDS	Visual Educom
15005	RESYC 600	Response Systems Corp.
15006	R-E-S	Charles Beseler
15007	Mata Response System	Scott Education Division
15008	Responadex	T. M. Visual Industries
15009	QRS 681-F	Quick Response Systems
15010	QRS 681-RCP	Quick Response Systems
15011	QRS 681-MS	Quick Response Systems
15012	Student Response Monitor	Gemco
15013	ASRM	Gemco
15014	Test Mate Responder (Mod II)	Instructive Devices
15015	Test Mate Responder (Mode I)	Instructive Devices
15016	L-3000	Link
15017	L-2000	Link
15018	Model 703-1	Carmody Response System
15019	RB-30	Cox Communication Corp.

(15) RESPONDERS

NUMBER	MODEL	MANUFACTURER
15020	RB-305	Cox Communications, Corp.
15021	System 1000	National Electro-Mechanical Systems, Inc.
15022	System 2000	National Electro-Mechanical Systems, Inc.
15023	System 3000	National Electro-Mechanical Systems, Inc.
15024	System 4000	National Electro-Mechanical Systems, Inc.
15025	System 6000	National Electro-Mechanical Systems, Inc.
15026	Answer Cube	Tydings
15027	Written Test	
15028	Oral Test	
15029	Practical Test	

MANUFACTURER INDEX

Acoutsifone Corp.
20149 Sunburst St.
Chatsworth, Calif. 91311

AKAI America Ltd
2139 E. Deltmo Blvd
Compton, Calif.

Allied Impex Corp.
% Interstate Photo Supply Corp
168 Glen Cove Rd
Carle Place, N. Y.

American Optical Corp.
Eggert Rd
Buffalo, N. Y.

Ampex Corp.
2201 Estes Ave.
Elk Grove Village, Ill. 60007

Amphicon Systems
1 Graphic Place
Moonachie, N. J. 07074

Audicon Div. of Columbia Scientific Ind.
P. O. Box 6190
3625 Ed Bluestein Blvd
Austin, Texas

Audiotronics Corp.
Video System Div.
P. O. Box 151
7428 Bellaire Ave.
North Hollywood, Calif. 91603

Audio Visual Systems, Inc.
1219 E. Fourth Ave.
Denver, Colorado 80218

Audiscan, Inc.
P. O. Box 1456
Bellevue, Washington 98005

A. V. E. Corp.
250 W. 54th St.
New York, N. Y. 10019

AVID Corp.
P M & E Electronics Div.
10 Tripps Lane
East Providence, R. I. 02914

Bell & Howell Co.
Audio Visual Div.
7100 McCormick Rd.
Chicago, Ill. 60645

Bergen Expo Systems, Inc.
Route 46
Lodi, N. J. 07644

Charles Beseler Co.
219 S. 18th St.
East Orange, N. J. 07018

Borg-Warner
Educational Systems
7450 N. Natcheg Ave.
Niles, Ill.

Braun Electric Canada, Ltd.
3269 American Dr.
Malton, Ontario

Brumberger Co., Inc.
1948 Troutman St.
Brooklyn, N. Y.

Buhl Optical Co.
1776 New Highway
Farmingdale, N. Y. 11735

Busch Film & Equipment Co.
214 S. Hamilton
Saginaw, Michigan 48602

Carmody Corp.
2361 Wehrle Dr.
Buffalo, N. Y. 14221

CBS Labs/Viewlex
Viewlex, Inc.
Holbrook, N. Y. 11741

Christie Electric Corp.
Xenolite Div.
3410 W. 67th St.
Los Angeles, Calif.

Colorado Visual Aids Supply Co.
955 Bannock St.
Denver, Colorado

Concord Electronics Corp.
Concord Commu. Systems Div.
1935 Armacost Ave.
Los Angeles, Calif. 90025

Ken Cook
9929 W. Silver Spring Rd
Milwaukee, Wis.

Cox Communications, Inc.
915 Howard St.
San Francisco, Calif.

Creatron, Inc.
36 Cherry Lane
Floral Park, N. Y. 11001

DASA Corp.
15 Stevens St.
Andover, Mass. 01810

Decision Systems, Inc.
E. 66 Midland Ave.
Paramus, N. J. 07625

Del Mar Industries
10457 Roselle
San Diego, Calif. 92121

Deltek Business Machines
Division of Dodwell & Co., Ltd.
120 Wall St.
New York, N. Y. 10005

Diamond Power Electronics
Box 415
Lancaster, Ohio 43130

Didactics Corp.
700 Grace St.
Mansfield, Ohio 44905

Dioptrix, Inc.
1020 Prospect St.
La Jolla, Calif. 92037

Dorsett Ed. System, Inc.
P. O. Box 1226
1225 W. Main St.
Norman, Oklahoma 73069

Dukane Corp.
103 N. 11th Ave.
St. Charles, Ill.

Eastman Kodak Co.
343 State St.
Rochester, N. Y. 14650

Educational Technology, Inc.
2224 Hewlett Ave.
Merrick, N. Y. 11566

Electronic Futures, Inc.
Division of KMS Industries, Inc.
57 Dodge Ave.
North Haven, Conn.

Enrich Corp.
3437 Alma St.
Palo Alto, Calif. 94306

Fortune Audio Visual
35 Bergen Turnpike
Little Ferry, N. J. 07643

G. A. F. Corp.
140 W. 51st St.
New York, N. Y.

GBC Closed Circuit TV Corp
74 5th Ave.
New York, N. Y. 10011

Gemco, Inc.
7700 E. 38th St.
Tulsa, Oklahoma 74145

General Electric
Visual Communication Product Dept.
Electronics Park
Syracuse, N. Y. 13201

General Learning Corp.
Media Division
250 James St.
Morristown, N. J. 07960

General Techniques, Inc.
1270 Broadway
New York, N. Y. 10001

Graflex, Singer Co.
3750 Monroe Ave.
Rochester, N. Y. 14603

Gregory Magnetic Industries, Inc.
317 S. W. Fifth St.
Pompano Beach, Florida 33060

Harwald, Co.
1245 Chicago Ave.
Evanstown, Ill. 60202

Karl Heitz, Inc.
979 Third Ave.
New York, N. Y. 10022

R. H. Hintley Co.
575 Lexington Ave.
New York, N. Y. 10022

Honeywell, Inc.
Photographic Products Div.
5501 Broadway
Littleton, Colorado 80120

Honor Products Co.
20 Moulton St.
Cambridge, Mass 02138

Hoover Brothers, Inc.
1305 N. 14th St.
Temple, Texas 76501

Hoppman Corp
5410 Poet Royal Road
Springfield, Va.

H-R Productions, Inc.
121 West 45th St.
New York, N. Y. 10036

Hudson Photographic Industries, Inc.
2 South Buckhout St.
Irvington-on-Hudson, N. Y. 10553

Hu-Mac, Inc.
2415 Chareston Rd.
Mountain View, Calif. 94040

Hypertech Corp.
7343 West Wilson Avenue
Harwood Heights, Ill. 60656

Instructive Devices
147 Armistice Blvd
Pawtucket, R. I.

Instructomatic, Inc.
30625 W. Eight Mile Rd.
Livonia, Michigan

International Audio Visual, Inc.
119 Blanchard St.
Seattle, Wash, 98121

IVC - New York
690 N. Broadway
White Plains, N. Y. 10603

Javelin Electronics Corp
5556 W. Washington Blvd
Los Angeles, Calif. 90016

JFD Systems, Div. of Riker Communication
14 Orchard St.
Norwalk, Conn. 06850

Kalart Victor Corp.
Hultenius Ave.
Plainsville, Conn. 06062

The Klitten Co., Inc.
1213 N. Amalfi Dr.
Pacific Palisades, Calif. 90272

LaBelle Industries, Inc.
510 S. Worthington St.
Oconomoc, Wisconsin 53066

Lafayette Instrument Co.
P. O. Box 1279
Lafayette, Indiana 47902

Link Educational Laboratories
P. O. Box 11073
Montgomery, Alabama 36111

Mackenzie Labs, Inc.
P. O. Box 3503
South El Monte, Calif. 91733

Magna-Tech Electronic Co., Inc.
630 Ninth Ave.
New York, N. Y. 10036

Magnavox
1700 Magnavox Way
Ft. Wayne, Ind. 46804

Mast Development Co.
2212 E. 12th Street
Davenport, Iowa 52802

McClure Projectors, Inc.
P. O. Box 7
1215 Washington Ave.
Wilmette, Ill. 60091

McMahon Elect.
381 West 7th Street
San Pedro, Calif. 90731

Microdisplays Systems, Inc.
% Rentention Communication Systems, Inc.
2 Pennsylvania Plaza, Suite 1199
New York, N. Y. 10001

3 M Co.
Visual Products Division
3 North Center
St. Paul, Minn.

Modec, Inc.
3404 North Holton St.
Milwaukee, Illinois

Montage Productions, Inc.
49 West 27th St.
New York, N. Y. 10001

Motiva, Ltd
155 East 55th St.
New York, N. Y. 10022

Motorola Systems, Inc.
4501 W. Augusta Blvd.
Chicago, Ill. 60651

M. P. Audio Corp.
Fairfield, Conn. 06430

National Electro-Mechanical Systems, Inc.
P. O. Box 86 East Side Station
32 Broad Ave.
Binghamton, N. Y. 13704

Newcomb Audio Products Co.
12881 Bradley Ave.
Sylmar, Calif. 91342

Norelco - North American Philips Corp.
Training and Education Systems
100 East 42nd St.
New York, N. Y. 10017

Optisonics Corp.
Montgomeryville Industrial Center
Montgomeryville, Pa. 18936

Paillard, Inc.
1900 Lower Rd
Linden, N. J. 07036

Panasonic
23-05 44th St.
Long Island City, N. Y.

Presentation Tech. Aids, Inc.
630 Ninth Ave.
New York, N. Y.

Programmo, Inc.
44 W. 44th
New York, N. Y.

Projection Optics Co.
271 11th Ave
East Orange, N. J. 07018

Quick Response Systems
800 North West St.
Alexandria, Va. 22314

Realist, Inc.
North 93 West 16288 Megal Drive
Menomenee Falls, Wisc.

Response Systems Corp.
Edgemont, Pennsylvania 19028

Retention Communications Systems, Inc.
2 Pennsylvania Plaza, Suite 1199
New York, N. Y. 10001

Revox Corp.
P. O. Box 196
Roslyn Heights, N. Y. 11577

Rheem Califone Div.
5922 Bolocroft Ave.
Los Angeles, Calif.

Sargent-Welch Scientific Co.
7300 North Linder Ave.
Skokie, Illinois 60076

Saunders Associates, Inc.
3 Old Boston Rd
Wilton, Conn. 06897

Scott Education Division
Holyoke, Mass. 01040

Self Development, Inc.
367 Almaden Ave.
San Jose, Calif. 95110

Setchell Carlson
SC Electronics, Inc.
Subsidiary Audiotronics Corp.
530 Fifth Ave. N.W.
St. Paul, Minn. 55112

Setco Audio-Visual, Inc.
4400 St Vincent Ave.
Webster Groves, Mo.

Sharp Electronics Corp.
10 Keystone Place
Paramus, N. J.

Shibaden Corp. of Am.
58-25 Brooklyn Queens Expwy
Woodside, N. Y. 11377

Sony Corp. of Am.
VTR Division
47-47 Van Dam St.
Long Island City, N. Y.

Sony/Superscope, Inc.
8150 Vineland Ave.
Sun Valley, Calif. 91352

Spindler & Sauppe, Inc.
1329 Grand Central Ave.
Glendale, Calif.

Standard Projector & Equip. Co., Inc.
1911 Pickwick Ave.
Glenview, Ill. 60025

Tandberg of America
8 Third Ave.
Pelham, N. Y.

Teaching Dynmaics, Inc.
Division Jetronics Industries, Inc.
Main & Cotton Streets
Philadelphia, Pa. 19127

Teaching Technology Corp.
P. O. Box 3817,
6837 Hayvenhurst Ave.
Van Nuys, Calif. 91407

Technicolor, Inc.
Commercial & Educational Division
299 Kalmus Drive
Costa Mesa, Calif. 92627

Technamation, Inc.
112 Pkwy Dr S.
Hauppauge, N. Y.

Tel-A-Story, Inc.
517 Main St.
Davenport, Iowa 52805

Telepro Industries, Inc.
Cherry Hill Industrial Center
Cherry Hill, N. J. 08034

Telex Communications Div.
Telex-Magnecord-Viking
9600 Aldrich Ave. South
Minneapolis, Minn. 55420

Telor Learning Device
Enrich Dept 4
3437 Alma St.
Palo Alto, Calif.

T. M. Visuals Industries, Inc.
25 West 45th St.
New York, N. Y.

Triangle Projectors, Inc.
3706 Oakton St.
Skokie, Illinois 60076

Tydings
1966 Kenneth S. Tydings
Long Beach, N. Y.

University Microfilms
A Xerox Company
300 N. Zeeb Rd
Ann Arbor, Mich. 48106

Viewlex, Inc.
1 Broadway Ave.
Holbrook, N. Y. 11741

Visual Educom, Inc.
4333 S. Ohio St.
Michigan City, Ind.

V M Corp
P. O. Box 1247
Benton Harbor, Mich. 49022

White Electronic Dev. Corp. Ltd
3041 Universal Dr.
Mississauga, Ontario

Whitehouse Products, Inc.
360 Furman St.
Brooklyn, N. Y. 11201

Wilson Corporation
555 W. Taft Drive
South Holland, Ill. 60473

Wollensak/3M Company
Bldg 224-6E, 3M Center
St. Paul, Minn. 55101

Zeiss Ikon
444 Fifth Ave.
New York, N. Y. 10018

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13. ABSTRACT

The selection of training media and devices is a process which must be based on the requirements of specific learning objectives. Conversely, media and devices will influence those portions of the statement of objectives which concern the manner and conditions under which the learned behavior is demonstrated and measured. The analysis and planning of this two-way interaction is facilitated by the use of a set of descriptive parameters which is common to both learning objectives and media. This report describes a system whereby the essential intent of learning objectives is analyzed in terms of these parameters covering manner of presentation, instructional strategy and desired mode of response. A profile of the requirement is then matched with the characteristic/capability profile of generic media types. These generic media types include both custom engineered devices and commercially available media. When the process leads to commercially available training devices, comparisons can be made among over 450 devices described in the report.

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Audio-visual						
Auto-instructional Aids						
Catalog						
Educational Technology						
Individualized Instruction						
Instructional Media						
Learning Objectives						
Media Selection						
Multi-media						
Programed Instruction						
Systems Approach						
Taxonomy						
Teaching Machines						
Training Aids						
Training Devices						

F - 14 FRAMP TRAINING PROGRAM — MEDIA STUDY PHASE ONE

REV. 2 12 OCT. 1971

01 2X2 SLIDE AND SOUND-SLIDE PROJECTORS

01-01 * ZOOM LENS

01-02 * SINGLE FIXED LENS

01-03 * ASSORTED LENSES

01-04 * CONVENTIONAL LAMP

01-05 * HIGH INTENSITY LAMP

01-06 * REEL TO REEL AUDIO TAPE

01-07 * CASSETTE AUDIO TAPE

01-08 * SPECIAL AUDIO GIVES REVERSE SYNCH

01-09 * INAUDIBLE SYNCH SIGNAL

01-10 * BUILT-IN RECORD CAPABILITY

01-11 * SLIDE CAPACITY UP TO 12

01-12 * UP TO 36

01-13 * UP TO 48

01-14 * UP TO 50

01-15 * UP TO 80

01-16 * UP TO 96

01-17 * UP TO 100

01-18 * UP TO 120

01-19 * UP TO 140

01-20 * REMOTE CONTROL

01-21 * BUILT-IN REAR PROJECTION

01-22 * FRONT PROJECTION

01-23 * BUILT-IN PROGRAMMER

01-24 * AUTOMATIC OPERATION

01-25 * PORTABLE

01-26 * FILM-STRIP OPTION

01-27 * PREVIEWER

MACH NO	FEATURES	PRICE CODE
01001	010100000011110000010101101	0 0000180
01002	101010000011111111110101100	0 0000390
01003	001010000011111111110101100	0 0001700
01004	001010000011111111110101100	0 0001800
01005	001010000011111111110101100	0 0002000
01006	010100000011000000010101100	1 0000170
01007	010100000010000000000100100	1 0000090
01008	001010000011111000010100100	0 0000750
01009	010100000011111000011001000	0 0000330
01010	010100111111111000001010000	0 0001100
01011	101010000011111000010100100	0 0000800
01012	101100001011111111110111110	1 0000280
01013	101010001011111111110111100	0 0001200
01014	101100001011111111110111110	1 0000190
01015	101100001011111111110100110	1 0000180
01016	001010000011111111100101100	0 0000800
01017	010100001011111110010111100	1 0000190
01018	010100000011000000001000100	0 0000090
01019	010100000011000000001000100	0 0000070
01021	101100001111111111010111110	1 0000270
01022	010100000011111000011001101	0 0000460
01023	010100000010000000000100100	0 0000040
01024	101010000011111111110101010	1 0002000
01025	010100101111111000001011000	0 0000580
01026	001010000011111000010100100	0 0000600
01027	101010000011111111110101010	1 0000780
01028	001010000010000000010100100	1 0000340
01029	001010000011100000010101100	1 0000820
01030	001010000011111100010101100	1 0001100
01031	001100000011000000010101100	1 0000450

01032	00101000001000000001001100	0 0000220
01033	01001000001110000000100100	0 0000040
01034	01010000001111000010000100	0 0000210
01035	01010010111111100011011100	0 0000700
01036	10110010111111111110111110	1 0000440
01037	01010010111100000011011100	0 0000400
01038	01010100111111111010111100	0 0000450
01039	01010010111111110010111100	0 0000460
01040	01010010111111000011011000	0 0001900
01041	01010010111111100011011000	0 0002800
01042	01010010101111100011001000	0 0001950
01043	10010001011110000010111100	0 0000530
01044	01010001011100000010111100	0 0000700
01047	10010010101111111111001000	1 0001020
01048	10110010101111111110101100	0 0000380
01049	01010010111111000011011110	0 0000490
01050	10100010111111111110111100	1 0000460

02 16MM PROJECTORS

02-1 * ZOOM LENS

02-2 * SINGLE FIXED LENS

02-3 * ASSORTED LENSES

02-4 * OPTICAL SOUND TRACK

02-5 * MAGNETIC SOUND TRACK

02-6 * RECORDING CAPABILITY

02-7 * REEL-TO-REEL LOADING

02-8 * CONTINUOUS LOOP CARTRIDGE LOADING

02-9 * SLOW MOTION

02-10 * SOUND SPEED (24 FPS)

02-11 * SILENT SPEED (18 FPS)

02-12 * STILL PICTURE / SINGLE FRAME

02-13 * CAPACITY UP TO 800 FEET

02-14	*	1000 FEET
02-15	*	1200 FEET
02-16	*	1600 FEET
02-17	*	2000 FEET
02-18	*	2200 FEET
02-19	*	2400 FEET
02-20	*	4000 FEET
02-21	*	5000 FEET
02-22	*	7000 FEET
02-23	*	AUTOMATIC THREADING
02-24	*	REMOTE CONTROL
02-25	*	BUILT-IN REAR PROJECTION
02-26	*	FRONT PROJECTION
02-27	*	BUILT-IN SPEAKER
02-28	*	REMOTE SPEAKER
02-29	*	REQUIRES SEPARATE AMPLIFIER
02-30	*	HIGH-INTENSITY LAMP
02-31	*	CONVENTIONAL LAMP
02-32	*	PORTABLE

MACH NO	FEATURES	PRICE CODE
02001	01011110011011111000001001110011	1 0001400
02002	01011010010011111111001001100011	1 0002000
02003	01011010010011111111100001001100	0 0005600
02004	00011010010011111111100001001100	0 0022000
02005	10011110110011111110000101100010	1 0001500
02006	11011110010011111111110101110101	1 0003700
02007	11011110010111111110000101010111	1 0003000
02008	01011010010011111000000001110011	1 0001500
02009	11011010011111111000000001100011	1 0001000
02010	10110010010011111000001001100011	1 0001800
02011	01010010011111111000001101100011	1 0001100

02012	0101101001101111100000001010111	1 0003300
02013	0101101001101111100000001010101	1 0003100
02014	0101001101101111000000010100010	0 0001100
02015	0101000101001000000000101010011	0 0000800
02016	0101001101101110000000010100011	0 0001000
02017	0101001001101111000000011100011	0 0000750
02018	0101101001101111111100000100101	0 0006600
02019	0101001001101111000000001010101	0 0004000
02020	0101101001101111100000000100101	0 0005900
02021	0101001001101111100000000101010011	0 0001600
02022	0011011001101111100000000101010011	1 0000650
02023	0101101001101111110000000101000	0 0001200
02024	0101001001101111100000000101000	1 0000700
02025	1011001001101111100000000111000	1 0000950
02026	1100111001111111100000000111000	1 0001300
02027	1011001001101111100000000110000	1 0000900
02028	1101001001101111100000000111000	1 0001800
02029	1101001001001111100000000111000	1 0000850
02030	1011001001111111100000100011000	1 0000950
02031	0101001101001000000000010100010	0 0002000
02032	1011001001001111100000101111001	1 0001300
02033	1101111011111111100000011111001	1 0001200
02034	0101000001101111100000101010001	0 0001000
02035	0101101001101100000000010100010	0 0002800
02036	0011101001101111111100001010101	1 0002200
02037	1011001001111111111000000111001	1 0000900
02038	1011101001111111111000000101001	1 0001100
02039	1011001001111111111000100111001	1 0001000
02040	1011001001111111111000100110001	1 0001600
02041	1011111001111111111000100101001	1 0001300
02042	0011101001101111111110000111010	1 0004900
02043	0101001001101111100000001110001	0 0000800
02044	0101000101101100000000010101001	0 0000800

02045	00110010010011000000000011100011	0 0000800
02046	00110010010011000000000001100011	0 0000850
02047	01011110011111111000000001110011	1 0001000
02048	01011110011111111000000001010011	1 0000800
02049	01011010011111111000000001110011	1 0000900
02050	01010010011011111000000001110011	1 0001400
02051	01011010011111111000000001010011	0 0000770
02052	01011110011011111000000001100011	1 0001100
02053	01011010010011111000000001100100	0 0002700
02054	00111010011011111000000001110011	1 0001300
02055	00110010010011111000000111100101	1 0003400
02056	00110001011011100000000011100011	1 0001490
02057	01010010011011110000000011100011	0 0000800
02058	01010010011011000000000001110011	1 0001700
02059	01011110010011111100000001110011	1 0002600
02060	11010010011011111100001001110011	1 0000900
02061	00100010111110000000000011000000	0 0001300

03 8MM/SUPER 8MM MOTION PICTURE PROJECTORS

03-01 * ZOOM LENS

03-02 * SINGLE FIXED LENS

03-03 * ASSORTED LENSES

03-04 * OPTICAL SOUND TRACK

03-05 * MAGNETIC SOUND TRACK

03-06 * CASSETTE MAGNETIC TAPE SOUND TRACK

03-07 * RECORDING CAPABILITY

03-08 * REEL TO REEL LOADING

03-09 * CARTRIDGE LOADING

03-10 * FILM FORMAT SUPER 8MM

03-11 * REGULAR 8MM

03-12 * CONTINUOUS LOOP CARTRIDGE LOADING

03-13 * CAPACITY UP TO 50 FEET

03-14	*	100 FEET
03-15	*	200 FEET
03-16	*	300 FEET
03-17	*	400 FEET
03-18	*	600 FEET
03-19	*	800 FEET
03-20	*	1200 FEET
03-21	*	VARIABLE SPEED SLOW MOTION
03-22	*	SINGLE FRAME / STILL
03-23	*	AUTOMATIC THREADING
03-24	*	BUILT-IN REAR PROJECTION
03-25	*	FRONT PROJECTION
03-26	*	REMOTE CONTROL
03-27	*	MIXED MOTION / STILL CAPABILITY
03-28	*	REMOTE SPEAKER
03-29	*	BUILT-IN SPEAKER
03-30	*	SILENT SPEED (18FPS)
03-31	*	SOUND SPEED (24FPS)
03-32	*	SLOW MOTION (6FPS)
03-33	*	SLOW MOTION (8FPS)

MACH NO	FEATURES	PRICE CODE
03001	0100101101001111111000101000111 00	0 0000500
03002	1100100001011111100001111000101 00	0 0000330
03003	1000011101001111100001011000111 00	1 0000340
03004	0100100001011100000001101000101 00	0 0000180
03005	0101101101001111110001101101011 00	0 0000550
03006	0100000101001111100001101110011 00	0 0000330
03007	0100100101001110000000101000111 00	0 0000200
03008	0100000011001100000001101000010 00	0 0000130
03009	0100101101001111111100001000111 00	0 0000650
03010	1000101101101111110000001000111 00	0 0000380

03011	1100101101001111110000001000111100	0 0000240
03012	0100101001011111100000101000101000	1 0000770
03013	0000101111001111110000010110010100	1 0000500
03014	0100101011011111100000011000101000	1 0000580
03015	0100101001011111100000010000101000	1 0000550
03016	0100101011011111100000001000101000	1 0000600
03017	1000000101101111110001101000011100	0 0000140
03018	1000011100011111100001101000110000	0 0000300
03019	1000000101101111100001001000010000	0 0000250
03020	1000101101101111100001001001111111	0 0000700
03021	1101100101101111111001101001111000	1 0000500
03022	0100101001011111111000101000101000	0 0000440
03023	1100000001011000000000111000001000	0 0000150
03024	0000101111001111100000011001110000	1 0000570
03025	0100110111001000000011110110111111	0 0000380
03026	1100101101001111111000101001111100	0 0000400
03027	1100000101001111100000101000010000	0 0000190
03028	0100100101001111100000101001001000	0 0000170
03029	1000101101001000000000101001101000	0 0000330
03030	1000101101001000000000101001111000	0 0000330
03031	1100000001011000000000111000010000	1 0000150
03032	0100000001011000000000111010001000	1 0000360
03033	1100000001011000000000111000010000	1 0000160
03034	0101000001011111110000111000101000	1 0000430
03035	0101000001011111110000111000101000	0 0000450
03036	1000100001011000000000111001011000	0 0000200
03037	1000011101100000100011101010110010	0 0000400
03038	1000000000000000100011101110110010	0 0000220
03039	0010000101001111100011101110011111	0 0000900

04 FILMSTRIP PROJECTORS

-1 * ZOOM LENS

04-2 * SINGLE FIXED LENS

04-3 * ASSORTED LENSES AVAILABLE

04-4 *

04-5 * 2 X 2 SLIDES

04-6 * CONTINUOUS LOOP

04-7 * DOUBLE FRAME FILMSTRIPS

04-8 * FRONT PROJECTION

04-9 * BUILT-IN REAR PROJECTION

04-10 * REMOTE CONTROL

04-11 * BATTERY OPERATION

04-12 * BUILT-IN POINTER

MACH NO	FEATURES	PRICE CODE
04001	001110010100	0 0000160
04002	001110010100	1 0000180
04003	010110010100	1 0000120
04004	001110010100	1 0000180
04005	001110010100	1 0000160
04006	001110010100	1 0000170
04007	010100010000	0 0000030
04008	010111010000	1 0000130
04009	010111010100	0 0000140
04010	001110010000	0 0000080
04011	010100010100	0 0000090
04012	010100011000	0 0000080
04013	010110010000	0 0000120
04014	001100010000	0 0000090
04015	010110010000	0 0000100
04016	010110010100	0 0000170
04017	010110010001	0 0000150
04018	010110010001	0 0000230
019	010110010010	1 0000090

04020	010110110110	0 0000180
04021	010110010000	1 0000030
04022	010100010000	1 0000050
04023	010100010100	1 0000090
04024	101110110100	1 0000240
04025	101110110100	1 0000230
04026	001100010000	0 0000100
04027	010110010000	1 0000090
04028	101110110001	0 0000130
04029	010110110000	0 0000230
04030	010010010000	0 0000050
04031	010100001000	0 0000030
04032	010100001000	0 0000070
04033	010100001000	0 0000020
04034	010100001000	0 0000020
04035	010100001100	0 0000040
04036	010100001000	0 0000050
04037	010100001000	0 0000070
04038	010100001100	0 0000010
04039	010100001000	0 0000020
04040	010100001000	0 0000030
04041	010100001100	0 0000020
04042	010100001000	0 0000070
04043	010100001000	0 0000030

05 SOUND FILMSTRIP PROJECTORS

05-1 * SINGLE FIXED LENS

05-2 * ASSORTED LENSES AVAILABLE

05-3 * DISK SPEED 16-2/3 RPM

05-4 * 33-1/3 RPM

05-5 * 45 RPM

05-6 * 78 RPM

05-7 * TAPE SPEED 1-7/8 IPS

05-8 * 3-3/4 IPS

05-9 * RECORD CAPABILITY

05-10 * 35MM FILMSTRIP

05-11 * CONTINUOUS LOOP

05-12 * 2 X 2 SLIDES

05-13 * 8MM/SUPER 8MM

05-14 * 16MM

05-15 * DOUBLE-FRAME FILMSTRIP

05-16 * FRONT PROJECTION

05-17 * BUILT-IN REAR PROJECTION

05-18 * BUILT-IN SPEAKER

05-19 * REMOTE SPEAKER

05-20 * AUTOMATIC OPERATION

05-21 * REMOTE CONTROL

05-22 * PROGRAM HOLD

MACH NO	FEATURES	PRICE CODE
05001	10000001010000000110010	0 0000320
05002	10000010010000000110100	0 0000350
05003	10000010010000001110011	1 0000450
05004	10000010010000000110011	0 0000350
05005	10011000010000000110011	1 0000250
05006	01011000010100010110000	1 0000210
05007	01011000010000010100000	1 0000150
05008	10010000010000000110110	1 0000250
05009	10011000010000000110010	0 0000150
05010	01011000010100010101010	1 0000340
05011	10000010010000000110111	0 0000250
05012	10000010011000000110000	0 0000250
05013	01000010010100010101111	1 0000300
05014	10000010010000000110010	0 0000250

05015	001111000000100101000O	0 0000060
05016	101111000100000011000O	0 0000120
05017	101111000100000101000O	0 0000100
05018	101111000101000101011O	0 0000310
05019	100000110100000011010O	0 0000350
05020	100000110010010011011O	0 0000300
05021	100000110010010011011O	0 0000400
05022	100000110100000011011O	0 0000370
05023	100000110010010111011O	0 0000380
05024	100110000101000111000O	0 0000110
05025	100000100100001101011O	0 0000290
05026	100000101101000101000O	0 0000170
05027	100111000101000111000O	0 0000160
05028	010000110100000111010O	0 0000390
05029	100000100100100111011O	0 0000180
05030	100000100010010011010O	0 0000275
05031	101111000100000100100O	0 0000120
05032	101111000101000101010O	0 0000350
05033	101111000100000111000O	0 0000120
05034	101111000100000111010O	0 0000250
05035	100000101100000111001O	0 0000250
05036	100000101101000111000O	1 0000110
05037	101111000101000111011O	0 0000180
05038	100000100101000111000O	0 0000210
05039	101111000100000011011O	0 0000250
05040	100000100100000011011O	0 0000280
05041	011111000101001100111O	0 0000290
05042	100000100000001101011O	0 0000290
05043	101111000101001100111O	0 0000260
05044	100000100100000011010O	0 0000120
05045	100000100100000011000O	0 0000080
05046	100001000100000010010I	0 0000150
047	100001000010100010010I	0 0000175

06 RANDOM ACCESS DEVICES

06-1 * ZOOM LENS

06-2 * ASSORTED LENSES

06-3 * CONVENTIAL LAMP

06-4 * HIGH INTENSITY LAMP

06-5 * 2 X 2 SLIDES

06-6 * SUPER 8MM

06-7 * 16MM

06-8 * 35MM CONTINUOUS LOOP

06-9 * LIMITING SEARCH INTERVAL UP TO 3.5 SEC.

06-10 * 4.0 SEC.

06-11 * 4.5 SEC.

06-12 * 5.5 SEC.

06-13 * 6.0 SEC.

06-14 * 7.0 SEC.

06-15 * 8.3 SEC.

06-16 * 9 MIN.

06-17 * 13.3 MIN.

06-18 * AVERAGE SEARCH INTERVAL - WIDE VARIATION

06-19 * UP TO 2.0 SEC

06-20 * 2.3 SEC

06-21 * 2.5 SEC

06-22 * 3.0 SEC

06-23 * 4.1 SEC

06-24 * 5.0 SEC

06-25 * 6.1 SEC

06-26 * PORTABLE

06-27 * REMOTE CONTROL

06-28 *

06-29 * DUAL PROJECTION CONTROL

06-30 * MULTIPLE CONTROL OF PROJECTOR

06-31	* CAPACITY UP TO	48 FRAMES
06-32	*	80 FRAMES
06-33	*	96 FRAMES
06-34	*	100 FRAMES
06-35	*	140 FRAMES
06-36	*	500 FRAMES
06-37	*	30,000 FRAMES

MACH NO	FEATURES	PRICE CODE
06001	1101100011111111101111111011111000001	1 0003000
06002	1110100000011111101111111100111000001	1 0001000
06003	1110100011111111101111111110111000001	1 0001500
06004	1110100000000111100000011101001111000	1 0000240
06005	1110100000000111100111111111011110001	0 0001100
06006	1111100011111111101111111110111000001	1 0001550
06007	0110011100000000111111111100011111111	0 0003900
06008	0110100000011111100011111110001000001	1 0002100
06009	0110100000011111100011111110001100001	1 0002800
06010	0110100000000011100000111011111110001	1 0003600
06011	0110100000000001100000001011111111101	1 0007300
06012	1110100001111111100001111110001110001	1 0000750
06013	1101100000011111101111111100111000001	1 0001500
06014	0101100000001111101111111010011111001	0 0001600
06015	0110000100000011100000111010001111101	1 0001775

07 OVERHEAD PROJECTORS

07-1 * APERTURE - AT LEAST 10 X 10

07-2 * 2 X 2 SLIDE ADAPTER

07-3 * SINGLE FIXED LENS

07-4 * ASSORTED LENSES

07-5 * WIDE ANGLE LENS

07-6 * MOTORIZED/CHANGER

07-7 * WRITING ROLL

07-8 * POLARIZING SPINNER

07-9 * REMOTE FOCUS

07-10 * MICROSWITCH DOWSER

07-11 * PORTABLE

07-12 * HIGH INTENSITY LAMP

07-13 * 360 DEGREE ROTATION SWIVEL

07-14 * SIMULTANEOUS SLIDE/TRANSPARENCY

MACH NO	FEATURES	PRICE CODE
07001	1010000000010	0 0000390
07002	1010101000100	0 0000190
07003	1010101000100	1 0000200
07004	1000101000100	1 0000240
07005	1010001100100	1 0000260
07006	1110001100100	1 0000320
07007	1100101100100	1 0000300
07008	1000101000100	1 0000180
07009	1000101000100	1 0000200
07010	1010001100010	1 0000460
07011	1101001101101	1 0000340
07012	1110001100010	1 0000480
07013	1010101100100	1 0000230
07014	1010001000110	0 0000370
07015	1000100000100	1 0000280
07016	1010001001101	1 0000270
07017	1110000000100	1 0000170
07018	1000101000100	1 0000330
07019	1110001000010	1 0001730
07020	1001010000010	1 0003250
07021	1010000010100	0 0000280

07022	1000100000100	0 0000200
07023	1010101000110	1 0000280
07024	1010001000110	1 0000320
07025	1010001101010	1 0000540
07026	1000101100100	1 0000280
07027	1000101000100	0 0000240
07028	1010001100100	1 0000580
07029	1010001000100	1 0000220
07030	1010001000100	1 0000270

08 MICRO DEVICES

08-1 * MICROFILM

08-2 * MICROFICHE

08-3 * APERTURE CARDS

08-4 * COM FICHE

08-4 * COM FICHE

08-5 * 16MM ROLL FILM

08-6 * 35MM

08-7 * MICRO-JACKETS

08-8 * REAR SCREEN PROJECTION

08-9 * FRONT PROJECTION

08-10 * 117 VAC

08-11 * BATTERY POWER

08-12 * PORTABLE

08-13 * INDEX METHOD BAR CODING

08-14 * STYLUS

08-15 * COUNTER

08-16 * MANUAL X-Y SEARCH

08-17 * MAGNIFICATION VARIABLE

08-18 * FIXED

08-19 * ZOOM CAPABILITY

08-20 * FIXED SCREEN SIZE

08-21 * OPTIONAL SCREEN SIZES AVAILABLE

08-22 *

08-23 * MAGAZINE LOAD

08-24 * RANDOM ACCESSING

MACH NO	FEATURES	PRICE CODE
08001	01010011010100010101 0000	1 000090
08002	01110011010101001000 0100	0 000200
08003	11111111010100011001 0000	1 000230
08004		
08005	11111111010000011001 0000	1 000370
08006	01110011110001001000 1000	1 000460
08007	01110011110001001010 1000	1 000510
08008	01110011111101001010 1000	1 000170
08009	01110011111100011011 0000	1 000250
08010	11110010110100010110 1100	0 000070
08011	01111111110000001001 0000	1 000900
08012	11111111011110011001 0000	1 000330
08013	11111111010010011001 0000	1 000590
08014	11111111010010011001 0000	1 002100
08015	01100011110001011001 0000	1 000275
08016	10000001010010111011 6010	1 0006620
08017	10001001010010011001 0000	1 0000780
08018	10001001010010010101 0011	0 0015000

09 VIDEO TAPE RECORDERS AND PLAYERS

09-1 * RECORD AND PLAY

09-2 * RECORD ONLY

09-3 * PLAY ONLY

09-4 * MONOCHROME

09-5 * COLOR

-6 * COLOR ADAPTOR

09-7 * 1 INCH TAPE

09-8 * 1/2 INCH TAPE

09-9 * VIDEO INPUTS 1

09-10 * 2

09-11 * VIDEO OUTPUTS 1

09-12 * 2

09-13 * 3

09-14 * AUDIO INPUTS 1

09-15 * 2

09-16 * 3

09-17 * AUDIO OUTPUTS 1

09-18 * 2

09-19 * 3

09-20 * SLOW MOTION CAPABILITY

09-21 * VARIABLE MOTION

09-22 * STOP ACTION CAPABILITY

09-23 * REMOTE CONTROL

09-24 * ELECTRONIC EDITING CAPABILITY

09-25 * FCC STANDARD ELECTRONIC EDITING

09-26 * PLAYING TIME UP TO 420 MIN (SLOW SCAN RATE)

09-27 * 60 MIN

09-28 * 40 MIN

09-29 * 30 MIN

09-30 * TAPE SPEED 9.6 IPS

09-31 * 7.5 IPS

09-32 * 8.57 IPS

09-33 * 7.8 IPS

09-34 * 1-1/16 IPS

09-35 * MANUFACTURER'S FORMAT

09-36 * TYPE-1 FORMAT

09-37 *

09-38 *

09-39 * SUIT CASE PORTABLE

09-40 * TIME LAPSE RECORDING

09-41 *

09-42 * 1 RECORD HEAD

09-43 * 2 RECORD HEADS

09-44 * 4 RECORD HEADS

09-45 * TAPE REEL 7 INCH

09-46 * 8-1/2 INCH

09-47 * 9-3/4 INCH

09-48 * 10-1/2 INCH

09-49 * TAPE SPEED 6.9 IPS

09-50 * TAPE REEL 8 INCHES

09-51 * PLAY WHILE RECORD

MACH NO	FEATURES	PRICE CODE
09001	0011111000010000010000000000010000100010000000010000	1 0002150
09002	1001001010100001010000000011110000100010010000010000	0 0002600
09004	1001111001010010010000000011110000100010010000000000	1 0013000
09003	1001111010100001010101010011110000100010010000010000	1 0005600
09005	1001001010010001100001000011110000100000010000000000	0 0001750
09006	1001110101010001010101110011101000010001101010000000	1 0001000
09007	1001000101100011000111010011101000010010001010000000	1 0000950
09008	1001100110100010100001000011101000010010001010000000	1 0001250
09009	1001011001001010010101010011100100100000000000100000	0 0005000
09010	1001101010100010010101000011101000100000000100001000	1 0004300
09011	1001001010100010010101011011100000000000000100000000	0 0009980
09012	1001000101100010010000000011101000101000000001000000	0 0000400
09013	1001000101010010010101010111101001010001000110000000	0 0002000
09014	1001000110100100100000000011101000010000000001000000	0 0000950
09015	1001110101010000000010000001110100001001000000100000	0 0001000
09016	1001010101100010010001000011101000100010000010100000	0 0001000
09017	1000100101010010001101000011101000010010000001000000	0 0001250
09018	1001111010100010010101100011100010100010001010000000	1 0004700

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09019      1001111001100010010101010011100000100010000010000000          1 0006000
09020      0011100000010000010000000001100000100000000000000000          0 0000800
09021 *    0011111000010010010001100000000001000000000000000110          1 0002300
09022 *    1001111010010010010001100011100000100000001000000110          1 0002750
09023 *    1001111010010010010001110011100000100000001000000110          1 0003900
09024 *    1001111010010010010101100011100000100010001000000110          1 0004000
09025 *    1001111010010010010001100011100000100010001000000110          0 0005200
09026 *    1001101010010000010001110011100000100010001000000110          0 0008000
09027 *    1001101010010010010001101011100000100010001000000101          0 0016000
```

* INDICATES MACHINE CODE IS LISTED ON ADDENDUM PAGE

10 PORTABLE VIDEO TAPE RECORDING SYSTEMS

10-1 * RECORDING CAPABILITY

10-2 * PLAYBACK CAPABILITY

10-3 * RF OUTPUT

10-4 * VIDEO OUTPUT

10-5 * MONOCHROME

10-6 * COLOR

10-7 * REEL TO REEL

10-8 * CASSETTE

10-9 * 1/2 INCH TAPE

10-10 * 1/4 INCH TAPE

10-11 * TYPE - 1 FORMAT

10-12 * MANUFACTURES FORMAT

10-13 *

10-14 * RECORDING TIME UP TO 60 MINUTES

10-15 * 40 MINUTES

10-16 * 38 MINUTES

10-17 * 30 MINUTES

10-18 * 25 MINUTES

10-19 * 20 MINUTES

10-20 * TAPE SPEED 7.5 IPS

10-21 * 7.9 IPS

10-22 * 11.25 IPS

10-23 * WEIGHT 33 LBS

10-24 * 25 LBS

10-25 * 20 LBS

10-26 * ELECTRONIC VIEW FINDER

10-27 * MECHANICAL VIEW FINDER

10-28 * ASSORTED LENSES COMPATIBILITY

10-29 * BATT. USAGE 80 MIN

10-30 * 60 MIN

10-31 * 40 MIN

10-32 * STOP ACTION CAPABILITY

10-33 * AUTO SEARCH

10-34 * SOUND DUBBING

10-35 * VIDEO EDITING CAPABILITY

10-36 * ZOOM LENS SUPPLIED

10-37 * SINGLE FIXED LENS SUPPLIED

10-38 * TAPE FOOTAGE COUNTER

10-39 * VIDEO SIGNAL LEVEL METER

10-40 * AUDIO SIGNAL LEVEL METER

10-41 * RECORD FROM TV

10-42 * 117 VAC POWER

10-43 * BATTERY

10-44 * SLOW MOTION CAPABILITY

10-45 * BUILT-IN MONITOR

10-46 * AUTOMATIC SHUTOFF

10-47 * ELAPSED TIME COUNTER

MACH NO	FEATURES	PRICE CODE
10001	1000101010100000111100001101111000010000011000	1 0001350
10002	1111101010010001111010100011000000001011110000	1 0001640
10003	1000101010010000001100001101001000010000001000	1 0001740

10004 1111101001010000001001001101011101000100111011O 1 0001600

10005 1111111011010011111110000110001191011010011111O0 1 0001500

10006 1111101010190000111100010101011101010000111O111 1 0001500

10007 1011101010190000111010001101111000011000000100O0 1 0001400

11 MAGNETIC TAPE AUDIO RECORDERS

11-01 * REEL TO REEL LOADING

11-02 * CASSETTE LOADING

11-03 * CONTINUOUS LOOP CARTRIDGE LOADING

11-04 * MONAURAL AUDIO

11-05 * STEREO AUDIO

11-06 * STEREO FORMAT 2 TRACK

11-07 * 4 TRACK

11-08 * 8 TRACK

11-09 * MONORAL FORMAT QUARTER TRACK

11-10 * HALF TRACK

11-11 * FULL TRACK

11-12 * MULTI-TRACK

11-13 * RECORDING CAPABILITY

11-14 * PLAYBACK CAPABILITY

11-15 * RANDOM ACCESSING

11-16 * SPEAKER / HEADSET OUPUT

11-17 * MICROPHONE INPUT (LOW LEVEL)

11-18 * RADIO / PHONO INPUT (HIGH LEVEL)

11-19 * INTERNAL SPEAKER

11-20 * EXTERNAL SPEAKER / HEAD SET REQUIRED

11-21 * 117 VAC POWER

11-22 * BATTERY OPERATION

11-23 * PORTABLE

11-24 * AUTOMATIC SHUT OFF

11-25 * FULL REMOTE CONTROL

11-26 * REMOTE PAUSE VIA MIKE SWITCH

11-27 * REMOTE PAUSE VIA FOOT CONTROL

11-28 * STUDENT RECORD TRACK

11-29 * 1-7/8 IPS SPEED

11-30 * 3-3/4 IPS SPEED

11-31 * 7-1/2 IPS SPEED

11-32 * 15 IPS SPEED

MACH NO	FEATURES	PRICE CODE
11001	10011010100011011101100010001110	1 0000690
11002	10101100000011011010101000000010	0 0001000
11003	10010000010011011110101100111110	1 0000330
11004	10010000010011011101100000111110	1 0000170
11005	10010000000111011101111000010100	0 0000300
11006	10001010000001010001100000000110	0 0000370
11007	10010000010011011110101000001110	0 0000260
11008	10010000010011011110101000001110	0 0000200
11009	10011110001011011110101000000111	0 0000670
11010	10010000010011011110101100000111	0 0000240
11011	10010000010011011110101000100111	0 0000375
11012	10001010000011011010101000001110	0 0000180
11013	10010000010011011010100000001110	0 0000160
11014	10010000010011011110101000011110	0 0000320
11015	10010000000100101101010000001110	0 0000110
11016	10011010001011001001100000001111	0 0000500
11017	10011010010001010001100000010110	0 0000420
11018	10010000010001011110101000001110	0 0000150
11019	10001010000011011001100000010110	0 0000590
11020	10010000010000011110101000001110	0 0000170
11021	10001010000011011110101000000110	0 0000240
11022	01010000010001010010111000101000	1 0000036
11023	01010000010011011110111000001000	1 0000090
11024	01011010010011011110111000001000	0 0000060

11025	0101101001001101111011100l001000	0 0000100
11026	0101000001000101111010100000l000	0 000030C
11027	0101000001001101111011000000l000	0 0000150
1102[illegible]	0101000001001101111011100l001000	0 0000060
11029	0101000001001101111011000000l000	0 0000150
11030	0101000001000101000110000000l000	0 0000130
11031	0101000001001101111011100000l000	0 0000070
11032	0101000001001101111011100l001000	0 0000080
11033	0101000001001101111010110001l000	0 0000200
11034	0101000001001101111001100l001000	0 0000060
11035	0101000001001101111010100000l000	0 0000150
11036	0101000001001101111010100000l000	0 0000130
11037	0101000001000101001011100[illegible]l000	0 0000040
11038	0101000001001101101011100l001000	0 0000050
11039	0101000001001101001011100[illegible]l000	0 0000060
11040	0101000001001101111010110000l000	0 0000070
11041		
11042	0101000001000101000110100010l000	1 0000180
11043	0101000001001101100110100001l000	0 0000290
11044	0101000001001101111010101l101000	1 0000370
11045	0101000001001101111011100010l000	1 0000110
11046	0011000001001101111010100000l100	0 0000300
11047	0011100100000111000110110000l100	0 0000680
11048	0010110000000111000110000000l100	0 0002350
11049	1001000000001111111011001l0010100	0 0002700

12 TEACHING MACHINES

12-1 * INDIVIDUAL STUDENT UNIT

12-2 * MULTIPLE CHOICE RESPONSE

12-3 * CONSTRUCTED RESPONSE

12-4 * STUDENT REINFORCEMENT

12-5 * RESPONSE COUNTER

12-6	* PERMANENT RECORD
12-7	* MOTION VISUAL
12-8	* STILL VISUAL
12-9	* AUDIO
12-10	* CASSETTE
12-11	* CARTRIDGE
12-12	* RESPONSE CONTROLLED MEDIA
12-13	* MANUAL CONTROL OF MEDIA
12-14	* WILL CONTROL EXTERNAL MEDIA
12-15	* 16MM FILM
12-16	* 2X2 SLIDE
12-17	* FILM STRIP
12-18	* MAGNETIC AUDIO TAPE
12-19	* AUDIO PRESSED DISC
12-20	* DESK TOP UNIT
12-21	* HAND PORTABLE
12-22	* MODULARIZED SYSTEM
12-23	* CARREL CONFIGURIZATION
12-24	* COMPUTER COMPATIBLE
12-25	* ADAPTIVE PROGRAM
12-26	* LINEAR PROGRAM
12-27	* BRANCHED PROGRAM
12-28	* STUDENT SELF PACING
12-29	* MACHINE PACING
12-30	* CUSTOMIZE PROGRAM REQUIRED
12-31	* SELF CONTAINED PROGRAMMING
12-32	* MANUFACTURER FORMAT
12-33	* RANDOM ACCESS INFORMATION RETRIEVAL

MACH NO	FEATURES	PRICE CODE
12001	11011001110110010101000001010010O	1 0003540
12002	11000001000100000000100001010111O	1 0000008

12003	1101100100010000100100000C1101010	0 0001250
12004	1110000111110000110100000101010	0 0000450
12005	1100000100010000001C100000101010	0 0000015
12006	1101000110011000101100000101010	0 0000300
12007	1101010110010000001100000001101010	0 0000500
12008	1100100110110000001100000101010	0 0000275
12009	1101000110111110110100000001101010	0 0001045
12010	1101011111011101010000100C1101010	1 0003160
12011	1101110111011001110101110011111100	1 0001100
12012	1100010011011100010010010101001000	1 0000190
12013	1101110110000000000100000101001000	1 0000180
12014	1100100111011001110000100101010100	0 0000600
12015	1110000100000000000100000101010100	0 0000025
12016	1100010011011100010101010101001000	1 0000250
12017	1100000110010000110101001011011000	1 0001500
12018	1101100100010001000100000101100000	0 0001250
12019	1101000100010000100100000101010000	0 0000500
12020	1101110110010001010000110101011000	1 0004200
12021	1101000110110101101000001010101000	0 0000600
12022	1111010101010000000010101100111010	0 0005000
12023	1100001111111011110001111111111001	1 0007000
12024	1100010110110010010101000101101000	1 0000500

13 T.V. MONITORS AND PROJECTORS

13-1 * MONITOR

13-2 * PROJECTOR

13-3 * COLOR

13-4 * MONOCHROME

13-5 * SOLID STATE ELECTRONICS

13-6 * R.F. RECEPTION

13-7 * UHF RECEPTION

13-8 * VHF RECEPTION
13-9 * CCTV INPUT
13-10 * 117 VAC 60 HZ
13-11 * 220 VAC 50 HZ
13-12 * BATTERY POWER
13-13 * RACK MOUNTED
13-14 * AUDIO INPUT JACK
13-15 * AUDIO OUTPUT JACK
13-16 *
13-17 * VIDEO OUTPUT JACK
13-18 * EXTERNAL VERTICAL SYNC INPUT
13-19 * EXTERNAL HORIZONTAL SYNC INPUT
13-20 * EXTENSION SPEAKER JACK
13-21 * MULTI-DISPLAY
13-22 * STANDBY CIRCUIT
13-23 * VIEWING AREA 37 SQ. IN.
13-24 * 44 SQ. IN.
13-25 * 71 SQ. IN.
13-26 * 88 SQ. IN.
13-27 * 125 SQ. IN.
13-28 * 172 SQ. IN.
13-29 * 270 SQ. IN.
13-30 * 282 SQ. IN.
13-31 * 295 SQ. IN.
13-32 * CRT 5 IN.
13-33 * 9 IN.
13-34 * 10 IN.
13-35 * 12 IN.
13-36 * 16 IN.
13-37 * 19 IN.
13-38 * 23 IN.
13-39 * 25 IN.

MACH NO	FEATURES	PRICE CODE
13001	10011111110001101000000013000000010000	0 0000250
13002	10011111110000001000010000000001000000	0 0000235
13003	10011111110000001000000010000000001000	0 0000300
13004	10011111110000001000000000010000000010	0 0000425
13005	10111111110001101001000000000100000001	0 0000380
13006	10011111110001101001000000000100000010	0 0000175
13007	10011111100000001000001000001000	0 0000095
13008	10011000110010000110100000000001000000	0 0000700
13009	10011000110000000110000000100000001000	0 0000240
13010	10011000110000000110000000001000000100	0 0000255
13011	10011000110000000110000000000100000001	0 0000300
13012	10011000110010000110000000001000000100	0 0000255
13013	10011000110001000110000000001000000010	0 0000320
13014	10111111110001101000010000000100000001	1 0000740
13015	10011000110010001110000100000000100000	1 0000225
13016	10011000110010001110100100000000100000	1 0000420
13017	10110000110000000111001000001000000100	0 0001100
13018	10110000110010001110013000010000000100	0 0001100
13019	10110000110000000111001000000001000000	0 0001200
13020	10011000110000000110000000010000000001000	1 0000280
13021	10011000110000000110000000000100000010	1 0000300
13022	10010111110001101000000010000000001000000	0 0000230
13023	10010111110001101000000000000001000000010	0 0000365
13024	10011111110001101100000000010000000100	0 0000230
13025	10011111110001101000000000100000000010000	0 0000200
13026	10011000110010000100101000000000001000000	0 0000440
13027	10010000110011101101101000000001000000	0 0000550
13028	10110111110001101000000001000000000010000	0 0000500
13029	10010111110011101000000000001000000000010	0 0000300
13030	10011000110100001000001000000000001000000	0 0000130
13031	10011111110100000000001000000000001000000	0 0000150

13032	0101011111100000000000000000000000000000	1 0003300
13033	0101011111100000000000000000000000000000	1 0007800
13034	0111111111100000000000000000000000000000	1 0028800
13035	0101000011000000000000000000000000000000	1 0003500
13036	0101011111000000000000000000000000000000	1 0003700
13037	0101011111000000000000000000000000000000	1 0028500
13038	0110011111000000000000000000000000000000	1 0039500

14 AUDIO VISUAL INTEGRATORS

14-1 * REEL TO REEL LOADING

14-2 * CASSETTE LOADING

14-3 * CONTINUOUS LOOP CARTRIDGE

14-4 * SEPARATE REEL TO REEL TAPE RECORDER REQUIRED

14-5 * SEPARATE TAPE RECORDER REQUIRED

14-6 * CONTROL METHOD SIGNAL PULSE

14-7 * PENCIL MARK

14-8 * NUMBER OF MACHINES / OPERATIONS CONTROLLABLE - AT LEAST 1

14-9 * 2

14-10 * 3

14-11 * 4

14-12 * BUILT-IN PROGRAMMING CAPABILITY

14-13 * SPECIAL PROGRAMMING DEVICE REQUIRED

14-14 * BUILT-IN AUDIO RECORD CAPABILITY

14-15 * REMOTE CONTROL FEATURE

14-16 * AUTOMATIC STOP FEATURE

14-17 * REVERSE SYNCHRONIZATION CAPABILITY

EACH NO	FEATURES	PRICE CODE
14001	0100010110010100 0	0 0000295
14002	0100010110010111 0	0 0000200
14003	0001001110010000 0	0 0000180

14004	0000110110010000	0 0000090
14005	0010010100011100	0 0000145
14006	0100010100010100	0 0000275
14007	0100010100001000	0 0000170
14008	0100010110001011	0 0000200
14009	0100010100010111	1 0000270
14010	0100010110010011	0 0000345
14011	0000110100001000	0 0000070
14012	0100010100010101	0 0000245
14013	0000110100001001	0 0000055
14014	0100010100010101	0 0000170
14015	0000110111010000	0 0000345
14016	0100010110010111	0 0000600
14017	0100010100010110	0 0000190
14018	0100010100010110	0 0000350
14019	0100010110010100	0 0000475
14020	0100010110010100	0 0000350
14021	0100010100010110	0 0000190
14022	0000010111110010	0 0000500

15 RESPONSERS

15-1 * DISPLAYED GROUP RESPONSE PER QUESTION IN

15-2 * DISPLAYED GROUP RESPONSE PER QUESTION

15-3 * DISPLAYED STUDENT CUMULATIVE SCORE

15-4 * DISPLAYED STUDENT CUMULATIVE SCORE IN

15-5 * DISPLAYED WEIGHT & ANSWER PER QUESTION

15-6 * DISPLAYED STUDENT ID BY NAME

15-7 * DISPLAYED MINIMAL STUDENT

15-8 * DISPLAYED RESPONSE DISTRIBUTION (REMOTE)

15-9 * SELF CONTAINED PROGRAMMING CAPABILITY

15-10 * CONFIDENTIAL RESPONDER

15-11 * COMPUTER COMPATIBLE - PUNCHED CARD

15-12 • - PUNCHED TAPE

15-13 • - MAGNETIC TAPE

15-14 • - ELECTRICAL

15-15 • AUTOMATED OPERATION - AUDIO/VISUAL

15-16 • Q & A

15-17 • STUDENT REINFORCEMENT CAPABILITY

15-18 • RECORDS RIGHT ANSWER INDICATION

15-19 • SPECIFIC WRONG ANSWER

15-20 • NO ANSWER INDICATION

15-21 • RAW SCORE PER QUESTION

15-22 • STUDENT ID BY NUMBER

15-23 • STUDENT TOTAL RAW SCORE

15-24 • STUDENT PERCENT SCORE

15-25 • STUDENT ID BY NAME

15-26 • RESPONSE FREEZE - AUTOMATED

15-27 • - MANUAL

15-28 • - TIMER

15-29 • STUDENT LOAD UP TO 1000

15-30 • STUDENT LOAD UP TO 240

15-31 • 150

15-32 • 100

15-33 • 60

15-34 • 50

15-35 • 30

15-36 • 15

15-37 • 10

15-38 • MANUAL MEDIA CONTROL

15-39 • RESPONSE - MULTIPLE CHOICE

15-40 • - CONSTRUCTED WRITTEN

15-41 • - CONSTRUCTED SPOKEN

15-42 • - DEMONSTRATED

15-43 • RESPONSE WEIGHTING

15-44 • SINGLE STUDENT USE

'ACH NO	FEATURES	PRICE CODE
15001	1000000011000010000000000[illegible]11101010001	1 0004400
15002	1110010001000000000000000[illegible]1111111000101	1 0007000
15003	1010000001000011000000000[illegible]1111111000101	1 0007000
15004	1000000001011011011101000000111111111101000101	1 0150000
15005	1100000101000100011110111[illegible]1000010[illegible]1	1 0025500
15006	1100010001000000110000100[illegible]1111111000101	1 0005300
15007	0100010000000000010000000[illegible]11101000001	1 0003700
15008	0100000001000000[illegible]1111110100001	1 0002800
15009	0000000011100000111000000[illegible]1000010	0 0000010
15010	0000000011100010111100000[illegible]1000010	0 0000030
15011	0000000011100010111100000[illegible]10100001	1 0000520
15012	0100010001000000110001000010000001111111000001	1 0012300
15013	0100010011000111111000100011000001111111000001	1 0023500
15014	0000000000000[illegible]1000010	0 0000020
15015	0000000000000[illegible]1000010	1 0000350
15016	1100011000101001111001110011001111111111000101	1 0056000
15017	1100000001000010010001100010000001111111000101	1 0009000
15018	0100010001000003100000000[illegible]11101000000	1 0001600
15019	0000000011000000111000000[illegible]1000010	0 0000075
15020	0000000011000100111000000[illegible]1000010	1 0000075
15021	0100000001000000000000000[illegible]1000001	1 0003800
15022	0100000001000000000000000[illegible]11000001	1 0005800
15023	1100000001000000000000000[illegible]11000001	1 0009200
15024	1111100001000111111111100111001000000011000101	1 0015000
15025	1111101001000111111111100111001000000011000101	1 0020000
15026	0100000000000000000000000[illegible]10100001	0 0000000
15027	0000000001000000011110111000000000000001100010	0 0000000
15028	0000000000000000000000000000000000000001010010	0 0000000
15029	0000000000000000000000000000000000000001010	0 0000000

END