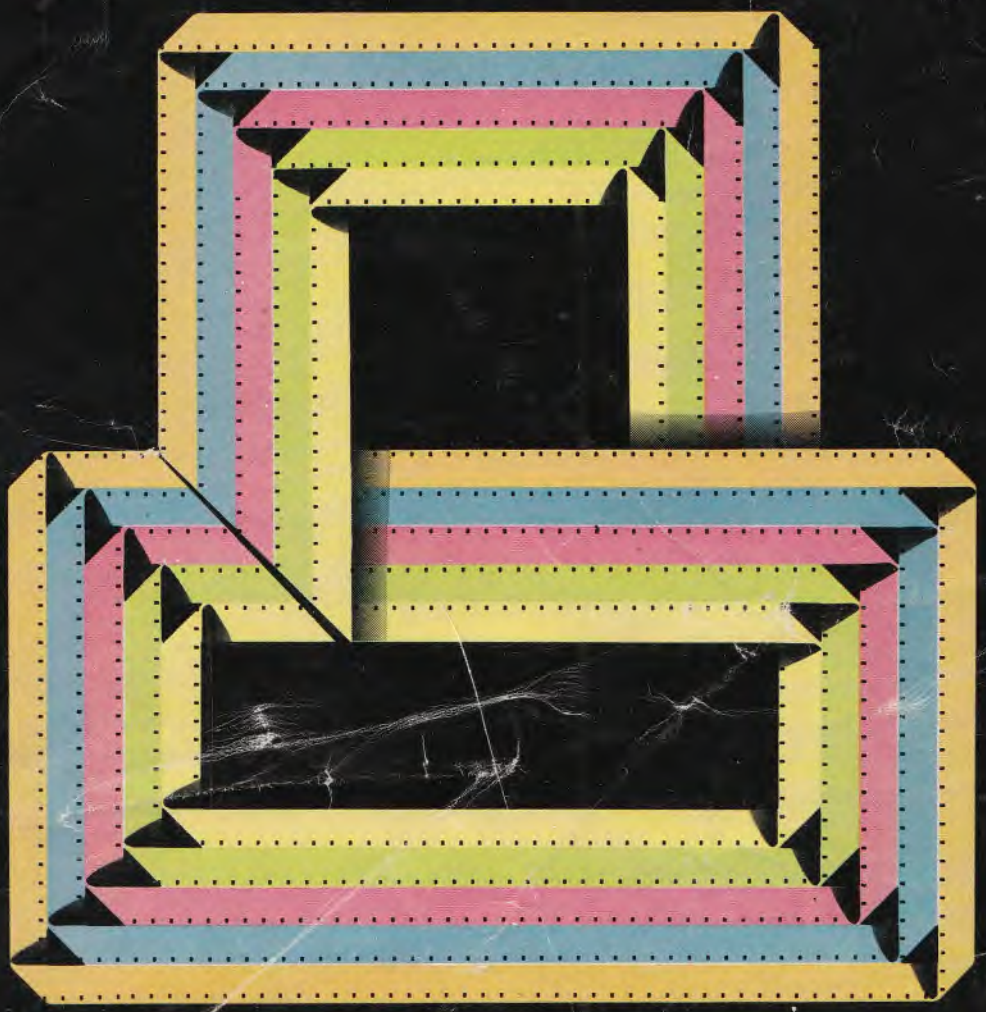
American Cinematographer
International Journal of Motion Picture Photography and Production Techniques

NOVEMBER 1975/ONE DOLLAR

PROFESSIONAL

SUPER



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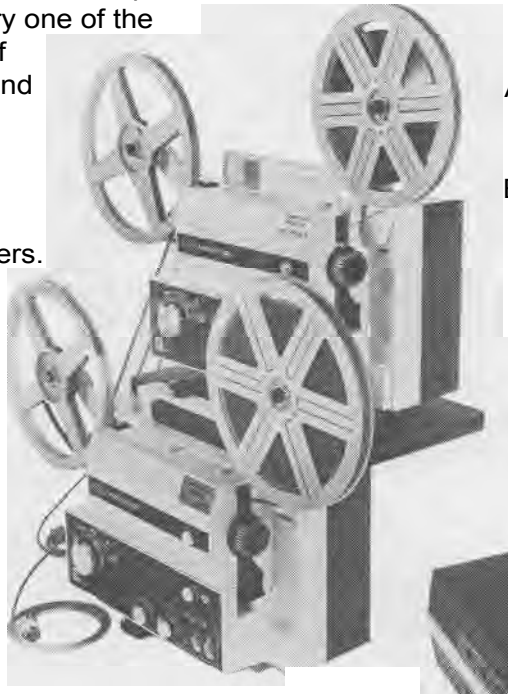

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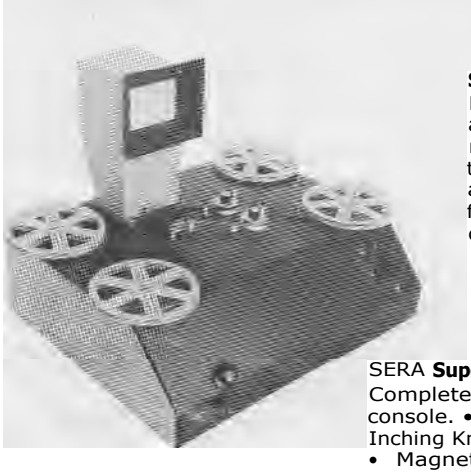

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International Journal of Motion Picture Photography and Production Techniques

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- **FEATURE ARTICLES**

- **DEPARTMENTS**

ON THE COVER: Multicolored strips of film combine in calling attention to the theme of this special issue of *American Cinematographer:* Professional Super-8, recognizing the fact that the once-amateur narrow-gauge format has come a long way from its humble beginnings. Cover design by DAN PERRI. Illustration by DEBORAH ROSS.

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PROFESSIONAL SUPER-8: THE STATE OF THE ART

Ten years ago predicting a professional future for the patently "amateur" Super-8 format drew scornful laughter. but now it is an accomplished fact

By HERB A. LIGHTMAN

As far back as 1966, *American Cinematographer* stuck its editorial neck out by predicting that the then-quite-new Super-8 format would not only enjoy a boom of popularity among amateur film-makers, but that it would ultimately come to be accepted as a professional medium, *for certain specific applications.*

This prediction was greeted with amusement, if not disdain, in most knowledgeable circles — and understandably so, if one were to consider only the obvious facts. Detractors, often referring to the narrow-gauge film as "sensitized string", scoffed at the idea that it could ever offer anything more than an idiot-proof format for the home movies market. It is also quite possible — although we have no way of knowing for sure — that even Eastman Kodak never envisioned it as anything more than a vastly improved format for the highly lucrative mass amateur market.

By the time the special "SUPER-8: THE STATE OF THE ART" issue of *American Cinematographer* appeared in December, 1969, it was already becoming obvious that the spunky little Super-8 format was refusing to "stay in its place" as a strictly amateur play-toy. Despite the wait-and-see inertia maintained by Eastman and an appalling lack of standardization promulgated by greedy equipment manufactuers, Super-8 was being forced into use as a professional medium — *for certain specific applications* — by innovative film-makers all over the world.

In the six years that have elapsed since then things have changed radically. There is no longer any question as to *whether* Super-8 will be accepted as a professional format. It is a fact — like it or not, and one is tempted to say: "You've come a long way, Baby!"

Just *how far* Super-8 has come as a professional medium is the reason for this current special issue of *American Cinematographer.* The intent is to report in detail the significant advances in equipment and techniques that have made possible the acceptance of Super-8 as a professional medium — *for certain specific applications.*

We purposely and repeatedly emphasize that latter phrase because certain realities must be faced in order not to confuse the issue — namely that there is no way that a Super-8 image will ever look as good as a 16mm image of the same subject. There is no way that a 16mm image will ever match the quality of a 35mm original, just as 35mm will never capture the detail of 70mm. This doesn't mean, however, that a professional cinematographer shoots 70mm whenever he can afford it. While one eye is looking through the viewfinder, the other eye must be looking at the image in the way that the audience is going to see it. The fact is that, in terms of total viewing time, 90% of today's audiences are going to see film images on television screens with a maximum diagonal size of 25 inches.

More and more cinematographers who release for the small screen use 16mm in original production rather than 35mm simply because it has proved to be economical and of good enough quality to satisfy themselves and their clients. It is also a combination of simple economics and "adequate" image quality that is causing many television stations to drop film production entirely in favor of videotape production. A key question raised by many of the writers of this special issue of *American Cinematographer* is whether Super-8's extremely low-cost can compromise with the effect of a slight sacrifice in image quality, in order to produce a "cost-effective; medium that will keep the techniques of cinematography active in original productions for television, as well as lower the production costs in many non-theatrical films.

The "cost" part of the answer to the question of Super-8 "cost-effectiveness" is to be found in a simple budget analysis of any film production. That part of the budget allocated for equipment and film stock is the primary part influenced by the gauge or format decision. Some sound costs, lab transfers and studio mixes, are reduced by the techniques used in Super-8 sync sound equipment, which allow the film-maker to do his own sound work. A typical non-theatrical film production budgets only about 10% for equipment and expendables, the balance consisting of research, scripting, talent, crew, travel, etc. Even if Super-8 stock costs only one-third as much as 16mm; even if Super-8 location, editing, and studio equipment costs only one-fifth as much as comparable 16mm equipment; and even if Super-8 video transfer equipment costs only one-tenth as much as 16mm, the saving is still limited to a small fraction of the total budget.

Since not all productions are typical, it is likely that those film productions with budgets consisting of more than 50% equipment and expendables will be first to use Super-8 as their original medium. This, of course, includes the many situations where the final film is not actually sold to anyone. such as filmmaking classes, in-house audio-visual groups, and even professional producers who might shoot a Super-8 "pilot" rather than invest a comparable amount in a static storyboard. But even with a clear cost advantage, a careful decision to go Super-8 must also include the "effect' side of Super-8's cost-effectiveness.

The comprehensive equipment review presented in this special issue on Professional Super-8 will convince knowledgeable cinematographers that virtually every production and post-production technique of sync sound cinematography is now possible in Super-8. There is no basic cinematographic reason for rejecting Super-8, except that of image quality. So the answer to the "effectiveness" side of Super-8 cost-effectiveness lies primarily in the size of the presentation screen. Where the presentation medium is television, including videotape and the upcoming videodisc, a rear-projection portable Super-8 projector, or a classroom screen, Super-8 is more than adequate, as can be seen by looking at the quality achievable in one-quarter of any 16mm screen image. Technically, a Super-8 print in 1975 has image resolution and grain structure superior to that of a comparable 16mm print made in 1965, when both are projected to the same screen size.

So two elements combine as sufficient conditions to shoot original Super-8: *Cost* — if a substantial fraction of the budget will be spent on equipment and expendables, and *Image Size* — if the size of the intended audience's viewing screen is small enough, then the decision to work in Super-8 is an intelligent professional decision. As more professional producers make that decision, we can look forward to a healthy growth in cinematography for the small screen.

However, despite all the aforemen-

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A DECADE OF PROGRESS HAS CULMINATED IN SUPER-8 SOUND

The seemingly simple addition of a voice to Super-8 is actually only the final step in a long and extremely complex trial-and-error process

By ALLAN L. WILLIAMS
Manager, Pacific Southern Region; M.P. & Audiovisual Markets Division, Eastman Kodak Company, Hollywood

The first serious talk that I remember hearing about Super-8 film as a professional medium goes back over a decade. Our research division, and many other people were wrestling with the strenuous problems involved in establishing a standardized small-format film medium, primarily because they foresaw the enormous opportunities that it would open for distributing films on a massive scale.

The hurdles that had to be cleared to make this dream come true were high. However, almost everyone in the film industry agreed that the opportunities were too substantial to ignore. That was the first time I heard the premise that the small-film format could do for movie-making what the paperback had done for publishing.

Furthermore, the lid would be taken off new production. Producers could tailor their films to the specific tastes and imaginations of consumers rather than the "mass appeal" sought by theaters and the television networks.

However, much had to be achieved before the dream of Super-8 film as a professional medium could become reality. Some predicted that it would take as long as three to five years for the new medium to take hold. In fact, it took a decade of innovative engineering and hard work.

The introduction of the Super-8 film frame format was the essential key for unlocking the puzzle. The new film frame dimensions upgraded the quality of the projected image from amateur to professional. And standardization is unlocking the door to earning the public's trust. Prior to this, few people were willing to invest in equipment which could become obsolete before they reaped a fair return.

Finally, even with that doubt allayed, there were still some important questions which had to be answered before progress could be made on a broad scale. Should sound be recorded and played back on an optical or a magnetic track? Should the film be fitted into a cartridge for easier handling during projection?

Most of these answers had to be hammered out on the anvil of trial and error. Fortunately, the promise didn't lie dormant awaiting developments in the consumer marketplace. In a world where almost everything that we do appears to be becoming increasingly more complex and specialized, Super-8 color-sound movies have provided the stuff that an evolution — not a revolution — in communications is made of. Progressive individuals in education, business and industry, government and the medical profession have recognized that the new medium is an effective way to bring their messages to people in a highly effective, standardized and individualized manner.

For example, at the University of Arizona, the agricultural education facility found that they could use Super-8 cameras to document hard-to-learn skills for students to view in groups as well as individually. Also in Arizona, a real estate broker began to use an existing-light movie camera and Kodak Ektachrome 160 movie film (type A) to produce economical movies that increased his sales and earnings. Instead of bringing all of his prospects to every site that he had to offer, he discovered that he could do considerable qualifying, and save a great deal of time by using a portable Kodak Supermatic 60 sound projector to show them films of what was available.

The idea also took hold in Milwaukee, where a producer filmed interview situations with top insurance salespersons, and then sold Super-8 color prints to hundreds of agencies for use in training. And, in Memphis, a manufacturer of spray-on paints found that Super-8 color-sound films were an excellent vehicle for making point-of-purchase demonstrations of how to use his products.

Then, there is the case of the manufacturer of dental furniture and equipment who produced demonstration films, and provided his sales force with release prints and portable Supermatic 60 sound projectors for making presentations in prospects' offices. Instead of just talking, they were demonstrating, and the result was that sales spurted upward.

In Georgia, a prison official charged with the responsibility for rehabilitating and training inmates to live and work on the outside, uses a Super-8 camera and a Supermatic 70 projector for producing a library of realistic instructional materials. And, in California, a fast-growing restaurant chain uses Supermatic 60 sound projectors to teach job skills to employees.

The key to the success of the new medium as a communications device is

The Kodak Supermatic 200 sound camera is an existing light, single-system sound Super-8 camera that runs at 18 and 24 frames per second with 18 frame separation, designed for use in television, education, business, industry and government. Camera features include acceptance of 50-foot and 200-foot silent and sound Super-8 cartridges, manual and automatic exposure control, zoom lens, and automatic gain control for sound recording.

the flexibility it permits in presenting information. No darkened rooms are needed, cumbersome film projectors and videotape playback units don't have to be hauled around and threading is only a memory. Consider the Supermatic 60 projector as an example. It is lightweight so a salesperson can carry it on trips, but also sturdy enough to withstand the rigors of travel. The cartridge-loading projector can be used to project an image on either a wall screen for big audiences or a self-contained high-gain screen for viewing by an individual or small group.

Furthermore, it is ideal for self-paced instruction and individualized presentations. A one-lever control permits the operator to advance forward, freeze on any frame or instantly replay any segment of a film.

Now, for added flexibility, there is the Kodak Supermatic film videoplayer VP-1. This unit is similar in size and appearance to the film projector and it uses the same cartridge.

However, that's where the similarities end. The film videoplayer is used to feed Super-8 film images to a single television set or to an entire TV network. With this unit, companies using both individual film projectors and closed-circuit television for training can produce and distribute everything in one medium.

With these fast-breaking developments, there have been some crucial questions raised for filmmakers. The most obvious is: What are the best methods for producing Super-8 movies? The answer is highly subjective.

For certain, anyone aiming at the massive consumer marketplace should think about originating on either 35mm or 16mm film stock, Depending upon the type of production, either Eastman color negative II film 5247/7247 or Eastman Ektachrome commercial film 7252 would be good choices. Both of these films are designed with a large number of release prints in mind.

By way of comparison, all of the Super-8 color films in use today are designed for optimum projection. As a result, some quality is invariably lost when a laboratory uses one of these films for making an internegative. Furthermore, many labs are using 16mm internegatives for Super-8 release printing. This means that the original Super-8 film image is usually further degenerated during the process of making 16mm intermediate blow-ups.

There are other important reasons for originating on a larger format film. Flexibility is primary among these. For example, consider the experience of the Loctite Corporation in Newington, Conn. The company is a major manufacturer and distributor of adhesives and sealants.

In 1964, Bruce Burnham, manager of communications projects for Loctite, produced their first 16mm film on location at a client's plant. Prints of the movie were used by the sales force to give prospects a firsthand view of how to use the product involved. The film was a great success, Burnham relates, because it demonstrated techniques and concepts that were very difficult to get across in words alone. As a result, other films were produced and Loctite continued to reap good results. The only limitation, in fact, was that presentations could be made effectively only where prospects were gathered and appropriate facilities were available for projection.

All of this rapidly changed with the introduction of portable Super-8 sound projectors. After testing the various models of equipment available, Loctite decided to provide each of their sales people with a Supermatic 60 sound projector and a library of all of their 16mm films reduced in size to the Super-8 format.

The flexibility of using both media — 16mm and Super-8 — gives them much more bang for their marketing buck. And while it would be technically feasible for Loctite to originate in the Super-8 format and do release printing in both 16mm and Super-8 from a blowup intermediate, the quality of both would be compromised, and the resultant savings in production costs would only be minimal.

Loctite, of course, is fortunate in having someone like Burnham. He writes his own scripts, records his own location sound, does his own camera work and produces his own movies. Outside specialists are brought in for recording narrations, editing film and mixing sound, as well as for lab work.

If a company doesn't have an internal film department, it's best to hire an outside filmmaker who is experienced with 16mm production techniques. He or she can often make a powerful contribution to the impact of the film, and that's no small contribution. After all, people don't usually make films to save money. They make them to solve problems.

However, different considerations have to be weighed when only one or a few prints are needed. In these cases, many hundreds of people are already originating Super-8 color-sound film for professional use. We believe that there will soon be thousands, if not tens of thousands of people doing this for a very simple reason. Today, the Super-8 camera is, by far, the easiest to use and the least costly color recording device available.

Super-8 movie cameras are being used for many types of reporting: The insurance agent or investigator who wants to document an accident; a real estate broker producing a sales film; a corporate executive reporting upon progress at a new construction site; a law enforcement officer recording evidence at the scene of a crime are all typical users of the new format.

And persons with safety, training and sales responsibilities coming to realize that there is no substitute for showing things the way that they really are use motion pictures. Many educators in schools, in the military services and in medicine have also come to similar conclusions.

In addition, there has also been a tremendous amount of interest in the Super-8 medium for television. For cable systems and educational broadcasters, as well as for many commercial UHF and other smaller stations, Super-8 sound film provides the first opportunity to produce local news, documentaries and commercials on location in color. It also allows all television stations to reap a tremendous harvest of material from stringers and free-lancers. There are an estimated seven million small-format movie

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The Kodak Supermatic film videoplayer VP-1 is designed for use in schools, business, industry, and government installations to play color and sound Super-8 movies over a standard color television set or closed-circuit television system. Features of the videoplayer include push-button controls, automatic threading, instant review, stop-motion, cassette loading, automatic rewind of the film into the cassette at the end of the film, and extremely quiet operation.

THE CASE *AGAINST* PROFESSIONAL SUPER-8

looking at thy other side of the Super-8 coin with a critical eye, a professional cinematographer concludes that the narrow-gauge format falls short as a professional medium, when compared with 16mm and 35mm

By ANTON WILSON

Super-8 was introduced about 10 years ago as an amateur format. In the first five years of its infancy, this amateur classification went almost unchallenged. With the seventies and an apparent improvement in related Super-8 equipment, the cry of "professional format" should have been expected. There is no doubt that Super-8 is applicable for certain professional (remunerative) situations. However, the reasons given by Super-8 aficionados for using the small format are usually erroneous, irrational and sometimes ludicrous. By taking a close and objective look at the "Super-8 System" we may get a more realistic appraisal of its professional applicability.

Super-8 equipment is much less expensive than similar larger format equipment. Not true! As a matter of fact, a Super-8 camera will cost *more* than a 16mm or 35mm camera of similar quality! The trap that most Super-8 proponents fall into is illogically comparing *amateur* Super-8 cameras with *professional* 16mm and 35mm cameras.

A professional Super-8 camera must be manufactured with *double* the precision of a 16mm camera to achieve the *same* professional standards. For example, professional registration is usually stated as at least 1/1000 of frame height for *any size format.* For 35mm this relates to about seven-tenths, for 16mm this becomes three-tenths and for Super-8 it is almost one-ten-thousandth of an inch. That is a pretty close tolerance, and very expensive to achieve. Likewise, flange-to-focal-plane distances (lens seating) will also have proportionally closer and more expensive tolerances to achieve the same visual standards of the larger formats. What this boils down to is that a Super-8 camera will cost more than a larger format camera *if you compare them on the basis of the same professional standards.*

This is not just theory. As an example, take the Arriflex 3511C and the Arriflex 16M cameras. Arriflex designed the 16M camera as a 16mm version of the 351IC camera. These two cameras are almost identical in terms of design: quick-change magazine, three-lens bayonet turret, mirror-shutte• etc. Yet the Arriflex engineers had to design the tolerances of the 16M much tighter than those of the 351IC in order to achieve the same standards of visual precision. As a result, the 16M actually cost 30% *more* than the Arriflex 351IC. One can draw the similar conclusion that if Arriflex ever came out with a professional Super-8, it would most likely cost about the same as their equivalent 16mm camera.

Conversely, the precision of most currently available Super-8 cameras would be comparable to that of a Fairchild 16mm Gun Camera which can be had for about $25. There are many 16mm cameras in the $100. to $1000. range that will give results, in terms of registration, better than Super-8 cameras of the same price. The point here is that for a given amount of money, a 16mm camera can be procured that will give as good, if not better, registration results than a similarly priced Super-8 camera.

There is another important point to be made about precision. Not only are the closer tolerances of Super-8 equipment more difficult and costly to achieve, but also more difficult to maintain. A Super-8 camera/lens is far more vulnerable to dirt and abuse than a camera of larger format. A given error in alignment, registration or seating will cause a much greater visual distortion with the smaller format. Super-8 equipment will thus have to be handled and maintained with greater care. Likewise, dirt and scratches on the film will visually appear at least three times as large with the smaller format. These facts hardly make Super-8 a format conducive to Q & D (quick and dirty), low budget or knock-about productions. As a matter of fact, if a production has to be shot Q & D, i.e., no A & B rolls, no work print, no editing gloves, etc., it most assuredly should be shot in 16mm. Under these extremely low budget conditions, a Super-8 print would be totally unintelligible. If Super-8 were used, greater care in terms of cleanliness and splicing would have to be used, even to get barely acceptable results.

We've been looking at camera gear. What about lighting and sound? Lighting for Super-8 is obviously going to be the same or *more* expensive than for a similar production in a larger format. To light a given area to a particular illumination level will require the same amount and type (and cost) of equipment regardless of the format being used. So here the expense is the same for any format. However, there are cases, quite frequently, where the Super-8 production will cost *more* to light than if 16mm or 35mm were employed. This is due to two facts.

Firstly, almost all Super-8 camera/lens combinations are much slower than the average 16mm package. This is due to the fact that almost all Super-8 cameras have zoom lenses coupled with beam-splitter-type viewfinders. The average Super-8 zoom lens does not employ as effective a coating as the better large format lenses and thus loses more light in the lens, not to mention the half-stop or so lost in the beam splitter. A Super-8 camera/lens using the beam-splitter system will lose better than one stop and sometimes as much as two stops in the lens/finder optics. This is why almost no Super-8 manufacturer advertises or even indicates 'T' stops on the lens (the exception being Angenieux) because that nice f/1.8 becomes a T/3.5, and even some of the so-called reflex XL cameras are still in reality around a T/2.8. Therefore, in 16mm, where fixed focal lengths of T/1.4 to T/1.8 and zoom lenses of T/1.9 to T/2.5 are quite common, the standard Super-8 lens will more likely be a T/2.8 to T/3.5, requiring from two to four times more light (and lighting equipment). Of course, there are new Super-8 zoom lenses, notably the Angenieux 6mm-80mm, T/1.4, that are fast and of professional calibre, but they are also professionally priced.

There are other factors that could make the large formats more conducive to low budget films. There are many devices, film stocks, special processes, etc., that can facilitate quick and cheap location production that are not available for the Super-8 format. For example, there are several proprietary processes, such as Chemtone, for the development of ECN II at 250 ASA with virtually no quality loss and 500 ASA with a minimum of loss. In addition, this process reduces contrast, which can minimize the use of fill light both indoors and out. Because these processes are not available for

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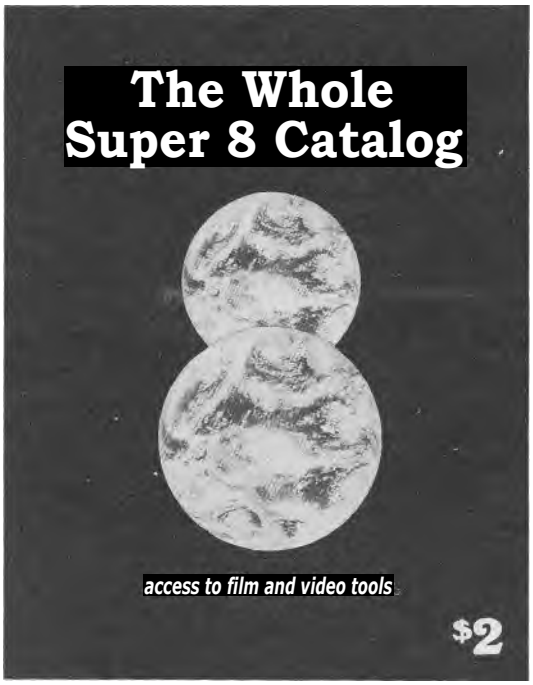
The Super8 Sound Catalog



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DOUBLE-SYSTEM AND SINGLE-SYSTEM SUPER-8 SYNC SOUND CAMERAS

The serious Super-8 film-maker is happily confronted by a veritable smorgasbord of highly sophisticated cameras for sync sound shooting

By JULIE MAMOLEN

Choosing a Super-8 camera from among the many fine double-system sound, single-system sound, and Double Super-8 cameras on the market is a difficult task. The Super-8 cinematographer is faced by an array of features that includes zoom ratios up to 13.3 to 1, lenses as fast as f/1.2 for filming in available light, interchangeable lens mounts, running speeds from time-lapse intervalometry to 80 frames per second, crystal camera controls, through-the-lens automatic exposure control with manual override and manual offset by one or two stops from the automatic setting, single-lens reflex viewing, macrocinematography down to the lens front element, and in-camera fades, dissolves, and superimpositions.

Double Super-8 cameras use 16mm-width film perforated Super-8 (1-4) and permit up to twenty-minute continuous-run loads, full backwind, professional emulsions such as 7252 (ECO), superior image registration, and stock processing economy.

Single-system cameras offer in-camera recording on a magnetic edge stripe, some with high-fidelity sound recording specifications, and you can transfer later to full-coat magnetic film for serious editing. New 200-foot sound cartridges allow up to ten-minute continuous-run filming, and some single-system cameras also have double-system sync connections.

Double-System Super-8 Cameras

What makes a Super-8 camera a double-system sync sound camera? All that's required is a sync signal (some means of carrying information about the frame rate of the camera — exact speed in fps — to a sync sound tape recorder). This sync signal may be recorded by a tape recorder on a special sync track alongside the audio track. Alternatively the sync signal may be used to speed-control Super-8 fullcoat magnetic film if a Super-8 Sound Recorder is used. Electronic servo-control of the recorder's speed insures that for each frame of picture film exposed in the camera exactly one sprocket hole of magnetic film passes the magnetic head of the Super-8 Sound Recorder.

The sync signal from the camera can be as simple as a switch that opens and closes once for each frame of film exposed. This 1/F (once-per-frame) sync signal is available on over 40 Super-8 cameras, where it has generally been included by the manufacturer as an electronic flash (PC) contact. Several cameras generate a 1/F tone burst, and have a special sync corrector.

The traditional sync signal used in 16mm and 35mm filmmaking is a 60Hz pilotone continuous wave, and this sync signal is used on some Super-8 cameras, Beaulieu, Cinema Pathe, and Nizo Professional. The difference between the pilotone and 1/F sync signals is shown in the accompanying figure.

We are summarizing here the major characteristics of the Super-8 cameras that are most widely used for double-system sync sound work. Important accessories, such as crystal camera controls and silencers, are available only for some cameras; if you need these devices, choose your camera carefully. Besides the brief description of the more notable cameras, we have collected data on 29 double-system cameras, 14 single-system cameras, and two Double Super-8 cameras into convenient comparison tables. Unless otherwise specified, all Super-8 cameras described in this article have the following features:

- —Use Super-8 film in 50' cartridges
- —Automatically keyed to film's ASA speed from ASA 25 to 160
- —Integral type-A (Wratten 85) filter manually keyed
- —Footage counter
- —End-of-film indicator in viewfinder
- —Zoom lens with battery-powered zoom, and manual override
- —Reflex groundglass viewing with beamsplitter in front of diaphragm
- —Focusing down to approximately 3-4 feet (some have macro capability)
- —Automatic exposure control (CdS cell) through the lens with exposure value displayed in viewfinder and manual override
- —Powered by AA (penlight) batteries
- —Screw-in filter mount (size specified)
- —24 fps speed as well as amateur 18 fps

(LEFT) The new Beaulieu 5008S is probably the highest quality Super-8 sound camera of any kind, single- or double-system, with sound recording specifications superior to those of most cassette recorders (Hervic Corporation). (RIGHT) The Canon 814E Sync Sound camera is compact and ruggedly built. Bell & Howell first modified this camera's very simple predecessor, the Canon 814, for Its Filmosound-8 (double-system with cassette recorder) combination.

(LEFT) The Braun line of Super-8 cameras, which can be used for sync sound filming, has many sophisticated features and capabilities. Nizo also manufactures the Nizo 800 Professional, which features built-In 60Hz pilotone and slating devices. (CENTER) The Bauer C Royal BE sync sound camera. (RIGHT) The Nikon R8 sync sound camera. This camera features the excellent CineNikkor lens and very complex controls allowing for a wide range of effects.

—Single frame with separate cable release socket
—Sound sync jack with one contact per frame (1/F)

Beaulieu 4008ZM2 and 4008M3 Sync Cameras

Two-thirds of all the Super-8 cameras in use as double-system sync sound cameras are made by Beaulieu or Nizo. The Beaulieu 4008ZM2 is the single most popular camera among Super-8 Sound customers, and also the most expensive. The Beaulieu's popularity is due to its Schneider 6-66mm lens (the widest angle lens of any Super-8 camera), its C-mount lens interchangeability, variable speeds from 2 to 70 fps, and manual ASA setting, together with the availability of a crystal camera control and silencer. The mirror shutter gains nearly half an f/stop over cameras with a beam splitter, and p'•,;.„ des a 2-stop brighter viewing image. The 4008M3 is a less expensive version of the 4008ZM2, with the electric zoom replaced by a smooth manual zoom. See the camera data table for more details.

The Beaulieu has some negative features. It is relatively noisy and somewhat fragile. It has no internal 1/F switch, and requires the addition of the modified Er!son sync contact switch to provide 1/F sync signals. Note that the single-system Beaulieu 5008S described below is also a double-system camera.

Nizo Sync Cameras

The Nizo cameras are probably the most reliable double-system Super-8 cameras; they are also the quietest. They withstand heavy student use (and abuse) with a minimum of repairs. The old Nizo S56 was chosen by MIT to be the crystal sync camera in the Leacock system. The **S56** was redesigned by Braun as the Nizo S560 to include lap dissolves and a 1/F sync pulse tone burst. Its current version, the Nizo 561, has an improved viewfinder that makes the f/stop scale easily visible. The 481 and 801 cameras are similar to the 561 except for the lens capability. See the double-system data table for details.

The Nizo cameras have always had two sync contacts — 1/F tone burst system, and the PC contact 1/F switch. Now the Nizo Professional 800P has a third sync capability — the standard 60 Hz pilotone signal (50Hz in European cameras). The Nizo Professional also has a macro version of the 7-80mm Schneider lens used on the 801, and a built-in slating lamp that fogs a frame and sends a clapper voltage for use with recorders having a bloop (beep) oscillator.

All the Nizo sync cameras except the S56 and S80 can be modified by Braun North America (55 Cambridge Parkway, Cambridge, MA. 02142) to accept the Super-8 Sound Crystal Camera Control.

Nizo also offers a number of "XL" cameras with a 225 shutter. The lens aperture ;',,,ec1 has not been increased to f/1.2, as with most cameras carrying the XL designation. These cameras have a PC contact for sync sound filming, and are the smallest sync sound cameras available.

Canon Sync Cameras

Canon cameras are very ruggedly built. Their f/1.4 lenses were the fastest Super-8 lenses until the new XL f/1.2 lenses. The Canon cameras are next most popular after Nizo and Beaulieu as sync sound cameras. They have been used for sync sound since Bell & Howell first modified the Canon 814 for their Filmosound 8 system in 1970. The Canon's low prices are perhaps the lowest-cost high-quality Super-8 cameras.

Nikon Sync Cameras

The strong points of the recently introduced Nikon Super-8 cameras are the excellent lens quality of the CineNikkor, and the very complex controls which allow virtually every effect, and which are extremely well thought out. For example, when the exposure control is switched from auto to manual it does not reset to the maximum f/stop; it stays on the f/stop that had been automatically set.

The Nikon PC sync socket is an unusual locking type that provides a secure sync sound connection, and the camera itself is very ruggedly built.

Bauer Sync Cameras

Bauer was the first manufacturer to include lap dissolve in its cameras and to incorporate automatic exposure control down to one frame per minute. Bauer sync sound cameras are equipped with the same miniature DIN 8-pin sync socket used by Nizo. The cable is different, however, because Bauer provides a 1/F switch, and not a tone burst like the Nizo.

Bolex Sync Cameras

Although Bolex is one of the great

The Bolex 580 sound camera. Bolex now includes 1/F sync contacts on its two best Super-8 cameras, the 450 and the 480 Macrozoom.

Single•System Camera Data Table

CAMERA	Head Phone Monitor	200'	Speeds	ASA	Zoom Range (met)	f/Stop	Min Focus	Filter	Batt.	Double-System Sync
Beaulieu 5008S	YES	NO	24,18	25-400	6-80	f/1.2	2'	72mm	NiCad	YES
Bell & Howell Filmosonic 1230	NO	NO	18	25-160	8.5-24"	f/1.3		none	6AA	NO
Bolex 550XL	YES	NO	18	25-160	8-40	f/1.2	5'		6AA+9V	NO
Bolex 580	YES	NO	18	25-160	7.5-60	1/1.7	5'			NO
Eumig 30XL	YES	NO	18	25-160	8.5-24	1/1.3	4'	none	6AA	NO
GAF SS805	YES	NO	18*	25-160	7.5-60	01.7	5'	58mm	6AA	NO
GAF SS605	YES	NO	18*	25-160	8-48	1/1.7	5'	58mm	6AA	NO
GAF SS250XL	YES	NO	18*	25-160	9-22.5	1/1.1	6'	none	6AA	NO
Kodak Ektasound 130	NO	NO	18	25-160	9	01.2	6'	none	6AA1-9V	NO
Kodak Ektasound 140	NO	NO	18	25-160	9-21'	1/1.2	6'	none	6AA+9V	NO
Kodak Ektasound 150	NO	NO	18	25-160	9-21	f/1.2	6'	none	6AA-19V	NO
Kodak Ektasound 160	NO	NO	18	25-160	9-21	1/1.2	6'	none	6AA-19V	NO
Kodak Supermatic 200	YES	YES	24,18	25-160	9-21	1/1.2	6'	none	6AA+9V	NO
Sankyo X L4OS	YES	YES	24,18	25-160	8.5-34	1/1.2	macro	55mm	6AA	NO

Double Super 8 Cameras

CAMERA	Battery	Sync Socket	ASA	Zoom	f/Stop	Min Focus	Filter	Weight	Noise Level	Options
Cinema Pathe DS8	Special NiCad	Special 4-pin (1/F switch + pilotone)	12-400	6-80	f/1.2 (T/1.4)	2'	72mm	3.4kg	NA	400' loads Barney
Canon DS8	8AA	none	10-320	8-64	1/1.4 (T/2)	4'	58mm	3.4kg	6046	–

names in 16mm, Bolex Super-8 cameras show little sign of benefitting from the technical expertise that produced the Bolex H-16 camera, the Bolex 16 Pro, and the new crystal-controlled Bolex EL. Bolex was first to introduce a macro lens on a Super-8 camera. They now include 1/F sync contacts on their two best Super-8 cameras, and 450 and the 480 Macrozoom.

The Cinema Pathe Electronic DS8 double-Super-8 sound camera is a conversion of the Pathe 16mm model and mounts a 6mm-80mm Angenieux zoom lens in place of the latter's three-lens turret.

Other Sync Cameras

There are a number of other Super-8 cameras that can be used as double-system sync cameras with the Super8 Sound Recorder and various sync cassette recorders such as the Scipio, the Philips 2209, and the new Uher CR134. They are listed in the accompanying data table.

Sync Camera Conversions

Owners of Super-8 or 16mm cameras without a once-per-frame contact switch can have an inexpensive conversion made by many fine camera repair services. We recommend the work of Mr. Willi (Vilmos) Keresztes at Marty Forscher's Professional Camera Repair Service, 37 W. 47th Street, New York, NY 10036. Professional Camera Repair also does 24 fps modifications of GAF sound cameras, and projector modifications to include the once-per-frame sync switch. On the west coast, we recommend the work of Bill Allen at Cinema Sync Systems, P.O. Box 61, Ontario, California, who does in-warranty conversions of any Beaulieu camera with Hervic Corporation approval.

Double Super-8 Cameras

Double Super-8 is 16mm film with Super-8 sprocket holes along both edges (perforated 1-4). It is used exactly as was old regular 8mm, which was 16mm film with twice the usual number of 16mm sprocket holes. DS8 film is run through the camera once, turned over, and run through again to expose the other side. Film is loaded on daylight spools, 100 ft. or 400 ft. in length. Many 16mm films are available in the DS format (e.g. Ektachrome Commercial and EF 7242). Since the DS8 cameras have built-in metal pressure plates, image registration and stability are superior to any Super-8 cartridge camera.

Only two manufacturers have regular production Double Super-8 (DS8) cameras - Cinema Pathe and Canon. Since the DS8 format has so many advantages to offer to the professional Super-8 filmmaker, we expect that other 16mm manufacturers may soon offer DS8 versions of their equipment. Eclair and Arriflex both have built special DS8 versions of their cameras, and have given them limited publicity at *Photokina.* Bolex has a strong position in the 16mm and Super-8 market, and might be expected to offer a DS8 version of their H-16 or new EL cameras. Beaulieu could offer a DS8 version of their R16B. If the strong interest in Super-8 TV News continues, Cinema Products might be tempted to build a DS8, perhaps based on their planned relatively inexpensive SMO camera.

Cinema Pathe Electronic DS8

The Pathe DS8 is a conversion of the Pathe 16mm Electronic camera. Into the rotating 3-lens turret has been mounted the new 6-80mm f/1.2 Angenieux lens. The 6-66mm f/1.8 Schneider-Optivaron lens is available as an option. The variable speed (8 to 80 fps) includes the highest speed of any Super-8 camera. The Pathe DS8 is a fully-equipped sync sound camera, with built-in 60Hz pilotone *and* 1/F sync switch. It is thus compatible with all sync recorders, cassette or reel-to-reel. The Pathe DS8 can be fitted with a 400-ft. magazine with an integral take-up motor. This permits a continuous shot of 20 minutes, one of the longest available runs in any film gauge. A custom sound barney is available from Karl Heitz, the importer, making the camera very quiet in operation.

Canon DS8

Although closely related structurally to the Canon Scoopic 16mm, the Canon DS8 is actually a

completely reworked camera. The permanently-mounted zoom lens is the same 8-to-1, f/1.4 lens as is on the Canon 814E. The Canon DS8 is not built as a sync sound camera; it must be modified (e.g. by Professional Camera Repair of New York) to include a 1/F sync switch.

It is very noisy, and some kind of barney is an essential accessory. The electric eye is not through-the-lens. Other technical details are listed in the table.

Bolex DS8

Owners of the Bolex H8 Rex camera should consider a conversion to the Double Super-8 format. This under-$200 modification is performed by J-K Camera Engineering, Dept. S8S, 5101 San Leandro St., Oakland, CA 94601.

Single-System Super-8

A single-system camera is a complete sync sound location outfit, combining a sync camera and a sync recorder in one housing. Sound is recorded in sync on the magnetic edge stripe at a standard position 18 frames from the picture gate. Shot after shot is in perfect sync; slating is only needed for transfers to double-system. For one-person film crews, single-system is the ultimate in convenience and simplicity. All the controls are in one place; all decisions, sound and picture, can be made by one person. For these reasons, it is clear that single-system sound cameras will eventually dominate the home movie market. This is probably also the best way to introduce a beginner to sync sound filmmaking, since it postpones learning how to sync up the rushes until the novice has a creative reason for wanting separate sound and picture.

The Super8 Sound Recorder can be used to transfer sound from the magnetic edge stripe to fullcoat mag film for double-system editing. This gives the filmmaker the best of both worlds - single-system production and double-system post-production.

The first single-system cameras built (Kodak Ektasound) are very primitive designs - 18fps only, rangefinder viewing, automatic gain control and exposure control, noisy, and with a sound hiatus between shots.

The second manufacturer to enter the field. Beaulieu, built a camera (the 5008S) that is probably the highest quality Super-8 camera of any kind, single- or double-system, with sound recording specifications superior to

Continued on Page 1322

Double•System Camera Data Table

CAMERA	Batt.	Sync Cable	ASA Range	Zoom Range (mm)	f/Stop	Min. Focus	Filter Thread	Weight	Noise Level	S8S XTAL	S8S Silencer	Other Features
Bauer C Royal 8E	6AA	CC8	25-160	7.5-60	f'1.8	Macro	49mm	1.1kg	NA	NO	KIT	1,2,3,4
Bauer C Royal 10E	6AA	CC8	25-160	7-70	f/1.8	Macro	55mm	1.1 kg	NA	NO	KIT	1,2,3,4
Beaulieu 4008ZM2	7.2V	Edson, Pilotone	10-400	6-66	f/1.8	Macro	61mm	1.5kg	55dB	YES	YES	1*,2,3,5
Beaulieu 4008M3	7.2V NiCad	Erlson, Piiotone	10-400	6-66	1/1.8	4'	61mm	1.5kg	5548	YES	YES	1.,2,3,5
Bolex 450	5AA	PC	25-160	8-40	f/1.8	4'	55mm	1.4kg	5556	NO	KIT	–
Bolex 480	5AA	PC	25-160	7-56	1/1.8	4'	55mm	1.5kg	55dB	NO	KIT	–
Canon 814E	4AA	PC	16-400	7-56	f/1.4	Macro	58mm	1.55kg	5448	NO	KIT	1,2
Canon 1014E	6AA	PC	16-400	7.70	f/1.4	Macro	58mm	2.0kg	54dB	NO	KIT	1,2
Elmo Super 110R	4AA	Special	25-160	7-70	f71.8	3'	62mm	1.4kg	51dB	NO	KIT	3*
Fujica Z800	4AA	Special	25-400	8-64	f/1.8	Macro	62mm	1.4kg	NA	NO	KIT	1,2,3
GAF ST802	4AA	PC	16-250	7.5-60	f/1.7	5'	58mm	1.7kg	NA	NO	KIT	–
GAF ST1002	4AA	PC	25-640	6.5-65	f/1.7	5'	77mm	1.9kg	NA	NO	KIT	–
Leicina Special	6AA	CC9	10-1000 Interchangeable Leica-Mount Lenses						55dB	Jensen	KIT	3,4.
Minolta Autopak8 D-12	5AA	CC9	10-400	6.5-78	f/1.8	Macro	67mm	2kg	55d8	NO	KIT	1,2,3,4*
Nikon R8	6AA	Locking PC	10-400	7.5-60	f/1.8	Macro	52men	1.6kg	NA	NO	KIT	1,2,3
Nikon R10	6AA	Locking PC	10-400	7-70	f/1.4	Macro	67mm	1.9kg	NA	NO	KIT	1,2,3
Nizo 136XL	4AA	PC	10-160	9-36	f/1.8	3'	49mm	.8kg	NA	YES	KIT	4
Nizo 148XL	4AA	PC	10-160	6-48	f/1.8	3'	49mm	.85kg	NA	YES	KIT	4
Nizo 156XL	4AA	PC	10-160	7-56	f/1.8	3'	49mm	.85kg	NA	YES	KIT	4
Nizo 481, 5480	6AA	PC,CC8	10160	8-48	f/1.8	3'	49mm	1.35kg	52dB	YES	YES	1,2,3,4
Nizo 561, 5560	6AA	PC,CC8	10-160	7-56	f/1.8	3'	49mm	1.35kg	52dB	YES	YES	1,2,3,4
Nizo 801	6AA	PC,CC8	10-160	7-80	f/1.8	4'	62mm	1.6kg	52dB	YES	YES	1,2,3,4
Nizo 800P	6AA	PC,CC8, Tuchel	10-160	7-80	f/1.8	Macro	62mm	1.6kg	52dB	YES	YES	1,2,3,4
Rollei SL84	3AA	PC	25-160	7-70	f/1.8	5'	55mm	1.1 kg	NA	ISS	KIT	1,3,4.
Sankyo CME444	4AA	PC	25-400	8.5-35	f/1.8	4'	49mm	1.3kg	NA	NO	KIT	
Sankyo CME666	4AA	PC	25-400	848	f/1.8	4'	49mm	1.3kg	NA	NO	KIT	
Sankyo CME1100	4AA	PC	25-400	6.565	1/1.8	Macro	55mm	1.6kg	NA	NO	KIT	–

1. Lap Dissolve (* if with accessory) 2. Variable Shutter 3. Tape Recorder Start/Stop 4. intervalometer (* if with accessory) 5. Mirror Shutter

The Beaulieu 4008ZM2 camera, shown here synced with the Super8 Sound Recorder, is the single most popular camera among Super-8 sound customers - and the most expensive. The Beaulieu's popularity is due to its Schneider 6mm-66mm lens (the widest-angle lens of any Super-8 camera), its C-mount lens interchangeability, various speeds from 2 to 70 fps, its manual ASA setting, together with the availability of a crystal camera control and silencer.

SUPER-8 SYNC SOUND RECORDERS

A surprisingly large number of cassette and reel-to-reel recorders are now available, or can easily be adapted, for Super-8 sync sound shooting

By ROBERT 0. DOYLE

There are a surprisingly large number of sync sound recorders available for use in Super-8 production.

First, any professional quarter-inch pilotone recorder can be used with the various Super-8 pilotone cameras, or with crystal-controlled Super-8 cameras if a crystal sync generator is added to the recorder.

Second, several hi-fi stereo recorders, reel-to-reel or cassette, record an audio track, plus either a pilotone sync track or the new one-pulse-per-frame (1/F) sync signal used in many Super-8 cameras.

Third, a number of cassette sync recorders have been specially designed for use in Super-8, most using the 1/F sync signal, and one that utilizes the standard pilotone.

Fourth, any single-system Super-8 camera is a sync recorder, since sound from the magnetic edge stripe is in frame-for-frame sync and may be transferred to Super-8 fullcoat magnetic film for editing.

Fifth, and finally, there is the Super8 Sound Recorder, a Super-8 fullcoat magnetic film recorder that is portable enough to be used as location recorder, laboratory resolver, sound studio dubber, and transfer recorder to and from magnetic edge stripe. These multiple functions and the comprehensive compatibility of the Super8 Sound Recorder have earned U.S. letters patent no. 3,900,251 and led *American Cinematographer* to describe the machine as the most important addition to the Super-8 scene" in their review, "Professional Super-8 at *Photokina* '74".

We summarize here the major operating features of the Super8 Sound Recorder and a number of new cassette sync recorders that are widely used in double-system Super-8 sync productions. We do not discuss sync recorders like Arrivox-Tandberg, Uher, Stellavox, and Nagra because 16mm cinematographers are familiar with these machines, and their operation in Super-8 is the same as 16mm, except that the transfer to mag stock is not normally done in a lab, but by the filmmaker himself, using his own Super-8 sound studio equipment.

The Super8 Sound Recorder is now in use by more than three hundred schools and universities in the United States and abroad, and more than two hundred industrial filmmakers, government filmmakers and independent filmmakers.

On Location

The Super8 Sound Recorder will record in sync on location with over 40 available Super-8 sync sound cameras. No camera modifications are required. The cameras must be equipped with a 1/F contact switch (electronic flash PC socket), a pilotone generator, or be crystal-controlled. The list of sync cameras currently available from Super8 Sound (all of which are also compatible with our sync cassette recorders) is given below.

Crystal controls are available for a number of these cameras from Super8 Sound. Single-system cameras can also be used as location recorders, with transfers to Super-8 magnetic film made back in the laboratory.

Argus 7310
Bauer C-Royal 8E, 10E
Beaulieu 4008ZM2, 4008M3, 5008S
Bolex 450, 480
Canon 814E, 1014E, DS8
Cinema Pathe DS8
Elmo Super 110R, 612
Fujica 2800
GAF ST/802, ST/1002
Leicina Special
Minolta Autopak-8 D12
Minolta XL400
Nikon R8, R10
Nizo 136XL, 148XL, 156XL, S480, 481
S560, 561, 801, 800P
Sankyo CME444, CME666, CME1100

In the Laboratory

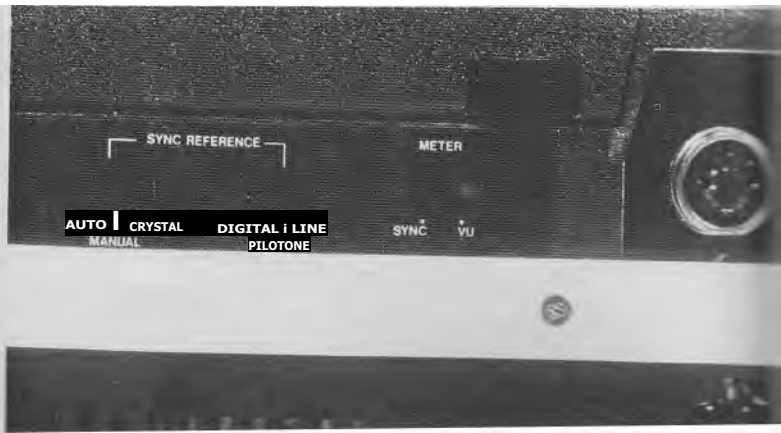
Transferring sync sound to Super-8 magnetic film requires a sync si

the Super8 Sound Recorder. The Recorder servo-controls its speed so that one frame of magnetic film passe the recording head for each "frame'

made from professional sync recorders such as Nagra, Stellavox, Arrivox-Tandberg, and Uher Neo-Pilot, and from the new sync cassette recorders such as Philips 2209 AV, Uher CR134, Super8 Sound's Scipio and others.

Transfers can also be made from the magnetic edge stripe of a single-system film by connecting the Super8 Sound Recorder to a projector with a 1/F contact switch. Professional sou labs can use the Super8 Sound Recorder in AC line sync with their other recorder/reproducers.

(LEFT) The Super8 Sound Recorder is the most widely used Super-8 magnetic film recorder. This extremely versatile machine acts as a Sync location **recorder, a crystal recorder, a laboratory resolver, a mixing unit, and a transfer machine. With the use of this equipment and** Supe r8**fullcoat magnetic film, Super-8 sync film-making is as straightforward as 16mm practice. (RIGHT) The side panel of the Super8 Sound Recorder, showing the sync socket connector and the panel of switches used to select and monitor the synchronous functions of the** recorcs-



(LEFT) The crystal-controlled Beaulieu 4008ZM2 and the Super8 Sound Recorder make an extremely inexpensive crystal-sync location rig. More than 40 cameras which, like the Beaulieu, provide a sync signal output, may be used for cabled sync location work with this recorder. (CENTER) Very lightweight sync cassette recorders, such as the Super8 Sound Scipio, may be used to record sync sound. The Super8 Sound Recorder then automatically resolves these tracks. It can also transfer sound from pilotone sync recorders like the Nagra and Stellavox. (RIGHT) The Super8 Sound Recorder will synchronize with any projector equipped with a once-per-frame sync switch, for interlock screenings. It is shown here with the Bolex SM8 sync projector.

in the Dubbing Theater

Since the Super8 Sound Recorder will run in perfect interlock with other Super8 Sound Recorders, with the Super8 Sound Sync projectors, and even with the Super8 Sound Double-Band Projector, the possibilities for dubbing and mixing are extensive. Filmmakers can listen to the original sync material, over and over if necessary until perfect, on a second fullcoat mag film recorder.

In the Sound Studio

The Super8 Sound Recorder offers two basic approaches to multiple track sync recording. One is to use multiple fullcoat magnetic film recorders, all running in sync with the AC line frequency. Any number of Super8 Sound Recorders can be interlocked this way, although sync operation is limited to a common start. No sync rollback is possible.

Another method is to transfer edited lip-sync material to one track of a four-channel quarter-inch tape. A pilotone sync signal from the Super8 Sound Recorder is also recorded as a control track. Now the same Super8 Sound Recorder can transfer a second fullcoat strand, with additional sync material, to a third track of the four-channel machine. The Super8 Sound Recorder will maintain sync against the control track. The fourth track can be used for music, narration, etc. All three tracks can then be mixed down to make a composite master fullcoat track, again on the same Super8 Sound Recorder synced to the control track.

In the Screening Room

Sound on fullcoat magnetic film, from the first look at synced-up rushes to the final composite master sound track. can be run in double-system sync with any projector equipped with a 1/F contact switch. Projector and Recorder are started together using either a Common Start Box or the Super8 Sound Photo Start for precisely repeatable starts.

Double-system interlock screenings with a sync rollback capacity can be accomplished on the Super8 Sound DoubleBand Projector. The Super8 Sound Recorder will also synchronize with AC synchronous equipment such as the Kodak TVM100A telecine projector. The Kodak Videoplayer VP-1 and VP-X are supplied by Super8 Sound with a 1/F sync pulse for double-system video transfers.

The Super8 Sound Recorder operates at both professional (24 fps) and amateur (18 fps) film speeds, and has built-in quartz-crystal control for cableless sync work at 24 fps. A sync meter provides positive indication of sync condition.

The Super8 Sound Recorder is a modified Sony TC800B quarter-inch tape recorder. It operates on batteries (12V) or 60Hz/110VAC. Export models operate on 50Hz, 220V or 110V; they synchronize at 24 fps, 25 fps, and 18 fps, and with a built-in 25 fps crystal.

An illustrated, 28-page Super8 Sound Recorder User's Manual is available for $1.

Super8 Sound Laboratory Recorder

The Super8 Sound Laboratory Recorder is a non-portable studio version of the Super8 Sound Recorder. It records on Super-8 fullcoat magnetic film, using 10½-inch reels (one full hour). It has all the automatic sync functions of the Super8 Sound Recorder except portable crystal sync operation. These include: transferring (resolving) sync sound from any sync recorder — cassette or reel-to-reel, 1/F sync pulse or pilotone; transferring sync sound to a magnetic edge stripe with any sync projector equipped with a 1/F sync switch or AC synchronous motor; transferring sound from the magnetic edge stripe to fullcoat magnetic film; and multiple recorder synchronization via AC line interlock.

The Lab Recorder is a modified Crown PRO-700 three-motor tape

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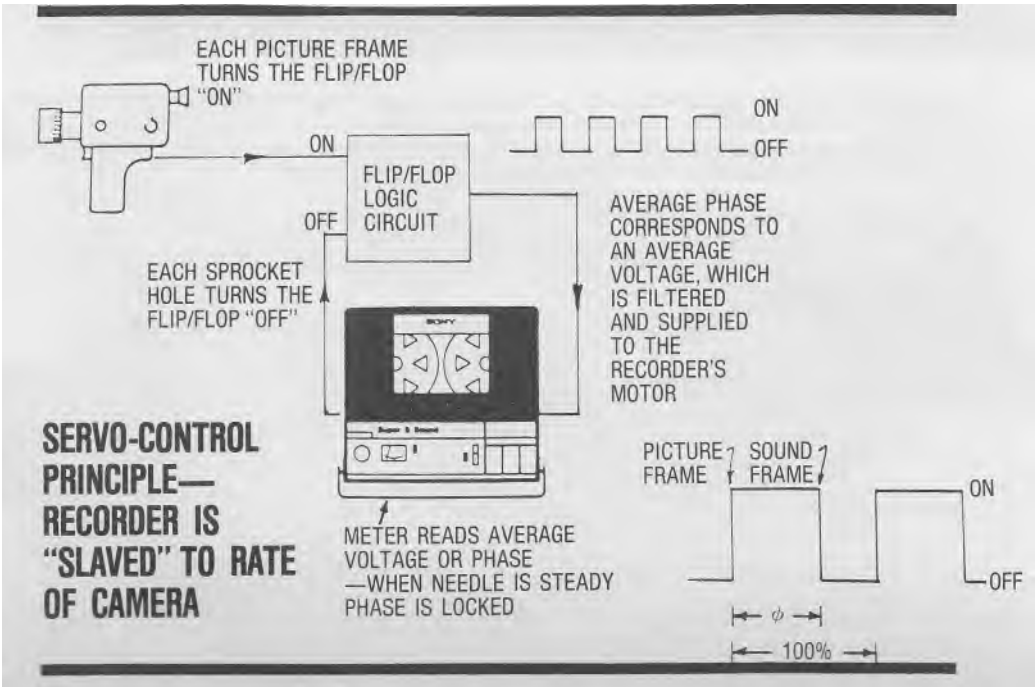
The Super8 Sound Recorder synchronizes automatically with the selected sync reference by means of its unique electronic speed servo-control capability. Diagram shows the operation of its flip-flop circuit, which ensures that the Recorder's speed matches the reference frame-for-frame.



CRYSTAL-- SYNC SUPER-8

Crystal-sync cableless operation of the camera-recorder pairs has freed Super-8 from the umbilical cord and made it an incomparably mobile format

By JON ROSENFELD and AL MECKLENBURG

From the beginning of our work with Ricky Leacock to build the original MIT Super-8 system, a key factor in the design was to provide crystal sync cableless operation of the camera-recorder pairs. The extreme portability and easy mobility of Super-8 cameras and cassette tape recorders would be senselessly compromised by an awkward cable between the two.

When we joined Super8 Sound, only the Super8 Sound Recorder was a crystal sync machine. Now we have produced crystal controls that mount on the camera for all the Beaulieu and Nizo double-system sound cameras, and developed lightweight crystal sync generators for a number of cassette sync recorders that use the Super-8 sync signal of one pulse per frame (1/F).

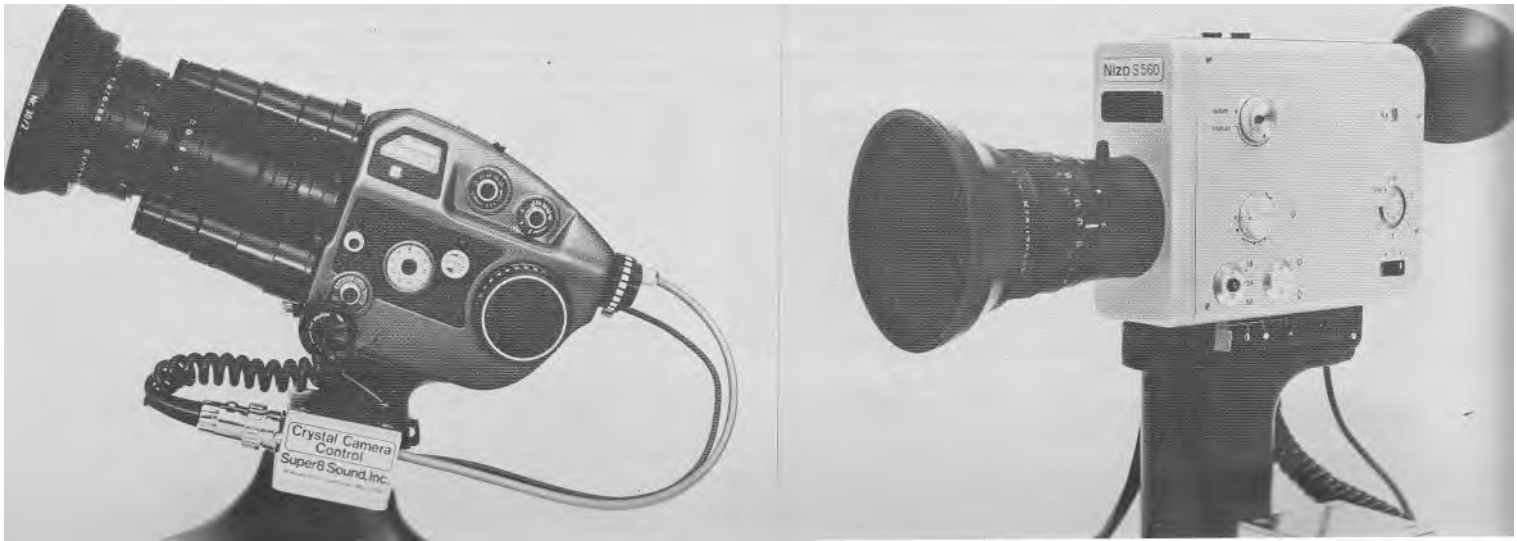
Our latest design is a conversion of a SONY Dolby cassette recorder known as the XSD Recorder that can be used for sync sound by 16mm or 35mm filmmakers as well as by Super-8 filmmakers, since it uses the industry standard 60Hz pilotone sync signal. The 1/F sync cassettes are transferred to fullcoat magnetic film using the self-resolving capability of the Super8 Sound Recorder. XSD cassettes can be resolved to Super-8 fullcoat the same way, and to 16mm or 35mm magnetic film using an external XSD resolver that matches the speed of an XSD cassette to the 60Hz AC line frequency.

The XSD Recorder is similar to the MIT/Leacock cassette recorder in that it is a converted stereo cassette machine, with one track used to carry the sync signal. Unlike the MIT recorder, it has a separate gain control on the sync channel, and this makes it possible to use the XSD Recorder with pilotone sync cameras, which vary widely in the voltage of their sync output signal.

Crystal Camera Control for Beaulieu cameras.

The crystal control is enclosed in a 1" x 2" x 2" box mounted on a 2" x 4" bracket. The bracket attaches to the tripod screw in the Beaulieu handle. It weighs only six ounces, adding very little to the three pounds of camera weight. One cable connects to the battery-charging socket of the camera. drawing the power necessary to drive the crystal oscillator, and energize the control circuitry. A second cable plugs into the remote control socket to regulate the speed of the camera. The frame rate of the camera is sensed by the modified Erlson screw-in mount contact switch. This 1/F contact switch is supplied by Hervic Corporation with a lock-ring 5 pin DIN plug suitable for cable connection to the Super8 Sound

(ABOVE LEFT) The authors with their first crystal-sync Super-8 rig. The crystal camera control is mounted in the box on the improvised battery belt worn by Jon Rosenfeld. The crystal-sync tone generator is in a box on the modified Sony TC 124 cassette recorder. The box also contains a bloop light and beep-tone generator, being activated by Al Mecklenburg. (BELOW LEFT) Beaulieu 4008ZM2 with Super8 Sound Crystal Camera Control. (RIGHT) Nizo S560 camera with Super8 Sound Crystal Camera Control.



Recorder. This same sync cable connects to a 5 pin DIN jack on the crystal camera control. The Beaulieu cameras require no modification whatever.

When the variable speed of the Beaulieu camera is set above 24fps, the crystal control holds it back to a true 24fps. Any setting below about 33fps is easily controlled, but a setting just above works best. A light-emitting-diode indicates proper sync operation. Accuracy is one frame in thirteen minutes over a temperature range from -10'C (15°F) to 40°C (108°F).

The control should be unplugged when not in use, even though the operating current is only 1 mA, and the Beaulieu batteries can supply this two weeks before discharging.

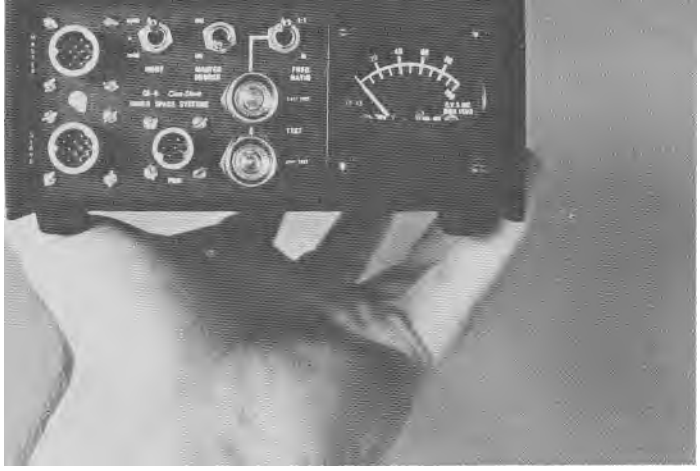
The Beaulieu control is available in a 25fps version for European use.

Crystal Camera Controls for Nizo cameras.

Braun will supply any new Nizo camera with a remote speed control jack that accepts the Super8 Sound Crystal Camera Control. Cameras without such a speed control capability may be returned to Braun North America, 55 Cambridge Parkway, Cambridge, Mass. 02140, and the control jack will be installed for $29.95. This jack serves the double function of supplying power to the Crystal Camera Control, and allowing the control to regulate the speed of the camera. The PC electronic flash contact on all Nizo cameras provides the necessary 1/F sync signal to the control unit.

The Super8 Sound Crystal Camera Control for the Nizo cameras is the same size and weight as the Beaulieu control described above. It also has the same speed accuracy, but a significantly higher power draw (35mA). Unlike the Beaulieu, the Nizo crystal control regulates the camera to 24fps whenever the camera is running on its 24fps position, and it is turned off when the camera run switch is off, so it can be left plugged into the camera indefinitely.

Crystal camera controls are also available for cameras other than the Beaulieu and Nizo from other manufacturers, notably from Inner Space Systems of Deerfield, Wisconsin. Inner Space Systems have for many years offered the CineSlave, a synchronizer that can control the speed of many types of film equipment. A Cine-Slave CS-5 with an optional plug-in crystal board can crystal-control any Super-8 camera custom-modified by Inner Space Systems. Recently, Inner Space Systems have offered more economical pocket-sized versions of their basic Cine-Slave control circuit. Their model



The Cine-Slave Universal Resolver was invented by Inner Space Systems' Technical Director, Bob White, in 1969 and marketed in 1970. In late 1971, ISS became the first firm to crystal-control Super-8 cameras on a full production basis. A Cine-Slave CS-5, with optional plug-in crystal board, can crystal-control any Super-8 camera custom-modified by Inner Space Systems.

PSX is a crystal-controlled Cine-Slave suitable for controlling modified cameras, and their new model PX is a crystal oscillator suitable for recording a 60Hz pilotone sync signal on one track of any two-channel recorder.

Crystal Sync Generator for Cassette Recorders.

For filmmakers who prefer to record with a lightweight cassette recorder in the field, rather than directly onto full-coat mag stock with the crystal sync Super8 Sound Recorder, Super8 Sound has produced lightweight crystal sync (1/F) pulse generators for three cassette recorders — the Scipio, the Philips 2209, and the stereo (plus sync) Uher CR134.

The Crystal Sync Generator XG24 is 1" x 2" x 2" and weighs about five ounces. It mounts directly to the strap of the recorder's carrying case, and derives its operating power from the cassette recorder batteries. Accuracy is one frame in thirteen minutes from — 10°C to 40°C. 25fps versions are available.

XSD (Crystal-Sync-Dolby) Recorder

This latest crystal sync product was designed for use by 16mm and 35mm filmmakers as well as Super-8.

The XSD Recorder is a SONY TC153SD stereo cassette recorder with Dolby Noise Reduction (Trade Mark, Dolby Labs), modified to include a built-in 60Hz pilotone quartz crystal oscillator. It can record sound in sync with any Super-8, 16mm, or 35mm camera that is crystal-controlled or has a standard pilotone sync output. The XSD Recorder uses high-density chromium-dioxide cassettes or standard cassettes. In sync use, it is monophonic with sync on cassette track 1. It reverts to a stereo cassette recorder in

Continued on Page 1320

The Beaulieu 4008ZM2 camera with Super8 Sound Crystal Camera Control and the Uher CR134 Stereo Cassette Recorder with Super8 Sound Crystal Sync Generator. Early on it was realized that crystal-sync was essential to optimizing the extreme portability of Super-8 cameras and tape recorders.

SUPER-8 LAB SERVICES AND STOCKS

The lack of professional film stocks and laboratory services presents serious problems for Super-8 which, it is hoped, will soon be solved.

By RICHARD LERMAN

Perhaps the most serious drawbacks to Super-8 original production are the lack of professional quality film stocks and professional-level laboratory services for Super-8 original film stocks.

The most widely available Super-8 film stocks — Kodachrome 40 and High-Speed Ektachrome 160 — are projection contrast emulsions intended for use by amateur filmmakers who screen the original camera stock. These stocks cannot be processed by most local laboratories, and their saturated colors duplicate poorly, with color shifts and loss of detail in shadows and highlights. Careful lighting can control the losses somewhat if ratios are kept well below 4:1, preferably 2:1, but there is no controlling the inherent contrast range of much subject material. Low-contrast Ektachrome Commercial (7252) is available in the Double Super-8 format (DS8), but a limited number of Super-8 filmmakers are using DS8 cameras. Ektachrome EF 7242 is available in Super-8 cartridges but it, too, is of projection contrast, has relatively soft images, and a large noticeable grain structure.

When all these options are considered, many labs prefer the high resolution of Kodachrome 40 as the best original stock in the Super-8 cartridge, despite its contrast problem. Most labs report a small volume (less than 5) of prints as the most common Super-8 original order, and these were struck directly from the original in most cases by continuous contact printing onto Eastman 7389 and processed in a modified ME-4 process.

The shortage of lab services is probably because labs have not yet been convinced that there is a significant volume of business in Super-8 original production to merit gearing up the expensive liquid-gate Super-8 printers. Most labs have been committed to Super-8 as a release print medium for years, with the principal original stock being 16mm Ektachrome Commercial — a low-contrast color reversal original. This stock was generally reduction-printed two-up onto Eastman 7387 or 7390 16mm perforated 1-4. For large quantity release an Eastman 7271 internegative was usually prepared, either two-rank on 16mm stock or four-rank on 35mm stock with five rows of Super-8 perforations. Quantities of color-release prints were made on Eastman 7381 or 7383, either two-rank or four-rank.

The problem is that few Super-8 producers require the volume of printing that could merit the preparation of four-rank internegatives, and 7271 is intended for use with low contrast original in any case. Kodak has recommended an interpositive two-rank reversal master on 7252, and this could then be printed onto 7387 or 7390 reversal color print film. George W. Colburn in Chicago is offering these services and with a Super-8 liquid gate. The cost of all these steps is, of course, as great as, or greater than, comparable steps starting with 16mm original. Colburn also has the capability of producing a 7271 two-rank internegative by a low-cost contact print in two steps from the Super-8 original, and is studying the possibility of a 7247 blow-up internegative on this newest 16mm color negative stock.

The lowest-quality and most common procedure is a straight reversal contact print onto Eastman Ektachrome R 7389. Many 16mm labs use 7389 as a reversal master, and this will no doubt occur also in Super-8, with prints then made also on 7389. Some Super-8 labs are offering single-strand contact prints onto 7389, so they can sell just one print at a time, as does Kodak's Consumer Print and Processing services. Newsfilm Labs in Los Angeles has a large quantity of pre-striped 7389 single-strand like that used by Kodak.

Most of the labs active in Super-8 original production have built heir own printers, by custom modifying 16mm equipment. An example is the Super-8 Division of Bellevue Pathe in Toronto, whose entry into Super-8 is chronicled by Murray Fallen in another article. But now equipment manufacturers are beginning to respond to the new demands.

One notable new product is the Acme Mini-Printer Model 5800 from Producers Service Corporation, Glendale, California. This is a lab-quality low-cost ($13,500) optical printer with four basic modes of operation: 1) single-strand Super-8 original to a Double Super-8 print; 2) single-strand Super-8 original blow-up to a 16mm print; 3) 16mm reduction to a Double Super-8 print; and 4) 16mm original to a 16mm print. The projector section accepts 1000 feet of original film and the camera section accepts a 1200-foot magazine loaded with 16mm film or 16mm film perforated Super-8 (1-4). Camera and Projector sections both run in forward or reverse, and have freeze frame/stop motion. The lens system includes filter holders for color and density correction, and a variable shutter allows fades and dissolves. The Mini-Printer has a 103mm Eastman Ektar lens for 1-1 printing and an 89mm Eastman Ektar lens for reduction and blow-ups, and is built for daylight operation.

For laboratories requiring additive color correction, scene-to-scene automatic timing, liquid gate, double-image, lenses for single-pass multiple printing, etc., Cinecraft, International of

Continued on Page 1315

Type of Film		Type of Color Balance	Filter/ASA Daylight	Photo Flood 3400 °K	Tungsten 3200°K	464 50' Silent	594 50' Sound	200' Silent	200' Sound	580 100' DS8	604 400' DS8
KMA	Kodachrome 40	A 3400 °K	85/25	none/40	82A/32	X	X			X	
EMA	Ektachrome 40	A 3400 °K	85/25	none/40	not rec.	X					
ELA	Ektachrome 160	A 3400 °K	85/100	none/160	82A/125	X	X				
EG	Ektachrome Type G (Indoor/Outdoor)	G any light	none/60	none/160	none/160	X					
EFB	Ektachrome EF (7242)	3200°K	8513/80	81A/100	none/125	X	X	X	X	X	
ECO	Ektachrome Commercial (7252)	3200 °K	8513/16	81A/100	none/25					X	X
SM	Ektachrome SM	B 3200 °K	85/100	81A/125	none/160			X	X		
PXR	Plus X Reversal 7276		— /60		— /40	X					
TXR	Tri X Reversal 7278		— /200		—/160	X					
4XR	4X Reversal 7277		— /400		— 120	X				X	

PROFESSIONAL SUPER-8 EDITING EQUIPMENT

Quiet but rapid progress in the development of Super-8 editing hardware has resulted in a stunning array of such equipment currently available

By GUNTHER HOOS

During the 1974 *Photokina,* an Eclair spokesman explained that one of the reasons why Eclair was not rushing their Super-8 camera to market was the lack of professional film handling and editing equipment. "After all," he said somewhat airily, "what's the good of a superior film image, if you can't edit it after you've shot it?"

In 1972, he might have had a point. But he said this in 1974 while at least eight firms, including KEM and Steenbeck, demonstrated their Super-8 editing hardware in the same building.

He was not being arrogant. Like many others, deeply involved in the traditional film business, he had simply been unaware of the quiet but rapid progress in the development of Super-8 editing equipment. Where in 1972 even Super-8 synchronizers were hard to find, by 1975 it had become possible to cut a Super-8 film on a very elegant ten-plate horizontal table.

What's more, rather than rushing off to a $100.00/hr sound mixing studio, the filmmaker would simply convert his editing table to the mixing configuration. He would then mix multiple sync track to a master and finally, still on the same table, transfer the mixed track in sync to his edge-striped film.

This article presents a summary of presently available and soon-to-be available editing hardware. Most of the equipment is in full production and into second and third generation models. The quantity and diversity of the equipment is astounding.

Super8 Sound, Inc.

Super8 Sound's contribution to double system editing is represented by three elegantly conceived motorized vertical editing benches. Three models are currently available, the original bench with one picture and one fullcoat track ($795.00), as well as two new models built around a four gang Moviola synchronizer. The main difference between the two new models is that one has two sound heads and the other three. ($1025.00 and $1090.00 respectively)

All three benches include a 24 fps motorized synchronizer activated via a foot-pedal and engaged with a very quick-acting electric clutch. Starts and stops are on the frame without coasting. Changeover to manual forward/rewind is quick. Fullcoat sound is read with a clever sliding magnetic head assembly mounted in editorial sync with the picture. This head can be moved 12 frames in either direction of center to help establish sync without necessitating removal of the entire fullcoat strand from the synchronizer. As nice as this feature is, I wish that the head assembly would truly slide rather than jerk. Perhaps the addition of a roller would help. Oil or graphite help a bit.

The sound quality is adequate for editing purposes. To get the thing to sound its best really takes a little practice in coordination. It's mainly a problem of applying the proper tension (drag) to the supply reels, and in not yanking too hard on the takeup while the motor pulls the fullcoat past the sound heads.

The synchronizers have been modified by the addition of "outriggers". These handy gadgets pull the film free from the sprocket teeth when the synchronizer roller arms are released, but continue to hold the film on the rollers during fast rewind/forward of single or multiple strands. These outriggers help to save you from yourself by preventing the disengaged film from dragging over the synchronizer sprockets. When reengagement of the film is desired, the outriggers make the process very quick.

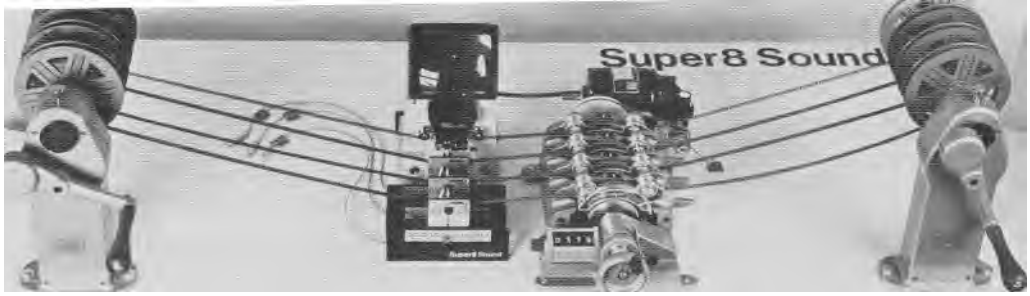
The outriggers also serve another function. The Minnette viewer has a closed gate, and unless you want to punch out the edge of the film frame in the gate, there is no way to mark the frame at the gate. The outrigger contains markers superimposed over the frame indicator disk of the synchronizer. By the fact that the viewer gate is exactly 50 frames from the center mark of the synchronizer, the displacement markers on the outriggers allow quick alignment of both sound and picture frame at the frame pointer of the synchronizer. Here the cuts are easily marked and the edits made.

The new benches also come with a little crank mounted on the synchronizer shaft. This crank introduces some semblance of speed control when hand-winding. It also permits quick location of cut and sync marks.

A device most useful when working with two strands, is the differential rewind adaptor. (Standard equipment on the two gang bench). This Super-8 Sound Original has a number of functions. First, it adapts the Super-8 reels for use with standard 16mm professional rewinds. Second, because of the differential action between the two reels, either strand can be moved independently of the other without the usual tedious clamp and spacer adjustments. Third, the differentials allow reels of unequal diameters and fullness to take up evenly. Since fullcoat is much thinner than film, this feature is very important in maintaining the editor's sanity.

Before we received our differentials, a disproportionate amount of energy and frustration went into the effort of keeping the film and fullcoat from spill-

In the editing room at Super 8 Film Group, author Gunther Hoos works with the MKM Model 824 tabletop horizontal editing console. Whereas in 1972 even Super-8 synchronizers were hard to find, at present it is possible to cut a Super-8 film on a very elegant 10-plate horizontal table. The quantity and diversity of Super-8 cutting equipment now available is astounding.



The Super8 Sound 4-gang editing bench provides the economies of vertical editing, combined with the design innovations that make vertical editing in Super-8 a vast improvement over conventional 16mm vertical set-ups. Unique "Third Hand" devices on the rewind arms prevent film spillage and automatically hold back on the supply and take-up reels; no film bins or bench top holes are necessary. The synchronous motor drive is activated by means of a convenient foot clutch.

ing all over the editing table.

All models of the bench come equipped with the Minnette S-5 viewer. This viewer has a long history of durability, brightness, and gentle film handling ability. Order several replacement lamps. For some reason, these lamps are hard to find. On a recent desperate search in New York, it took five hours to locate two lamps.

The editing benches also come equipped with 16mm professional rewinds, friction drags, and long shafts. A pre-drilled Formica mounting board completes the setup.

Other than the extra two gangs, the four-gang model differs only in that differentials are not used. To accomplish essentially the same results, Super8 Sound modified the rewinds with "third hand" rewind clutches that automatically hold back on the feed reel. By locking the synchronizer and releasing the desired outrigger, the third hand, in conjunction with smooth-acting spacers and hub adaptors, allows a single strand of film or fullcoat to be moved independently of all the others.

In addition to all the hardware, these benches come equipped with very detail ed operation and assembly manuals. The only item not included is a squawk box.

To my mind, the four-gang model is really the most useful. Not only can three sound tracks be simultaneously cut, but later, the film can be conformed into A & B printing rolls. A set of differentials is included for use in the two-gang mode.

What with differentials, third hands, outriggers, sync tuning, and displacement markers, these benches may at first appear a little strange. Take courage. Read the operations manual carefully and sit down to edit. In a few hours you will be cutting as efficiently as if you had a horizontal table costing from two to five times as much.

Specialties Design & Manufacturing Co.

The Specialties editor is a very economical and versatile editing tool Designed from scratch, this compact unit incorporates a powered four-gang synchronizer operable either manually, or, via a foot switch and magnetic clutch. It is driven by a synchronous motor at 24fps and includes a footage/frame counter.

The unit is designed to work with the Minette S-5 viewer on one gang and three magnetic heads on the other three gangs. A three-channel solid state mixer-amplifier with individual and master volume control is built in. A speaker is also built in. Sound quality is adequate for editing and pre-mix cuing. A fluorescent light well, very useful in A&B roll preparation, is built in directly in front of the viewer and adjacent to the synchronizer. The basic price (without rewinds and viewer) is $595.00.

In practice, the editor would sit on a table between a set of rewinds. The viewer would be positioned so that the film path is directly in line with the rear synchronizer gang. Picture and sound would not be in editorial sync since sound is read at the synchronizer, while the appropriate picture appears some distance to the left.

To edit with this machine, the filmmaker must first locate the viewer at some definite point left of the synchronizer frame pointer. Let's say 60 frames. This location should then be marked so that the viewer can always be put in this position during editing.

Then, assuming that picture and sound are in sync and that a cut will be made, the frame-counter disk is zeroed on the desired sound frame. By moving the synchronizer 60 frames forward, the picture frame corresponding to the sound frame will be opposite the frame pointer. The frame is marked and the cut is made. It is not as simple as in line sync, but it's adequate.

MKM Industries, Inc.

Karl Murgas, president and principal engineer at MKM Industries of Skokie, Ill., stands as a pioneer in the field of Super-8 horizontal table design. The model 824 Super-8 four-plate editing deck evolved from a personal need. Murgas found the available Super-8 editing systems to be unworkable, so he designed his own. The table was introduced in 1973 for $1200.00. This summer, the first models of the second generation machines will be delivered. Current price for a complete machine is $2000.00.

The present model features a very bright ground glass projected image (3.75x5"), 750 ft. reel capacity (almost 40 min at 24f ps), 24f ps sync speed with pushbutton/in/out, a variable speed motor drive from 1-65fps forward/reverse, instant on-frame stop/start switch that stops the film from any speed, an inching knob, a solid state amplifier and built in speaker, a flywheel stabilized sound head for Super-8 fullcoat, independent torque motors with cutoff switches for each supply and take-up plate, common AC start in sync for interlock with other AC sync fullcoat machines, modular component assembly for fast repair by the filmmaker or the factory (only the defective module is sent out, not the 100 pound table), and of course a declutching mechanism to allow independent transport of tracks.

Options include a two channel amplifier ($125.00), a flywheel stabilized single system sound stripe reader ($145.00), and an extension speaker ($45.00). For video use, a TV safety mask will be available soon. U.S. distributor is Cinecraft International. European distribution is handled through Kem Electronic Mechanisms Ltd., London, England.

Apart from the technical improvements, the new model has new human engineering. The controls-have been more logically grouped and allow the activating hand to rest on the edge of the deck during operation, rather than having to remain suspended in space. The threading path has also been redesign'ed so that proper film tension is easily achieved.

Unquestionably, the MKM is a fine piece of engineering and is built to withstand considerable abuse by novice editors. Chances are that it will work troublefree for many hundreds of hours. The model in our studio, used at least 50 hours per week, needed service only after about 1200 hours. Nevertheless, a couple of items should be considered.

There is no real advantage to the deck format. All it does is shrink working space, limit the placement of controls, and necessitate the building of a special height table to accommodate the machine. Lack of

work space is the worst complaint that I have. In splicing, it sometimes happens that control buttons are bumped by the splicer, causing the machine to start moving at the most awkward moments.

Despite the fact that a hood has been added to the viewing system, there is still a lot of light spill. A tighter and more enclosing gate is needed.

Expensive or not, a decent frame/footage/time counter is sorely needed. The present version simply tells you how many times the sprocket wheel has rotated. You must multiply by 16 to get a frame count. Perhaps a digital counter could be offered as option.

Finally, there is a great need for a comprehensive user's manual and for a trouble-shooting guide. Many Super-8 filmmakers are new to film and to complex equipment. They need all the help they can get. A good model would be the Super8 Sound recorder User's Manual.

As useful as the four-plate machine is, more exciting still will be the new six-plate model now in prototype and planned for late 1975 production.

The machine has been designed to be more than just an editing table. Tolerances in the fullcoat sprocket drives and flywheel stabilization have been engineered to permit high-quality sound transfers, re-recording, and mixing.

In its full postproduction configuration, the picture track will have record/playback capability allowing playback and recording of magnetic edge stripe as well as fullcoat. The other two fullcoat tracks will be able to record and playback.

Thus, single-system sound film can be edited double-system by transferring the sound from the mag edge stripe to one of the fullcoat tracks. After conventional editing and a mix, the sound can be rerecorded on the mag edge stripe with the proper 18fps picture/sound separation.

Using common sync start, the table can be interlocked with any number of fullcoat recorders for more complex mixes or to record a master track.

If the filmmaker already owns one of the MKM four-plate editors, a mechanical interlock is possible to provide 2 picture/3 sound track editing capability.

The basic six-plate table will sell for less than $4000.00. With various recording amplifiers, a mixer, an equalizer, a frame/time digital counter etc. its cost will be about $5000.00. The first production model will be introduced at the upcoming SMPTE Conference in Los Angeles.

Super8 Research Associates, Inc.

The Super8 Research series of horizontal tables, after almost monthly design changes, finally seem to have arrived at a final version. Rick Minicucci and Sam Roney have designed a truly versatile postproduction console for the Super-8 filmmaker.

The current models, due for changes this fall, are all modular in design. The table is expandable from a basic four-plate to a ten-plate with three sound tracks and two picture heads. Current prices run from $2600.00 to $4500.00.

The features of the table are impressive. Independent electric clutching allowing fingertip switching control of sound and picture. Manual inching of each track. 24fps sync drive system. Variable speed motor permitting 0-120 fps forward/reverse. Independently switchable torque motors for each take-up/supply reel. Single lever transport function control (sync, variable speed, forward/reverse). Large drive sprockets for safe unstressed film transport. (Masking tape splices even go through) The viewing system employs a modified Minette viewer with quartz light. Pulldown sync is possible. The table is designed with excellent work space.

As is stands, the PPC-25 is a honey of a machine, but some improvements wouldn't hurt. Granted, viewing systems are not easy or inexpensive to design. However, considering the possible applications of the table, a really high-quality viewing system is required. At the present, it is impossible for more than one person to see the image. In fact, one person cannot glance at both picture heads without some head craning. It has been my experience that there are always people who need to sit in on an editing session or for an interlock runthrough. Unless they can see, it will be an unhappy experience. Use of the Minette viewing systems should be a stopgap measure only.

The sound on current machines is a bit unsteady. It can be greatly improved with an optional flywheel ($100.00). It should not be an option. Without the flywheel, the sound is about on a par with a motorized synchronizer, a condition no respectable flatbed should long endure.

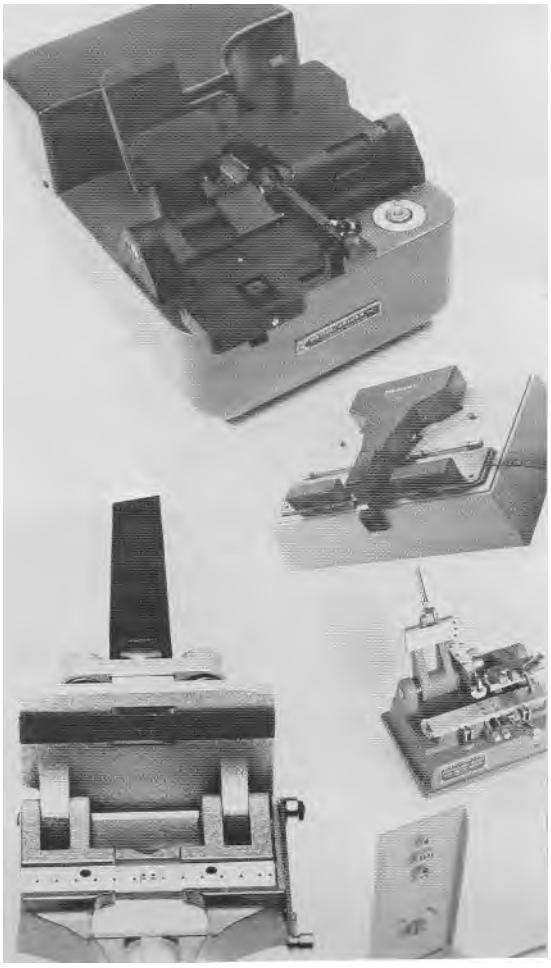
But enough, those who already own the machine have learned to live with it and those who don't have the new improved version to look forward to. The new model designations are PPC-35M and the PPC-45M. The new models will be available in 6 or 8 plate versions ($3895.00 and $4495.00). Additional Picture heads will cost $800.00 each.

These new machines, they say, will truly be postproduction consoles. They will edit and they will mix. Not only that, but they can lock to a digital pulse train and resolve to Super-8 fullcoat. Full recording capability for mag edge stripe and fullcoat is part of the plan. Separate high quality heads for mixing and transfer will be provided. Special threading paths during recording and mixing will serve to stabilize the sound. All sound transports will be flywheel stabilized. A digital footage/time counter will be an option. Common start for interlock with other sync machines will also be provided. Optionally, the machine will be convertible for full large-screen projection. Available this fall, this new version of the PPC will definitely be worth waiting for.

Another new machine, now available, is a very basic (and I stress basic) four plate editing deck. For only $1095.00 you can edit horizontally. You should not expect an overly sophisticated machine however. There is no amplifier. You provide it. There are no flywheels. If you want them, they cost $100.00 each. If you want a mag stripe

Continued on Page 1302

More and more excellent Super-8 splicers, utilizing both tape and cement, are becoming available on the market.



SUPER-8 SYNC SOUND PROJECTORS

The projector is much more important in Super-8 filmmaking than in 16mm, because it is often used to transfer sound from fullcoat to edge-stripe

By ROBIN OGDEN

The projector plays a much more important role in Super-8 filmmaking than it does in 16mm. The reason is that the Super-8 projector is often used as part of the sound transfer system for getting sound from fullcoat to magnetic edge stripe (and from stripe to fullcoat in the case of single-system original films). Filmmakers doing their own sound transfers may find it necessary to own more than one machine — with one primarily for screening or presentation and another dedicated to sound transfer work. Active Super-8 producers will eventually use still other types of Super-8 projectors such as continuous-loop repeating projectors for exhibits, telecine projectors for video film chain work, Xenon-arc or metal-arc lamp projectors for theater use, and interlock projectors for screening a workprint with double-system sound just before final editorial decisions are made. Most of these types of projectors are available now in Super-8, and are described below.

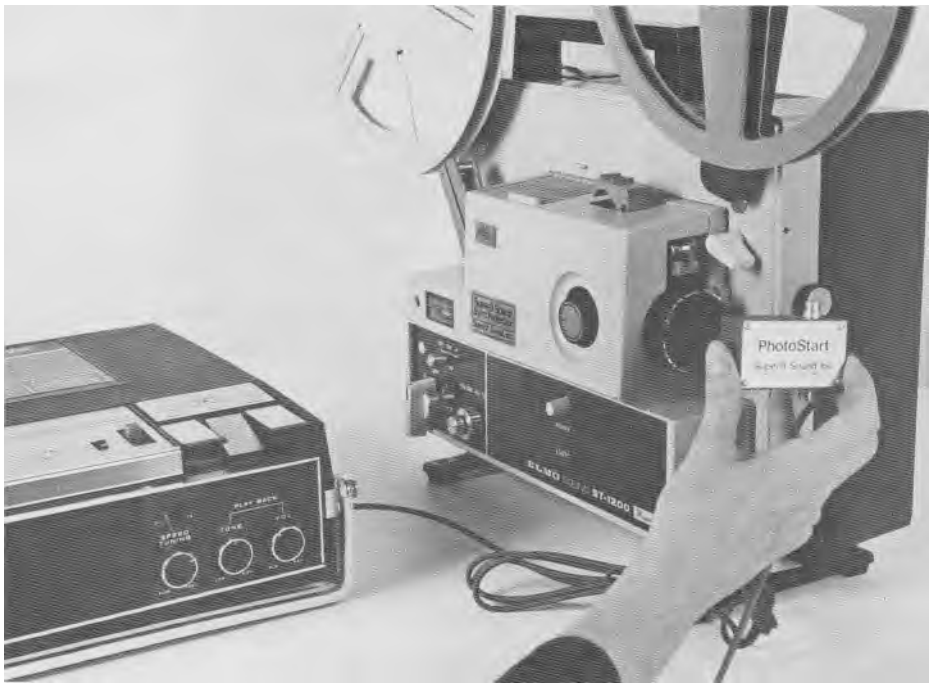
Any Super-8 sound-recording projector can be adapted for sync work with the installation of an inexpensive sync signal generator, e.g., a one-pulse-per-frame (1/F) magnetic reed switch device. This sync signal is used to control the speed of fullcoat mag film on the Super-8 Sound Recorder, matching up picture and sound on an exact frame-for-frame basis. All projectors supplied by Super-8 Sound are sync projectors, and Elmo is now supplying all its ST1200 projectors with the standard 1/F sync signal.

To start sound and picture in sync, both projector and recorder can be plugged into the same switched outlet box. When power is turned on, both machines make a "common start". If start frames of picture and sound are precisely at the gate of the projector at a calibrated point near the nagnetic head of the recorder respectively, the two will start in sync and then remain in sync because of the Super-8 Sound Recorder's speed servo-control. A sync start method superior to common start is a photoflash start, in which a punched frame in opaque leader fires an electronic switch to start the fullcoat recorder. Super8 Sound's Photo-Start device plugs into the remote control jack of the Super8 Sound Recorder, and prevents the Recorder from running until activated by a bright flash of light, e.g. a scraped frame of an opaque leader, or a 1000Hz burst of bloop tone. This device insures a repeatable double-system sync start without the frame calibration required for "common start", and works with projectors such as the Bolex SM8 which don't have the "inching knob" required to get the sync start picture frame exactly at the gate.

If you want to be able to stop and restart the projector, and even rewind. in sync, then you need the capabilities of a double-band (picture film and magnetic film) interlock projector. A machine with such rock-and-roll capabilities is available from Super8 Sound and is described below.

The installation of a 1/F sync signal is a simple task that can be accomplished by any camera repair technician. Super8 Sound provides a kit of materials — magnetic reed switches, magnets, mounting strips, adhesives, cable with wired DIN plug — and a set of basic instructions that cover installation of a 1/F sync contact switch in most popular Super-8 projectors. They also do installations.

Super-8 projectors equipped with a once-per-frame sync switch may be used to transfer sync sound directly from Super-8 fullcoat magnetic film to the magnetic edge-stripe of a Super-8 print. A flash frame on the opaque leader of the picture film fires an electronic switch to start the fullcoat recorder.



ELMO ST1200 SYNC PROJECTOR

The Elmo ST1200 stands out as the best general purpose Super-8 projector currently available. It has the largest reel capacity (1200 feet, 365mm), one of the brightest lamps, the fastest projection lens available in a Super-8 projector (f/1.1, as an optional extra), and an automatic threading system that can be monitored by opening the projector side and (with difficulty) be unthreaded in the middle of a film. It handles fullcoat well, and it is almost impossible to damage film with the Elmo. The major drawback is the Elmo ST1200's poor sound fidelity on film spliced with tape. This is no problem for transfers to prints, or with a well-cemented spliced original, but every time a tape splice passes the loop former there is a significant wow, and occasionally a lost loop. It is easy to regain the loop with the loop former.

The Elmo ST1200 is the first Super-8 sound projector supplied directly by the manufacturer with a standard 1/F sync contact switch.

EUMIG PROJECTORS

The Eumig Super-8 sound projectors are the most widely used in the United States, primarily because they have been the lowest-priced adequate sound-recording and reproducing Super-8 projectors. The latest generation of Eumig machines have "High Quality Sound". a 10-watt IC

PROJECTOR	AMP POWER	FREQ RESPONSE	RECORD LEVEL CONTROL	INCHING	STILL	REEL CAP.	SPLICE HANDLING	LAMP VOLT/WATT	LAMP ANSI CODE	LAMP LIFE/ HOURS	LENS
Bolex SM8	8W	60-8500Hz	MANUAL (VU)	NO	NO	800'	EATS FILM W/TAPE SPLICES	↑2V/100W	EFP (P6834)	50	f/1.3, 15-25mm
Bolex SP8	3W	75-10,000Hz	AUTO/MANUAL (LED's)	YES	PREHEAT ONLY	600'	GOOD	↑2V/100W	EFP	50	f/1.3, 15-30mm
Bolex SM80	↑0W	75-10,000Hz	AUTO/MANUAL (LED's)	YES	PREHEAT ONLY	600'	GOOD	↑5V/150W	EFR	50	5/1.2 ↑2.5-25mm
Bolex SP80 Special	I OW	75-10,000Hz	AUTO/MANUAL (LED's)	YES	PREHEAT ONLY	600'	GOOD	↑2V/100W	EFP	50	1/1.3, 15-25mm
Elmo ST1200	10W	50-9500Hz	AUTO/MANUAL (VU)	YES	YES	1200'	SOUND WOWS W/TAPE SPLICES	↑5V/150W	EFR	50	f/1.3, 15-25mm, 5/1.1, 12.5-25mm, 5/1.4, 25-50mm
Eumig 5807	3W	75-10,000Hz	AUTO	YES	PREHEAT ONLY	600'	FAIR	12V/75W	(P68531	NA	1/1.6, 17-30mm
Eumig 810 HOS	↑0W	75-10,000Hz	AUTO	YES	PREHEAT ONLY	600'	FAIR	↑2V/100W	EFP	50	f/1.3, 15-30mm
GAF 3000S	NA	↑00-5000Hz	AUTO	NA	NA	400'		↑2V/150W	DNE	↑2	1/1.3, 15-25mm
Kodak Ektasound 245	NA				YES	400'	EXCELLENT	30V/80W	DFE	50	5/1.3, 15-30mm
Kodak Supermatic 70	4W	↑00-5000Hz	AUTO/MANUAL (VU)	NO	YES	400'	EXCELLENT	30V/80W	ELB	15	5/1.3, 15-30mm
Kodak TVM100A	4W	↑00-5000Hz	MANUAL (VU)	YES	NO	↑200'	EXCELLENT	21V;150W	DNF	25	5/1.6, 5/2.0, f/2.5
Sankyo	NA	NA	AUTO/MANUAL (VU)		NO	600'		↑2V/100W	EFP	50	5/1.4, 15-25mm
Si!ma Bivox D-Lux	4W	↑00-7000Hz	MANUAL	NO	PREHEAT ONLY	600'		12V/100W	EFP	50	1/1.3, 16.5-30mm
Videotronic Compact	5W	NA	NA	NO	NO	400'		21V/150W	DNF, E LZ, ELV	25	

Sync Projector Data Table

A note on sound projector fidelity: Figures quoted here are as supplied by manufacturers, who vary widely in their criteria for frequency response, power output, etc. Power is generally quoted at the 5% distortion level. Frequency response is generally quoted if there is any response — a few manufacturers also give the range over which response is linear within a certain ±dB figure. Most projectors have a significant 24 Hz flutter component, at least .2%.

amplifier with excellent frequency and signal/noise ratio. They have an inching knob and a dimly visible still frame illu minated by the lamp preheat position. They have automatic threading, automatic gain control only. There is no VU meter. They have a significant 60Hz hum on playback (you must learn to adjust the hum-bucking coil) and it is essential to have an equalizer with a 60Hz cut for transfers from strip to fullcoat. They handle fullcoat well, but are unforgiving if improperly loaded and occasionally chew up polyester-base fil ms.

BOLEX PROJECTORS

The Bolex SM8 is a very sturdily built projector. It is reliable with well-cemented acetate base splices. It has a VU recording meter and manual gain control. However, it is autothreading, and cannot handle fullcoat or polyester-base Single 8 films. It often buckles at a tape splice and chews up the film in the top sprocket. There is no inching knob and no still frame.

The Bolex SP8, SP80, and SM80 are built for Bolex by Eumig and are mechanically similar to the Eumig projectors — inching knob, dim still frame, 60Hz hum. and no VU meter (LED's are used for record level). They have manual gain control as well as automatic gain control. Bolex too have added superior integrated circuit electronics to their latest machines.

KODAK SUPERMATIC 70 PROJECTOR

The Supermatic 70 is Kodak's compromise between a conventional projector and a continuous-loop cartridge projector. It accepts film in Kodak Supermatic cassettes, and projects them onto either a built-in Ektalite screen or a standard wall screen using just one lens. It has high speed automatic rewind through the gate, and is ready to restart moments after showing the film. It has still frame, automatic or manual gain control, and a VU meter. The same Supermatic cassette fits the Kodak Videoplayer VP-1 or VP-X.

EASTMAN SUPER 8 VIDEOFILM PROJECTOR TVM100A

The TVM100A is a conversion of the rugged Kodak Pageant chassis and is probably the heaviest-duty Super-8 projector on the market today. An open port on a multiplexer is all that is required to give a TV station full Super-8 capability. The TVM100A is AC-synchronous at 24 fps. It's 5-bladed shutter produces 120 images per second. It has remote control of all functions, and an inching knob, but no still frame. It has automatic threading through the gate. The lamp is a 21V/150W ANSI code DNF, with a 3-level lamp switch. A neutral density or color correction filter holder is provided. It has manual gain control with a VU meter.

ELMO TC1200 TELECINE PROJECTOR

Elmo makes a telecine version of their fine ST1200 projector. 60Hz (U.S.) and 50Hz (Europe) versions are available. The 1200-foot reel capacity (360m) holds one hour of film, with magnetic or optical sound tracks. The Elmo TC1200 has a special telecine lens (25-50mm), and a 15V/150W lamp. The automatic threading is removable in the middle of a film. The 60Hz version produces 120 images per second; the 50Hz produces 50 images per second. It has remote control of forward projection only.

CONTINUOUS-LOOP SUPER-8 PROJECTORS

These cartridges projectors are highly portable rear-screen projectors (some with optional front screen), usually packaged in an attache case. Console versions are also available. They allow Super-8 sound films to be

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SUPER-8 TO THE SUMMIT

A slap-happy Super-8 sync sound safari conquers Mt. Rainier, with the sustenance of Ding Dongs, M & M's, Budweiser six-packs and Kool-Aid

By AMBROSE SALMINI

"3 Climbers Fall Into Crevasse"
"Avalanche Buries Mountaineers"
"Rescue Helicopter Crashes Into Mountain"
"Frostbite Claims Toes, Fingers of 'Lost' Climbers"

Even though Jim Mitchell assured me the weather forecast was excellent, recent newspaper headlines like these spoke with a little more authority. I knew Jim had just spent four days bivouacked in a snow cave in some "excellent" weather. Jim is an internationally famous mountain guide who would be leading a group of climbing students up 14,410-foot Mt. Rainier in Washington State. I had been working on a series of survival education films with Jim, and he felt an instructional film on mountain climbing would fit in very nicely.

Jim couldn't understand why I wasn't enthusiastic about shooting sync sound while going over, under, around, and through glaciers, crevasses, avalanches — especially above 10,000 feet.

I was starting to run out of excuses.

"The rental shop won't let me have another thing unless I leave my car for deposit."

"Leave the driving to me."

"How can I load an Arri in blowing snow at 3:00 a.m. with freezing hands?"

Jim, not knowing a Panavision conversion from an Instamatic (1'd at least seen a picture of the Panavision): "Use that cartridge film that you can buy in all the drug stores."

"Don't be ridiculous, that's Super-8 film for those amateur cameras .. .

Zap! I found myself repeating, "... Super-8 film for those amateur cameras ... long zoom lenses, auto and manual exposure, fast and slow motion, self-contained batteries, lightweight, portable ..."

Setting up to shoot at "Base Camp" on Mt. Rainier. A variety of Super-8 cameras were used, shooting both double-system and single-system sound. The footage was shot for ultimate transfer to 2-inch video tape, with digital time code readout to aid in editing.

Three days later (artistic license) in the parking lot at the 5,500-foot level of Mt. Rainier I was desperately attempting to shove one more Super-8 50-foot cartridge in between a peanut butter and jelly sandwich and a first aid kit.

At some point the lightweight and portable concept became: the Hamton Engineering modified Nizo S56 and Sony TC124 cassette recorder for sync shooting; Kodak Ektasound 130 for research and development purposes (also to separate Ding Dongs from extra socks); Bauer C5XL modified with a once-per-frame contact switch; Minolta D-6 with Intervalometer; Super8 Sound Recorder to shoot sync with Bauer; Sony TC55 cassette recorder for wild sound; Bolex tripod with small Miller fluid head; Mountain Safety Research rock helmet modified by me for POV shots; Bolex 233 camera for mounting on helmet; Instamatic X15 for still photo documentation; and 50 cartridges of the amateur stuff.

My brother, Peter, usually acts as sound operator/gaffer/grip/gofer. He had conveniently chosen this weekend to shoot a documentary about water skiing on Lake Washington. Thus, Jeff Tobolski, a local pilot/fisherman/tape-gap expert, was recruited as sound operator/tape-gap expert/Sherpa (a Sherpa is one who carries your equipment, gets paid very little, and calls you Sahib). We dispensed with the Sahib routine and shot a couple of quick interviews in the parking lot as the sun went down Friday night.

Thinking out loud, I mumbled, "If I leave my first aid kit in the car I'll have room for five more film cartridges and a pack of M & M's."

Jim emerged from the Ranger Station where we had all registered. "Looks like another group fell into a crevasse up on top ..." Then, without a pause, "... Make sure you all have your 12 essentials — extra wool clothing, emergency food and shelter, water, waterproof matches, candles, fire-starter, flashlight with extra bulb and batteries, map and compass, a signalling device, knife, extra sunglasses, and a first aid kit. We're leaving in five minutes."

Although I had planned more extensive coverage of the parking lot departure, it was now 9:00 p.m., Friday, and Jim planned to climb for an hour or so before camping at the base of the Nisqually glacier. Jeff and I filmed a bear going through garbage cans with the Super8 Sound Recorder and the Bauer C5XL and then decided to leave them in the car. The Super8 Sound Recorder has proven to be an excellent resolving, dubbing, transferring machine in the studio — but it's a bit heavy to haul up mountains. The C5XL is a fine existing light camera with a 5-to-1 zoom that runs at 24 fps. With a 230-degree shutter, f/1.2 lens, and Ektachrome ELA 160, it's damn near possible to shoot by moonlight. The Bauer was modified by Willie at Professional Camera Repair in New York City, who added a once-per-frame contact switch — this contact switch is necessary for many of the sync systems now on the market. Some Bauer people tell me their repair facilities are capable of making this conversion quicker and cheaper, but I haven't checked. The C5XL works especially well at rock concerts where the noise of its 60 H.P., two-cycle engine is easily mistaken for a drum roll.

Continued overleaf

(LEFT) The climbers on Mt. Rainier, buffeted by icy winds and cheered by the roar of recurrent avalanches, arrive at the conclusion that it would be a nice day to shoot a water-skiing documentary on Lake Washington. (LEFT) On the summit of Mt. Rainier, Jim Mitchell records the historic moment for posterity with a Hamton Engineering-modified Nizo S56 camera synced to a Sony TC124 cassette tape recorder.

"Man from Mars" rig features a Bolex 233 camera mounted on Mountain Safety Research helmet, with cable release.

The author waiting to be pulled from crevasse during filming of crevasse rescue practice prior to Mt. Rainier summit climb — a requirement.

Shooting with Ektasound 130 on summit of Mt. Adams. Note Mt. Rainier in background. In snow, over-exposure of 1/2 to 2 stops Is required to photograph people.

(ABOVE LEFT) The author, with one of the four cameras he hauled to the summit. (CENTER) The magnificence of 14,410-foot Mt. Rainier, as seen from 50 miles away. (RIGHT) Array of Super-8 equipment carried to the summits of Mt. Rainier and Mt. Adams. (BELOW LEFT) Filming with helmet-mounted Bolex 233, while crossing crevasse In which two climbers had just spent 56 hours awaiting rescue. (RIGHT) Jim and Nancy Mitchell during early summer filming of survival education series.

Crisis #1 struck when Jeff attempted to pull on his backpack. With the help of two innocent bystanders he got strapped in and began calling me many different names, none of which was Sahib. Crisis #2 struck when a third bystander had to be called over to help the other two lower the pack on my back. I began yelling about six-figure budgets and National Geographic Specials where camera operators only have to carry a light meter. Then Jim gave his inspiring, "Because it's there!" presentation. Twenty yards from the parking lot, still deeply inspired and only slightly exhausted, Jeff turned to me —

"You forgot something."

Thinking I had enough film, batteries and equipment for a twenty-six week series, I cautiously asked, "What?"

"You forgot to put the Budweiser in the cooler."

A serious error, quickly corrected — as I say, these Sherpas work for cheap wages.

The local lab seems to hate Super-8, and they take it out by processing my EFB 7242 in warm bath water and cleaning it with wire brushes. If nothing else, they are consistent. I've tried several different labs with the Ektachrome EMA 40, and it always comes back soft, grainy, washed-out, etc. — must be the film. As with larger formats, some emulsion batches just seem to be bad — perhaps a function of Kodak "stock" on Wall Street. The "2 stops more fun film," Ektachrome ELA 160, is a good original for prints on Ektachrome 7389, and it's only one stop more expensive. I had thirty cartridges on my back. Jeff carried twenty cartridges of Kodachrome II so we could qualify as amateurs and thus avoid getting releases from the climbing party. I also planned to go directly to 2-inch videotape with the finished film, so I wanted different stocks to play with.

Secure in the knowledge that the Buds were now getting cold, we shifted into high to catch up with the pack. Soon we were 50, 60, then 70 yards from the car. I wanted to get some silhouette shots against the full moon overhead. "Pat on the Back" #1 goes to me for rigging a camera harness which allowed one hand to get warm in a pocket and the other to get cold on the ice axe. At all times in the climb I had a camera in position ready to film avalanches, falling climbers, Yeti (Abominable Snowpeople — locally called "Sasquatch") and occasionally I got the lens cap off in time to get something.

Spectacular shot #1 was accomplished with the Ektasound 130 (Yup!) and 160 film. The Bauer stayed in the car because I couldn't see hauling two XL cameras — the 130 went for political/financial reasons (a product report for the National Enquirer). Moonlight reflecting off the snow gave a sacred existential glow to the climbers.

Although the Ektasound 130 only cranks at 18 fps, the silent footage could easily be cut with the 24 fps footage (most uphill climbing takes place at a snail's pace — it's the head-over-heels downhill footage that's a little jerky).

We had a slight 40-degree slope to go down to reach "Base Camp". I remembered to yell "Falling!" just as I reached terminal velocity — then remembered it only helped to yell "Falling!" if you are on a rope team and the other team members can help you stop. I got my ice axe in the full stop position in time to see Jeff go by head-first. We both laughed this off 300 yards below until I realized my camera insurance policy covered floods, nuclear blasts, earthquakes, exorcisms — but nothing about crevasses.

Fortunately, Jeff had turned on the Sony TC55 before he fell, so we already had some nice documentary sound of a Sony ECM16 mike flailing down a snow field. This technique of anticipating exciting events proved to be very valuable in the course of the next few days.

Although my down sleeping bag had been advertised "good to 30 below" and priced accordingly, it apparently hadn't been tested with 3 cameras, 2 boots, 2 quarts of water, $30 worth of batteries, and 1 body. As mountaineers affectionately put it, "I slept cold." I dream of helicopters, five-figure budgets, the parking lot — and woke up with the imprint of a Minolta D-6 in my left side.

Our gourmet breakfast of Ding Dongs and Kool-Aid hardly digested, we decided to get up ahead of the party for a potentially beautiful sunrise shot. We spent the next hour trying to differentiate a Singapore Slip Knot from a Bowline. Finally roped up with prusiks in place (a prusik enables a conscious climber to ascend from a crevasse), we crossed the Nisqually glacier and set up a telephoto shot with the Nizo on the tripod. The problem with the Nizo is that its Schneider lens is too "cold" — if that's a problem. It's hard to cut some of its crisp footage with that shot by the warmer Minoltas, Bauers, and Kodaks. The early Nizos had trouble pushing through some of the thicker emulsions, such as Tri-X. The "multiple imaging" on single frames that resulted was a nice effect, but, unfortunately, there was no way of predicting or controlling it. This apparently can be completely corrected with a take-up torque adjustment. The blimped crystal-controlled Nizo modified by Hamton Engineering was the first and perhaps the best of the professional Super-8 sound cameras ever manufactured. Unfortunately, production was stopped several months ago — but many other manufacturers have jumped in with continuously upgraded lines of cameras and camera controls for both single and double-system filming.

Now the work began. Our objective for the day was Camp Hazard at 11,500 feet. This meant about five miles and 6,000 vertical feet, and that's a lot of Kool-Aid. In spite of the frequent need of cardiopulmonary resuscitation (air), Jeff was doing as fine a job as any high-priced Sherpa. From a precarious perch on a cliff, we shot some nice instructional sequences of Jim pulling people up the mountain.

Pat on the back #2 goes to Jeff for constantly reminding me to disregard automatic exposure readings when there's snow around. The automatic setting will make snow look like an 18% gray card and the brightness range is too great for the film to record. Depending on light conditions, it's necessary to overexpose anywhere between 1/2 and 2 stops to get the proper exposure for subjects on the snow. This tends to wash out the snow, but take your pick — two-dimensional silhouettes or washed-out snow.

When the sun got pretty high I threw an ND 0.50 filter on the front of the Nizo to bring the light down 1-1/2 stops to acceptable exposure levels for the diaphragm to handle.

Spectacular shot #2 was a time-lapse sequence filmed with a Minolta D-6. I got the climbers running up a 2,000 foot slope in six seconds. The Minolta Intervalometer P which I had can be adjusted to expose a single frame once every half-second or with other settings up to once every hour. This time-lapse stuff usually gets a laugh because it relieves the boredom of the rest of the film, so it was probably worth the extra ten pounds. I brought the D-6 along because from past experience I knew it would function even if everything else quit — even if I didn't sleep with it to keep the batteries happy.

We arrived at what was supposed to be Camp Hazard at 5:00 p.m. All Jeff and I could see was a hairy rock slide area with a seventy-foot glacial wall hanging overhead — a nice place to camp. Jim Mitchell began clearing a two-foot by eight-foot bedding area and stacked up stone slabs on the perimeter to form a grotto — like a little temple. Maybe he knew something we didn't, so we built our little grotto and put up a prayer wheel just to be safe.

Then we had some fun shooting dinner preparations. By adding a little water to what looked like an air-sickness bag

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SUPER-8 SYNC SOUND PROJECTORS

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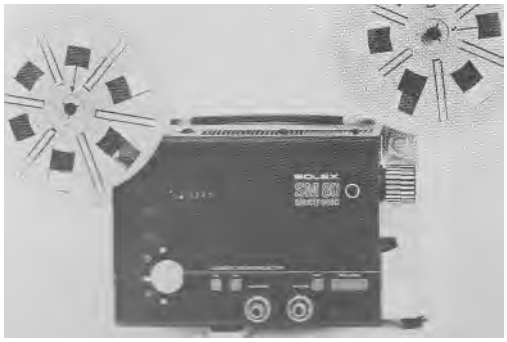
shown in a normally-lit office, plant, or exhibit. They are widely used by salesmen to make a specific point that is best made by a short single-concept film. They are much less expensive and more portable than color videotape recorders/monitors that are also widely used to accomplish the same thing.

A large fraction of all Super-8 release prints made are presented in the continuous-loop format. In the past such films were produced in 16mm and reduction-printed for Super-8 release. Today many Super-8 cartridge-loaded films are produced on Super-8 original stock, with a cost saving of between 50 to 70% on the stock cost, and a saving of 80% on the production and post-production equipment costs, when compared to 16mm production.

The three most popular types of continuous loop projector are the Technicolor, Fairchild, and Videotronic. All three now use magnetic sound tracks. Because there is no interchangeability of cartridges between different brand projectors, producers whose clients already have such equipment must be supplied with the Technicolor and Fairchild cartridge projectors, but we recommend that a new installation be equipped with the remarkable MPO Videotronic Compact Super-8 projector.

We have found the Videotronic to be quieter, with better sound and a brighter, larger picture (the 21V/150W bulb is the strongest used in any Super-8 projector), and in a lighter and smaller package than the Technicolor and Fairchild units. With an auxiliary lens, the Videotronic can also be used for front-screen projections.

The Bolex SM80 is one of a fine line of Super-8 sound recording projectors incorporating an inching knob, still-frame, sound-on-sound recording, manual and automatic gain control.



ELMO SC-8T REAR SCREEN PROJECTOR

Although this is not a continuous-loop projector, it has many of the same applications. The Elmo SC-8T has basically the same mechanical and electrical components as the Elmo ST1200, but squeezed into a portable case with a large rear screen. It accepts film on reels (400 ft.), and can project them both rear-screen, and front-screen, with an auxiliary lens.

XENON ARC AND METAL ARC SUPER 8 PROJECTORS

A Xenon-arc conversion of the Heurtier ST42 is being offered by Valley Projection of Burbank, CA. The lamp is an ozone-free 500-watt Osram Xenon. 1500-hour lamp life. Another firm doing Xenon arc conversions of Super-8 projectors is the Optical Radiation Corporation.

We expect that General Electric or Sylvania will soon offer a version of the Marc (GE) or Colorarc (Sylvania) metal-arc lamps and power supplies suitable for replacing the standard Super-8 quartz-halogen lamp. Most Super-8 projectors now use the common EFP lamp, and the blower system can adequately cool the lowest-power metal-arc projector lamps.

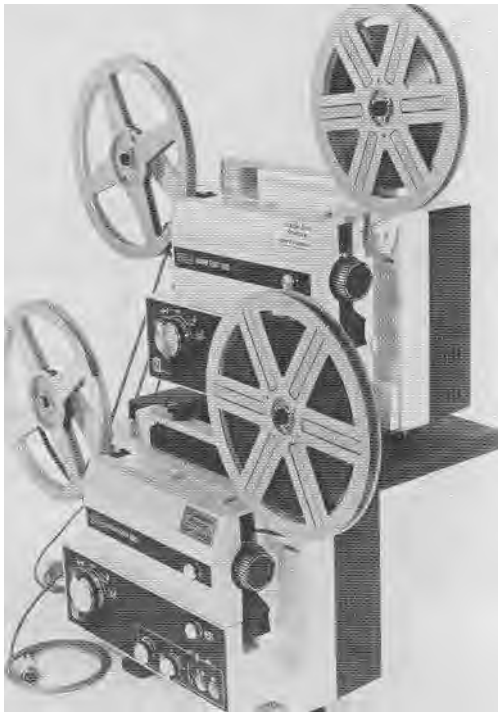
This is especially true of the Elmo ST1200, which already uses the 150W EFR bulb. Elmo has introduced a metal-arc projector in Japan, and we hope it will be available soon in the U.S.

SUPERS SOUND DOUBLEBAND PROJECTOR

The Super8 Sound DoubleBand Projector is a versatile tool for the Super-8 filmmaker's sound studio, dubbing theatre and screening room. It consists of two identical Super-8 sound movie projectors which are mechanically interlocked to permit stopping, restarting, and even rewinding in perfect sync. Its primary use is to permit a double-system screening of an edited workprint and fine-cut sync sound on Super-8 fullcoat magnetic film.

The two projectors can be instantly uncoupled and run separately. This permits easy threading of picture film and sound film. Each projector has an inching knob to facilitate setting of start marks in the gate. Once running in sync, either projector can be in the playback or the record mode, permitting sound transfers from fullcoat magnetic film to magnetic edge stripe, or from stripe to fullcoat.

Each projector is equipped with a once-per-frame (1/F) sync contact switch, permitting sync operation with the Super8 Sound Recorder. With the



The Super8 Sound DoubleBand Projector, based on the Eumig S807, makes possible in Super-8 the interlocked double-system screenings so necessary for many applications. The two projectors may also be separated for individual use when needed.

DoubleBand Projector and two Super-8 Sound Recorders, a two-track sync sound mix can be made while simultaneously viewing the picture workprint. Of course, wild sounds may be mixed in at the same time. If Super-8 fullcoat is run in both projectors, a three-track blind mixdown can be accomplished.

The DoubleBand Projector can be used to dub new sounds on fullcoat in sync with the picture. Its sync rollback capability allows concentration on just one short segment at a time. A short loop of picture, or original sound, can be run in one projector for the repeated playings needed to achieve a precise replacement of the original material.

For further details on Super-8 projectors, including the cables needed to do double system screenings and strip/fullcoat transfers, send for a copy of the SuperB Sound Catalog ($1) and SuperB Sound Recorder User's Manual ($1) to SuperB Sound, Inc., Dept. P, 95 Harvey Street, Cambridge, Mass. 02140. ■

(ABOUT THE AUTHOR: Robin Ogden is a video and film producer at Video Vision, an experimental video production company in Cambridge, Mass. He has experimented with the Kodak Videoplayer and is a consultant at Super8 Sound, where he is setting up an inexpensive film/video transfer service using the Videoplayer.)

THE DEVELOPMENT OF PROFESSIONAL SUPER-8

Super-8 originated as an improved format for home movies, but the professional world is now beating a path to this "better mousetrap"

By RODGER J. ROSS

Fifty years ago a new generation of filmmakers was learning how to make use of 16mm film for what was then termed non-theatrical production. That format was introduced in 1923, when the Eastman Kodak Company began to manufacture 16mm film on a safety acetate base that could be processed with a reversal method to give positive picture images on the original film exposed in the camera. Intended from the first to meet the needs of amateur movie makers, it was soon found that 16mm offered many new — and highly profitable — opportunities for utilizing film as an audio-visual medium in situations where 35mm was either too cumbersome or too expensive. The professional 35mm sector of the motion picture industry put the stamp "sub-standard" on 16mm, but this only served to spur enthusiasts to demonstrate the advantages of the new format, and as manufacturers improved film materials and equipment, and better film handling methods were adopted, 16mm soon acquired professional status in its own right.

Today there is a new contender for professional status: Super-8. A film 8mm in width had been introduced in 1932, to still further reduce the cost of amateur movie-making. That new format was made available simply by slitting 16mm film in half. By the early 1960's demands for improvements in 8mm picture and sound quality gave rise to numerous proposals for a modification of the format. At the technical conference of the Society of Motion Picture and Television Engineers in Los Angeles in April 1964, Eastman Kodak proposed that the perforations should be reduced in size and placed nearer the edge of the film, giving fifty percent more space for the picture frames, and allowing placement of the sound track on the edge of the film opposite the perforations.

The proposed format was enthusiastically received. Within 12 months, equipment to handle the new 8mm film was being marketed and by the end of 1965 SMPTE engineering committees had under consideration no less than 16 standard proposals. The term "Super-8" was adopted to distinguish the new format from the older "regular-8." Within two years, almost every camera manufacturer in the world had discontinued the building of regular-8 cameras.

It was anticipated that an enormous mass market would open up for low cost Super-8 prints, mainly for educational and home use. However, a significant limiting factor in the universal acceptance of films for commercial and educational purposes was the inconvenience of traditional projection equipment. To remedy this situation many new designs for Super-8 projectors were developed, featuring automatic threading and cartridge loading. Manufacturers here and abroad rushed into the design and production of competing incompatible cartridge projection systems. This lack of concern for interchangeability no doubt bewildered many prospective Super-8 film users. Visionaries of the 1960's predicted that department stores would sell as many Super-8 films as record albums, and our local libraries would circulate vast numbers of "paperback films", but disregard of the user's needs choked the full development of Super-8 as a communications medium.

In contrast to the cartridge projector situation, a consensus was reached quickly on the main features of Super-8 camera design.

The daylight-loading camera cartridge was accepted as the most convenient method for handling film. The camera should have an automatic exposure control system, eliminating laborious calculations with an exposure meter. The drop-in film cartridge should have notches in the leading edge to automatically set the exposure-control mechanism for the speed of the film in the cartridge. A large, bright, upright viewfinder display should be provided with an easily visible indicating needle showing f/stop at which the control system sets the lens. The camera should be fitted with a motor-driven zoom lens. Dry cell batteries in an internal compartment should be utilized to supply power for the camera motor and zoom lens. The camera should be designed for hand-holding, and it should be as light, small, and fool-proof as possible.

Many variations on these basic design features, in a price range from about $200 to $1200, have emerged in the market place, as amateur movie-makers, and later on, professional film producers began to explore the possibilities that Super-8 offers. Some

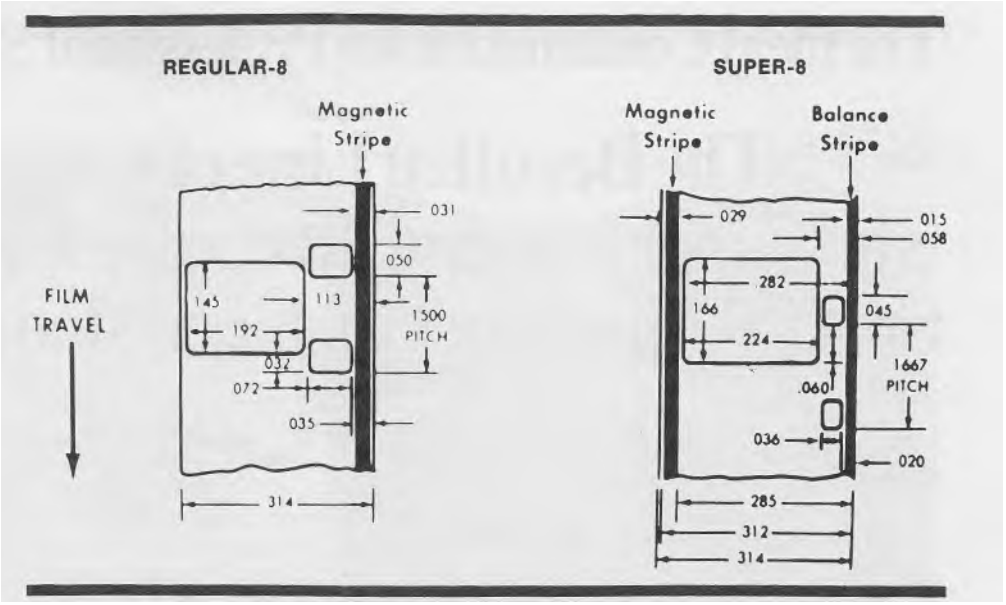
The photograph below shows various Super-8 picture and sound stocks, as compared to their 16mm counterparts. Shown from left to right are: Super-8 picture film; Super-8 leader, with magnetic edge stripe area; Super-8 "fullcoat" magnetic film; 16mm double-perforated picture film, used in silent or double-system filming; and 16mm fullcoat magnetic film, used to record the sound in double-system filming.

cameras can be run backwards, enabling effects such as4ap dissolves to be incorporated while the original film is being exposed. Many offer a choice of filming speeds, from 80 frames/sec. down to still-frame exposures. One significant improvement over regular-8 is what might be termed "in-camera editing." Super-8 cameras have an instant stop-start action of the shutter, so that no frames are overexposed at the beginning or end of a shot. The join-up between one scene and the next looks like a physical splice.

At first, Super-8 cameras did not have sound recording capability, mainly because sound was not a major consideration for amateur movie-makers. Those who insisted on the need for sound with the pictures could have a magnetic strip applied to the edge of the processed camera films, and then a voice-over recording could be made using a recording projector. In 1969, Bell & Howell introduced a double-system sync camera to the market, a separate tape recorder being used for the sound. With this arrangement, pulses generated in the camera were carried by a cable to the tape recorder and laid down as a separate track on the tape. These pulses were then utilized in projection to synchronize the playback of the tape with the picture projector. There was no capability for editing; even simple rearrangement of sync shots was essentially impossible.

In 1972, the documentary filmmaker Richard Leacock announced the development of the first complete professional Super-8 system. With the assistance of a $300,000 grant from the Massachusetts Institute of Technology, Professor Leacock and his associates modified consumer market cameras, recorders, and projectors to provide professional capabilities. The camera was blimped to reduce operating noise and crystal-controlled, eliminating the cable connection to the cassette tape recorder, which recorded sync pulses from a built-in crystal generator. A fullcoat magnetic film recorder was built with a capability for transferring (resolving) sync sound from the location cassette. A 4-plate motorized horizontal editing table was constructed for editing of picture film and magnetic film. A projector was modified to incorporate a 5-bladed shutter and AC synchronism, which permitted synchronous transfers of Super-8 film to a color video camera.

Eastman Kodak announced an AC synchronous telecine version of their M100A projector the same year, and in the spring of 1973, Robert a Doyle, a research fellow at Harvard University. developed a portable fullcoat magnetic film recorder compatible with the Bell & Howell double-system and the MIT/Leacock system, including crystal sync. Doyle's new firm, Super8 Sound of Cambridge, Mass., also announced inexpensive double-system editing equipment based on conventional mechanical synchronizers, rewinds, viewer, and magnetic head. Double-system screenings were achieved by installing a one-contact-per-frame sync switch in the projector.



A comparison of the old "regular-8" format and the present Super-8 format, introduced by Eastman Kodak in 1964. Note that the Super-8 format has a much larger picture area, smaller sprocket holes, placement of the magnetic edge stripe opposite the sprocket holes, and a "balance stripe" to equalize the film plane in both the filming and projection to insure equal focus across the width of the film. Overall film widths of both formats are exactly the same: 8 millimeters.

Single-system sound came to Super-8 with the announcement in the fall of 1973 by Eastman Kodak that camera films with a magnetic stripe would be made available in 50-ft. cartridges at a cost between $5 and $6. Soon a number of single-system Super-8 cameras appeared on the market, the most notable of which were the Kodak Supermatic 200 with 24 fps operation and 10 minute, 200-foot film loads, and the Beaulieu 5008S, which has a 6-80mm zoom lens, an f/1.2 (T/1.4) aperture, and high-fidelity sound performance.

The scope of Super-8 utilizations has been extended still further with the introduction by Eastman Kodak of their film video player, VP-1. This small, compact, automatic device, at a cost less than $1400, gives a video output from Super-8 film that can be displayed on television picture monitors and receivers. The quality of the television pictures from the videoplayer compares favorably with those obtained through the use of much more complicated and costly equipment.

Original filming with Super-8 cameras has the disadvantage that it is somewhat difficult to make prints, and some losses in picture quality cannot be avoided in the printing process. Filmmakers associated with television broadcasting have discovered thatthere are many advantages in transferring the original Super-8 films to videotape. From that point on, various promising avenues of exploitation open up. For example, the film sequences for a program can be edited into A & B rolls and, during the transfer to videotape, access can be gained to the full range of electronic special effects that a television studio control room offers.

This method of program assembly has the advantage that once the transfers to videotape have been made, the Super-8 originals can be retained in safe storage, while distribution of the program can be effected with any of the popular videotape formats.

At the SMPTE technical conference in Toronto in November, 1974, the chairman of the Super-8 study group of the Canadian Broadcasting Corporation, Karl Kruger, described his group's research with Super-8 as an original medium for television production. Equipment studied included the MIT/Leacock system, the Super8 Sound Recorder, a custom-engineered fullcoat recorder that was selsyn-interlocked with a Kodak TVM100A, and a rear-projection system that gave excellent television pictures from Super-8 film. This was accomplished by setting up a studio camera facing a small translucent screen in a light box. The light beam from the Super-8 projector was directed by an arrangement of mirrors inside the box to the rear side of the

Continued on Page 1321

TEACHING FILMMAKING WITH SUPER-8 AT MIT

How the modification of appropriate existing equipment, funded by a $300,000 grant, led to the development of a complete Super-8 filming methodology modeled closely on existing 16mm crystal-sync systems

By JOHN TERRY

The Massachusetts Institute of Technology began a limited film production course in 1969 under the supervision of Ed Pincus. Richard Leacock became the director in 1970, and I joined the program shortly thereafter. From the beginning the basic philosophy of film teaching at MIT has been to approach each student as a potential filmmaker rather than a potential technician. Filmmaking was approached not solely from a technical point of view, but from one that encouraged the student to consider his filmmaking experience on many levels — personal, political, sociological, etc. The relationship between ideas and their execution in film form has been our main point of discussion with students. The primary intent of the film curriculum is to introduce students from many disciplines to the techniques of making film, in the expectation that they will use this skill as a tool for research and exploration within their own fields. The way in which we have attempted to implement this philosophy in the past six years has been dependent on the level of technology with which we have been able to equip ourselves and the problems and successes we encountered.

We began production courses with 16mm non-sync Bolex and Scoopic cameras and Sony 1/4" reel-to-reel tape recorders. Students learned double-system editing on Moviolas and synchronizer/viewer/squawk box combinations. From the beginning we felt the necessity for teaching double-system techniques as the primary grammar of filmmaking. Our limited facilities meant virtually no synchronous sound filming.

Al Mecklenburg and Charles Meyer thread double-system interlock projector for final screening of student films at U.F.S.C. Summer Institute. Also pictured are John Terry and Richard Leacock.

But the importance of sync cannot be overstressed. Significant work can be done non-synchronously, but a student must have the possibility of sync sound if he is to be given access to the full range of possibilities of film. Gradually, we developed a modest 16mm sync production facility. Introductory students continued to work with 16mm double-system non-sync, and advanced students were "free" to use the 16mm sync equipment. The limitations were largely of an economic nature. Often neither MIT nor the students could afford the budget for a serious sync film. Because of the high cost of 16mm sync cameras, we could own only a few of them; student demand was great and consequently students could spend only a limited amount of time in the field with the equipment. We thought that the existence of a Super-8 sync system might solve some of these problems.

Over the years, we have found that students who filmed on-going realities have had more expeditious learning experiences than those who have filmed directed performances. We have observed much less wasted time and effort by introductory and intermediate students filming an on-going interaction, event, or performance than by those who have also been responsible for the arrival, direction, and performance of actors and crews. Thus, the further reduction of the baggage of filmmaking by the development of a lightweight, highly portable and technologically simple Super-8 sync system seemed a most desirable goal.

In early 1971 MIT granted Richard Leacock $300,000 to develop a complete Super-8 production system, modeled closely on existing 16mm crystal-sync systems.

The design philosophy we sought to utilize was the modification of appropriate existing Super-8 products, whenever possible, rather than to design totally new equipment. Also, we attempted to find electronic solutions rather than mechanical solutions because we believed this would be a cheaper approach. We hoped our new designs would have many advantages for teaching film over existing techniques.

By the summer of 1971, we had modified two prototype Nizo S-56 cameras for cableless crystal sync. One was blimped and one was un-blimped.

In the prototype blimped camera all the crystal control electronics were fitted inside the camera body. Extending through the blimp were the automatic light meter control (which also allowed for manual setting), as well as the control which positioned an 85 (type A) filter in front of the film plane.

MIT's first sync prototype cassette recorder was a modified Sony TC 124. The crystal synctone electronics were mounted in a "black box" attached to the side of the recorder. Since the TC 124 was a stereo recorder, a 48 cps sync tone was fed into the line input of one channel and the microphone signal went directly to the microphone input of the other channel. A slating device (visible light, and a "beep" tone on the audio track) was considered to be a design requirement and was incorporated in even the earliest prototypes. Very quickly in our research it became apparent that high-quality cassette sound could only be achieved by using better microphones thar those supplied with the recorders. We chose the Sony ECM 21 electret condenser microphone.

By incorporating a pre-amp around the microphone itself, one was able to control volume with the fingers of the hand holding the microphone. We alsc included in the black pre-amp box a switchable low frequency cut-off filter which was very useful in eliminatinc wind noise and in improving the clarity of speech.

For editing, we had two jury-riggec motorized double-gang synchronizers with viewers. Thus equipped, we wen: off to Hampshire College to teach Super-8 sync-sound filmmaking for the first time. The occasion was the firs: U.F.S.C. Summer Institute, a three-week intensive gathering of students with teachers, filmmakers, photographers, film critics and historians of al persuasions.

Out of this somewhat primitive equipment came some remarkable filr efforts. MIT's research and development of Super-8 sync continuec spurred on by the success of our intensive course. Since the summer o' 1971, we have gradually equipped ourselves at MIT with more and more

Super-8 production equipment so that during the past year at MIT, both introductory and advanced production courses were conducted in Super-8 sync, and 16mm was used only for "special projects" (those projects with outside funding when the client clearly wanted 16mm production). We have also taught four more summer workshops, and from this experience a very interesting observation has emerged. There seems to be very little difference between student progress in the three-week intensive workshop and a regular one-semester course of work at MIT. Students seem to learn as much in three weeks (with classes every day, often editing all night) and emerge with about the same "level" of finished film as they do in a course meeting once or twice a week over four months of the academic semester. Though we have never performed similar comparisons in 16mm production (and we never could, due to the high cost of 16mm production), this would be an interesting experiment.

Teaching with both 16mm and Super-8 for five years has also raised several other interesting issues. Recently, another film teacher asked me directly, *"Is teaching Super-8 really different from teaching 16mm sync, or is it pretty much the same?"* The best answer I could come up with is, "Yes."

There are several facts about the nature of Super-8 sync that make intensive teaching situations a viable educational possibility. In our summer workshop courses, there are some students who have no comprehension of ASA, exposure, focal lengths, etc. After explaining a few switches, dials, and an initial discussion of automatic light meters (concentrating on the necessity of using them only to get a proper manual setting), students go out in pairs and shoot a test roll of sync! The next day, they resolve-transfer their sound and the problems of attaining good sound are discussed. The third day film is back from the laboratory; rushes are screened silently and camera work is critiqued. Students then proceed to the editing tables, where they sync up the test rolls. This seeming assembly-line-like procedure allows the students to experience the entire process of double-system filmmaking before actually beginning their film projects. This confronts directly the problems we encounter with students who arrive with ideas for cinematic projects that are not feasible because of the time span of the course and their level of technical expertise.

From the standpoint of cost, perhaps the most important difference between 16mm and Super-8, many questions arise. While the debate rages as to exactly how much cheaper Super-8 is than 16mm, let us accept, for the purpose of discussion, an estimate of film stock, mag film, and other editing supplies as being about one-half of the 16mm price per minute. Let us also accept the cost of Super-8 cameras and recorders, editing equipment, etc. as being about one-fifth that of 16mm equipment. Stock and equipment are separate issues, and we should discuss separately the implications of the cheapness of each.

Because of the lower capital value of the equipment, one can simply own more of it. At MIT we have seven Super-8 camera-recorder pairs and three 16mm camera-recorder pairs. This means we handle more students, who can film in the field for longer projects, can tackle projects further away from the equipment checkout room, and can be involved in higher "risk" situations. Students can film in areas of the city where it would not be wise for inexperienced filmmakers to appear with a 16mm sync rig that looks as if it's worth $10,000 (and indeed is). Because of the "lower profile," innocuous appearance of some of our Super-8 rigs, we never have had any of them stolen from students in the act of filming, which has sometimes occurred with 16mm equipment.

But the greatest virtue of cheaper equipment is the possibility of giving more students access to the equipment. Having more students necessarily means we will see a greater variety of interests in the people who are coming to learn. If an appropriate atmosphere for the exchange of ideas and viewpoints can be maintained, an opportunity for a superb educational experience will exist. Having increasing numbers of students in film is also a fact of the times. It is important to remember Laslo Moholy-Nagy's statement that "the illiterates of the future will be ignorant of both the pen and the camera."

Cheaper raw stock and mag film are also a plus, but not as clear a benefit as they might at first appear to be. One's immediate instinct is to believe that the more one can shoot, the greater the learning experience, and the better cameraperson one becomes. Generally, this seems to be true. However, in our summer workshop experiences I have often found that the students who shoot the most often do so because they have the least clear ideas of what it is they're after and therefore they go for a kind of "buckshot" approach and try to shoot everything. The same students often have trouble editing their films because they find that in shooting everything, they concentrated on nothing.

The most important aspect of camera technique that filmmaking

Continued on Page 1299

In the MIT prototype blimped camera all the crystal-control electronics are fitted Inside the camera body. Extending through the blimp are the automatic light control meter (which also allows for manual setting), as well as the control which positions an 85 (type A) filter In position in front of the film plane. The Sony TC 124 cassette recorder, unlike the final Hamton production model, has not yet had the crystal-sync generator electronics moved Inside the recorder body. This lack of internal wiring resulted In some degree of unreliability, due to plugs coming unplugged and the loss of sync or radio signal.

IS THE 18 fps "AMATEUR" SPEED ACCEPTABLE FOR PROFESSIONAL USE?

Even though 24 fps is the accepted sound speed in all professional formats, there is a case to be made for standardizing at the 18 fps rate for Super-8

By LENNY LIPTON

All Super-8 sound projectors can operate at either 18 or 24 fps. So can many Super-8 cameras. What does this really mean to you as a filmmaker? What are the reasons for the choice?

People coming to Super-8 from the larger 16mm or 35mm formats will probably advise you that the only speed to use is 24 fps. That's the way it's done in the larger formats. Although most 16mm projectors in service will operate at either 16 or 24 fps, few, if any, are suited for sound projection at 18 fps: the amplifier is usually turned off at the slow speed. And 16mm projectors designed for theatrical projection usually don't operate at the slower speed. Thirty-five mm projectors also rarely operate at what is considered to be the silent speed by professionals.

All in all, it's fair to say that a sound fil m at 18 fps for the 16mm or 35mm formats is totally incompatible with projection facilities.

How we inherited the two fps standards is an interesting story: Edison and his research associate William Dickson chose 48 fps for their battery-operated camera in 1889. (It's interesting to note that the very first movie camera was battery-operated. People didn't hand-crank cameras until the rate was lowered to 16 fps.)

While Edison was exclusively interested in peep show or nickelodeon display of his movies, the French Lumière Brothers, Louis and Auguste, had other ideas. They adapted early Edison apparatus and produced the first theatrically projected motion picture images. The Lumières, who were photographic plate manufacturers, decided that the Edison rate of 48 fps was too high to be economical, so they experimented with lower rates, and in 1895 settled on 16 fps. Twenty years later the Gestalt psychologists exhaustively determined this very same value for the phenomenon in their laboratories in Germany.

The Lumières were trying to produce an acceptable illusion of motion while using the least amount of film. So in the silent days of theatrical motion pictures, the standard was a nominal 16 fps. This was an era of hand-cranked cameras — and hand-cranked projectors as well. With an active audience in the theater, and a musical ensemble in the pit, the projectionist was creatively tied and profoundly alive to the dynamics of the moment, cranking the projector faster or slower to suit the dramatic circuit of images, audience response and music.

With the coming of sound, all that disappeared. (I was going to say forever, but the description reminds me of the great light shows that flourished in the rock houses of the psychedelic late '60s.) Sound forced the decision to raise the fps rate to 24 to get the most out of the unperfected optical tracks of those days. For the technology of the '20s, running 35mm at a higher speed meant less flutter, that gargling sound or poorly reproduced recordings; and it also meant better high-frequency response for clearer speech and more treble for music.

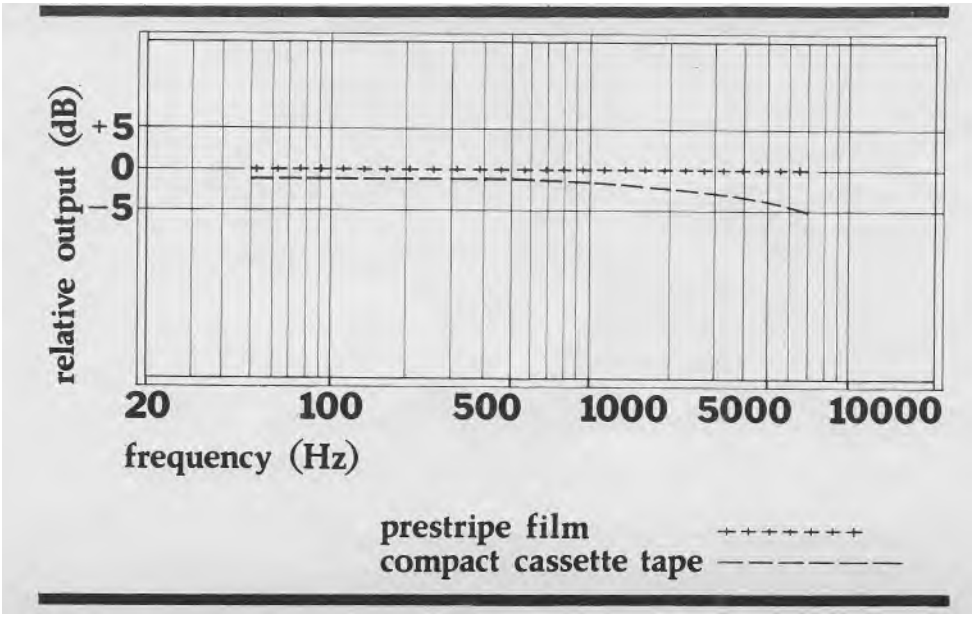
As I look at it, 16mm optical sound really didn't click until the '40s and the wartime need for sound entertainment and training films for the armed forces. Naturally enough, 24 fps was needed for good quality 16mm optical sound; as an important feature, it also provided compatibility with 35mm films optically reduced to 16mm.

In the early '50s, magnetic sound tracks for 35mm prints were developed, notably with four-track stereophonic sound for CinemaScope: but many theaters balked at having to install new sound equipment as well as screens and lenses, so Fox retreated from their original standards and added an optical track to their release prints. That's why you're more likely to hear optical than magnetic sound at your local theater.

Despite the fact that it's really a hell of a lot better sound than optical, 16mm magnetic sound never caught on in a big way in this country. It had two strikes against it from the beginning: magnetic sound prints are more costly than optical prints, and magnetic recordings can't be played back with the optical soundheads installed in hundreds of thousands of 16mm projectors in service.

But now we have Super-8. It's a whole new ballgame, a new era, and an opportunity to develop standards that are not locked into the technology of the past. Films made in Super-8 with magnetic sound meant for Super-8 projection or TV display ought to be shot at 18 fps. In terms of sound qualit\ there is no reason not to. Why stick to standards based on an obsolete med - um for original scund recordinc developed in an era that used tubes instead of printed circuit chips?

Comparison of cassette and striped film frequency response. Eastman scientists engineered a special tape deck that could accept either cassette tape or prestriped Super-8 film in order to eliminate the deck as a factor. Note superior stripe response, attributable to its higher lined rate (3 or 4 ips), compared with tape (1 7/8 ips).



A Super-8 film at 18 fps travels at three inches per second (ips) past the soundhead, and 4 ips at 24 fps. The difference in sound quality with good equipment is hard to hear, although test equipment may show some slight improvement at the higher speed. And for magnetic recording this marginal improvement will become all but meaningless as technology improves in the immediate future.

If you have a reel-to-reel tape recorder, you know it uses quarter-inch tape (6.35mm). The 27 mil Super-8 track is just about the same width as one of the four stereo tracks these machines use. Your recorder probably runs at any of, or all, these speeds: 1 7/8, 3 3/4 and 7 1/2 ips. You can get great results at 3 3/4 with your machine. So can Super-8 at 3 ips.

If you have a quality tape deck, using Philips-'designed audio cassettes, you're getting hi-fidelity sound with stereo tracks only 21 mils wide, running at 1-7/8 ips.

If you have listened to a good Super-8 track played back through good speakers at 18 fps, you know the sound is really good; and if you bother to run a test, you'll find you have a hard time telling the difference between 18 and 24 fps. Make the test for music and voice recordings: your ears are the judge.

Now what about picture quality? Won't an image projected at 24 fps look a lot better than one at 18 fps? Won't it have less flicker and be less jerky?

There's a vast amount of research that has been done on the phi phenomenon: Gestalt psychologists were practically obsessed with it because they used it as the experimental basis for their theory of electrical fields moving through the visual center of the brain. While people working in psychology and neurology today think this theory is not correct, the mass of experiments they performed are valid nonetheless. The phi phenomenon requires from 12 to 16 fps for the illusion of motion, the figures varying with the sources I've looked up. Certainly 18 fps is more than enough for this illusion. Try it out. Take shots of the same action at 18 and 24 fps. Do the movies projected at 18 fps look any less smooth? I think you'll agree that they look just as good as those taken at 24 fps.

Now what about the constraint imposed by the persistence of vision, the Critical Fusion Frequency? Simply put, if a light flickers about 50 times a second. or more, you won't see a flicker. but rather a continuous light. This 50 flickers a second is called the Critical Fusion Frequency, and it varies with the brightness of the light and other factors. Well, for shutters used in projectors designed to work primarily at 24 fps, there usually are 48 flickers or effective frames per second; in most Super-8 projectors, at 18 fps the shutter produces an effective 54 fps. So, all things being equal, you'd expect less flicker at 18 than at 24 fps. Using the same projector at 18 or 24 fps, you'll be experiencing 54 or 72 flashes per second respectively, since the shutter is usually set up to satisfy the Critical Fusion Frequency for the lower speed; you will probably not be able to see (or hear) any difference.

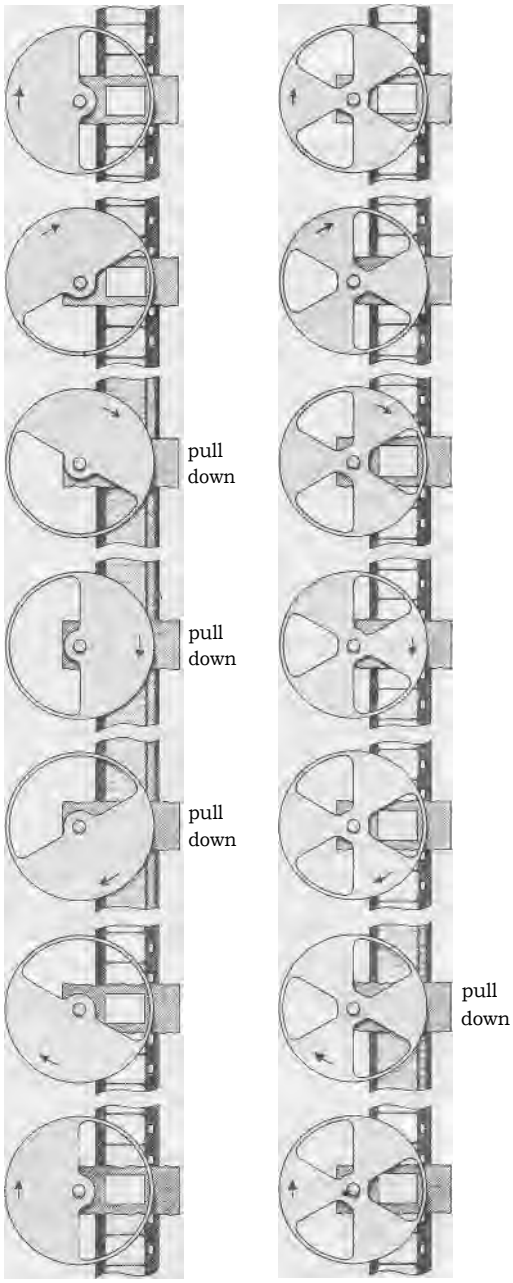
But why the pressure to shoot and project at 24 instead of 18 fps? Elitism, ignorance, snobbism, conservatism; or simply hanging on to standards that once had meaning? Who cares?

Don't be taken in. Think the thing through for yourself. Try the simple comparisons I've suggested. Shooting at 18 fps, look how much money and fil m you save! Three 50-foot cartridges at 18 fps will equal the running time of four cartridges at 24 fps. Both will run for ten minutes. Both will give fine quality. Only someone planning a blow-up to 16mm or 35mm, or Super-8 optical sound release prints, has to choose the faster speed.

But there's even more: you gain about half a stop shooting at 18 fps. This means that in marginal low-light situations you can take movies at 18 that you couldn't have at 24 fps. Also, all hardware runs more quietly at 18 fps. It's a fact of life: machines' motors and other running parts make less noise running at a slower speed. Not only does this apply to the camera, but your projector will run more quietly too.

I think it's an absolute disgrace that 24 fps is being palmed off as necessary by an industry rapidly expanding to fill the needs of people deeply into Super-8 filmmaking. And a few items of good equipment will operate only at 24 fps. For shame! Moreover, as long as 24 fps is considered to be the professional standard, designers are likely to maximize their equipment specifications for this speed, letting the 18 fps user take second best. If designers want to make superior 18 fps equipment, they can easily enough, since the difference between 3 ips and 4 ips is not very great.

And even if video presentation is planned, there isn't any excuse for this. The Eastman videoplayer will operate at both speeds, so films can be shown closed circuit, broadcast live or transferred to tape, if need be, all at 18 fps, the home moviemaker's humble speed.



A Camera-projector shutter cycle. The drawing compares the action of the camera and projector shutters and pulldown for one frame of film. While the camera shutter is made of a single blade, the projector shutter in most Super-8 machines is made of three blades. The segment of the projector shutter marked with the arrow prevents projection of the moving film, while the other segments interrupt each frame twice, producing an effective fps rate of 54 at 18 fps, and 72 at 24 fps.

(ABOUT THE AUTHOR: LENNY LIPTON is a well-known filmmaker and author whose current passion is the simplicity of the Kodak Ektasound Super-8 single-system camera. He defends even the lowest-cost cameras as valuable communications tools adequate to many tasks. Here he argues that the more economical 18 fps amateur film speed, originally standardized as the Super-8 silent speed, but now a sound speed on low-cost Ektasound cameras, provides more than just acceptable image and sound quality. His latest publication "Super 8 Book", is now available from Straight Arrow Books.)

THE NEED FOR SYNC SOUND STANDARDS FOR SUPER-8

Taking a lesson from past selfish stupidities, equipment manufacturers must realize, before it's too late, that Super-8 sound can grow and prosper as a universal professional format only through standardization

By ROBERT 0. DOYLE

The need for standards, especially compatible sync signals and interchangeable equipment, should be obvious to anyone who wants to make Super-8 a professional medium. But despite the obvious, inventive people seek to do things slightly differently, and almost always for what they perceive to be a good engineering reason. This urge to do one's own thing is also motivated by the thought of financial gain as the inventor's company reaps the benefits of a market place it hopes will become wedded to its proprietary (usually incompatible) approach.

Few strong voices tend to be raised in support of doing things in just one way, simply in order to get on with the business of doing things. Moreover, these isolated voices rarely have the media clout of a large company widely advertising its patented process in an attempt to corner the market.

The failure to agree on standards has led to production inefficiencies and, in some cases, virtually complete market collapse as giant companies refused to compromise on any one design. Examples close to the motion picture industry include 33 1/3 vs. 45 rpm record speeds, the videotape format controversy, and the choice of audio cassette design. RCA's 45 rpm disc with the large hole and second speed have kept record-handling equipment more expensive than it should have been for years. The loss to one consumer may be only a few dollars or cents but the societal loss is in the millions of dollars. The multiplicity of videotape widths and formats was reduced somewhat with the well-known EIAJ-1 standard for 1/2 inch videotape, but then complicated by Sony's introduction of a 3/4 inch videotape and the option of reel-to-reel or cassette versions of 1/2-inch tape offered by Philips and Sony. The standard compact audio cassette is considered a classic of industry cooperation, initiated by Philips' unusual offer of royalty-free licenses to any company observing the technical specifications of Philips' compact cassette design. This led to the withdrawal from the market of competing cassette designs by 3M/Wollensak, RCA, and others who are now benefiting from the resulting enormous audio cassette market. A similar competition is in process to establish a preferred design for the new Videodisc, with many of the same companies in the running.

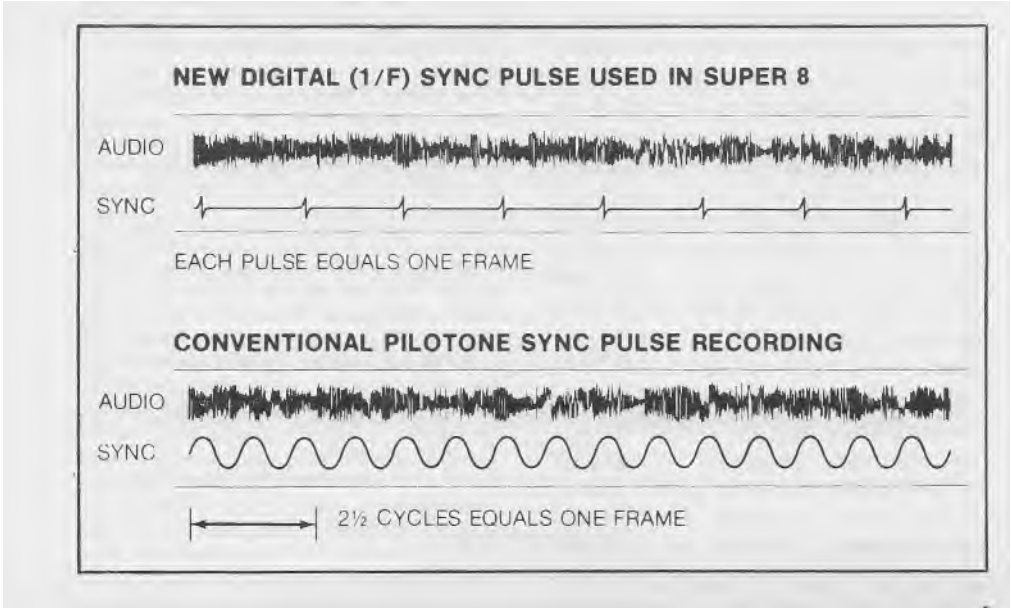
Standardization problems within the Super-8 industry are considered responsible for the failure of Super-8 fil m to become much more widely used as an audio-visual medium. In the late 1960's almost every projector manufacturer rushed to design his own automatic-threading, automatic-loading Super-8 cartridge in the hopes of cornering the market. The thought was that the more convenient Super-8 projectors would replace harder-to-use 16mm equipment — a $4-million annual market. Unfortunately, potential users found it difficult or impossible to decide between projection cartridges from Kodak, Bell and Howell, Technicolor, Fairchild, Bohn-Benton, and several others. As a result, most film users stayed with 16mm which, while somewhat harder to use, was at least an internationally standardized format.

Although the Super-8 projection cartridges were incompatible, one would naively think that at least the Super-8 sound film inside the cartridge was standard. This was actually not so, thanks to the imaginative design efforts of engineers in the different companies on how to record sound tracks. Some chose optical sound. others magnetic. Some recorded sound at 18 frames displacement from the picture, some 28 frames and some 125 frames. The result drove laboratories crazy and kept lab charges high as each Super-8 order had to be a custom order.

Today Super-8 sound tracks are almost invariably magnetic, and with sound displaced 18 frames from the picture. This has been the result o' users expressing their preferences through their buying decisions in the marketplace, and not because o' industry agreement or compromise Basically the only option that remains besides magnetic or optical sound is the frame rate- 24 fps or 18 fps.

In their original design recommendations for the Super-8 format. Kodak designated 18 fps as the nev. silent film speed, with 24 fps as the sound speed. Subsequently, Kodak's Consumer Markets division introduced single-system sound-on-stripe Super-8 cameras (Ektasound), with just one running speed — 18 fps — which they now refer to as the "amateu- sound speed", 24 fps being called the "professional sound speed'• Equipment manufacturers are nov. asking SMPTE for sound test films a• the 18 fps speed. Since the and fidelity at 18 fps is more than adequate, enthusiastic proponents of the speed like Lenny Lipton wa - everyone to save the additional 25°/: - fil m stock costs.

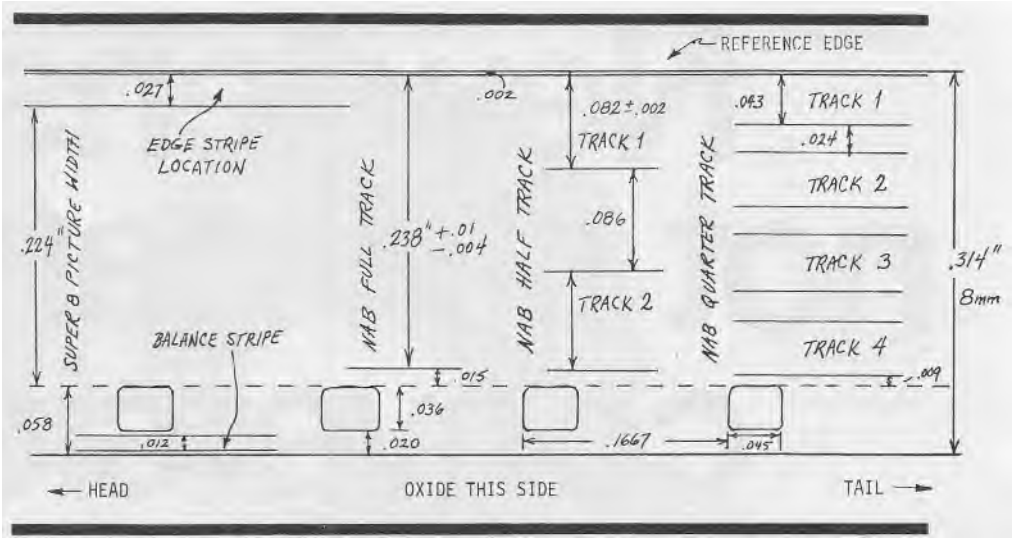
Diagram showing comparison between the new "1/F" (once-per-frame) sync pulse signal, and the conventional pilotone signal (60Hz sine wave, 50Hz in Europe), which is a perfectly acceptable alternate sync signal for Super-8 use. Most new sync cameras and projectors have a built-in 1/F switch.



Lipton's eloquent defense of 18 fps in the accompanying article demonstrates the directly measurable benefits for any filmmaker who shoots 18 fps. What is not stated is the indirect disadvantage that accrues to the filmmaker and to all Super-8 filmmakers, because of the resulting confusion between speed options and the requirement for manufacturers to include every such option on all future equipment.

While each additional option may seem easy to defend, the additional cost added by the manufacturer increases the final cost of Super-8 equipment to the filmmaker and reduces the overall size of the industry. For example, sound projectors that can handle both Regular 8 and Super-8 cost about $100 more than those exclusively Super-8.

The confusion produced by too many options extends everywhere. Will every Super-8 film festival require a leader on each film stating the projection speed? Even that won't prevent some false starts at the wrong speed, and the resulting amateurish environment. How will a teacher using Super-8 be sure of the speed? The potential for embarrassment will no doubt sometimes prevent the use of film in class. Will labs be slower to buy the more expensive sound equipment required for two-speed capability instead of just one speed? If so, this will postpone the day when complete Super-8 lab services will be available everywhere.



RECOMMENDED STANDARD TRACK POSITIONS ON SUPER-8 FULLCOAT MAG FILM

Super-8 fullcoat magnetic film has the same width, sprocket-hole size, and pitch as Super-8 picture film (ANSI Standard PH 22.161-1968). It is recommended that it be used in "A" wind, so that if run through a Super-8 sound projector it would have the emulsion (magnetic oxide) position away from the lens, in the normal magnetic stripe position.

The location of the magnetic record on the mag film is specified with reference to the edge opposite the sprocket holes. The dimensions and locations are defined to be the same as the NAB standards for quarter-inch magnetic tape. There is slightly more than one quarter-inch (.251 inches) between the reference edge and the inside edge of the sprocket holes.

Any recording made on track 1 of a four-track NAB recorder adapted to fullcoat, or track 1 of an adapted two-track NAB recorder, or an adapted full-track NAB recorder, provides a magnetic record in the area of the Super-8 magnetic edge stripe (.027 inches from the defined edge). Conversely, signals recorded on the magnetic film by a Super-8 recording projector could be read by track 1 of any format adapted NAB recorder, although with decreased signal/noise ratio in the larger format.

A Single "Professional" Sound Speed For Super-8

We strongly recommend 24 fps as the preferred sound speed. Film shot at 24 fps can be transferred to video on high-quality telecine projectors, and can be blown up to 16mm on a frame-for-frame basis. With this choice, there is a single sound speed for all professional film formats — 8, 16, 35, and 70mm.

A New Sync Signal For Super-8

We recommend that the Super-8 sync control track consist of a single pulse for each frame of film. The "pulse" may be a short burst of tone (nominal 1000Hz), a voltage spike, a square wave or a sine wave, or any other signal that can be converted by available electronic circuitry to one of the above. A multiplicity of waveforms are all compatible with the basic requirement of one "signal" for each frame of film. An important example is a simple switch closing once per frame (1/F). Such a switch (mechanical or optoelectronic) is used in most Super-8 sync cameras and sync projectors. We call this "1/F" (once-per-frame) sync or "digital" sync to distinguish it from the conventional pilotone signal (60Hz sine wave, 50Hz in Europe) which is a perfectly acceptable *alternate* sync signal for Super-8 use.

Track Locations For Super 8 Fullcoat Magnetic Film

We recommend that Super-8 magnetic film have the same width, sprocket hole size, and pitch as Super-8 picture film (ANSI Standard PH 22.161-1968) and that it be used in "A" wind, with the emulsion (magnetic oxide) position away from the lens when run through a Super-8 projector.

The distance from the inside edge of a sprocket hole to the unsprocketed edge of Super-8 fullcoat is .255 inches, just slightly wider than quarter-inch magnetic tape. Because of this fortunate coincidence, there is no need to design new magnetic heads for use with Super-8 fullcoat. We recommend that the existing international standard track locations for quarter-inch tape (half-track, quarter-track, and full-track) be adopted as the standard track locations on Super-8 fullcoat magnetic film. The position of the magnetic record on the fullcoat will overlap the normal magnetic edge stripe position on Super-8 sound picture film, whether quarter-track, half-track, or full-track magnetic heads are used. This choice of track location insures that the magnetic head in a Super-8 sound projector will be able to read the fullcoat sound track, and tracks recorded in Super-8 projectors can be played back on Super-8 fullcoat recorders. At *Photokina* in 1974 every manufacturer of fullcoat recording equipment and fullcoat editing equipment was compatible with this recommendation except one (and this one announced it would conform to the recommended practice in the future).

The ad hoc committee of SMPTE is considering many other recommended practices relating to sync sound Super-8 equipment, but these three are far and away the most important issues before us. Every potential user of Super-8 is also a participant in the process of establishing workable standards, for in the last analysis it will be the equipment that is bought and used that will define tomorrow's standards.

CASE AGAINST SUPER-8

Continued from Page 1255

Super-8, the Super-8 producer will have the added expense of working around location problems without the benefit of these tools.

There are other little gadgets for 16mm cameras that are designed specifically for low budget filming. Among these are freeze-frame devices, slide duplicators and the like. In addition, there are certain 16mm cameras that are particularly suited to producing professional films on a minimum budget. The Bolex Rex 5 is probably the best example, with a myriad of in-camera low budget trickery, as well as reflex viewing. It has a variable shutter, automatic fades and dissolves, frame counter, backwind for multiple exposures, matte box for split screens and mattes, single-frame, variable-speed time-exposure, plus the availability of 400' magazines, crystal motors and an underwater housing. The imaginative low budget producer can make a very professional looking film complete with effects and titles with the raw stock never leaving the camera. The Bolex body can still be had for around $1000. new, and that would be hard to beat in Super-8.

Because sound gear is totally independent of the cinematography, it should be obvious that the expenses involved for sound recording and transfer should be about the same regardless of the film format employed. It is true that there have been new low budget sound recording/transferring techniques developed for Super-8, most notably the "Super8 Sound Recorder". However, if this quality is acceptable, there is no reason why the Super8 Sound Recorder couldn't be used on a Super Panavision 70 production as well as 16mm. In general, most low budget techniques designed for Super-8 can be applied to the larger formats but the opposite is not always true.

Now we come to physical size. First, size of equipment. As Super-8 gets more sophisticated, the cameras are getting bigger while 16mm cameras are getting smaller. I have recently seen a prototype of a new silent-reflexed, double-system 16mm camera made by a major professional camera company that is about the same size and weight as the larger Super-8 cameras. I do not believe there is that much size or weight advantage to Super-8 for a given class of camera. However, this parameter is easy to judge and each producer can decide for himself. The size of the film is a different story. There is an optimum size for every product that must be handled by human beings. This is a science known as human engineering, or anatomical design. An example of poor anatomical design is the digital calculator company, which, in its zeal to miniaturize, made a calculator so small that the human finger would depress four buttons at once, due to the small size and close proximity of the buttons.

Obviously, there is always an anatomical optimum for any product that is handled. Most editors will agree that 35mm (not to mention 70mm) is quite bulky to work with. On the other hand, 8mm and Super-8 are most assuredly on the small side of perfection. (Ask any Super-8 editor who can be identified by his squinty, bloodshot eyes and frazzled nerves). The optimum anatomical size is somewhere between these two extremes and most likely around 15mm to 17mm.

Now a clear picture is beginning to form. In reality, 16mm is better suited to low budget production in most situations. The cost of camera, lighting and sound gear is approximately the same for the 16mm and Super-8 formats. The 16mm format, however, has several advantages in available light, low budget location situations as previously discussed. In addition there is a greater variety of film stocks, processing and devices available to the larger formats that can facilitate low budget techniques. Moreover, the larger size of 16mm can cope with the less-than-immaculate and haphazard conditions that surround extremely low budget productions where the Super-8 format would yield totally unacceptable results.

The notion that Super-8 production is less expensive than 16mm is largely a myth. One of the main reasons for this myth is that psychologically one is willing to accept much lower standards of quality when shooting Super-8. ("That's not bad for Super-8.") Moreover, the average Super-8 filmmaker is more dedicated to low-budget technique. If the Super-8 producer would apply these same standards and low budget zeal to 16mm production, he would be surprised to find a superior end product with less hassle for the same, if not smaller, budget.

So where is the great advantage of Super-8? Almost all overhead is the same no matter what format you use: film crews, post-production, equipment, lighting, sound recording/transfer, transportation, rent, shipping, etc. As we have seen, Super-8 can actually be more expensive in many situations. With specific exceptions, the advantage of Super-8 can be summed up in one statement: *"Super-8 offers an advantage over larger formats only when the cost of the raw stock and processing comprise the major portion of the budget."* Thus, if the overhead can be reduced to the point where the raw stock accounts for more than 50% of the total production costs *(and Super-8 image quality is acceptable),* then Super-8 offers a decided advantage.

Into this category will fall sports analysis, student films and small TV news stations where the new Kodak Super-8 video transfer machine will offer decided advantages over electronic news gathering.

But for the majority of film production — and this includes the most simple educational, documentary, in-plant and commercial films — the cost of raw stock is a mere fraction of the total budget once all production, pre-production and post-production costs and overhead are realistically calculated. The bottom line figures will usually indicate that the larger format will pose fewer problems, facilitate quicker production, and, in the end, save money over Super-8 production. Not to mention the fact that a larger format produces a far superior image, and always will. ■

CINEMA WORKSHOP

Continued from Page 1236

ing image quality is the generation of the projector print. I have recently seen some large screen projection tests, and am convinced that projected Kodachrome Super-8 original is indistinguishable from (if not better than) standard third-generation 16mm (16mm release from internegative of 16mm ECO original). This is a prime consideration for camera-original direct projection applications, such as film-to-video and sports analysis.

The cinematographer should be familiar with the basic statistics for a reference. However, an exhaustive and comprehensive analysis of the format systems must precede a final decision on format size.

A.S.C. CINEMATOGRAPHERS AVAILABLE FOR SEMINARS, LECTURES, INFORMAL DISCUSSIONS AND QUESTIONS & ANSWERS SESSIONS.

The following Members of the American Society of Cinematographers have indicated their availability to appear for seminars, lectures, informal discussions and questions and answers sessions pertaining to motion picture and television photography, lighting, special photographic effects and production in general: Ted Voigtländer, Alan Stensvold, Vilmos Zsigmond, Ernest Laszlo, L.B. Abbott, Lloyd Ahern, Chuck Austin, Victor Duncan, Ray Fernstrom, Lee Garmes, Burnett Guffey, Gerald Hirschfeld, Michel Hugo, Victor J. Kemper, Andrew Laszlo, Frank W. Stanley, Richard Shore, Earl Rath, Sol Negrin, Richard Moore, Fred Mandl, Harry Wolf, Ralph Woolsey, Taylor Byars, Richard A. Kelley, David S. Horsley and James Wong Howe.

Arrangements as to availability and other details are to be made directly with the individual A.S.C. Member. For further information, contact: American Society of Cinematographers, P.O. Box 2230, Hollywood, California 90028. Telephone: (213) 876-5080.

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REORGANIZATION OF SUPERS INSTITUTE

Mr. Soo Hum, motion picture producer, researcher and writer on all aspects of Super-8 production and post-production, has been appointed the new President of the Professional Super-8 Film Institute.

The Institute was originally formed in August of 1973 to meet the needs of people who were interested in obtaining the maximum professional quality from Super-8 film and equipment, and to have an organization where they could get in touch with others who were equally seriously interested in upgrading the quality of work in this film format. This basic concept is still the prime directive of the organization. In light of the ever growing volume of software, the Institute will expand its activities to provide detailed reports oriented to the industrial user.

The Institute's new program will take the form of an Information Release every second month commencing in June. The releases will contain the latest in-depth reports on professional Super-8 production and technology, subscriber feedback, and its own unique equipment reports.

The Institute is in the process of compiling the first Super-8 *Information Resource Directory.* This publication contains the "what" and "where-to-find-it" of Super-8 professional services that are available to the serious Super-8 film-maker. The Directory will be updated periodically in keeping with the Institute's policy of having the latest and most definitive information constantly available to its readers. They will all be based on actual use of the service or product by the research staff of the Institute.

The Institute will also be reporting on Super-8's involvement in the videotape field. Many people today are shooting productions in Super-8 film because of the light weight and low cost as compared to conventional 16mm and 35mm equipment and film, and also compared to portable videotape equipment. The developed Super-8 color films are then transferred to videotape, edited in videotape, and the

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THE STATE OF THE ART

Continued from Page 1252

tioned optimism, the growth of Super-8 as a professional *filming* format will remain stunted until the last formidable obstacle in its path has been removed — namely, the inability to get Super-8 prints of even acceptable home-movies quality from Super-8 originals shot with cartridge-load cameras.

Consider the irony and incongruity of the fact that Eastman originated the Super-8 format in cartridge-load form. Moreover, it developed highly sophisticated cameras to accept that cartridge and encouraged many other manufacturers to do so. Yet, with all of this emphasis on the cartridge, the simple fact is that all of Eastman's cartridge-loaded color films on the market to date "are designed for optimum projection" — to use the company's own term. In other words, they are all inherently high-contrast films which look fine when projected, but which make perfectly abominable prints when used as printing meda. Using inter-negatives made from these high-contrast originals simply compounds the felony.

Eastman blithely talks its way around this problem by telling us that if we want professional-quality prints we should shoot in 35mm or 16mm and make Super-8 reduction prints. The only other alternative is to shoot in Double Super-8, using one of the few cameras on the market designed to that format — and which are the same size as 16mm cameras. In either case, the advantages of using small, highly sophisticated cartridge-load Super-8 cameras are negated.

No "professional" in his right mind would consider going through all the trauma of making a film and then projecting his precious original for all of the screenings. Yet, that is what he must do if he uses cartridge-load cameras and hopes to get an image of professional quality onto the screen.

It is hoped that it will finally dawn on the Eastman people that talk of "professional Super-8" is all very fine, but that if the term is to amount to anything more than fine-sounding talk, the company should make its ECO reversal and 7247 color negative stocks available in cartridge-load form.

When I have made this suggestion to Eastman executives over the years, I have been told, "As soon as there is sufficient demand, the company will do something about it."

Gentlemen, the demand exists — now!

The purpose of this special Professional Super-8 issue of *American Cinematographer* is not only to provide a comprehensive summation of the very latest state-of-the-art developments in equipment and techniques for Super-8 production on a "professional" level, but also to present as objectively as possible the "pros" and "cons" of such production. It is not the purpose of this publication to endorse or recommend any of the methods or equipment discussed in these pages, but merely to make the data available, so that the reader may form his own judgment on the basis of the facts presented — plus, it is hoped, his own research.

The major bulk of the subject content of this issue was researched, assembled and edited by Robert 0. Doyle, Julie Mamolen and Anton Wilson. *American Cinematographer* wishes to express deepest gratitude to these people — as well as to the individual contributors — for their tremendous dedication, attention to detail and sheer professionalism in making available the vast mass of information presented in these pages.

(EDITOR'S NOTE: When various experts in the field were invited to contribute feature articles for this special Professional Super-8 issue, the response was so overwhelming that, despite the addition of 16 extra pages, we regretfully had to omit several excellent articles. However, they will appear in the next — December, 19 75 — issue of American Cinematographer.)

SUPER-8 AT MIT
Continued from Page 1287

students can be taught in a production course is the difference between "shooting" and "looking." Shooting here implies an attitude that there is a reality out there, and that to point the camera in the general direction of the highest action will somehow "capture" or "get" it on film. With notable exceptions due to the grace of chance, nothing could be further from the truth. The fact of the matter is that seeing through a movie camera is physically more difficult than with your naked eyes. Unless one strains and puts out some positive force through the viewfinder to "see" what is going on in a scene, that reality will never be visible on the screen.

Quality camera work involves the mind and eye in a constant interplay of proposal and rejection of hypotheses. Let me give a few examples. What does a gesture mean? How can one translate that gesture into a comprehensible and meaningful form on the screen for the viewer. All reality and images of it, however formed, are susceptible to human misinterpretation. In camera work of both real time and scripted situations questions constantly arise as to when and where to look in order to convey the most meaning. For example, in an interaction between two or more people, when does one look at the principal action, when does one look for the responses going on with the others involved in the interaction, or when does one look at both? Meaning here must be understood only in a general context as expressing the intent of the filmmaker because presentation of ambiguity, suspense, development of character, etc., all fall within the context of meaning. These questions arise continuously in quality camerawork, greatly removing it from the passive act of letting the camera run.

Although cheaper film can encourage less disciplined camera work, the other side of the coin has an obvious virtue. Only with the proper discipline to "see" and think about what you're doing is it true that the more you shoot, the better you get. Teaching 16mm has brought up some cases that relate to this issue of cheap film. Sometimes a student will go out and shoot a few thousand feet of 16mm film and come back with nothing, i.e., there simply is not a film there (for whatever reasons) — a very expensive and discouraging experience — and the student may give up. It requires much effort on the part of the teacher to convince the person that he or she might still have a future in film. When disaster strikes in Super-8, reactions are less severe. Because it's cheaper, one can either re-do the project quickly or forget about it more easily with less ego involvement, in order to go on to another film.

A fundamental teaching issue in Super-8 is editing, which includes the problems (and sometimes virtues) of editing original. Though Super-8 workprints are a standard lab practice now, and several establishments offer ink edge coding of original and workprint, the fact remains that because of the high costs involved, editing workprint is not feasible for a teaching method in Super-8.

With no workprint, students learning to edit Super-8 never get that "editor's feeling" that the film itself is nothing of value, that lack of respect that lets you run it onto the floor when you want to look at newly-cut sequence in a hurry. In Super-8 each cut shows, even when two contiguous pieces are reunited, because of that glitch of a splice. Less adventurous editing and less experimentation are a possible result of this. In our experience both at MIT and summer workshops, some students tend to get one idea for editing their film and never change it. There just isn't the possibility of attempting to intercut two diverse sequences, to see how it looks and, if it doesn't look good, to reconstitute the sequence and start again. The same is true in 16mm when, for economic reasons, one edits original. But in 16mm one of the techniques available is to look at rushes on a gentle editing machine and then decide what portions are valuable enough to selectively workprint. In the Super-8 medium a big step would be made in the right direction if Kodak would see fit to print latent edge numbers on Super-8 raw stock.

But there is another more positive aspect to the necessity of editing original in Super-8. On the one hand, one may not have the freedom of making decisions and then going back on them. But on the other, good editors are often very decisive, and Super-8 editing of original certainly encourages decisiveness. Good editors are often quick and Super-8 editing of original encourages speed, since the more time you spend editing with Super-8 original, the dirtier and more scratched it gets.

As in any skill, craft, or art, there exists in Super-8 a varying relationship between technical competence and imaginative conception, or authentic quality. That is to say, we have seen

some good films made by very precise craftspersons and we have also seen some good films made by very sloppy filmmakers. No one, to my knowledge, has quite put a finger on the role that chance plays in a work. The extent to which lack of experimentation holds back creative development can be confounded when the same rigidity expresses itself as discipline and leads to productivity. On the one hand, lack of care (dirt on the film, inattention to exposure, excessive camera movement) allows for experimentation that can be productive. On the other hand, it is easier to relax or change disciplines than it is to change bad habits. Super-8 incorporates both approaches because editing original demands discipline and cheapness allows experimentation.

On the most practical side, it might be useful to relate some of the problems we have encountered over the years in teaching Super-8 sync. Dependability has been the key problem. Nothing is more frustrating to someone trying to learn filmmaking than wasting money on footage that is out of focus, registration, or not in sync. There is little doubt that at this point Super-8 equipment is generally less rugged, less dependable, and requires more frequent maintenance than 16mm. As a result, our staff has had to become much more alert and vigilant when checking out Super-8 equipment to students. We have recently developed a single sync checker for cameras that consists of a crystal-controlled light emitting diode which flashes at 24 frames per second. When viewed through the aperture plate of a running crystal sync camera, strobing of the L.E.D. indicates out of sync. Cassette tape recorders are checked simply by running a few feet of sound and then playing it back on a resolver to see if it resolves.

Battery capacity for given equipment is generally less in Super-8 than 16mm; the standard battery supplies in Super-8 don't run the cameras and tape recorders for as much time as in 16mm. Here, too, staff must be more attentive in checking battery charge each time before equipment is given out. Notable and welcome exceptions to this problem are the many Sony audio recorders which are equipped by the manufacturer with built-in chargers for "NICAD" battery packs. Here the filmmaker can generally take along an AC cord and charge the batteries at home or in the field whenever necessary.

High-quality, reliable, safe projection is one of the most important requirements for film-teaching in any gauge. Only in projection-size images can camera work be judged and editing timing be accurately and adequately evaluated. Also, in classroom situations, starting in (and keeping in) sync is a necessity in order to preserve sanity and egos. It simply isn't possible to evaluate an out-of-sync film.

Former M.I.T. students Del Hiligartner and Lisa Jackson on location with the early Super-8 sync rigs. The equipment is remarkably light and simple to operate, yet retains certain design features, such as built in slate-light systems and "through the lens" light metering, that enable beginning students to learn double-system filmmaking in an inexpensive but professional manner.

Finding a satisfactory projector for double-system work has been one of our toughest problems to solve at MIT. In general, the most frustrating Super-8 projector problems are automatic threading systems that are difficult to unthread and gates and film paths that are inaccessible for cleaning. We have gone through too many projector/recorder combinations to mention. We've tried projectors with sync motors, Super-8 mag film reproducers slaved to projectors, and both projector and magnetic film reproducer "locked" to the line with simultaneous start. We've been through projectors that had ravenous appetites for film and splices and projectors that were very gentle but dim. Finally, we've put xenon arc lamps in dim gentle projectors. The last two of these trials deserve the most attention. Our first really reliable machine was the Kodak TVM100A. Its AC sync motor made double-system sync problems easier, it threaded easily, and the gate opened wide for cleaning. It also had a five-blade shutter, so it could be used for video transfers. The one problem was that it was too dim. So we put a G.E. Marc 300 lamp in it. Because the lamp was putting out a beam for 16mm and wasn't as efficient as it would have been if condensed for the Super-8 aperture, it was still too dim. Thus, we went to another similar Kodak machine, the M 100A (which is unfortunately no longer manufactured). The M 100A with its normal projection lamp puts more light through the film because it has a three-blade shutter and, with a f/1.2 lens, it gives a superb bright image. The problem was that since it wasn't a TV projector, Kodak didn't put a sync motor in it. So we added one, but we had to leave in the existing motor because of the complexity of the on-off controls. The switching for the two motors is more complicated than it needs to be, but it works. For playing back magnetic film double-system with the M 100A we use another reliable product, the Superb Sound Recorder. on remote start, with its motor locked to the A.C. line.

This discussion of the history, equipment experiences, teaching dispositions, and beliefs about the values of Super-8 filmmaking of the M.I.T. Film Section would be incomplete without an indication of our thoughts about the pedagogical, aesthetic and formal implications that this Super-8 dynamic might have for the future of film and visual communication. In a following article, a review of some of the films made by our students in Super-8 attempts to show how these thoughts are elicited by the films themselves.

(ABOUT THE AUTHOR: JOHN TERRY is an Assistant Professor of Film at the Massachussetts Institute of Technology. As an independent filmmaker he has made numerous experimental documentaries. He also works commercially as a free-lance cinematographer. He filmed and producec the Super-8 segments of the N.E.T. production, An American Family. *Recently he was the director of photography for a French feature comedy, shot in 16mm and blown up to 35mm, which stars Jean Pierre Leaud and is called* Les Lolos de Lola.)

SUPER-8 EDITING
Continued from Page 1273

reader for the picture head, it costs $125.00. Sync drive is included, but variable speed costs $150.00. Manual inching is provided.

This deck is an all metal machine weighing about 45 pounds. The viewer, a modified Goko, provides an adequate 3.5"x5" picture. The deck is essentially a stripped down version of the $2600.00 PPC-25 four plate. The basic high quality drives, sprockets and controls of the PPC-25 are retained. At $1095.00, this machine provides the modestly endowed filmmaker with an alternative to vertical editing.

Without a doubt, the Super-8 Research tables are designed by filmmakers for filmmakers. Further, the company adheres to the notion shared by most manufacturers in the Super-8 editing field, that all equipment must have multiple uses, provide complete in-house capabilities, and be adaptable for improvement over the years.

Optasound Corporation:

Mercifully, the manufacturers of Super-8 editing equipment have been relatively subdued in their advertising claims. They have generally stayed with the facts and left the users to judge for themselves.

Not so with Optasound! Though still not delivering any units at the time of this writing (early June), the company makes claims such as "Now the ESTEC gives Super-8 its Voice" and "In editing alone, and sound editing in particular, Super-8 has fallen short of its promise. Until now. Now, in a single step, the ESTEC closes the gap". (From their latest promotional piece.)

Hype is hype, but the Leacock system was introduced in 1972 and since then there has been a steady stream of excellent equipment designed for editing Super-8 picture and sound. True, this company is introducing some innovations, and they are needed and appreciated, but enough already! After years of misleading promises, the game has become tiresome. Let's see some equipment, or, as the saying goes, "Put up or shut up".

At $2950.00, the ESTEC console is designed to be a complete post-production unit. It can be used to transfer, to edit both sound and picture, to mix multiple sync tracks to picture, and to transfer the completed mixed track to edge stripe at high speed. The ESTEC also allows transfer of single-system sound, to fulicoat for conventional double-system editing.

As a conventional editing machine, the Estec does not offer a great deal. Due to its vertical configuration, splicing and film handling is a little awkward. The picture is small and difficult to see. A Muray viewer on a $3000.00 machine with ESTEC's sophistication seems a little bizarre. All developmental efforts seem to have gone into the electronics and sound functions; with the optical aspects kind of thrown on. As a result, syncing rushes without slates is an impossibility.

Where sound is concerned, the ESTEC is superb. The electronics are so good that several generations of mixdowns are possible without significant degradation of the tracks. The right fulicoat movement is capable of recording two separate sound tracks on one strand of fullcoat. These two tracks can then either be mixed to the edge stripe or to fullcoat. (Either to the left fullcoat movement or to an external recorder) More than two tracks would require mix-downs.

Again considering the sophistication of this machine, it is strange that four-track capability was not built in. Super-8 Fullcoat is capable of four-track recording and quad heads are readily available. If not as standard equipment, the four-track capability on the right fullcoat movement should be an option.

Prior to the ESTEC, all transfers to Super-8 magnetic edge stripe of single strand films had to be done on projectors in real time. The quality was good, but the transfer was slow and there was always the chance of scratching the film. With the ESTEC, sound can be transferred at twice normal speed (48 fps) without projection. There is virtually no chance of scratches.

The feature most discussed about the ESTEC has been the electronic editing. It is basically a system of transfer editing via electronic-cue-activated re-recording from an original to a master. Film is marked and cut in the usual manner, but each sound segment is cued up with an electronic start and stop mark. At the appropriate time this cue noiselessly puts the master track into record, and on the stop cue takes it out of record. It does it exactly on the desired frame. There is no noise between the butted segments. The cue marks are recorded while the transports are stationary.

If the ESTEC ever gets into full production, it will be a powerful tool for Super-8 filmmakers. Just to be able to mix multiple sync tracks to picture and to transfer at double speed without projection, make it worth the price.

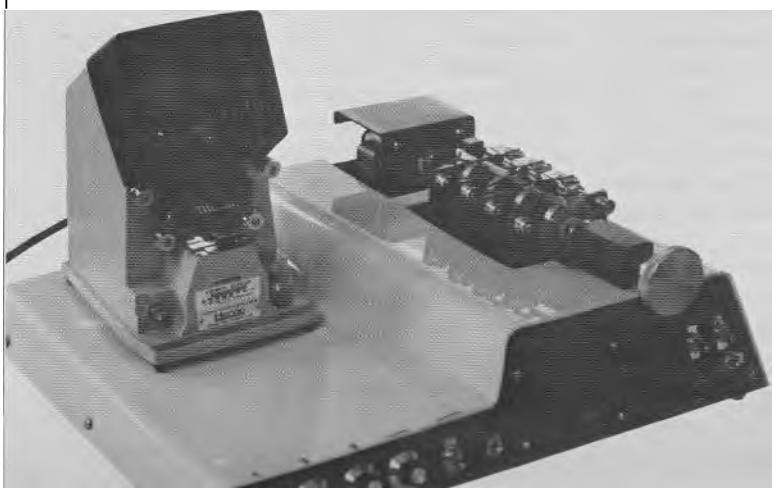
The Heavies: Steenbeck, KEM, and Moviola.

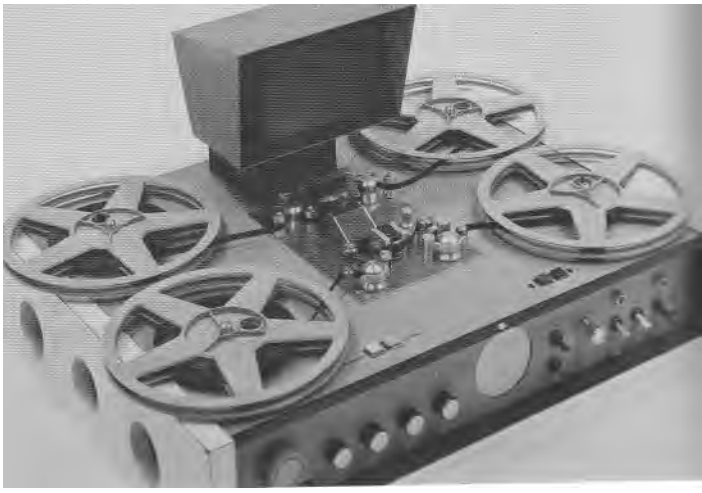
A sure sign that professional Super-8 is a reality comes from the introduction of Super-8 editing equipment by the "heavies" in the field. Both KEM and Steenbeck have an established line of equipment, and Moviola, it is rumored, may introduce a four-plate later this year.

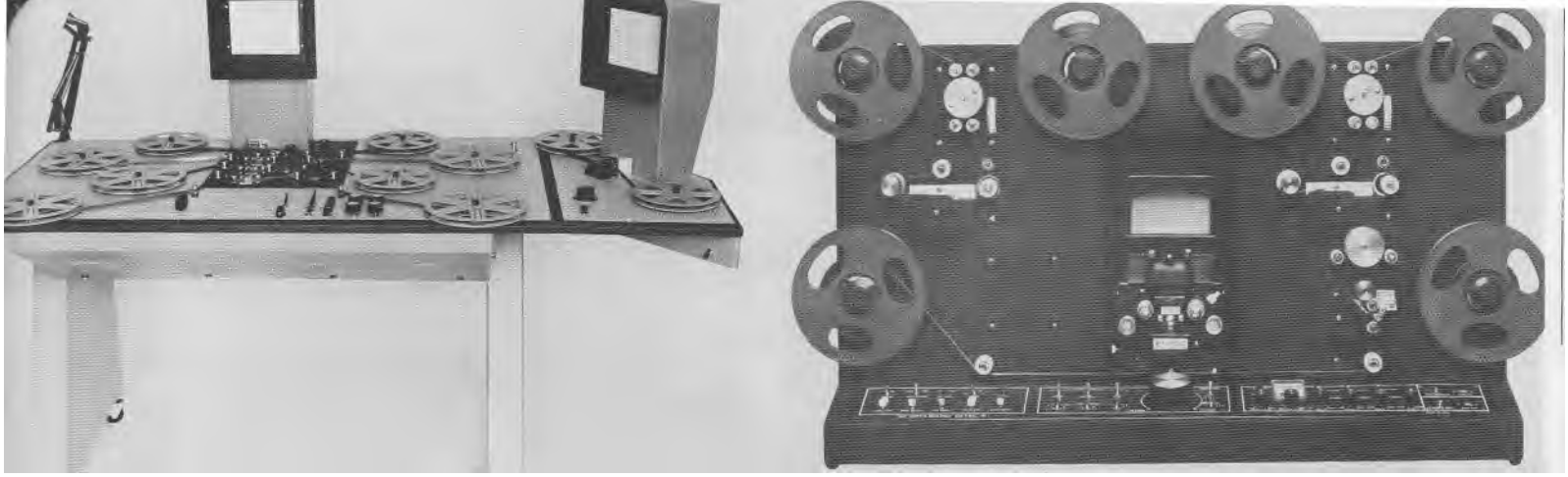
Steenbeck

The current model Steenbeck machines are designed for Super-8

(LEFT) Specialties Design Co. has produced a Super-8 "Moviola Junior", an inexpensive motorized 4-gang sync block built into a light table, to which the film-maker adds a viewer and rewinds. (RIGHT) The first completely Super-8 horizontal editing table to go into full-scale production, the M KM Model 824, is still the most widely used. A 6-plate version will soon be available.







(LEFT) Super-8 Research Associates provides the greatest versatility in Super-8 horizontal editing tables. Their basic 4-plate may be expanded as economics and editing needs dictate, with the ultimate being the 10-plate version shown here. (RIGHT) A prototype version of Optasound's ESTEC, which is designed as an ambitious interlock dubbing and mixing console, with two Super-8 fulicoat tracks and one Super-8 picture. Sound editing is accomplished through "spliceless" electronic cueing of tracks.

picture and 16mm fullcoat track. Future models will have the option of Super-8 fullcoat. One machine allows the interchanging of Super-8 and 16mm picture heads. Both machines are equipped with optical/magnetic single-system sound readers.

The ST 1068S is a non-interchangeable four-plate model ($5800). The viewer is bright and the image is a fairly sharp 6"x8". Functions parallel those of standard Steenbeck tables. 24 fps sync speed plus a variable speed from 1-200 fps forward/reverse. The drive system employs an electronically governed DC motor and is operated via a switch lever. The picture transport is very easy on film and enables the viewing and editing of original footage.

Unlike most Super-8 tables, the Steenbeck accepts up to 1000-ft. cores. If reels are used, the capacity is 600 feet. There is a footage counter, or a minute/second counter.

The sound reproduction is very good. It is unfortunate that recording heads and amplifiers are not part (or an option) of the machine. Recording capability would have made this a much better bargain and a much more useful machine.

A Super-8 picture module is available for use with the six-plate ST 6000 machine. The basic 16mm machine costs about $8000.00 and the Super-8 picture module about $1500.00. This module is also equipped with a mag/optical stripe reader for single-system film. Despite high quality sound, there are no mixing or recording provisions on this table either.

KEM

KEM offers two possibilities for editing Super-8 film. The first is in the form **of a** picture module (S2400.00) that will **fit the KEM Universal.** The second is the KEM Rapid-S six-plate table with Super-8/16mm interchangeable picture heads.

The Rapid-S (costs about $8000.00 plus $1500.00 for the Super-8 picture head) is a very basic editing machine. One lever controls the running speed of 0-100fps forward/reverse. The 24fps sync speed position is notched. Interlock in any combination is done via three light indicator buttons. The screen is a very bright 8.5"x11.5" (the largest around). Each track has its own separate frame counter and large inching knob. The film transport is fairly gentle. Film capacity is 1000 feet on a core.

The sound is of very high quality. Again, it would have been nice if both edge stripe and fullcoat recording capability had been designed in. At present, the Super-8 picture modules do not have single-system sound readers. KEMs are not available with Super-8 fullcoat tracks.

Moviola/Magnasync

At the moment there is nothing definite. The company did not respond to inquiries about forthcoming Super-8 editing equipment, but well-placed sources do indicate that a very fine four-plate flatbed, similar to the 16mm version, is under development. The ability to record on edge stripe and on the fullcoat track will be part of the design. It will also be the first "heavy" machine to shun 16mm fullcoat in favor of a straight Super-8 picture/Super-8 mag fullcoat arrangement.

It is interesting that these firms (Moviola possibly excepted) who pioneered the flatbed concept of editing, are not willing to carry their designs to the logical conclusion. Namely, complete in-house postproduction for Super-8.

Part of their approach must have to do with their own vision of Super-8's future directions. Their view seems to be cast in the mold of established 16mm and 35mm production techniques, even though Super-8 is clearly carving out a totally different niche. A niche that is essentially based on the premise "do it yourself".

Schmid:

Two editing tables from Europe, the Schmid and the Atema, do follow the in-house post-production systems to their logical ends. The Schmid Diplomat II is given as an example.

The Schmid Diplomat II at $12,500.00 is fully equipped for both Super-8 and 16mm editing and mixing. Though available with Super-8 fullcoat tracks, the most logical configuration would be 16mm mag heads and Super-8/16mm interchangeable picture modules.

As a cutting table, the unit is set up for rapid and simple threading of all heads. The picture, rather than displayed on ground glass, is actually projected on a small screen and gives a much brighter and sharper image than conventional tables. By moving a tiltable mirror, the image can be projected onto a larger supplementary screen for group viewing.

In addition to the 24fps sync speed, movement is variable from 1-110 fps. Like all horizontal tables, the various tracks can be disengaged and run independently. Editing sound quality is very good, with little wow and flutter. The picture transport is designed to be harmless to film; enabling editing of original film. The picture head is equipped with edge stripe playback and recording heads.

If sound is to be recorded on the

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CANADA'S LARGEST FILM LAB GOES INTO SUPER-8

A good deal of trial and error has led to methods of processing and printing Super-8 to achieve the optimum professional result

By MURRAY FALLEN

Since the inception of Super-8 in 1965, there has been talk of filming professional Super-8 original productions. One of the largest problems, in Canada at least, was the lack of Super-8 lab services. There were the odd services available, such as mag-striping and the odd cartridge loading centre capable of loading only one type of cartridge, as weli as one or two photofinishing labs processing Super-8 cassettes. However, it wasn't until Bellevue Pathe started its Super-8 Division in 1969 that any hope for original production in Super-8 was even feasible.

Our initial goals were to provide reduction printing from 16 to Super-8, sound and silent, as well as cartridging and lubrication. We built a homemade printer consisting of a 16mm projector, Ektar lens, and a double Super-8 Pathe camera modified to accept 2,000 foot loads. The projector and camera were electronically synchronized and the end results were high-quality Super-8 release prints. The resolution was extremely good (as a matter of fact, I haven't seen better since). The main problem with this set-up was the fact that the Pathe camera was not designed for large volumes, even with our modifications. The result was that we had to take the camera apart every hundred thousand feet or so to make minor repairs.

To provide sound on Super-8 we took a Kodak M100 projector and modified it to run in sync with the Ampex equipment in our Sound Dept. We were fortunate in that the Super-8 Division was part of the overall 16/35 lab and were able to take advantage of existing equipment, such as sound and processing equipment. The sound quality was reasonably acceptable but we did have a problem with the sync. Some cartridge projectors did not have the normal 18-frame sound advance. Therefore, we had to set up special syncs for nearly each different projector. At the beginning we didn't even have some of the projectors to properly check out our sync and had to ship out the prints, cross our fingers, and hope that the client wouldn't come back screaming. It worked most of the time.

We kept receiving inquiries about duping Super-8 original with promises that we'd be millionaires if we put in the service. I couldn't take it too seriously, since these potential clients wanted only a couple of hundred feet duped and even I know that a few more feet was needed to make the first million. However, since we wanted to become a full-service lab, we would have to offer a complete line of services for Super-8.

We had an old Depue black-and-white printer that was set up for printing double Super-8 black-and-white. Since we were not doing this type of work and there was no demand, it was the obvious choice to modify for Super-8 duplicating. The modifications were relatively minor and, in no time, we were in the Super-8 duplicating business, providing an excellent product. At first we were using 7389 color reversal print stock and processing normal. We found that there was quite an increase in contrast with some originals so we tried a few experiments to help reduce the contrast. We ended up printing on 7389 and processing as 7242. This apparently gives us a better overall reproduction.

Now that we had Super-8 dupes under control we felt that we were offering a complete service. We could make internegs from dupes and go into release printing either from Super-8 or 16mm, both sound and silent. We could lubricate and load a variety of Super-8 cartridges, as weli as striping Super-8 original and duplicates. What more is there for a lab to do?

Weli it wasn't two weeks after we started duplicating that a client asked us about A and B rolls and title supers for Super-8 original. After I stopped laughing at the absurdity of this question, I thought to myself, "Why not." I'm used to doing the impossible, so what's one more task? The first problem is what to use for black leader since none was readily available. After numerous tests it was decided to fog 7381, process and slit it. This film unlike 7389 was black enough to hold back the light in the printer and we could produce it economically. Once we ironed out the problems of syncing up the A&B rolls it was just a matter of doing the job. We found that we could successfully print A&B rolls and superimposed titles over live action. The titles are shot on Kodachrome II, white lettering over a black background, preferably using Polaroid filters to obtain the optimum contrast, since the black had to hold back the light of the printer.

Now that we were offering a complete laboratory service for Super-8 original production we claimed that anyone could do professional production at a much lower cost than 16mm. We recommended the use of a double Super-8 camera for a number of reasons. The film is more economical than cassettes, since each roll contains 200 feet of Super-8. One can shoot for five minutes (at sound speed) without having to reload the camera. Since the camera has its own aperture plate, higher resolution and steadier pictures can be obtained. Dissolves of any length are possible. Ektachrome Commercial is available for shooting and this stock gives the best reproduction, especially when going through an internegative. Both Ektachrome Commercial and High Speed Ektachrome can be developed by most professional labs with or without force processing.

We tried to stay away from ali types of hardware, such as synchronizers. rewinds, editing benches, etc. However, we did get caught up with editing benches. We started building small editing tables with Super-8 accessories. Since that was all that was available at the time it served its purpose even though we weren't really crazy about the end result.

Thank goodness other manufacturers shared our optimism on Super-8 and decided to build professional high-quality equipment. We could now get back to the business of being a Super-8 lab and reap all the rewards (?) that go with it.

More and more people were beginning to involve themselves with Super-8 productions, but there was stili an important service missing. We could not do optical effects such as fades. dissolves, freeze frames, reverse action, etc. Here we go again — trying to develop a piece of equipment to produce the desired effect. Since we had to start from scratch, we wanted to be able to incorporate ali the effects presently available on 16mm (short of mattes) as well as reduce slides directly onto Super-8. Being a former ani-

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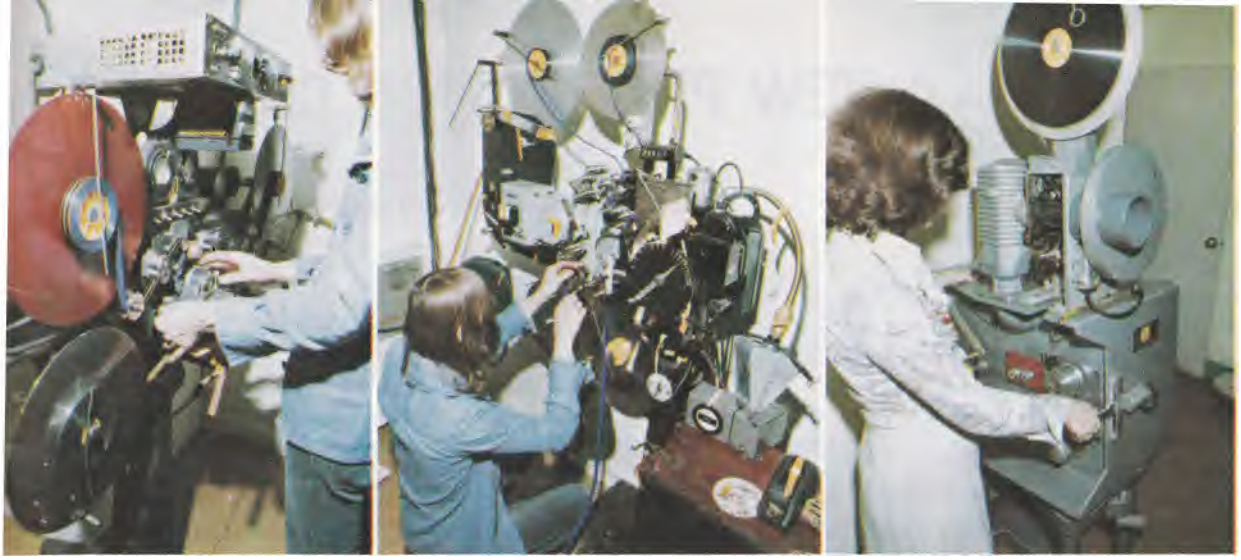

At Bellevue-Pathe Lab in Toronto, Murray Fallen and his colleagues use a variety of standard and modified equipment to provide many Super-8 printing services. (LEFT) A modified Depue single-strand printer is threaded prior to printing workprints and Double Super-8 internegatives. (CENTER) A converted 16mm printer is used for release printing Double Super-8 from internegatives. (RIGHT) Using a high-speed Double Super-8 projector, ali processed film is screened prior to slitting.

(LEFT) In operation at Bellevue-Pathe Lab, a HFC Super-8 panel printer makes high-speed Super-8 reduction prints at the rate of 200 feet per minute. (RIGHT) The Filmline processor is a positive processor for developing prints at 150 feet per minute. Laboratory services for Super-8, stili in the formative stages, are continually changing. It is definitely a specialized service thus far, as compared to standard 16mm-35mm operations.

A Super-8 slitter, **manufactured by the Hollywood** Film Company, slits Double Super-8 **to** single strand. The Double Super-8 **format offers** low-contrast color reversal (ECO) and negative stocks not yet available in Cartridge Super-8.

Many of Bellevue-Pathe's Super-8 prints are screened in continuous-loop Super-8 cartridge projectors. Prints are lubricated in the machines shown here prior to loading the cartridges for smooth running of the film through the projector. Ultra-sonic cleaners are used to remove dirt, grease and other materials from the negatives before printing.

SUPER-8 VIDEO—A NEW PRODUCTION CONCEPT

Several technical factors have combined to make Super-8 the lowest-cost video production method — opening up a vast new field of possibilities

By ROBERT 0. DOYLE

"Super-8 Video" is a new concept in video production, utilizing inexpensive Super-8 film cameras as the original medium, and Super-8 editing, studio, and transfer equipment in post-production. Four factors combine to make Super-8 Video the lowest cost video production method:

• Super-8 cameras, with built-in single-system or external double-system sound recording facilities, are the least expensive means of original program production for video release or television broadcast. While there is a noticeable loss of picture quality, especially in the areas of picture resolution and image stability, the difference is easily detectable only on broadcast monitors.

• Super-8 editing equipment, with its capabilities for multiple sound tracks, and straightforward physical editing (cutting) at an exact frame, is the least expensive and most versatile means of editing an original production for video or television.

• Super-8 sound studio equipment, with up to three sound tracks and a sync control track on an inexpensive but high-fidelity four-channel tape recorder, is the least expensive means of sophisticated post-production sound for video or television.

• Super-8 television film chains, especially the extraordinary Kodak Videoplayer flying-spot scanner, are the least expensive means of transfer to video, or direct broadcast of film. The $1350 Videoplayer replaces between $10,000 and $20,000 of conventional 16mm film/video transfer equipment, and a new external sync version will soon allow A & B roll transfers to video, with video special effects and live video camera inserts where desired.

Super-8 Video thus offers the video producer the lowest cost production and post-production techniques available, including color, sync sound, sound and picture editing, and multiple sound track capability. Super-8 Video offers all this, plus the extreme portability of three-pound cameras and lightweight cassette sync-sound recorders, or the new single-system Super-8 cameras that combine sound and picture recording in a single unit. Super-8 cameras go anywhere, operate on penlight or rechargeable batteries, and fil m in extreme low light situations (approximately 10 foot-candles) in full color.

TRANSFERRING SUPER-8 TO VIDEO

Transfers of Super-8 films to video can be accomplished using conventional film chain techniques, since AC-syrchronous telecine Super-8 projectors are now available This allows the use of image enhancers, electronic colocorrection, and other sophisticated video processinc Laboratories that specialize in film-video transfers are nov, offering these services, notably the National Video Center ;r New York City who have a Kodak TVM100A Super-E projector as a permanent installation in their telecine chain .

Alternatively, transfers can be made with the Kodak Videoplayer, an inexpensive flying-spot scanner that converts Super-8 film to a standard NTSC color signal — 525 lines fully-interlaced composite video, with separate audio derived from the magnetic edge stripe or a fullcoat magnetic film recorder running in double-system sync. The Kodak Videoplayer is so inexpensive that most videc production houses will acquire one just to keep open the option of accepting Super-8 color sound film as a source a' material.

The extraordinary Kodak VP-1 flying-spot-scanner can replace a video camera and telecine projector in a Super-8 film chain, with much less capital investment. The video signal may be displayed on a monitor or taped on standard 3/4", 1" or 2" tape decks.

VIDEO EDITING OF SUPER-8 ORIGINAL

Although the double-system Super-8 sync editing equipment available today is by far the least expensive way to edit a Super-8 Video production, a video editor with access to sophisticated 2" quad editing equipment may prefer to transfer the Super-8 original film and sound directly to 2" quad tape for video editing. This practice is recommended by the Canadian Broadcasting Corporation study group that endorsed Super-8 as acceptable for broadcast on Canadian television (SMPTE Journal, April 1974).

An alternative to 2" quad equipment is SONY's new VO-2850 U-matic 3/4 inch Videocassette editing system. This relatively inexpensive video editing system and a Kodak Videoplayer (for inexpensive video transfers without tying up a color camera) are an attractive low-cost combination that many smaller television stations and cable companies will find fits well today's tight budgets.

However, video editing techniques are limited and would cramp the cinematographic style of most film editors, who might prefer to cut Super-8 film despite its small size, and then transfer to video.

HOW GOOD IS SUPER-8 ON TV?

Super-8 image quality — assuming use of the finest resolution film available in the Super-8 format, Kodachrome 40, and assuming camera lenses of the highest optical quality available — can achieve 100 lines per millimeter resolution. The Super-8 frame is 4.2mm high 10 5.7mm wide, giving a horizontal resolution in excess of 500 lines, which is comparable to the finest 2" quad videotape equipment and to broadcast-standard resolution. B. comparison, the 3/4" videocassette (U-matic) recorder haE a horizontal resolution of only 240 lines, and the home vide: format of the future — Videodisc — is expected to have only; 300 lines resolution.

There is, of course, a distinctive change in the vide: image quality whenever the original medium is film, rathethan video camera or video tape. Characteristic differences between film and video in their dynamic contrast range. a associated color shifts, produce the familiar "film" look. E.E compared to the "live video camera" look. But this look o'

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SUPER-8 IN TELEVISION

On a long-term basis, professional Super-8 would seem like a viable alternative for meeting the challenge of Electronic News Gathering

By CHUCK CYBERSKI

Super-8 has always been somewhat of a pipe-dream for broadcasters suffering from the daily expense of 16mm operations. But interest in the small format reached a peak in the early seventies, when inflation began to erode 16mm budgets, and Super-8 manufacturers introduced sophisticated new silent cameras, such as the Beaulieu 4008ZM2. In a survey of US television stations conducted by Super-8 Research News at that time, 55% of the responding news directors voiced a solid interest in changing to Super-8 if given new and improved systems suitable for the job. Unfortunately for the format, the call was premature. The major link in the Super-8 system, the sound cartridge, was missing and years away. The opportunity quickly passed, despite the pioneering efforts of Geoff Williamson (Wilcam) to manufacture a professional Super-8 sound camera.

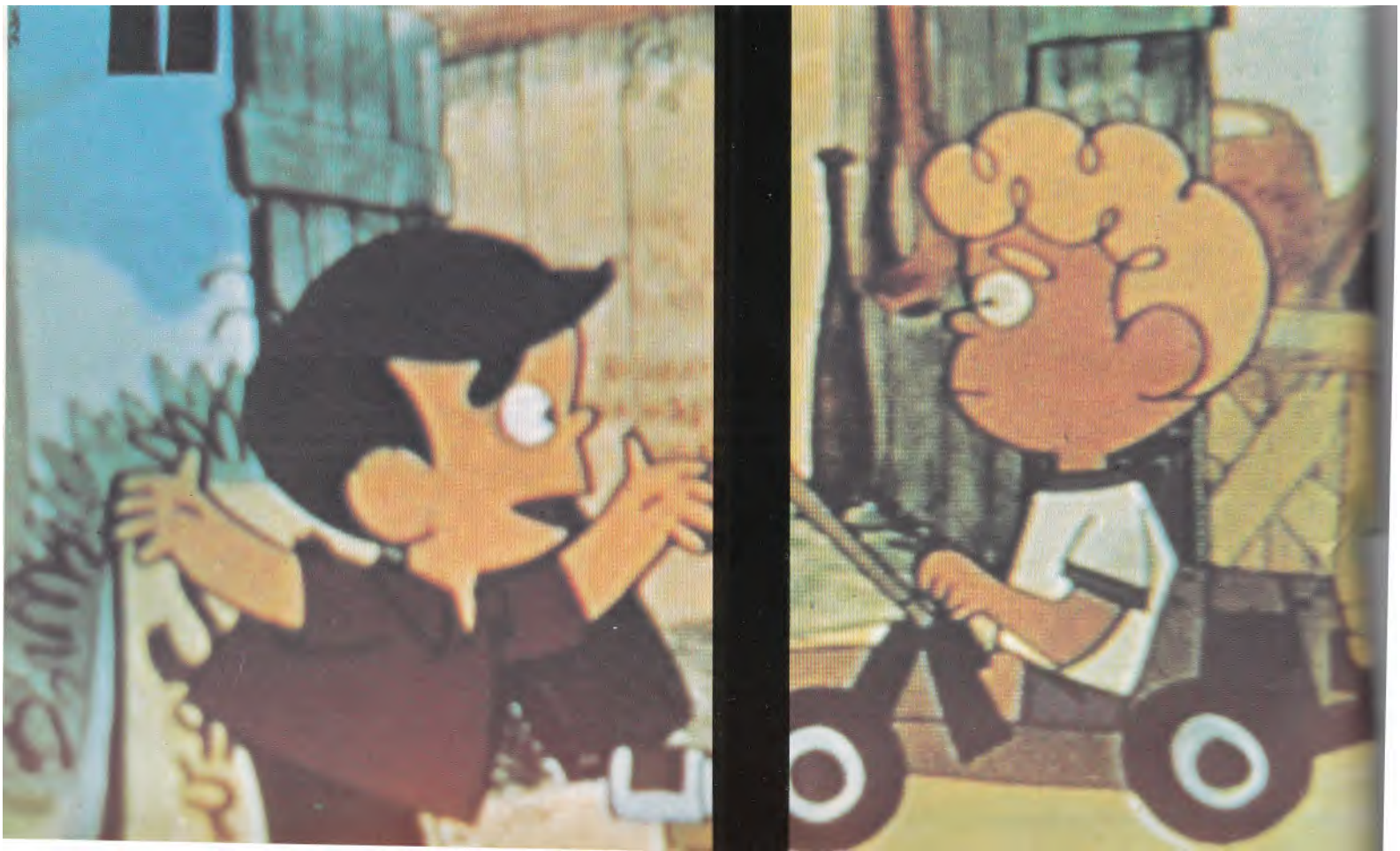
KDUB-TV, a small and relatively new UHF station in Dubuque, Iowa, clung to the idea, though, and in the summer of 1972 the station announced its decision to make a total commitment to Super-8 for both news and commercial production. After shooting 85,000 feet of Super-8 the first year, the station became the first in the country to prove significant savings could be realized through Super-8 — savings in excess of 50% in raw stock, chemistry, and equipment. Letters from over 35 countries around the world were soon pouring into Dubuque, and more than a dozen US stations initiated various experimental programs. However, an easy and economical method of recording single-system Super-8 sound was still missing.

In February 1973, the Wali Street Journal leaked word that Eastman was preparing a new Super-8 sound product, and that summer Kodak announced the important missing link in the Super-8 system, dubbing it the Ektasound cartridge. The announcement of the consumer product was followed shortly by a series of new professional products destined for distribution by 1975: the Supermatic 8 processor, the VP-1 and VP-X videoplayers, the Supermatic 24 XL camera and Supermatic 200 sound camera, and a rapid access news-film available in both 50' and 200' Super 8 cartridges.

Now, to the satisfaction of many of its die-hard supporters, Super-8 has started inching its way toward professional acceptance by a growing number of TV stations, but its real progress and potential have almost been totally obscured by another factor in television: ENG. ENG is the acronym for "Electronic News Gathering", the practice of using lightweight color video cameras and video tape recorders to "film" news events, and in some cases electronically relay them back to the station for instant viewing by portable microwave, or even simultaneous broadcast as in the case of the SLA shootout in Los Angeles.

In short, the classic film-tape debate has suddenly erupted into a real-life

The extreme color blow-up below shows a split-screen comparison between unenhanced 16mm film (LEFT) next to an enhanced Super-8 print. Both photos were shot from a TV screen. Enhancement makes the Super-8 appear sharper, though somewhat coarser and grapier. The appearance of grain is normally increased with enhancement, but much of the high-frequency noise is lost in the home receiver. Electronic image enhancement has been the single most important factor in bringing the Super-8 image up to broadcast standards.

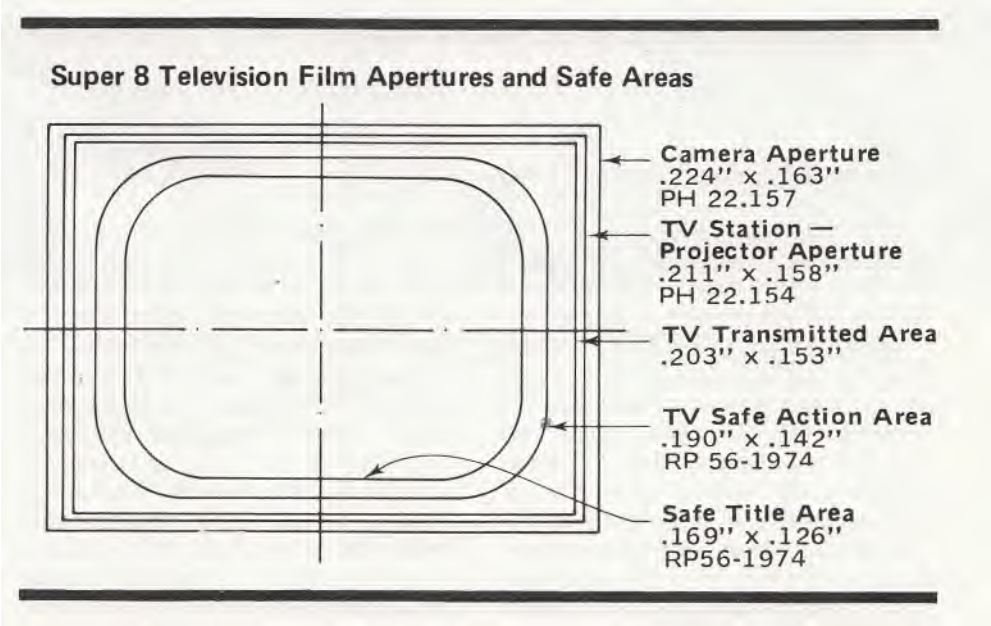


struggle between the traditional 16mm film cameras and the new ENG video cameras, virtually eclipsing the professional capability that Super-8 has finally attained. It's no exaggeration to state that the future of the entire film industry in television is at stake in the ENG movement; to measure the potential of Super-8 in television today requires a very careful examination of what's at the heart of the ENG-16mm debate.

ENG porta-pak costs are very close to 16mm SOF camera costs, operating costs (raw stock) are incomparably lower than 16mm, even when some of the video tapes are archived. Additional ENG bonuses are the elimination of processing with the instant replay, and the capability of live transmissions from the scene. One popular ENG unit has been the Akai VTS-150; it's priced under $7,000 and uses relatively inexpensive ¼-inch video tape which can be reused many times. The hand-held camera weighs about 6 pounds and is umbilically tied to the 16-pound video recorder which is carried by a shoulder strap. The recorder is highly automated and trigger-operated from the camera. After every "video shot" the recorder automatically rolls back a few seconds and goes to a standby mode to wait for the next shot. This allows the reporter to make automatic add-on edits right in the field, much like the "editing in the camera" technique used with film. An electronic iris selects the proper f/stop in the 6x zoom lens, and the small electronic viewfinder with its bright television image doubles as a monitor for instantly checking the recording.

Not surprisingly, the ENG movement is sweeping through the broadcast industry with unprecedented interest and acceptance. Broadcasters attending the 1975 NAB show (National Association of Broadcasters) voted ENG equipment their number one priority on shopping lists, and stations like WCBD of Charleston, South Carolina, and KMOX of St. Louis, Missouri, gave glowing reports boasting of their total elimination of film. As one network news executive told affiliate managers, The question is not whether you will get into ENG, but when." The goat was obviously 16mm.

In response to the challenge, Kodak recently introduced their long-awaited "Video-film", designed to reduce both processing time and chemistry costs. Cinema Products, the leading US 16mm camera manufacturer, has been outpacing Super-8 manufacturers with such camera innovations as multiple LED exposure indicators, bright fiber optic viewing screens, and built-in wireless microphones. But still, the scales are tipping heavily in favor of ENG, and it seems quite certain now that 16mm film and equipment sales to TV stations have reached their final peak.



Indeed, the future of film in television is at stake here, and the only format capable of competing with the innovations of ENG on a long-term basis is professional Super-8. A landslide of new professional products has just begun to hit the market, making Super-8 a match for ENG that should not be overlooked.

The key that finally unlocked the development programs was the Ektasound cartridge. The new 50-foot cartridge closely resembles the silent version, with the main difference occurring in the extended lower portion where there is a second aperture for the record head and capstan/pinch roller assembly. Complete compatibility in the upper portion of the cartridge allows conventional silent cartridges to be used in the new sound cameras.

Both silent and sound versions of the cartridge possess a host of features attractive to news reporters. The most basic and obvious advantage can be found right in the black plastic cartridge: it's a handy light-tight, fog-proof container for the film that allows instant loading under all conditions. The inert plastic also avoids a problem that has plagued the lightweight 16mm cameras: blue spots on the film caused by magnesium particles (Cinema Products recently sought to solve this problem by introducing plastic magazines for the CP-16).

In addition, both silent and sound cartridges contain speed notches which automatically program the camera for the proper ASA, and filter notches which control the Type 85 daylight filter that is built into all Super-8 cameras. The cartridge label provides a convenient means for identifying news stories shot in the field, and the cartridges can be handled roughly with no fear of loose film ends unraveling and fogging the day's work. Kodak is currently supplying four types of film in the 50-foot sound cartridge: Kodachrome 40, Ektachrome 160, Ektachrome EF 7242, and Ektachrome SM 7244; the new multi-illuminant Type-G Ektachrome and Ektachrome 7240 video-film are under consideration. Available in the silent cartridge at the present are all of the above, plus Ektachrome 40 and Ektachrome Type G.

The real significance of the Ektasound cartridge lies in the new generation of compact sound-cameras it has fostered. Kodak operated a dis-

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The Kodak Supermatic 200 sound camera accepts the new 200-foot cartridge of prestriped Super-8 film, as shown here. The camera also uses the 50-foot sound cartridge now widely in use.

TRANSFERRING SUPER-8 TO VIDEO

One of the areas in which Super-8 would seem to have a great future is in the recording of events to be transferred later to videotape

By ALAN ROGERS

One of the areas where Super-8 has a tremendous future is in recording events in color, silent or sound, which will then be transferred to videotape.

Today, for an investment of a few hundred dollars, even a non-professional can take excellent motion pictures with the highly automated Super-8 equipment that is readily available, and the state-of-the-art of transferring film to videotape makes it very easy to release the production in videotape, either for broadcast telecasting over the airwaves, or for use on cable television or other closed-circuit viewing.

Super-8 film as an originating medium for final release on videotape has been facing the same "chicken-and-egg" problem as it faced in the film print areas. Here it was difficult to get labs and other post-production services to invest in the equipment and related services to make prints of professional quality and at competitive prices until there was a high volume of work, and there could not be a high volume of work until the services existed!

The same situation pertains in the video end of Super-8 filmmaking today ... most videotape houses with broadcast-quality equipment able to transfer Super-8 film to 2-inch broadcast-quality videotape do not have enough of this business to warrant mounting a Super-8 projector permanently into their film chain. Consequently, the transfer of Super-8 to videotape is usually a makeshift arrangement and very often the quality of the final transfer suffers greatly.

However it so happens that the three executive officers of National Video Center, Robert Weisgerber, the President; Alan Rogers, V.P. of Marketing, and Philip Mancino, V.P. of Engineering, all have an extensive background in motion pictures as well as in videotape, which is unique for a video service company.

Because of their interest, experience, and faith in the future of Super-8 film and videotape, they have installed a Kodak TVM 100 Super-8 telecine projector permanently in their broadcast-quality filmchain island.

They can transfer Super-8 film to any format of videotape, 1/2-inch, ¾-inch videocassette, 1-inch or 2-inch Quad videotape. They can transfer the sound either from the magnetic stripe on the side of the Super-8 film, from a Super-8 fullcoat recorder (Super8 Sound Recorder) or from a 16mm mag track in interlock.

Many television broadcasters and CATV operators have installed Super-8 projectors in their telecine chains, often as a temporary lashup for occasional use. Others, avoiding the need for modifying existing telecine equipment, project the Super-8 films onto a small white or gray screen to pick up the optical images with a live television camera that can be mounted into position on a dolly in their studio. If care is taken, you can obtain television transfers in this manner, but the quality will be quite low.

The next step up in obtaining better quality Super-8 film-to-tape transfers is to use a small Multiplexer unit whereby you can project Super-8 film directly to a color television tube. With a unit like this you can put your television camera into position when you want to transfer film to tape, and it can be taken out and used for other purposes the rest of the time. This way you do not tie up a color TV camera the way you would have to do if it had to be permanently fixed to the Multiplexer.

The telecine chain at National Video Center is a most complete and complex unit for transferring film to videotape. It has several film projectors and a 35mm still photo projector feeding into the unit, and has a high-quality video camera dedicated to the telecine chain work.

National Video recommends transferring camera original Super-8 film to 2-inch Quad Videotape, and then to do all the editing electronically, with scene-to-scene density correction and color correction.

Kodachrome 40 is the best film to shoot for maximum sharpness in Super-8, even though it has inherently high contrast and is not a good film to shoot with if you want film prints to be made. The density can easily be controlled electronically.

A problem in using Kodachrome is that it is still considered an amateur film by Kodak, and they develop it with less controls than they develop their 16mm Ektachrome films. The result is that once in a while you get a critically important roll back with developing streaks, water marks, dirt, or other problems which are not noticeable to most amateurs, but which are ruinous to a person trying to use this format of film for professional purposes.

Kodak does make a low-contrast Ektachrome 7252 available in 100-foot rolls of Double Super-8, and this film does get developed in the same bath as their 16mm Ektachrome 7252. While it does not give as sharp an image as the dye-structured Kodachrome, it is still quite sharp and gives very good results when transferred to videotape, where it will only be shown on a 26-inch TV screen at most.

A note of caution here to Super-8 filmmakers ... film shot at 18 fps CAN be transferred to videotape, BUT ONLY with a flying-spot scanner videoplayer such as the Kodak VP-1 or VP-X. The problem is that, as yet, not too many video houses have this unit, and if you have film shot at 18 fps and want to transfer it to 2-inch Quad videotape for broadcast use, *it cannot be done with any of the conventional high-qualify broadcast telecine chains!* If in doubt, shoot at 24 fps ... for then you can have it transferred by both the VP-1 or the conventional telecine cameras ... the slight amount of film you save is not worth the price you may have to pay later when you find you have a great production, and a television station is willing to pay good money for it, but it cannot be transferred!

If possible the Super-8 film should be ultrasonically cleaned after all

This color correction console at National Video Center allows an infinite range of color corrections in either 35mm, 16mm or Super-8. The unit can make frame-by-frame color and density correction of film going into and coming out of dissolves, where two pieces of film require correction of each frame.

(LEFT) Alan Rogers, V.P. of Marketing for National Video Center, operates the video switcher, as the final editing and special effects are done on the hour-long production of the International Ballet Competition in Bulgaria. It was shot on Super-8 Ektachrome with a Nikon R-10 camera and transferred to 2-inch quad tape by NVC. (CENTER) Rogers operates the new Kodak Supermatic 200 Super-8 single-system sound camera. The film shot was transferred to 2-inch quad tape, given electronic editing and color correction, plus a multiple sound mix, and ended up as a highly professional TV spot. (RIGHT) Bob Weisgerber, President of NVC, explains Super-8/videotape transfer to producer Zeida Cecelia-Mendez.

editing is finished, and as close as possible before the time of the telecine transfer. The startmarks for picture and Super-8 mag tracks should be the same as in 16mm and should be in editorial sync. Splices should be of the mylar type, like the HPI Quik Splices, as they are extremely thin and less liable to cause the projector to jump while being projected. *This is particularly important because a video house charges by the clock, and if the film projector jumps because of one of your splices, and the film has to be run back to the beginning, YOU PAY FOR THAT TIME!*

Many people run up unexpected expenses because they do not have their Super-8 film and sound material properly prepared for the videotape transfer. It is extremely important to always check with the video house that is going to do the transfer and find out all their requirements and recommendations for the preparation of your material. This could save you hundreds of dollars and could also save you from missing an all-important deadline.

One of the leading Super-8 producers in New York City is Zeida Cecelia-Mendez. She is an ex-dancer who is now producing television commercials and documentaries for the Spanish-speaking markets in the United States.

This year she shot sixty Super-8 rolls of High Speed Ektachrome 160 with a Nikon R-10 camera at the International Ballet Competition in Carna, Bulgaria.

Professional photographers using 35mm and 16mm movie cameras were not allowed to film this festival, but the festival did allow it to be shot in "amateur" Super-8!

Zeida shot the whole festival with the hand-held Nikon and recorded sound wild with a small portable Sony tape recorder a one-person production team!

She had the film developed by Kodak in Fairlawn, N.J. It was then edited by the Super-8 Film Group of New York City (one of the country's leading production and post-production companies). They also synced up the sound track shot in Bulgaria, mixed in new voiceover narration, and also put in a new music track. The final sound was four-track, two music tracks to achieve cross dissolves, a sound effects track and a narration track.

They then took the edited Super-8 film and mixed audio track (the latter being on fullcoat Super-8 mag stock) to National Video Center, and it was all transferred to two-inch Quad videotape. She finished with a 60-minute quad tape of the highest television broadcast-quality which was aired on the National Educational Network in New York in August.

There was a wide variation in the color and densities of the Super-8 film, but this was easily adjusted when being transferred to quad tape with the use of the automatic density unit on the National filmchain, and with the use of the computer-controlled Color Corrector designed by National earlier this year.

Another very interesting Super-8/video job that was done at National Video Center was a 60-second commercial for the State Capital Savings Bank. It was shot the day before Christmas of 1974 on high-speed Super-8 Ektachrome 160 by Gunther Hoos and Mark Mikolas of the Super 8 Film Group of New York City. It was shot on Super-8 film because the client only came to them the day before Xmas with the final concepts for the commercial, and it had to be on the air 3 days later!

Because of union holidays all the 35mm and 16mm labs were closed, and the only way to have film processed was to shoot in Super-8, and have it processed by a smali non-union lab that was open over the holiday season.

There was no time to even try to get a workprint made, and so they had to edit their sound-track against the original Super-8 film. They edited in A & B roli and did a three-machine video mix at National Video Center in order to obtain dissolves in the final tape transfer.

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Phil Mancino shows Zeida Cecelia-Mendez how the National Video Center Color Corrector works. Her Super-8 footage of the International Dance Festival in Bulgaria, after transfer to 2-inch quad tape with automatic density control, image enhancement and color correction, resulted in a final quad tape of high broadcast quality.

SUPER-8 LABORATORY SERVICES AND STOCKS

Continued from Page 1270

Moonachie, N. J., is now supplying Takita Printers, for Super-8 original stocks, including Optical Printers, Contact Step Printers, and Continuous Contact Printers.

Most labs are processing Super-8 in their 16mm processing equipment. Only recently have processing equipment manufacturers turned their attention to special requirements for the processing of Super-8 original, e.g. the Jamieson Compac Model S. If Super-8 film becomes widely used as an original production medium, especially outside the U.S., in the developing countries, there will be an increasing demand for Super-8 processors.

Eastman Kodak has anticipated this market, and the need for rapid turnaround processing of Super-8 in the U.S. for television news applications. They have announced a new fully-automatic processor and a new film stock intended for use with the new ES-8 process.

The Supermatic 8 Processor can be loaded in daylight with any Super-8 cartridge (50 foot, 200 foot, and special 400 foot cartridges). The processed film, ready to project, emerges 13 1/2 minutes later (50 feet). The machine needs only sources of water and electricity, and a drain. Chemicals are added from prepared packages, and the processor automatically maintains chemistry quality. When chemicals are exhausted, the machine disposes of them, cleans itself, and calls for new chemicals before it will restart.

The Supermatic 8 processor can at present process only a single emulsion, the new Kodak SM 7244, which is available in 50 foot and 200 foot silent and sound cartridges. The price of the Supermatic 8 processor is $12,500. About 10-20 Super 8 cartridges per day will amortize such a capital outlay, over a few years' period, by comparison with typical commercial processing costs.

Since Kodak hopes that much Super 8 film will be transferred directly to video using their new flying-spot scanner Videoplayer, the combination of the automatic in-house processor and video as a release medium may limit the growth of a truly large volume Super-8 business for motion picture laboratories.

(ABOUT THE AUTHOR: Richard Lerman is an independent filmmaker, composer of electronic music and writer. He teaches at the Boston Museum School of Fine Arts and is co-owner of the Super-8 Workshop, a film school and production house in Cambridge, MA.)

SUPER-8 VIDEO — A NEW PRODUCTION CONCEPT

Continued from Page 1308

film is the same whether the original film is 16mm or Super-8. With a crisp Super-8 original, with image enhancement as is generally used for 16mm film transfers, and with electronic color correction, it is extremely difficult to distinguish Super-8 from 16mm in off-the-monitor tests reported in the SMPTE Journal, and shown in this issue of *American Cinematographer* in the article by Chuck Cyberski.

KODAK SUPERMATIC FILM VIDEOPLAYERS

The Kodak Super-8 Film Videoplayer replaces an entire conventional telecine film chain — including telecine projector, optical imaging system, and color video camera — at a price about one-tenth the lowest-cost 16mm film chain. It does this with a device known as a flying-spot-scanner.

The Videoplayer moves Super-8 film continuously (no intermittent motion) past an aerial image of a small TV screen. The screen has no picture on it, just a gray raster-scanning pattern. The image of the screen is the same size as a Super-8 picture frame, and falls directly on the film. If the image could be seen in microsecond time intervals, it would appear to be a small spot (the image of the spot where the electron beam falls on the TV tube phosphor), raster scanning back and forth across the Super-8 frame. Thus the name "flying-spot-scanner". Three photo-multiplier detector tubes (Red, Green, Blue) on the other side of the film measure the color of the spot from moment to moment and convert the result into a full NTSC standard composite color signal. There is no color camera.

The Kodak Videoplayer is an enormous engineering breakthrough that expands the options of a Super-8 film producer to include video distribution of his films as well as normal projection. A combination of a Super-8 film production system and a Kodak Videoplayer is the lowest cost independent video production system with color, editability, and extreme location portability.

KODAK FILM VIDEOPLAYER VP-1

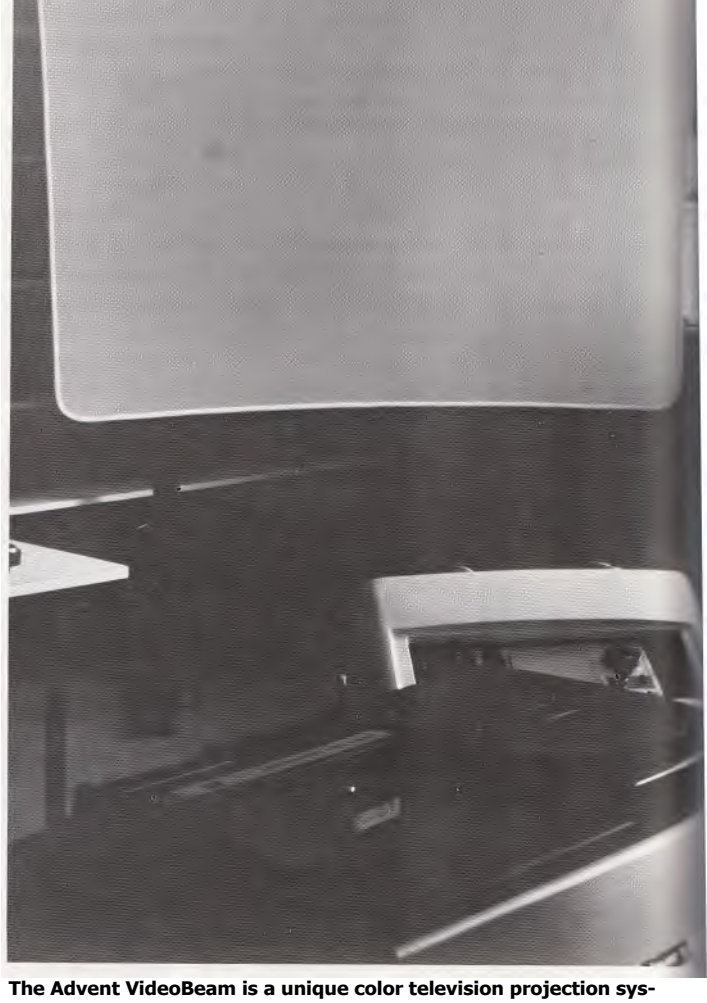
The VP-1 accepts Super-8 film, color or black/white, sound or silent, on standard Super-8 reels or automatic-loading Supermatic cassettes (400-ft. maximum — 20 minutes). It operates at 24fps or 18fps, and converts the Super-8 picture film into a standard color television signal that can be displayed on an ordinary color television receiver or a color monitor. Sound is derived from the magnetic edge stripe of a single-system film, or from Super-8 fullcoat magnetic film being played back in synchronism on a double-system sync recorder (Super8 Sound Recorder).

Kodak Videoplayer controls include still-frame capability, framing adjustment for still and running frame, a vertical steadiness adjustment/blue/red tint control, and focus.

RF signal outputs are channels 2 or 3. A switch is provided to select between the Videoplayer or the VHF antenna of an ordinary color TV set. Video signal output is fully interlaced (525 lines) NTSC composite video, with a separate audio. These signals are suitable for display on a color TV monitor, or recording on a videotape recorder.

KODAK FILM VIDEOPLAYER VP-X

The VP-X has the same specifications as the VP-1, except that it has no RF-modulated output, and it is equipped to accept external synchronization for use in broadcast situations, or where a large video system is run on system-wide "station sync". The external sync inputs include burst flag, composite blanking, vertical drive, composite sync,



The Advent VideoBeam is a unique color television projection system that produces an 87" diagonal picture on a special Ektalite screen. In conjunction with the Kodak VP-1 Videoplayer or video-cassette players, the VideoBeam can be an important part of an in-plant video distribution system, since a very large audience can simultaneously view the program.

horizontal drive, and color subcarrier (BNC connectors). The outputs are composite video 1-volt peak-to-peak across 75 ohms (BNC connector), and a 600-ohm unbalanced audio signal (RCA phono jack). Signal/rms noise ratio is a greater than 37dB. Horizontal resolution is 240 lines (color). No time-base correction is required. A number of VP-X Videoplayers can be synchronized to one another using an external color sync generator, a distribution amplifier, and a phase shifter to control tint variations between Videoplayers.

A video switcher or special effects generator can select between the videoplayers, live video cameras, or video tape recorders with time-base correction, and the result can be directly broadcast or recorded on a master videotape.

Because the Videoplayers do not transport the Super-8 film in frame-for-frame sync interlock with the external sync signal (only the video raster scan is in sync), precise A & B rolling is impossible. The switch from the "A" roll to the "B" roll cannot be guaranteed to occur on a specific frame. Super8 sound of Cambridge is working on a servo-control sync interlock system for the VP-X that will permit such precise switching between A and B rolls, and allow the switch points to be programmed electronically.

Super8 Sound was among the small group of eight dealers selected by Eastman Kodak to receive the first Videoplayer franchises. We modify all the Videoplayers we sell to include a standard 1/F sync pulse signal, suitable for synchronizing a fullcoat magnetic film soundtrack. This permits highest fidelity double-system audio/videc transfers using the Super8 Sound Recorder.

SUPER-8 SOUND RECORDERS
Continued from Page 1265

deck. The record-reproduce electronics are available in monophonic and stereophonic versions. The Super-8 fullcoat head assembly is manufactured by Crown to Super8 Sound specifications. Each Lab Recorder is supplied by Crown biased and equalized for recording on Super-8 fullcoat magnetic film, with calibrated frequency response test charts.

The Super8 Sound Laboratory Recorder consists of three components — the fullcoat transport, record/reproduce electronics, and sync electronics. A portable case is available, but the three components are designed for rack-mounting in standard 19-inch racks.

With its one-hour running time, the Lab Recorder can do transfers to the longest available Super-8 film loads — 1200 feet. This length facilitates double-system sync transfers from Super-8 to video with no need for intermediate stops on even the longest video cassette.

Super8 Sound Recorders are not sprocketed machines. They interlock with other sync equipment by servo-electronic speed control employing negative feedback. The rate of sprocket holes passing the magnetic head is sensed photo-electrically by a light-emitting diode and photo-transistor. This rate is compared to whatever sync reference rate is desired (camera, 60Hz pilotone, quartz crystal, AC line frequency, recorded sync signal, projector, etc.). If the Super8 Sound Recorder rate is too fast, or too slow, an error signal is generated that slows down or speeds up the Recorder capstan speed (negative feedback). The changes made in the capstan speed contribute no detectable wow or flutter. The error signal itself is displayed on a visual sync indicator meter, so the operator can monitor sync conditions at any time.

Synchronism between the rate of mag film sprocket holes and a "master" rate set by the external sync reference, (camera, projector, etc.) is accomplished by matching up "master pulses" from the sync reference to "slave pulses" from the mag film sprocket holes one by one. For example, each frame of film exposed in the camera has a corresponding master pulse derived from the 1/F contact switch in the camera. For each master pulse there will be one, and only one, slave pulse coming from a mag film sprocket hole passing the head of the Super8 Sound Recorder, when the Recorder is in sync.

Any speed "error" in the Super8 Sound Recorder is detected and measured by a digital logic device known as a "flip/flop". Each master pulse turns the flip/flop to its "on" state, and each slave pulse turns the flip/flop "off". If the recorder is slow, as assumed, the average time the flip/flop is on will be increasing. The average "on" time of this flip/flop is an error signal which can be fed back into the motor of the Super8 Sound Recorder, creating a closed servo "loop", with the following property of stability at the correct master pulse rate:

IF the Recorder runs slow *relative to the master sync pulses, the average voltage from the flip/flop* increases, *speeding the Recorder up to the correct speed.*

IF the Recorder runs fast *relative to the master sync pulses, the average voltage from the flip/flop* decreases, *slowing the Recorder down to the correct speed.*

It follows that the Super8 Sound Recorder cannot run at any speed but that which matches slave pulses to master pulses. The Recorder is said to be "slaved" to the external sync reference. If any small tendency to run fast develops, the servo sends a "slow down" error signal back around the negative feedback loop to the motor; if any tendency to run slow appears, feedback of the error signal speeds up the Super8 Sound Recorder.

Negative feedback and the principle

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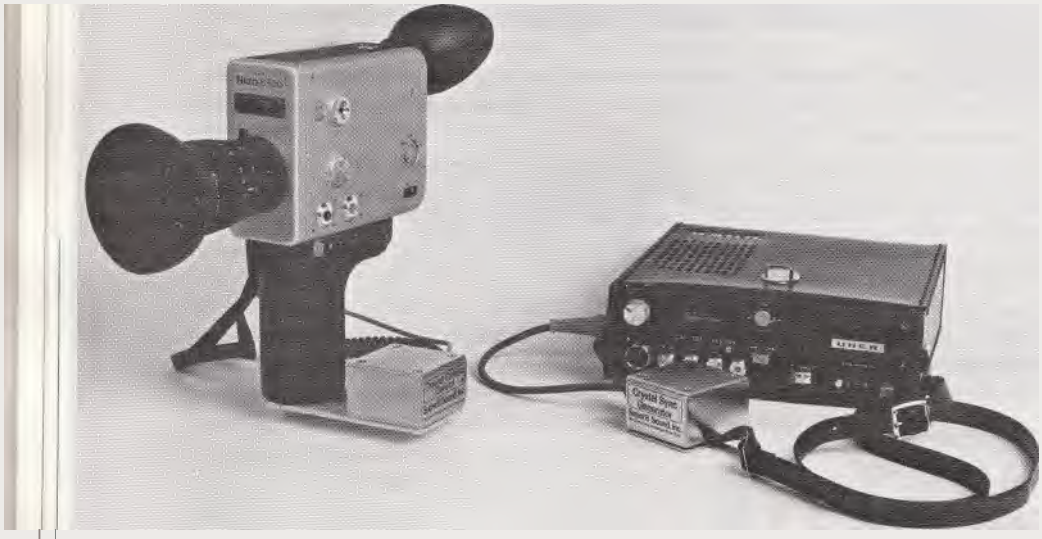
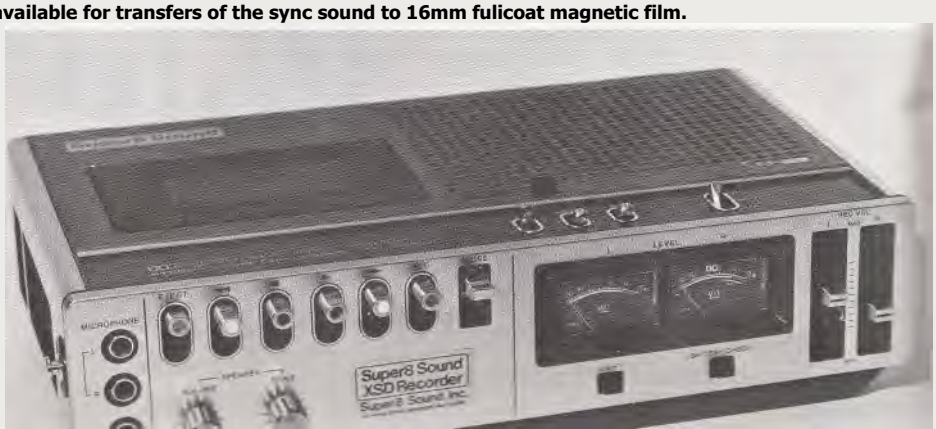
The Nizo S560 and Philips 2209 sync cassette recorder make an inexpensive and lightweight location rig. Camera and recorder may be crystal-controlled with the addition of external crystal boxes.



The Uher CR134 recorder records extremely high-fidelity stereo sync sound on cassettes. The sound quality compares favorably with that of cassette recorders with Dolby noise reduction. The addition of a crystal sync generator makes possible sync use with crystal-controlled cameras.

The XSD Recorder, based on the Sony TC153-SD cassette recorder with Dolby noise reduction circuitry, has internal crystal sync, as weli as the capability to synchronize with cameras equipped with the standard pilotone output. A companion XSD Resolver is available for transfers of the sync sound to 16mm fulicoat magnetic film.



CRYSTAL-SYNC SUPER-8
Continued from Page 1267

non-sync use. In addition to cableless crystal-sync work, the recorder can be cable-connected to pilotone cameras. Cables are available for standard Tuchel (Arri,Bolex), Canon XLR (Eclair), and BNC (Beaulieu) connections.

The 60Hz crystal pilotone appears on the left channel (track 1) when the input selector is on "mic" and there is nothing plugged into the left channel microphone input jack. A pilotone cable plugged into the left channel overrides the crystal tone with the camera sync tone. Level is adjustable to compensate for a wide range of pilotone input voltages (.4V to 4V rms).

The XSD Recorder has Dolby B noise reduction encoding and decoding circuitry. Location tapes can be transferred to fullcoat magnetic film while still encoded for Dolby noise reduction. Successive generations of sound can also remain encoded, up to the stage of mixing with another sound track. Dolby Noise Reduction Adapters are available for use at the mixing stage.

Resolving to Magnetic Film

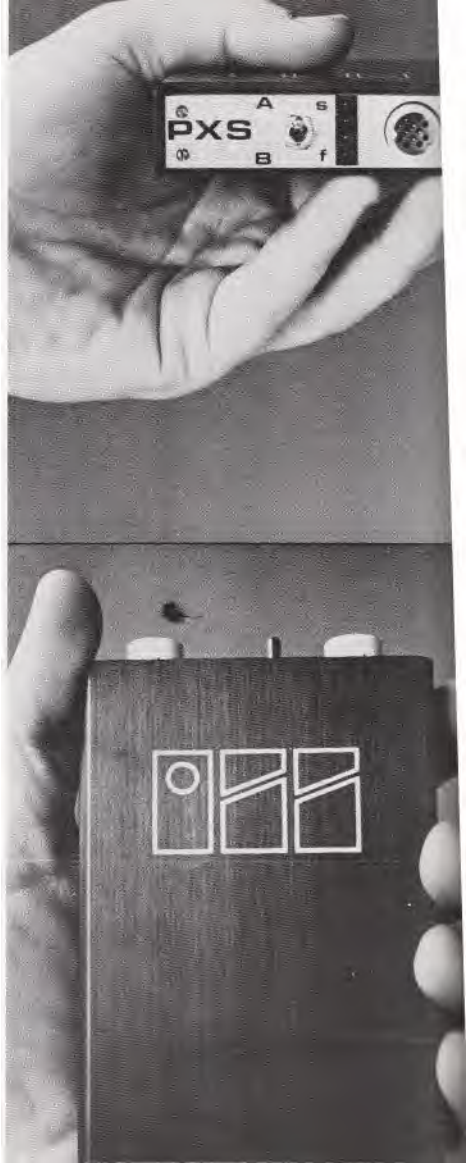
The XSD Recorder has a built-in capability of self-resolving. The 60Hz pilotone signal can be matched to the AC 60Hz line frequency for transfers to magnetic film on sprocketed synchronous dubbers. This requires the use of the optional XSD Resolver Unit. Write Super8 Sound for a list of labs equipped with the XSD Recorder and XSD Resolver, and who can transfer sound to 16mm or 35mm fullcoat magnetic film. Transfers to Super-8 fullcoat do not require the XSD Resolver, since the Super8 Sound Recorder can match its speed to the 60Hz pilotone signal. An alternative method of resolving is to transfer selected passages to a quarter-inch pilotone recorder, and have your sound lab resolve from quarter=inch.

The XSD Resolver is intended for use by labs and production houses with AC-synchronous magnetic film recorders. The Resolver plugs into a 110-125V AC 60Hz line source. It accepts the 60Hz pilotone from track 1 (left channel) of the XSD Recorder, and delivers a servo-electronic speed control signal to the special speed control input jack of the XSD Recorder. The original 60Hz tone on the sync track of the Recorder is compared to the 60Hz AC line source and the speed of the XSD Recorder is automatically adjusted to maintain sync.

A sync meter on the front panel of the XSD Resolver displays the sync condition. The automatic servo speed control can be set so that transfers of tracks made with pilotone cameras will not change speed in those sections where the camera was stopped. A speed-range control adjustment is provided on the front panel. With this adjustment it is possible to capture and lock on original pilotone signals that were ± 10% from the nominal 24fps. Screwdriver adjustment is provided for still larger speed corrections, if necessary.

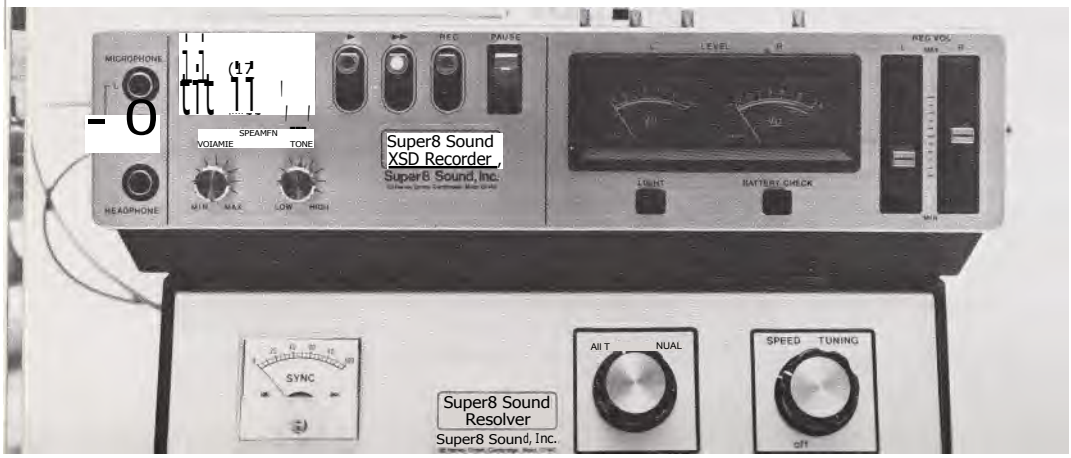
XSD Recorder Specifications

Frequency response 30-15,000 (Cr02). Signal/Noise ratio with Dolby OFF — 48db, with Dolby ON 53db at 1 KHz, 58db at 5KHz. Wow and Flutter 0.15% NAM RMS. Bias Frequency 105KHz. Pilotone separation 36db. Crystal accuracy, ± 1 frame in 13 minutes, -10°C to 40°C (50ppm stability over temperature range). Power DC 6V/8W (4D cells or NiCad battery pack), AC 110V/12W. Size 23.8cm x 37.8cm x 10.8cm (9-3/8" x 14-7/8°" x 4-1/4"). Weight, 5.4kg (12 lbs) with batteries. Microphone input, 1/4" phone jacks. Line input/output, RCA phone jacks. Sync output nominal 1V RMS 60Hz, RCA phono jack. Low impedance stereo-phone monitor output. Microphone sensitivity, 0.2mV at noa. 60Hz standard pilotone sync pulse on cassette track 1 (left channel). Speed control input: special power connector to XSD Resolver. ■



Inner Space Systems' recently introduced Model PXS is a pocket-size, economical Cine-Slave for crystal-controlling modified cameras. Their Model PX, the same size, is a crystal oscillator suitable for recording a 60Hz pilotone sync signal on the track of any two-channel recorder.

The Super8 Sound XSD Recorder with XSD Resolver. The XSD Recorder has a built-in capability of self-resolving. The 60Hz pilotone signal can be matched to the AC 60Hz line frequency for transfers to magnetic film on sprocketed synchronous dubbers. This requires the use of the optional XSD Resolver Unit.



(ABOUT THE AUTHORS: JON ROSENFELD and AL MECKLENBURG. Rosenfeld is a former physicist who joined the staff of the MIT/Leacock Super-8 project at its inception. He holds the U.S. patent for the MIT Super-8 System. Mecklenburg was an engineering undergraduate at MIT when the Leacock project began, and worked with Rosenfeld on the design of the system. He has made several films and worked as soundman on segments of "An American Family", some of which was shot on Super-8 using the MIT equipment. Filmmakers themselves, they bring a practical combination of engineering and film production experience to the design of Super-8 gear.)

DEVELOPMENT OF SUPER-8
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screen. A facility of this kind has a number of attractive features — it can be set up in the studio where the program producer or director has direct control of Super-8 film inserts in the same way as all the other studio facilities; perhaps even more important, the rear screen projection concept can be extended easily to provide multiple projection facilities and optical mixing of the projector light beams. With such an arrangement optical effects such as lap dissolves and superimposed titles could be produced with only a single television camera.

To simplify and speed up the processing of Super-8 camera film, especially for television news purposes, Eastman Kodak has introduced the Kodak Supermatic 8 processor, designed for operation in an office environment. Features of this highly automated, compact processor include cartridge loading of the film, easy operation, simplified handling of liquid concentrate chemicals, and a dry-to-dry time of 131/2 mins. This machine is designed to process the new Kodak Ektachrome SM film 7244.

In the early stages of Super-8 development, attention was concentrated mainly on meeting the needs of the anticipated mass market for low cost prints with magnetic sound tracks and projectors to handle these materials in the simplest and most convenient manner. It was expected that these prints would be made by optical reduction from 16mm or 35mm originals, and that there would be little demand for printing from Super-8 originals. Many motion picture laboratories have facilities for printing from Super-8 originals, including the insertion of simple optical effects, and where prints are needed for distribution, this is the obvious route to take. Within the past few years significant improvements have been made in the films needed for the print process, and the equipment being used to make the prints. One factor limiting progress in this direction is the pressure to keep costs for prints as low as possible, while unfortunately the amount of time needed to make one or two prints from a half-hour Super-8 film is likely to exceed that for a comparable 16mm operation.

Some film users look to Super-8 as a means for reducing production costs. In fact this is a short-sighted attitude to take. While it is true that, minute-for-minute, Super-8 is far less expensive than 16mm, this is by no means its most important feature. Super-8 is a new medium, and we have yet to learn how to exploit this new medium most effectively. The concept of low-cost mass-production for home and school use is a most alluring prospect, but it depends for its success on the acceptance by the public of the Super-8 film format as a communications and entertainment medium. Until there is a demonstrated large-scale demand for Super-8 prints by home and educational users, the mass production and distribution concept cannot be fully realized.

The cartridge projector incompatibility referred to earlier has no doubt been a major factor in limiting the growth of the Super-8 release print market. Significant technical strides were taken by Eastman Kodak and various film laboratories to lower the cost of Super-8 prints, including methods for mass producing Super-8 prints, complete with magnetic sound tracks, at 40 times sound projection speed. This was accomplished by optical reduction of a 16mm color original to produce four rows of Super-8 frames on a 35mm internegative, and then making the prints on a special 35mm material with four rows of Super-8 perforations and four pre-striped

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most cassette recorders.

Five or six other camera manufacturers have now built single-system cameras and it appears likely that most will eventually do so. These cameras are much more sophisticated than the Kodak Ektasound, and some, like the Beaulieu, are clearly aimed at professional Super-8 applications. Some run at 24fps, accept 200-ft. sound cartridges, have manual gain control, headphone sound monitoring, and advanced lenses.

Cinema Beaulieu 5008S Sound Camera

The Cinema Beaulieu 5008S Sound Camera is in many respects the standard against which all other Super-8 cameras, silent or sound, are measured. It has the finest Super-8 lens of any camera, the magnificent C-mount Angenieux 6-80mm f/1.2 (T/1.4). The well-known Schneider 6-66mm Macrozoom lens is also available as an option at a much lower cost. The 5008S is both a single-system (stripe) sound camera and a double-system sync camera, since it has both pilotone generator and 1/F sync contact switch accessories. It has been made quieter running (about 3dB) than the 4008 and has a much improved handle structure, but its run switch is difficult to operate compared to the 4008. The long telephoto and the awkward controls demand that this camera be used on a chestpod or tripod, to produce steady images.

The 5008S is strongly recommended for TV News operations, as a prime camera in beginning sound filmmaking classes, and as the most generally useful Super-8 camera.

As a sync sound recorder, the Beaulieu 5008S is superb — actually superior to the Scipio and Philips 2209 sync cassette recorders in most respects. The viewfinder exposure needle switches over to become a VU meter needle for precise manual gain adjustments. Automatic gain control is also included. A high impedance headphone (200061) is necessary for monitoring. Sound specifications: Three inputs — microphone (.15mV), 50-500061, line 1 (3mV, 100K61), and line 2 (30mV, 500K61); Monitor output (subminiplug, 1.5K61 impedance); Frequency response, 50-12,000Hz± 1.5dB; Weighted Signal/Noise Ratio, 57dB (amplifier electronics only); Wow and Flutter, 0.4%; Bias, 60KHz; Distortion at maximum 0.75%; OVU-10dB below track saturation.

The Kodak Supermatic 200 Sound Camera is an improved version of the Kodak Ektasound camera made by Eastman Kodak's Motion Picture and Audiovisual Markets Division. It runs at 24fps, accepts the 200 ft. sound cartridge, has manual gain control, and headphone sound monitoring. Like the Ektasound cameras, it is noisy and has a relatively low quality lens.

The inexpensive Sankyo XL4OS Sound Camera list price is less than the Kodak Supermatic 200's, yet it has 24fps speed, 200-ft. sound cartridge capability, and its f/1.2 lens has a 4-to-1 zoom and macro focusing. In tests at Super8 Sound, the Sankyo was found to be the quietest running Super-8 camera of any yet measured.

Bolex has put their longest zoom lens (8-to-1) on a single-system sound camera called the Bolex 580. They also have an XL version of the camera with a 5-to-1 zoom lens, the Bolex 550XL. Unfortunately, both of these cameras run at 18fps only.

There are many other single-system sound cameras on the market, and they are described in the accompanying data table. Many more are in the works at various manufacturers. We saw prototypes of several at *Photokina*, '74. For example, Anton Wilson described the Agfa-Gevaert Movexoom 10 Sound camera in his article in the December, 1974, *American Cinematographer.*

Some Comments on Cutting Single-System Super-8

Cutting single-system film with sound on the magnetic edge stripe has the drawback that the sound and picture are displaced from one another by 3/4 second (18 frames). An editor/viewer with a mag stripe reader is essential with single-system footage to make the best cutting decisions.

The Minette is the brightest and sharpest Super-8 viewer on the market. Teeth are in the standard position at the rear for proper editorial wind. A built-in pressure plate keeps the image in focus even when not winding. A single-system sound reader attachment is available for the Minette.

The Elmo 912 is a single-system viewer, with a larger but dimmer picture than the Minette S-5. Teeth are at the front and the viewer is therefore not compatible with standard Super-8 synchronizers. Accessories are available for counting frames and cleaning film.

Several manufacturers have recently introduced tape splicers that leave a space in the area of the magnetic edge stripe, allowing cutting of single-system original film. The Guillotine splicer (a plastic version of the best-known professional film splicer) cuts sprocket holes and cuts a shortened piece of tape on the sound track side, to avoid covering the magnetic edge stripe. Two recently introduced splicers use prepared splices and apply them fully automatically so that fingers, editing gloves with little hairs, dust, etc., never get near the sticky side of the tape. The HPI Quik-Splice Super Splicer and the less expensive Hervic Minette Tape Splicer work this way.

Filmmakers should realize that it's very difficult to get intelligble sound when pulling Super-8 film by hand. No one as yet manufactures a motorized sound editor/viewer, but single-system versions of the Super8 Sound Editing Benches, the MKM Editing Tables, and the Super-8 Research Associates Post-Production Consoles are available. These allow both single-system and double-system editing.

It is also possible to edit single-system by eliminating the 18-frame sound and picture separation with a displacement recorder. The Moser Displacement Recorder will pick up the sound from the 18-frame advance position and rerecord it on the edge stripe in "editorial sync" (immediately next to the corresponding picture). When picture is cut, the accompanying sound is also cut. After editing, the Displacement Recorder replaces the sound on the edited footage at the normal 18-frame advance position for projection or transfer to video.

If you want to keep in touch with the rapid pace of new introductions of Super-8 equipment, write to Super8 Sound, Dept. JBM, 95 Harvey Street, Cambridge, Mass., 02140 for copies of the Super8 Sound Catalog ($2), and the Reference Book Super-8 ($15), a comprehensive compilation of original manufacturers' literature and data sheets on Super-8 cameras, recorders, and post-production equipment.

(ABOUT THE AUTHOR: JULIE MAMOLEN is the National Sales Manager of Super8 Sound, Inc. Her background was in computer systems and design of the Wide-Area-Telephone-System at AT&T. She and Bob Doyle have studied all the sync sound Super-8 cameras on the market and have designed various integrated production systems based on most of them.)

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closure program to manufacturers several months before the official Ektasound announcement, and as a result of that, Beaulieu of France was the first manufacturer to deliver a truly professional Super-8 sound camera. Beaulieu's lead came in part from his own research which the company had been conducting on the Super-8 sound problem for several years.

The Beaulieu 5008S Super-8 sound camera carries an impressive set of manufacturer's specs: a frequency response range of 50 to 12,000 Hz + 1.5dB @ 24 fps; distortion at less than 0.75%; a signal-to-noise ratio of 57dB (amplifier electronics only), and wow and flutter below 0.4%. Angenieux's contribution to the camera was a record-breaking 13-to-1 f/1.2 power zoom lens. Coupled with the camera's mirrored shutter that delivers all of the lens light to the film, the 5008S gives amazing results in 6 foot-candles with any high-speed Ektachrome stock.

The electronics in the 5008S allow total automation in sound filming if desired. At the flick of a switch a servo motor swings into action to control the iris, and an automatic level control rides gain on the audio. Of course, manual exposure and audio control are also possible, and in these modes the camera's viewfinder needle acts as both a VU meter and exposure indicator. As with all cartridge sound cameras, the solid-state amplifier is built right into the camera, and allows for a choice of input levels, in addition to a monitor output for earphone or headphone. Like earlier Beaulieu models, the camera can handle an ASA range of 10 to 400, but running speeds are understandably limited to 18 and 24 fps for sound filming. One of the first stations to begin using the new Beaulieu for TV news reporting was KHGI in Kearney, Nebraska.

The Kodak Supermatic 8 processor, announced November 1, 1974 by Eastman Kodak Company, features cartridge loading of the new Kodak Ektachrome SM film, 7244, in 50 and 200-foot cartridges, as weli as in 400-foot darkroom-loaded cartridges. The processor has a dry-to-dry time of 81/2 minutes. Developed film is wound onto a reel at the opposite end of the machine and is ready for projection.

Another company that has been closely involved in the development of Super-8 magnetic sound since 1965 is Eumig, an Austrian electronics and manufacturing firm that is well known for its sound projectors. Earlier this year Eumig introduced their new sound camera, the 30 XL. Eumig has traditionally favored viewfinders filled with information indicators, and the new sound camera is no exception: a green LED is used to indicate audio modulation, while a red **LED** is used to warn of possible underexposure. Off to the right of the viewfinder screen is a moving arrowhead which indicates film advance; this arrowhead turns to a bright red approximately 20 seconds before the 50-foot cartridge runs out, allowing a reporter to plan accordingly. Still another viewfinder innovation is the filter indicator (sunlight or tungsten bulb) which lights momentarily at the beginning of each shot to remind the cameraman of what type of light he has the filter set for. Features like these, and the camera's auto-exposure system and automatic level control are what make Super-8 such an attractive, fool-proof tool for gathering news under adverse conditions. And the camera's price (approximately $350) makes it ideal for news stringers.

The Eumig's single running speed of 18 frames per second raises the age-old question of the quality of this slower speed. The 18 frames per second rate translates to a linear stripe speed of 3 inches per second — still substantially faster than the 1-7/8 inches per second of the Phillips audio cassette. David L. Carr of Eastman Kodak recently delivered a technical paper to the Society of Motion Picture and Television Engineers documenting the

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(LEFT) Film chain at KDUB shows the Kodak TVM100A Super-8 TV projector used with an RCA color TV camera. The projector's automatic threading has proved to be very reliable. (RIGHT) Editing Super-8 at KDUB, using the Wilcam sound editor and Bolex hot-splicer. Note the "seconds" counter on the left side of the editor. In 1972, KDUB-TV in Dubuque was the first station to announce a.total commitment to Super-8 for both news and commercial production.

SUPER-8 TO THE SUMMIT
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everybody came up with his own little treat — a real Howard Johnson's menu — chicken tetrazzini, beef almondine, tuna a la neptune, turkey supreme, prunes. Of course, regardless of the label, everything tasted the same, but this was somehow reassuring.

Before the sun went down I jammed the Bolex tripod between two rocks and set up a time-lapse shot toward 12,326-ft. Mt. Adams, fifty miles to the south. The sun set as directed, and the shot was superb.

Our climbing schedule called for a 2:00 A.M. wake-up on Sunday, with a 3:00 A.M. departure. That meant "getting organized" at 10:00 P.M. Saturday night. Since we planned to return via the same route the next day, we were able to stash ali the unnecessary equipment — which amounted to fifteen exposed cartridges.

The periodic roar of avalanches somehow kept us awake. To pass the time I pulled out my little black book (lighter and more portable than the *American Cinematographer* Manual) and showed Jeff some facts and figures. He was asleep instantly.

	Super 8	16mm
* 100 minutes raw stock with processing	$ 240	$ 720
* One-light workprint with edgenumbering	$ 300	$ 360
* 20-minute timed A & B answer print with sound	$ 130	$ 240
TOTAL:	$ 670	$1320

A cursory glance at these figures reveals the real cost advantage of Super-8 is in the raw stock and processing stage. This means with selective workprinting I can take the shooting ratio up to immodest levels without spending lots more money. (Though not to the obscene eighty-to-one 35mm shooting ratio of JONATHAN LIVINGSTON SEAGULL.)

Another money-saving possibility is to transfer the original footage directly to videotape and use that as a workprint. One method of accomplishing this is the following: View the original footage once and record on a shot log the exact content and length of all takes. Sync up all the sound footage very carefully in one pass through an editing table with a seconds or footage counter. The sound footage is then played back double-system for videotaping. Add a digital clock that reads out in seconds in one of the lower corners of the screen and you have a reference between the videotape and the seconds and/or footage counter on the editing table.

This means handling the original three times, but I've found that the amateur "projection" stocks, 160 and K11 are tough to scratch. The real advantage of a videotape workprint is the fast forward and reverse capability, and the ability to make practice edits without cutting anything. I view the videotape numerous times to become intimately familiar with every shot, and then edit electronically to a master deck — usually a Sony 3650. Theoretically, the original Super-8 can be conformed by someone who has never seen a frame of footage. For example, the first shot on the edited videotape is a long shot of Mt. Rainier. The digital clock readout on the tape says 01 01 12 and advances to 01 01 25 before the first cut occurs. The editor would then put the 01 roll of film on the table, go in until the counter reads 1 minute, 12 seconds (or its footage equivalent, 24 ft. 00 frames), and clip out the next 13 seconds (or 4 ft. 24 frames). The second scene on the edited tape is Jim Mitchell signing out at the ranger station — readout 03 02 27 to 03 02 42 — you guessed it. Pull out roll 03 and so on.

This editing system works and was primarily developed by Al Fisk of South Seattle Community College. As a matter of fact, many of the ideas, camera, and recorder techniques referred to in this article were "developed" by Al.

A couple of years ago Al had the foresight to purchase one of the original Hamton/MIT/Leacock Super-8 systems. He felt the cost savings in raw stock and processing would pay for the system in one year. Al has put together a very substantial film and sound studio for student use at the college and is very generous with his time and expertise, and the school's equipment. Occasionally he will be a Sherpa if you throw in a little extra Budweiser.

Back to Rainier. Our summit attempt began promptly at 3:00 A.M., and, luckily, we didn't have a footcandle of light until about 6:00. Every hour Jim would rest and talk about the importance of pacing, water intake, sunburn protection, and the symptoms of altitute sickness. Fortunately, Jeff and I are normally lightheaded, pale, lethargic — so we just kept cranking with the Nizo and Sony.

We got to see a real live rescue just below the summit. A helicopter landed at 14,000 ft., adjacent to a crevasse where two injured climbers had just spent 56 hours. I was waiting to see local news crews jump out so I could throw their CP-16's, Angenieux's, power packs, body pods, and light meters down into oblivion. Instead it was a few of the super-professional mountain rescue people who make "impossible" saves time after time.

The pilot's walkie-talkie did strange things to our Hamton/Sony sync recorder. Here we are filming a life and death drama on the top of the world and all the recorder can do is pick up Wolfman Jack down the coast.

This apparently excited Jeff. We ran to the summit to get the arrival of the climbers and shot twelve minutes of ecstatic, exhausted people slapping and taking pictures of each other. Jeff chose this time to get the final twelve-minute gap on the tape. With the earlier six minutes of blank tape, his contract was fulfilled, and he was now asking for residuals.

This seemed like a good time to move to single-system shooting. I was tired of focusing anyway, so I pulled out the Ektasound 130. Given their limitations, the 130 and 140 really do a good job. I'm waiting anxiously to get my hands on the new Supermatic 200 with its 24 fps professional sound speed, auto-exposure override, and 200-foot load (10 minute sound, 13 minute silent).

Jim Mitchell was pointing out all the landmarks from the summit —Mt. Hood, Mt. St. Helens, the smog where Tacoma was supposed to be, and the parking lot 9,000 ft. and 10 miles below. Noticing my cameras, a gentleman waving madly at Mt. Adams approached and offered me a check if I would sign a piece of paper (money talks at that altitude in those conditions).

The next thing I knew it was Wednesday morning and I had signed a contract to film a Mt. Adams climb the coming weekend.

"Jeff, do you remember that sunset shot we got of Mt. Adams from Mt. Rainier?"

"Beautiful shot!"

"We've got a chance to get one going the other way."

Jeff was up, grabbed his salmon pole, garbled something about Sherpa fishing rights, and hasn't been seen since.

Twenty yards from the parking lot Al Fisk turned to me — **"You** forgot something."

Hallucinating about helicopters, Ding Dongs, and four-figure budgets, I stumbled to the car and squeezed the extra Buds into the cooler. ■

(ABOUT THE AUTHOR: AMBROSE SALMINI is a filmmaker with McKinley Productions in Seattle, Washington. He is also the organizer and current pre **p** *it organization trying to stimulate the distribution of small-format [Super-8 and Video] productions in the United States.)*

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SUPER-8 SOUND RECORDERS

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of servo-control are thus able to replace the brute force synchronism achieved by mechanical sprocket drives, and without the flutter that results as sprocket teeth pop in and out of sprocket holes. A comparison with 16mm fullcoat magnetic film recorders will reveal how much simpler and more elegant are the so-called "electronic sprockets" of the Superb Sound Recorder.

Sprocketed Magnetic Film Recorders

For some purposes it is essential to have mechanically sprocketed drives for fullcoat magnetic film dubbers. Multi-Track-Magnetics of Closter, N.J. is now offering Super-8 versions of their R 1 0 7U Dual-Lock recorder/reproducer. The machine is available with a half-track fullcoat magnetic head assembly (compatible with the SuperB Sound Recorder) and/or an interchangeable edge stripe magnetic head assembly. The edge stripe head assembly is relieved in the picture area, and can be used by labs to transfer sound to striped film from a fullcoat track on an interlocked reproducer.

Simple mechanical interlock is available for multiple units in the same rack mount. Selsyn electrical interlock (single phase or three phase) is available for labs with a selsyn distribution system. In this manner Super-8 projectors can be interlocked and run forward and backward in sync with the Super-8 dubbers. Another projector interlock method is by flexible shaft from the R107U to the main drive shaft of the projector (24fps - 1440rpm), but this requires custom modification of the projector.

Cassette Sync Recorders

Cassette tape is the least expensive and most convenient method available of recording location sync sound. Cassettes are easily labeled with dates, locations, take-numbers, etc. They can be permanently protected from accidental erasure or reuse by punching out the record-protection tabs. Two hours of cassette tape are packed into the same volume as 2 1/2 minutes of Super-8 film.

Any 1/F sync cassette recorder is compatible with more than forty Super-8 cameras equipped with a once-per-frame (1/F) sync contact switch or internal pulse generator (Nizo). The camera-recorder sync cable requires a miniature built-in pulse generator that converts the camera's 1/F switch into a recordable voltage. Alternatively, the

Continued overleaf

and it is described in the article on crystal sync Super-8 equipment by its designers, Al Mecklenburg and Jon Rosenfeld. It cannot record sync sound with 1/F sync pulse cameras.

Back in the laboratory, original sync cassette sound should be played back on the same sync recorder as was used in the field. The sync tape recorder is connected to the Super8 Sound Fullcoat Recorder by a (SYNC) Resolver Cable. This cable carries the 1/F (or pilotone) sync signal recorded in the field, and feeds it to the servo-control speed-matching circuitry of the Super8 Sound Recorder. The Super8 Sound Recorder will change its speed to match any variations in the original camera speed, plus any variations in speed of the sync cassette tape playback. It will record one frame of fullcoat magnetic film for each frame of picture originally taken, and without letting camera or recorder speed variations affect the sound fidelity.

We strongly recommend the use of an audio equalizer during transfers to Super-8 fullcoat magnetic film, especially with the Scipio and 2209 recorder which have a relatively high level of tape hiss. This is also true of transfers from a magnetic edge stripe of a single-system original film.

Once sound is on fullcoat magnetic film, any sophisticated post-production sound technique can be accomplished:

Sync Transfers: *Fullcoat magnetic film to quarter-inch tape; Quarter-inch tape to fullcoat; Fullcoat to magnetic edge stripe.*

Sync Recording: *Voice-overs; Narration; Sound effects; Music tracks, etc. can then be edited into sync.*

Rerecording: *Dubbing dialogue in sync with original dialogue; Dubbing in sync with loops of picture.*

Multi-Track Recording: *Multiple fullcoat recorders in sync (with one fullcoat strand for each track); Multiple track quarter-inch tape recorders in sync with one or more fullcoat recorders.*

Mixing: *Souna mix with picture; Mix without picture (blind); Loops of sound for room tone, wind, traffic effects; Disc recordings of library effects.*

MULTIPLE-TRACK RECORDERS

Multiple-track tape recorders, used in conjunction with the Super8 Sound Recorder, allow voice-overs, narration, sound effects, and music tracks to be added alongside sync dialogue or on-location sound effects tracks.

Mixes of up to three sync tracks are readily achieved on quadraphonic four-

channel tape recorders (one channel carries sync pilotone). One Super8 Sound Recorder is used to play-back an edited "A" fullcoat track of sync material. The Recorder provides a 60Hz pilotone signal in sync with the "A" track's sprocket holes. This signal is recorded on track 4 of the 4-channel recorder while the audio is recorded on channel 1, say. Alternatively, the 60Hz pilotone signal could have been pre-recorded, and the Super8 Sound Recorder would "self-resolve" to match speed with that pilotone signal.

Now a "B" track of edited sync material is put on the same Super8 Sound Recorder. It is started by a bloop tone at the sync start of track "A", and self-resolves to match the pilotone, allowing the "B" track to be recorded on channel 2, say. This can be repeated with channel 3 and a third sync track, or channel 3 can be used to add a wild narration or other wild material.

The three channels are then mixed back to a fullcoat composite mixed master track on the same Super8 Sound Recorder, again synchronizing with the 60Hz pilotone control track.

The four-channel recorders most suited to this work have independent recording channels and the capability to record straight across from a pre-recorded track, while listening to that previously recorded track in sync with the track being laid down via the record head (and not through a separate monitor or playback head some distance away, which would introduce a delay.) Such machines are described as having "Syncro-Trak" (SONY) or "Simul-Sync" (TEAC).

MULTIPLE FULLCOAT RECORDERS

Since any number of Super8 Sound Recorders will run together in sync with the AC line frequency, any number of tracks can be mixed, and recorded on a master track recorder also running in sync. The Super8 Sound Recorders are started simultaneously in sync by using an AC Common Start Box or a Photo-Start/BeepStart device, which responds to a beep tone, and releases each recorder at the same instant.

With an AC synchronous projector or an AC synchronous editing table these mixes can be done while watching the picture in sync. If your projector only has 1/F sync capability, you can still run up to six Super8 Sound Recorders in sync with it by using special multiple recorder sync cables.

Post-synchronous sound, e.g. dubbing dialogue or replacing lines which are unusable in the original recording, can be accomplished with two Super8 Sound Recorders with or without picture.

DEVELOPMENT OF SUPER-8

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sound tracks. In this way the time needed to turn out a 100-ft. Super-8 print could be reduced to 7 or 8 seconds, compared with conventional laboratory procedures requiring 10 to 20 minutes.

Despite these efforts, a ten-minute color sound Super-8 film print from a major studio (e.g. Walt Disney) sells for about $30. When we compare the projected price of $10-$15 for a feature-length film on the new Videodisc system to be introduced in 1976, there is room for concern for the widespread use of Super-8 as a release medium.

On the other hand, there is the quite different — one might almost say the opposite — concept of original program production with Super-8 cameras. This concept is much more attractive, especially for those concerned mainly with putting ideas on film in an independent manner. With this objective, ideas can be made to materialize for others through the audio-visual medium. The pictures can be shown either by direct projection on a screen or as television picture displays. Distribution can be achieved either with film prints or by means of videotape or videodisc copies. Assembly of programs can be effected by physical editing of the original camera films or by electronic means during transfer to videotape or by videotape editing.

Low-cost Super-8 cameras are so much less expensive and more flexible than portable color video cameras, that it seems likely film will retain a competitive edge over videotape location facilities for the indefinite future. There is a great deal of interest today in the more glamorous video equipment, especially at television stations where portable electronic-news-gathering equipment is putting many film cameramen out of work. No doubt the leading news operations will continue their commitment to the electronic approach, but when smaller operations and independent video producers in government, education, and industry examine the comparative cost of Super-8 location and editing equipment, the cinematographic talents of the film cameramen and film editors will no doubt be back in demand.

If cinematographers are to make serious use of the new gauge, they must understand its shortcomings as well as its advantages. It can never equal the image quality of 16mm. One need only look at one-quarter (actually

one-third) of a 16mm projected image to see the quality available. But when Super-8 is used as an intimate, close-up medium, taking full advantage of the long lenses and low light level facilities, it can create a sensitive involvement and a cinema as exciting as 16mm or 35mm, since all the technical facilities are readily available at relatively modest cost to accomplish the full range of cinematic techniques - complex editing, multiple sound tracks, optical effects, etc.

The stage has now been reached where applications considerations can be given first priority. Movie makers, amateur or professional, can now make use of either double or single-system cameras for original Super-8 productions complete with sound, inexpensively and unobtrusively. With his battery-driven hand-held camera, the Super-8 filmmaker can go anywhere, even in potentially hostile situations, with assurance that he will be taken for just another amateur, filming for fun. With careful pre-planning and as much in-camera editing as possible, a Super-8 film half-an-hour in length can be made for less than $100 direct costs.

Super-8 is so simple and inexpensive that it is within easy reach of almost anyone who has the urge to communicate visually with others. But learning how to communicate effectively is much more difficult to achieve. Super-8 makes the learning process somewhat easier, since the filmmaker can more easily retain personal control of how the medium is used. Super-8 favors this kind of attitude, since nothing need stand between the filmmaker and his audience - what he sees in the camera viewfinder he can show on a screen or on a television receiver.

The young generation learning film today should know that their enthusiasm will be the key to demonstrating that Super-8 need not be considered "sub-standard". They must study the techniques of professional cinematography, and they must study the technical capabilities of Super-8; then they must go out and show us how best to exploit the newest communications medium - professional Super-8.

(ABOUT THE AUTHOR: RODGER J. ROSS is an internationally recognized author and lecturer. He is a film and television consultant to Eastman Kodak Company and the Canadian Broadcasting Corporation. With John Lant and Karl Kruger, Ross published in the SMPTE Journal (March, 1971) the original recommendation for what is now Kodak's 200 foot single-system sound camera, the Kodak automatic processor with the rapidly processable new film stock 7244, and the Kodak Videoplayer. Ross is the American correspondent for the BKSTS Journal.)

SUPER-8 EDITING
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fullcoat tracks, the cutting heads are removed and special high-quality heads and additional guides are installed. The new configuration, though more complex than before, reduces any noticeable wow and flutter from playback and recording.

Single-system film (Super-8 or 16mm) can be transferred to a fullcoat track, edited as double-system and transferred back to stripe.

The table incorporates a very high-quality mixing console and frequency equalizers. Consequently, three tracks can be mixed directly to the magnetic edge stripe or (since the picture head also accepts fullcoat) to a master track. Since each 16mm fullcoat strand can also be recorded with edge and center track, conceivably, six tracks could be mixed simultaneously.

Of additional interest is a 35mm clear film band that runs in synchronism with the tracks. This film band passes over a light well and may be used to mark sound cues for mixes without picture.

It is expected that the Schmid will be available in the U.S. by year's end.

Inner Space Systems, Inc. (ISS)

The ISS approach works equally well for 16mm or 35mm film in that fullcoat is not required (though it can be used on suitable recorders). Instead, the editing of the sound track can be accomplished directly from the original ¼-inch recording via an electronic transfer to a master ¼-inch tape on another recorder. Since both recorders are electronically locked in sync with the projector, absolute frame-for-frame sync is maintained.

The basic requirements for editing with this system are an ISS modified projector, any number of modified recorders with solenoid-operated pause controls, Cine-Slave for each recorder, and a matching Sensit box for each recorder.

The projector is modified to produce sync pulses and to respond to light reflective tape tabs. These tape tabs provide cue pulses to start or stop the recorders.

The Cine-Siave unit is basically a synchronizing device capable of syncing any one device to any other. The Sensit box is the control unit for the automatic, near-instantaneous starting and stopping of ISS modified recorders during editing. It also governs the recorder operation while the recorder is slaved to the projector via the Cine-Slave synchronizer.

To view rushes with this system. a reflective tape tab is placed on the

slated film frame. Then, the audio slate on the recorder is cued up. Thy projector is turned on. Then as the tap' tab passes the gate, the Sensit acti vates the recorder on that frame an(the Cine-Slave will hold them in sync.

Since the sensors at the film gate an such that one scans the left and the other the right half of the film frame, bu alternating from right to left, the tab. are used to turn the recorders on or of at specified frames.

It is this ability to stop and star instantaneously that enables the elec tronic editing of original sound withou cutting tape.

For basic editing, a projector, two recorders, two Cine-Slaves, and two Sensit boxes are required.

The basic editing procedure is a follows. First, tape tabs are placed a the slate marks of the film using, let'; say, the left sensor. Then at the locatior where a cut is desired, an additions tape tab (on the opposite side from the slate tab) is attached. At the tail of the scene (again opposite from head tab another tab is attached.

Then as the film is run, the first tat (slate) activates the recorder and the second (scene head) stops it. At the point the tape is marked.

Then, the second recorder (master is put into the recording mode and the original sound tape is cued up at the previously marked start mark. The pro jector is turned on and run up to speed As the first tab passes the sensor, boll recorders are started. The origina recorder plays, as the master records As soon as the first tab is passed, the master recorder Sensit is switched t(the stop mode. This causes the recorder to stop when the second tat passes the projector gate. At this poin a frame-for-frame transfer in sync o the desired sound segment has beer made. The tabs remain on the film td indicate splice points.

Subsequent cuts are transferred and cued up in the same way. The edited segments are accurately and noise lessly butted with one another.

After the basic sound track has beer assembled in this manner, the film is cut in the conventional way and guided by the tape tabs. After this the edited sound track can be run in sync with the picture and final cuts and adjustment: are made.

When the editing work completed, a start tab can activate sync transfer of the edited track to the film': edge stripe.

It is obvious that this editing method requires many projections of the film Consequently, workprinting is a mus and original film editing out of the question. There is no Super-8 pro

jector made that won't scratch the film after a few passes.

If a mix is desired, one Sensit box, one Cine-Slave, and one recorder would be required for each sync track. Again activated by the tape tab, these recorders would run in sync with the projector and could be patched through a mixer. The mixed audio track could then be transferred directly to the edge stripe of the film or to another synced recorder for a master track. The mix would be done to picture.

The advantages of this system lies in its economy and quality, if not in speediness of operation. No question about it, it is a slow process. However, the same Cine-Slave that synced the projector to the recorder can also be used to sync the camera to the recorder during a shoot. Unless you are using fullcoat recorders rather than ¼-inch machines, you never get involved with fullcoat at all. Consequently, the sound should be better.

Individual components are priced as follows. Cine-Slave units about $350.00. Sensit boxes $125.00 to $330.00 depending upon recorder. Projector modification about $165.00.

Editor-Viewers:

Out of the fifty or more viewers made for Super-8 use, only a very few can really be trusted with original film. Viewer design seems to follow the perverse notion that the ability to see the picture is unimportant and that no one cares whether or not the film gets scratched.

Based on our experience, the following viewers are acceptable: the Minette S-5, the Hahnel VB-214, the Elmo 912, the HKS projecto editor. They all cost around $100.00.

The Elmo and the HKS can be fitted with an optional 18 frames offset sound head/amplifier for single-system editing. Frame counters and cleaning attachments are also available. The HKS actually projects the image on a small boxed-in screen and gives about the sharpest picture. The Hahnel with its V film guide provides a very sharp picture and is a snap to thread. It is very gentle on film.

The Minette S-5 has been the real workhorse of Super-8. Super-8 Sound, Specialties Design, and Super 8 Research, all have incorporated this viewer into their editing systems. It is easy to understand why. The viewer is well balanced with most of its weight on the bottom. Coupled with rubber feet. this makes it rock steady. Unless grossly misused, the Minette never damages film. It has a very bright and very sharp viewing system that is easily modified to accept the Phillips 10-watt

quartz lamp for even greater brightness.

For some reason, Super-8 viewers are designed to punch out the edge of the frame to indicate cuts. There is no way to use grease pencil because the gates are ali enclosed. Some system of less permanently marking frames would be welcomed. Of course punching the edge is still better than perforating the middle of the frame, as some viewers do.

All viewers allow frame adjustments, focus, and inching. Of course, most of the controls for these adjustments require watchmakers' hands. They are incredibly small and, in some instances, inconveniently placed.

Splicers:

There are almost as many Super-8 splicers as there are cameras. Only a very few, however, are worth anything.

The best cement splicers are the Bolex and Hahnel. Both make low visibility and low noise splices. Each end of the film is bevelled so that a well-made splice is not much thicker than the film itself. This is very important if the film is to be striped for sound. Splices made without bevels suffer dropout at every splice. They also chatter horribly when they pass through the projector.

Both splicers can be used to splice A&B rolls, though the Bolex must have the regular 8mm guide pins removed. Neither splicer is heated, but the Bolex can easily be modified with a 10-watt/1500 ohm resistor. Both splicers also grind rather than scrape the film. This causes film dust to scatter all over the place and creates a cleaning problem. After about 50 splices, the Bolex film cutter blade gives out. After that a razor blade must be used. Bolex about $57.50. Hahnel about $49.95.

The Maier-Hancock model 816-S is a formidable splicer with a clean scraping blade and 100°F heated block. It is the best, fastest, cleanest, and easiest splicer to use in preparing Super-8 A&B rolls. Because it does not make bevelled splices, its use for projection or sound-striped film is limited. The splicer converts for 16mm use. $350.00.

Other professional hot splicers for Super-8 are made by the Hollywood Film Co. and by Harwald.

Tape splicers are abundant. The cheapest and most useful for both picture and fullcoat is the $20.00 Guillotine. This splicer uses unperforated mylar tape. It is a wraparound splice covering two frames and does not cover the sound stripe. Cost per splice is less than 'IC. It is most useful for work print because the splices are easily unmade. A metal semi-pro model is

available for $39.95 and an even more rugged pro version for $275.00.

For fullcoat splicing, we load the same $20.00 plastic model with 3/8-inch opaque audio splicing tape. This tape is highly visible on the fullcoat and strong enough to be taped only on the base side of the fullcoat. Cuts are completely noiseless.

An excellent new tape splicer is the HPI and uses T-8X perforated quick-splices. It covers four frames and is very strong. The splicer is unique in that it cuts the film, positions it, removes the paper backing, and applies the splice to both sides of the film. Very little handling occurs, reducing the chance of trapping dirt under the splice. It is good splicer for original projection or for Super-8 to Video transfers. The splicer costs about $30.00 and splices run about 2.5C each.

Other useful tape splicers are made by Fuji Photo and by Eastman Kodak.

If you are working with polyester-base film and you don't want to tape-splice, the only option is the Metro-Kalvar portable ultrasonic splicer. It costs $1500.00 and does not work very well on acetate-based films.

Synchronizers:

High-quality Super-8 sync blocks are manufactured by Ediquip, Inc., Hollywood Film Co., Inc., and Magnasync/Moviola Corp. The synchronizers are constructed the same way as their 16mm and 35mm brothers and cost about the same.

The following options and configurations are available, though not from each manufacturer. Available are: 1-6 gangs, various gangs may be declutchable from the others, front or rear-facing sprocket placement, sound readers, front and rear footage counters, 24fps sync motors, frame indicater plates, timers, and gearing for Super-8/16mm combinations.

Miscellaneous:

Although most Super-8 flatbeds are designed to be used with film reels, some can also handle film and fullcoat on cores. To wind the film on the cores requires a tight wind. Hollywood Film Co. makes one and Leon Flohl of New York City custom builds them. Split reels to handle the cores are also available from Hollywood Film Co. and from Comprehensive Service, Inc.

Neumade Products Corp. manufactures brass shaft adapters to adapt Super-8 reels for the standard professional rewinds. They also make a single hub footage measuring machine for Super-8 film.

16mm film bins are not suitable for

Super-8 unless their film hanging pins are exchanged with thinner ones to accommodate the smaller super-8 sprocket hole. Only one firm offers a film bin suitable for Super-8 (as well as for 16mm and 35mm). The Roto Bin, manufactured by the Communicators, Inc. uses non-magnetic clamps to hold the pieces of film and fullcoat. Though very handy with its magnifying glass, illuminated drum, and rotating film carousel, the Roto Bin is also quite expensive: $395.00. The company is planning to market a more austere model in the near future.

Super-8 Magnetic Fulicoat:

Like it or not, Pyral Super-8 fullcoat is the only quality fullcoat readily available in the U.S. It seems a little strange that more options don't exist; particularly since virtually all Super-8 editing systems rely on it.

Other brands do exist (usually cheaper), but beware before you stock up. The dealers won't tell you who made the stuff, and it's been our experience that most of these off brands are inferior to Pyral. The main problem has been frequent and severe dropout. Some others completely gunk up the recording heads.

A gripe with respect to Super-8 fullcoat is its price. Granted that not as many feet of it are in use as 16mm, but is that enough reason to charge twice as much as 16mm mag? In some cases, dealers are charging $45.00 for a 1200-foot roll. According to a company spokesman, Pyral is wholesaling Super-8 fullcoat at the same price as 16mm and by 1976 they expect to reduce the price significantly. Fair prices in quantities of 10 1200 ft. rolls or more should not exceed $28.00 per roll.

Most likely 3M will manufacture Super-8 fullcoat in the near future. It wili be a completely new formulation with higher quality than Pyral. Hopefully the price will be lower as well.

Super-8 Edge Numbers:

With all of this wonderfully sophisticated hardware, it seems that professional editing of Super-8 film has come of age. Almost. There is still one problem crying out for a solution. That is effective coding of original, work print and fullcoat.

True, a fairly large amount of Super-8 is cut in the original. However, the best results still require work printing and subsequent conforming of the original. Currently only three labs across the country offer edge-numbers for original and work print. No one is able to code Super-8 fullcoat.

Even the edge numbers available are

not the best that could be. They generally follow 16mm spacing (too far apart) and, in some cases, the yellow ink has been known to bleed or splash into the frame area. What's more, the service takes forever.

If someone out there is looking to make an investment, he should design or sponsor the design of a Super-8 edge-numbering machine for routine lab use. The machine should be able to clearly and cleanly code single-strand Super-8 original, work print, and full-coat. The spacing should be about 20 frames.

Conclusion:

The editing of Super-8 film and sound has reached a very sound and practical level. Many systems exist; some mimicking 16mm practice and others following totally unique approaches. In many instances, the editing systems provide a flexibility of use not found in the 16mm world. The ability to adapt the editing machines to multitrack sync sound mixes is probably the most outstanding example of that trend.

All of the hardware is well past prototype and much of it is already in field use. New dramatic innovations probably won't appear for a while, as manufacturers refine and improve the existing systems.

It is hoped that film makers using this new equipment will not suffer passively if problems develop or they find certain aspects of the systems troublesome and inefficient. All criticisms, comments and suggestions should be forwarded to the manufacturers. They need this field data badly. Manufacturers actively solicit this feedback from all equipment users. ■

(ABOUT THE AUTHOR: GUNTHER HOOS and his partner Mark Mikolas founded the Super-8 Film Group, a New York production house that works in Super-8. He has published many articles on Super-8, including a special report on Super-8 at Photokina '74, and is a co-author with Mikolas of Handbook of Super-8 Production, scheduled to be made available very soon by United Business Publications, the publishers of Video Handbook.)

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cameras in use in this country.

For all of these people, there ar(many choices to make after they decid(to originate in the Super-8 sound medium. What equipment do the need? Which film should they use', How should they record sound and edit?

To answer these questions, in necessary to define the mission. Where will the film be produced, and particu• larly, what will the lighting conditions be like?

Is it important to record sound or location or would it be more effective td add a narration, music and perhaps effects later? Of course, you should also know in advance how the film wil be used.

Many cameras provide a choice between recording 18 or 24 frames pei second. The first will lower film anc processing costs by 25 percent and wili also make it possible to compress the action shown during a specifid amount of time. These can be important considerations. However first make certain that you will be using a projector which operates at 18 frames per second if your playback medium is going to be television.

Other features to look for when selecting a Super-8 camera include: Is it lightweight and easy to hand-hold? II it's cartridge-loading, can it be used with existing-light films such as Kodak Ektachrome 160, Ektachrome EF 7242 and Ektachrome SM 7244 films? Does it have a built-in type A filter, which will be needed for switching from exposure under tungsten light to daylight? And, finally, the availability of a zoom control is very desirable for producing small-format films with a professional look.

There are currently several cameras now capable of recording single-system sound on prestriped film, including the Kodak Supermatic 200 sound camera. The Supermatic 200 camera operates at either 18 or 24 frames per second and can be used with both 50- and 200-foot-capacity fil m cartridges.

The main question that brings up is whether or not you will be filming events which might require you to record film and sound at 24 frames per second without interruption for up to 10 minutes at a time? If so, the Super-matic 200 camera can provide that capability, along with the flexibility of also using the 50-foot cartridge when that is desirable. When you are con-sidering this, remember that these are

cartridge-loading cameras which take only seconds to reload.

That's one of the major production advantages of Super-8 filming. There is practically no setup time, and there is also a great deal of mobility. Each of the three existing-light films mentioned earlier have a recommended exposure index of 100 in daylight (using a type A filter) and 160 in tungsten illumination. All of the films are available, both silent and prestriped, in 50-foot cartridges; however, only Ektachrome EF 7242 and Ektachrome SM 7244 films can be purchased in 200-foot cartridges, silent and prestriped.

The film speed combined with the fast f/1.2 lens and 230 degree shutter angle on the Supermatic 200 camera makes it possible for producers to work without the aid of artificial illumination in most situations. Furthermore, the automatic exposure feature will generally provide for a uniformly well-exposed end product. The main thing to watch out for in this last regard is backlighting. For example, light coming in from a window in the background can fool an automatic exposure meter and result in a badly underexposed foreground. The manual override on the exposure control wili allow you to adjust for backlighting.

Another thing to keep in mind is that your film will most likely be shown on a comparatively small screen. As a result, an establishing long shot, which could be very effective in the 16mm format, could result in such tiny images in the background that they would be indistinguishable on a small screen.

The cure is simple. Work in close and focus on an image that will fill up the screen. You can still produce a visually interesting movie by occasionally panning slowly, using your manual zoom control (the Supermatic 200 camera has a 9mm to 21mm zoom lens) and by frequently changing the perspective of your camera to the subject. Most of your editing can be done right in the camera.

Your choice of films will be dictated mainly by your plans for recording single-system sound and also by the sources of film processing most available to you. In most parts of the country, Ektachrome 160 film, which was first introduced to the amateur market, can be processed within 48 hours. Some of the photofinishers equipped to machine-process this film might also be willing to negotiate special arrangements for making even faster deliveries.

Ektachrome EF film 7242 (tungsten) is most commonly used in the 16mm format for newsfilm work by corn-

mercial broadcasters all over the nation. Many of these broadcast stations will provide high-quality fast service to outside customers, and this is a big advantage to filmmakers working with this product. Many commercial laboratories already are equipped to process this film in the larger format, so fast service shouldn't be a problem anyplace.

Sometimes, however, you may want access to the processed film in a matter of minutes. When you're using a film such as Ektachrome SM film 7244 (type A), this immediacy is possible with the Kodak Supermatic 8 processor.

This compact processing machine accepts 50- and 200-foot cartridges of film and can be operated in room light by practically anyone. Using the Supermatic 8 processor, you can have a 50-foot roll of film ready for viewing within 15 minutes after loading the unprocessed film into the machine.

There also are other alternatives regarding the selection of film. Fot example, some smaller televisior stations using Super-8 film rely upor the slower but much sharper and finer-grained Kodachrome 40 film (type A) of Kodak Ektachrome 40 movie film (type A) for producing commercials. Both of these films have an exposure index 01 25 (using a type A filter) in daylight anc 40 under tungsten illumination.

Because of their relatively slow speeds, you'll probably have to use some sort of artificial illumination when shooting indoors. This could be done by simply handholding a tungsten-balanced spotlight. However, for optimum lighting, three lightweight stands, each holding a tungsten-balanced 650-watt bulb, can be used with great effect. Place two of the lights on either side 01 your camera and the third to one side and to the rear of the subject (out of the shooting frame, of course). This should give you a well-lighted subject without shadows and with good depth of field.

Another thing to remember during planning is that you have a tremendous amount of flexibility in recording sound on a magnetic track. Single-system sound should generally be recorded whenever you are filming interviews. This technique can also be used when the cameraman's or reporter's on-the-spot observations are important. For example, an insurance investigator at the scene of an accident might want to record his on-the-spot observations, as weli as other people's comments.

Appropriate background sounds can also add a great deal of authenticity to a film. These, however, don't necessarily have to be recorded on the stripe at the

time of shooting. In fact, there is a good argument for recording background sounds with a portable audiotape player. This can facilitate mixing location background sounds with voice-over narration recorded after observing the film.

Adding this sound track after the film is processed is then a simple matter. If a prestriped film is used, you are ready to record as soon as the film is processed. If nonstriped film was used, a magnetic stripe can be applied by many processing laboratories.

Then, it's as simple as loading the film into a Kodak Supermatic 70 sound projector and transferring sound from a tape player onto the film's magnetic track. A film can consist of a combination of single-system on-location interviews and a voice-over narration.

While there are various options to consider in the making of a Super-8 color-sound film, one statement can be made with absolute certainty: The dream has become reality. Super-8 sound movies are a viable medium for today.

TRANSFERRING SUPER-8
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The sound was transferred in sync from a fullcoat Super-8 mag track.

Two hours after they walked in the doors of National Video with their Super-8 elements they had a two-inch Quad videotape master of both a 60-second and a 30-second spot. One hour after the two spots were approved by the client, they had all their tape dubs ready to send to the various television stations.

Another interesting use of Super-8 film in the video field is where a television spot has been shot in videotape, and is so successful that the client or agency wants to have a Super-8 film print to show in rear-screen projectors. Since all film transfers from videotape are in 16mm, National first shoots in that format and then has reduction Super-8 film prints made. Since the film is only being shown on a small screen there are no television lines showing, and it looks as if the TV spot had been shot originally on film.

National Video Center is offering a service to its clients of renting the new Kodak Supermatic 200 Super-8 single-system sound camera which operates at 24 frames per second. Both 50-foot (2 minute) and 200-foot (10 minutes of shooting time) are available for this camera.

With the use of this camera, ad agencies can shoot on location such as supermarkets and do many test commercials at very low cost. One such

commercial was shot recently by National Video Center to show the feasibility of the concept.

Ten rolls of the 50-foot cartridges were shot in one hour on Kodachrome, processed the next day by Kodak, transferred to 2-inch quad videotape the next day. That same day the spot was edited on quad tape, titles and special optical effects put in, and a finished 60-second spot was transferred to both quad and a 3/4 inch videocassette for ad agency personnel and key clients to view before they proceeded to shoot the final commercial with conventional videotape color cameras.

Super-8 is not just a scaled-down version of 16mm, which has become the mainstay of local TV film programming. It is a new medium with its own special features. Experts feel that it will not replace 16mm film any more than 16mm film has replaced 35mm film, but it will definitely find more and more uses in professional areas such as in education, cable television, small-market stations and remote stringer operations, and many other areas of modern day life where an automatic, light-weight combination camera-recorder can be easily operated by one person.

To even an untrained eye, there is a noticeable quality-difference between a film shot with 16mm and one shot with Super-8 when viewed one after the other on a broadcast-quality film chain. However, where the Super-8 film is not going to be directly compared with 16mm, an electronically enhanced Super-8 production is more than satisfactory. Since a loss of resolution is only noticeable in the higher picture-frequencies, one should avoid shots with a great amount of detail and concentrate on medium shots and

Super-8 film will eventually provide an additional input to television from sources such as amateurs, community groups, scientists, educational institutions and industry, and Super-8 equipment packages will be considered by smali television program originating points as an alternate to other means (16mm or video) of gathering and editing program materials requiring a much larger capital investment for equal quality.

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superior frequency response capabilities of the ferric oxide stripe over the ferric oxide cassette under similar conditions. All of Eumig's HQS projectors (High Quality Sound) are now shipped from the factory with individual lab graphs certifying the machine's frequency response to 12 kHz at 24 fps and 10 kHz at 18 fs. Tests at KDUB have shown that the frequency response is more than adequate for conventional news filming when proper sound recording techniques are used. Another important factor that has improved the status of 18 frames per second in television is Kodak's Videoplayer, which is capable of converting the 18 fs footage to the 30 fps rate of the NTSC system with no noticeable flicker or speed change. The original intent of the 18 fps rate was greater economy to the consumer, and this bonus drops the raw stock cost of high-speed color Super-8 sound film down to $1.25 a minute (vs $1.65 a minute @ 24 fps). The higher packing density on the film also shortens the effective processing time.

Numerous other manufacturers now have 18 fs XL sound cameras on the market, including Bauer, Bolex, Bell & Howell, Chinon, GAF, Elmo, and Sankyo. In terms of lowest price, the Kodak Ektasound 130 can be found in discount camera stores for about $150.

While Polaroid continues to file patents for various instant-processing Super-8 systems, Eastman Kodak recently began deliveries on another new professional product designed exclusively for Super-8: the Supermatic 8 processor. Well aware of the unpleasant mess and odor that often accompanies conventional film processors, Kodak set out to design a totally automated processor that could be easily operated by unskilled n. rsonnel. Originally slated for introuuution in 1974, the machine has been held up by Kodak's determination to market a near-foolproof product. The packaging of the Xerox-size machine is attractive, and the installation is like that of a household washer (220 VAC, cold water, and a drain). The light-tight Super8 cartridge is loaded directly into the processor, eliminating the need for a darkroom. A roller transport is used; thus, there is no leader to thread through the tanks as in conventional processors. The machine operates at 10 feet per minute, producing a completely processed 50-foot roll in 13 1/2 minutes. One of the innovations on the Supermatic 8 is its automatic chemistry control: an internal clock

counts the footage in the cartridges processed, and a sound alarm warns when the 5,000-foot mark is reached. Then at the push of a button, the machine flushes the depleted chemistry and starts a clean-up cycle. At the completion of this cycle an "ADD CHEMICALS" sign lights up, cuing the operator to add the liquid concentrates. Only four chemicals are required, and each concentrate comes in a different shape-coded size to insure that the right bottle is poured down the right hole.

The price of the processor is a hefty $12,500, but this figure is well in line with comparable installations requiring external plumbing and supply tanks. ENG has its counterpart to the expensive processor also: an electronic signal processing device called a TBC (Time Base Corrector) which brings the ENG video tapes up to broadcast specs, also priced in the neighborhood of $12,000.

The Supermatic 8 is designed to handle the new Ektachrome SM 7244 film introduced by Kodak in 50 and 200-foot cartridges. The film is not unlike the new Ektachrome 7240 videofilm, in that both films are prehardened in manufacturing, eliminating the pre-hardener and neutralizer steps in processing. The 200-foot cartridge is slowly starting to make its way to the market. Kodak's Supermatic 200 and Sankyo's XL 40S sound cameras are designed to take the cartridge, and Beaulieu is reportedly working on a camera to accept it also. Like the 50-foot cartridges, the 200-footer is constructed of lightweight, disposable black plastic. Two hundred feet of Super-8 yield 10 minutes at 24 fps and 13:20 at 18 fs.

Some of the professional editing equipment required for using Super-8 in broadcasting has been on the market for several years now. Cement or tape splices may be used, although extensive testing at KDUB indicated cement splices were to be preferred. Maier-Hancock has been manufacturing a Super-8 hot splicer closely styled along the lines of its 16mm model; Guillotine also makes comparable professional tape splicers.

Good Super-8 viewers have always been somewhat of a scarcity, and practice at KDUB indicated that there was virtually only one viewer which could be compared to the Moviscop for brilliance, clarity, ruggedness, and film handling: the Minette, distributed by the Hervic Corp in the US. While it is possible for any handyman to mount a magnetic head on the viewer with an 18-frame advance, Hervic has announced that the Minette will soon be

available with a magnetic sound-reader attached. Elmo and Bolex are also marketing Super-8 viewers with a modular sound head for single-system sound editing.

There's no denying that the editing stage of Super-8 requires a lot of care and patience. Handling is not quite as easy as 16mm, although one can become accustomed. The sound advance is so close to the picture at 24 fps (less than a second) that very clean single-system edits can be Made if proper techniques are used in shooting. Cleanliness is extremely critical, as dirt, dust, and film shavings are very noticeable when the film is blown up on a large TV screen. Scratches automatically add to a poor impression of the film.

At the point of transfer to video the broadcaster has a choice of two routes; the conventional method has been to use a special TV projector equipped with a 5-bladed shutter and synchronous motor. Both Eastman Kodak and Elmo are marketing such projectors. They are limited to running at 24 frames per second, and must be projected into a telecine chain for pick-up by a color TV camera. Telecine chains are standard equipment in TV stations, but oftentimes all of the normally available "inputs" are used up by other types of Projectors (16mm film, 35mm slide, etc). Such was the case at KDUB's installation. However, the problem was solved by adding a fifth mirror to the chain. (Note: Engineers with the CBC used a similar approach in the Montreal installation).

Image enhancement is a critical factor in the conventional film chain approach. Until recently, most film chains were not equipped with enhancers, so in many cases an external enhancer is required when Super-8 is used. This device examines the television signal on a line-by-line and dot-by-dot basis to detect detail and increase its contrast; the net effect is a sharper picture. Photos accompanying this article demonstrate how enhancement can improve the Super-8 image. The accompanying cartoon photo(s) show a comparison of an unenhanced 16mm print with an enhanced Super-8 print (both photos were shot from a TV screen). Enhancement makes the Super-8 appear sharper, though somewhat coarser and grainier. The appearance of grain is normally increased with enhancement, but much of this high-frequency noise is lost in the home receiver. Electronic image enhancement has been the single most important factor in bringing the Super-8 image up to broadcast standards.

The alternate approach to using a TV projector is to use Kodak's new Supermatic videoplayer. This remarkable device defies adequate description, especially when one considers that it does the job of both the TV projector *and* color TV camera, and yet costs less than either! Priced at an astounding $1,350, the videoplayer is capable of matching the color quality of color TV cameras costing as much as $35,000! As incredible as it sounds, the videoplayer is entirely capable of this because of the approach used in the transfer process.

Technically the device is called a flying-spot scanner, and because of its inherent advantages of perfect color registration and color uniformity, it's used quite commonly in Europe for broadcasting film. Until recently US broadcasters have been unable to use the approach because of incompatibilities between the film frame rate (18 or 24 fps) and the American NTSC television frame rate (30 fps), but unique technology perfected by Kodak with assistance from Sylvania has solved the problem. A look inside the 45-pound box will show a small 4-inch TV screen which is used to illuminate the film instead of a conventional projection lamp. The raster light is cool, so there is no danger of heating or burning the film as in conventional projectors. If one could examine the TV screen in slow motion, he could see that it is simply a "flying spot" of light transversing the screen line by line. When the traveling spot of light shines through the film, it is picked up by three photocells, each responding to one of the primary colors. The resulting photocell signals are then combined to form the NTSC television signal.

The real technical accomplishment in the videoplayer is the traveling raster which allows the film to travel at a continuous rate through the player. To accomplish this, a specially elongated film gate is used, and complex sync signals are employed to force the raster to move and follow the film frame as it moves through the gate, until the entire frame has been scanned or illuminated. This process eliminates nearly all film wear, and provides for much quieter operation, but it produces the side effect of frame jitter if the controls are not properly adjusted. Both focus and steadiness controls on the player contribute to timing the raster speed to the film speed so that minimum jitter occurs.

The video output signal of the player is amazingly sharp — sharp enough to show the grain clearly — and this is due in part to the horizontal image

enhancement th at is included in the machine's electronics. An RF modulator is also built into the player, allowing it to be used with consumer TV sets when desired.

As mentioned earlier, the video-player is capable of transferring film shot at either 18 or 24 fps; in fact, the player is actually capable of transferring film shot at any speed if the proper adjustment in the drive motor's speed is made. The first model introduced by Kodak, the VP-1, carries a standard video output and can be used for basic transfers to a quad tape machine or any other type of video recorder, but for synchronous operation with the rest of a TV station's equipment the second model, VP-X, is required. Priced at only $1,250, this version contains a variety of sync inputs in the back for driving the player in sync with other studio equipment.

This review of new products and technology is clear proof that professional Super-8 has now arrived on the scene, and is ready for broadcasting. Two solid years of experience with the format at KDUB have shown that with care and quality control, the enhanced Super-8 image can compete quite weli as newsfilm. A side-by-side comparison will show the picture quality of Super-8 very close to that achieved with the 1/4-inch Akai system. Color porta-paks near the *size and price* of Super-8 sound cameras are li ght-years away, and this simple fact is what will keep Super-8 alive as a viable option in television. Competition from ENG and 16mm is going to be tough in the future, but with automation and innovation as the cornerstones of the Super-8 system, professional Super-8 is ready for the challenge of television now.

(ABOUT THE AUTHOR: CHUCK CYBERSKI has been a long-time advocate of the Super-8 format as a publisher of the pioneering "Super-8 Research News". He was Operations Manager of KDUB-TV, Dubuque, Iowa from 1972 to 1974, during the start-up of the first all-Super-8 TV news department. He is now an independent writer and consultant.)

BUY-SELL-SWAP

Continued from Page 1357

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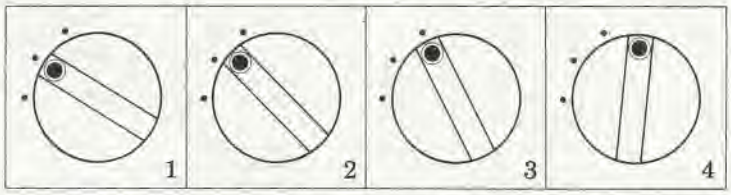

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