we've packaged a major studio

into a portable recording system

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VERSATILE ... Whatever the power source, camera, or utilization, a simple plug-in or interchange of motors is all that's ever required to operate the 56 system. Designed around 24 volt, precisely engineered, Air Force approved batteries. Accommodate 110 or 220 volts, 1 or 3 phase, 50 or 60 cycle power input.

QUALITY ... Engineered by Stancil-Hoffman, manufacturers of equipment used throughout the world by film producers, radio and television stations, the Military, and nuclear research laboratories. Find out how the 56 magnetic film recording system for portable and fixed recording can best meet your requirements ... send for specifications now! Credit terms arranged on domestic purchases.

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Innovations Highlight New S6 Magnetic Recorder

Stancil-Hoffman Corp. has packaged the complete facilities of a major studio sound recording system in a lightweight, portable, 3-unit magnetic film recorder.

By FREDERICK FOSTER

Three portable, easy-to-carry pieces of equipment comprise the new model S6 Stancil-Hoffman professional magnetic film recording system. The three-unit package has been especially designed for three-way use—for studio, portable or mobile recording. Whatever the power source, camera, or utilization, a simple plug-in or interchange of motors is all that is ever required to operate the S6 recorder. Designed around 24-volt, precisely engineered, Air Force-designed batteries, the system also operates on 110 or 220 volts, single or three-phase 50 or 60 cycle power input.

The immediate and obvious requirements as to size and weight have been successfully met without any compromise in performance. Particular care has been taken in the design and fabrication of the large cross-sectional casings and the bearing suspension along with the weight distribution of the mechanical members.

The aim for high efficiency and low power consumption is seen in the design which uses batteries for power. This was accomplished by designing the amplifiers for D.C. operation. Every moving component of the recorder is mounted on precision ball-bearings, carefully aligned and assembled. Many of the frills are eliminated to conserve both power and maintenance time.

The S6 uses a single motor drive, which operates a worm gear reduction for the main sprocket drive as well as the take-up clutch. By carefully lapping a metal worm gear working in conjunction with a nylon gear, a low-flutter drive system has been obtained. The mechanical filter is a balanced system consisting of two flywheels and two spring-loaded stabilizer arms using a silicone dashpot on one of the members. While the weight of the flywheels has been kept to a minimum, the system presents extremely low flutter in the order of 0.15% to 0.2%.

For simplicity in threading, a single sprocket is used plus an automatic control to open and close the “keepers” and establish the film tight loop.

To meet all of today’s demands in magnetic recording, the S6 is available for either 17.5mm or 16mm perforated film. The 16mm transport system operates at the conventional 36-feet per minute speed. In the 17.5mm recorder, advantage has been taken of the new trend toward use of 45 f.p.m. speed—one-half that of standard 35mm film. As both the frequency and motion exceed present standards, considerable savings in raw stock costs result through this halving of film travel speed.

One of the great problems with portable recording equipment has been the various voltages and currents encountered in the field. In the S6 this has been readily solved by the
 provision of facilities for quick change of both the gear box and the motor. It is possible to carry a 110-volt single-phase motor and a 220-volt 3-phase motor, along with a 50 cycle and a 60 cycle gear box, and to change from one complete system to the other without tools.

Basically, the specifications of the S6 are as follows:

Frequency response—flat from 50 cycles to at least 12,000 cycles in both film speeds. The signal-to-noise is in excess of 55 db with less than 2% total harmonic distortion through the entire system. The transport system in the case weighs less than 24 pounds and the electronic section, less than 18 pounds. A 1000-foot film capacity is provided although obviously smaller amounts of film may be handled where desired. Either reels or open-flange type film holders may be used.

Perhaps the most outstanding feature of the Stencil-Hoffman S6 recording system is its flexibility and versatility. It is available as a one-, two-, or three-unit system for a wide variety of applications and uses. The three-unit system is virtually a major studio unit compressed into three lightweight components, easy to carry and to use, and provides for use of two microphones. The two-unit package is for use with single microphone. The one-unit is also a single microphone model and provides automatic volume control, making it ideal for such applications as newsreel, documentary and remote sound effects recording.

Any one of the three systems can be readily changed to operate as a one-, two-, or three-unit recording system, where the three components are available. Where the ideal sound recording channel uses a remote microphone preamplifier, permitting the mixer to operate at the scene of the action, many times this facility becomes a burden and unnecessary.

REAR VIEW of S6 transport unit showing the replaceable gear box and replaceable motor for either 50 or 60 cpc. 110-120 AC.

REAR VIEW of recording and playback amplifier sections. Removable panels provide for plug-in mike preamp or remote amplifier.

THE REPLACEABLE center section of the ARP6 amplifier system which contains the plug-in microphone preamplifier mentioned at left.

MODEL S6 transport unit with the open flanges and film guiding members affording fast loading and unloading of film.

POWER SUPPLY pack for the Model S6 is available in two models for 24-volt DC operation and for 110-volt single-phase power.

ROTARY CONVERTER which furnishes 230 volts 3-phase current from 24-volt batteries for powering heavy-duty 35mm equipment.
where only a single microphone is used. In the two-unit system, all functions are available such as recording gain control, playback gain control with a selective switch for "Live" and "Tape," dialogue equalizer, and adjustments for optimum frequency response.

The single case unit employs Stancill-Hoffman's recently developed subminiature compression recording and playback amplifiers. Incidentally, this electronic section, complete with its dry batteries, weighs a mere 3½ pounds. The compression feature offers a wide latitude of sound pick-up so that it is possible to record the speech of a moving person ranging from microphone position up to a distance of 10 to 15 feet away, with the recording level remaining constant.

All of the units are uniform in size. Panel is 14¼" x 10½", Depth of each unit is 6". To keep weight at the absolute minimum, a durable, flexible "Royalite" plastic case encloses each unit. Case is held in place by two thumbcrews which also secure the handle and four rubber feet. The case may be removed in a matter of seconds to permit access to the mechanism components. Choice of the "Royalite" case was predicated on the desire to provide equipment with lowest possible weight for low-cost aerial or express shipment.

While the model S6 is said to represent one of the major advancements in portable magnetic sound recorder design, the most interesting feature perhaps is the system's adaptability for battery operation. With sound systems through the years a wide variety of batteries voltages have been used. Generally no consideration has been given to the power facilities necessary for the camera, although the chief purpose of a field recording system is to provide lip-sync sound with a minimum of equipment.

In designing the S6, a study of the efficiencies of batteries indicated that a 24-volt battery was the most ideal, considering weight and size, and it was made the basic power source for operation of both camera and sound equipment.

All amplifier filaments of the S6 work in 24-volt strings which can be directly tied across the battery. The amplifiers may be operated from "B" batteries, but a tremendous amount of weight is saved through the use of a small dynamotor which is an integral part of the system, and which operates from the 24-volt battery to furnish 250-volt output. The dynamotor is completely enclosed and shielded, both electrically and acoustically.

As stated earlier, either a 110-volt single-phase or a 220-volt 3-phase motor may be used interchangeably with the system. When operating from batteries, it is only necessary then to provide one or the other power system to handle the recorder. In the early stages of developing the Model S6, the company proposed using a "multi-duty" or AC/DC camera motor operating from a 24-volt battery source. Due to the extremely high cost of motors of that type and to the mechanical problems in adapting them to the wide variety of motion picture cameras in use today, the proposal was discarded in favor of the comparatively inexpensive 241-volt-DC-to-110-volt-AC vibrator inverter. This item of equipment weighs only 19 pounds and has ample capacity to power any 16mm camera motor along with the S6 transport system. It is adequately filtered so that it offers no objectional electrical noise. The recording and playback amplifiers plus the inverter altogether pull in the order of 4 amperes from the 24-volt battery, so that it is possible to operate for an average day of normal shooting without need for recharging.

In designing the 35mm camera drive, the company encountered a severe problem. Because the Mitchell NC and BNC cameras have long been standard equipment in Hollywood studios, cameramen have come to favor a 3-phase 220-volt drive motor. It offers the reserve power necessary to drive the camera efficiently at low temperatures, and it is extremely quiet acoustically. But on location camera motors of this type generally require use of a sound truck, which has battery power sufficient to drive both the camera motor and the recording equipment, and this often limits portable operation and distant location shooting, which are important factors in film production today.

To overcome this, Stancill-Hoffman designed a rotary converter generating 250 volts of 3-phase current from a 24-volt storage battery. This provides sufficient output to drive a Mitchell camera motor along with the S6 recording system under any environmental conditions.

The converter, along with its control unit, also permits "under ranking" the camera, which is so important in many motion picture photographic assignments. The converter weighs 35 pounds and operates from the same 24-volt battery which powers the electronic section of the S6. It is acoustically quiet and does not create any electrical noise in the system. The control unit, also known as the camera control, operates from a remote position to stop and start the converter; it also sets the speed, as indicated by vibrating reeds, in any range between 16 and 26 f.p.s. The reeds are calibrated in half-frame increments, from 23 to 25 frames.

According to William Stancill, president of the company, in designing the S6 system, the company has endeavored to provide as accessories all cables, batteries, battery chargers, spare tube kits, microphones, sound powered telephones, plug-in audio oscillators necessary to field maintenance—everything that is required for a complete sound recording system.

"Our aim," he said, "has been to provide the film producer with a portable magnetic recording system that is sufficiently complete, compact, and efficient to enable him to accomplish the most difficult mobile or location shots."
MODEL 56 SYSTEMS

The magnetic recording and reproducing equipment covered under our Model 56 is, in reality, a system rather than individual components of a recording channel. We felt it was best to supply compatible pieces of equipment packaged as a system to meet the various requirements in motion picture recording and reproduction.

Obviously, the equipment is used in fixed locations, such as on motion picture sound stages, but of more importance, the 56 system is designed to be highly portable and to be operated from storage batteries as well as normal power sources with no sacrifice in performance. Further, the 56 system is broken down into a single case unit—two cases or three cases—depending upon the type of motion picture production and the size of crew available.

For major motion picture studio production, we have a three-case system which is comprised of a microphone preamplifier mixer, generally located at the scene of action, then connected by means of a single cable is the electronic section for recording and the film transport section.

For certain types of production, a single microphone input is all that is necessary and, accordingly, the 56 may be broken down into two cases and yet provide all of the features and facilities necessary.

A third type of operation utilizes a single case unit for newsreel and on-the-spot recording along with sound effects and exploration type of recording where weight is of prime importance.

We then, of course, have rack-mounted units for re-recording and transfer applications along with the interlocked dummies or film phonographs.

This, then provides four basic systems:

1. The Model 56B—which is the three-case unit consisting of the Model ARP6 two-channel microphone preamplifier mixer, the Model ARP6 record and playback electronic section, and the 56 film transport. Base price.........................$1,745.00

2. The Model 56C system—which is the two-case unit having a single microphone input using the Model ARP6 and the 56. Base price........................................$1,489.00

3. The Model 56D system—which is the Model 56 with transistorized automatic volume control amplifiers, Model ARP23 mounted as a part of the transport unit. Base price........................................$1,295.00

4. The 56 rack-mount unit for recording/reproducing equipment with either vacuum tubes, using the ARP5 meter panel and controls, or transistor amplifiers. Synchronous, or synchronous-interlock motors, and rack cabinets available as accessories. Base price........................................$1,708.00

5. The 56 rack-mount dummy unit, or playback, equipped with either vacuum tube or transistor amplifiers. Synchronous, or synchronous-interlock motors and rack cabinets available as accessories. Base price........................................$1,308.00

Of importance, any of the above systems, except the rack-mount units, may be converted to a different system in a matter of a few minutes by either unplugging and/or interchanging accessory components. When using the 56 as a part of the 56B or 56C systems, no electrical or mechanical changes are made. To convert from the 56B or 56C to a single case 56D, simply remove thumb screws which hold the back connector plate and replace with the 56D connector plate.
All electrical connections are established by a plug. These changes can be made in the field by laymen in a few minutes.

These systems may be operated from 117V, 60 or 50 cycles, as ordered, or 220V-3 phase. Furthermore, the entire electronic section is designed around a 24V battery system, and we make several types of rotary converters or vibrator inverters to power the synchronous motors of the recorder and the cameras.

While the S6 will not handle 35mm film—it is available for:

16mm at 36 feet per minute 17.5mm at 45 feet per minute 17.5mm at 90 feet per minute

The components covered as accessories are briefly described to show their application. We appreciate the many problems encountered in motion picture production and, accordingly, after you have studied this information, please feel free to call upon the Stancil-Hoffman Corporation for engineering assistance in selecting the right equipment and the right accessories to achieve the maximum efficiency and best quality sound.

The choice of 24V battery systems was made because of the availability of highly efficient and compact 24V aircraft batteries that are military approved and readily available. Furthermore, it is always possible to rent or purchase 12V batteries for automobiles any place in the world. As you will observe from the individual sheets describing the microphone preamplifier mixer—Model AM6, and the electronic section Model ARP6—the filament strings are designed for 24V operation. This means that these may be tied directly across the same battery that powers the motors. This achieves maximum efficiency and performance.

Rather than carry the unnecessary weight of "B" batteries for field work, we have designed a light weight dynamotor power supply for the amplifiers. Since the type of camera used with the S6 is the determining factor as to the size of the 24V DC to AC converter for synchronous motor power, we have three basic converters. Cameras, such as the 35mm Mitchell NC or BNC, may require upwards of 600W of power. To handle these cameras, we have a rotary converter with an accessory speed control unit to permit "undercranking" and "overcranking". For quietness and efficiency, the Mitchell cameras usually have a 3-phase motor; however, we have a single phase rotary converter of the same power capabilities for larger single phase motors.

For smaller 16mm cameras, we have a stock vibrator inverter which has ample power to handle the usual 16mm camera and the S6. In all cases the S6 only takes in the order of 40 to 50W, whereas the cameras will take from 80W upwards. Furthermore, it must be borne in mind that portable equipment of this type is frequently used in sub-zero temperatures under which conditions the batteries are the least efficient and the mechanical loads are tremendous.

Any good quality microphone having an impedance in the range of 50 to 200 ohms may be used with the S6 system. However, we have suggested the use of the American Microphone, Model D44 for exterior use, and the DR330 for interior use. Most directional microphones consist of a ribbon element and a moving coil or dynamic element to achieve a "cardiod" pattern. Yet, any microphone using a ribbon element is highly susceptible to mechanical shock or abuse, and even wind noise. For that reason, the Model D44 has been chosen for rough usage in the field and the DR330 for studio and sheltered use. While the Model D44 is non-directional, this does not pose a problem for exterior shooting.

**MODEL S6 FILM TRANSPORT**

For the first time, a precision lightweight film transport system is available in the Model S6. Built with the precision of a watch, the S6 is rugged for field and portable work, and flutter-free for the finest in music recording. The battery-powered version of the S6 may be operated in vehicles, boats, airplanes, and even roller coasters.

While the 16mm S6 surpasses 35mm standards, it has long been the practice to record on the same film size as used in the camera and, because of the extended frequency range, the trend is to conserve film usage by reducing to 45 feet per minute when shooting 35mm picture. To further conserve, a 17.5mm (35mm split) width is used. The Model S6 answers the long-awaited portable requirements and may be obtained with the half speed—17.5mm—or 16mm standard speed. In most
major cities, there are Stancil-Hoffman installations in service to transfer and re-record the "good takes" to 35mm or 16mm magnetic editing tracks. For those interested in such installations, this equipment is quickly available in the Model 57 series for dual speeds as well as single speeds. Also, several types of the Model S6RP are available for single speed "one to one" transfer.

A single film sprocket is driven by our precision lapped gear assembly. Film hold-down idlers or "keepers" are set by a bar knob control which also establishes the proper film loop by automatically presetting the stabilizing idlers. Two flywheels are driven by the idlers closely coupled to the record and playback heads. The motion stabilizes quickly after starting. The motor switch establishes an electrical interlock with the recording circuit to prevent accidental double recording. The S6 motor may be quickly and simply replaced in the field by a 117V single phase or 230V 3-phase motor. Furthermore, replaceable gear boxes are available to as quickly change from 50 cycles to 60 cycles, furnishing an operating unit for all possible combinations. The entire movement is so quiet it is possible to operate near the action. The record and playback heads are available for inspection and maintenance by removing the stainless steel head cover. Complete adjustments of rotation, tilt, and azimuth are provided. The playback head is triple-shielded for maximum hum reduction. The unit is designed and manufactured for the rough handling encountered in portable recording. Low flutter is made possible by two flywheels, precision bearing suspended stabilizer arms, and a silicone dashpot.

**SPECIFICATIONS - PORTABLE EQUIPMENT**

Single motor drive, 1200 feet reel capacity; track width - 0.200 inches
Size: 14-1/2" x 10-3/4" x 8"
Net Weight: 25 lbs.

When the S6 transport is mounted on a rack for cabinet and fixed operation, or when it is mounted on a rack panel for carrying case operation, the transport dimensions are 14" high x 19" wide x 12" deep. The standard S6 transport panel is mounted on the 19" wide panel from which is suspended a motor mounting tray. On the tray can be mounted either a synchronous motor, or a synchronous and an interlock motor. These 50/60 cycle motors may be for either single phase or 3-phase.

A Gilmer belt coupling is made between the motors and the S6 gear reduction assembly. This permits compatible interlock performance with any type of interlock system a customer may have. The synchronous motor has reserve power to drive a 16mm projector through the interlock motors. The synchronous motor is of hysteresis design, which is very important as it will compatibly work with synchronous motors on other equipment through interlock and not have a tendency to "hunt". The usual synchronous motor cannot be so operated.

For convenience of rewind and high speed forward, torque motors may be added on both the feed and takeup reel spindles. The following model numbers are thus created:

- **S6RP** - A rack-mounted S6 transport with a friction takeup clutch for Recording and Playback.
- **S6P** - A rack-mounted S6 transport with a friction takeup clutch for Playback.
- **S6RPT** - A rack-mounted S6 transport for Record and Playback with the addition of torque motors using push-button operated relays for control.
- **S6PT** - A rack-mounted S6 transport for Playback with the addition of torque motors using push-button operated relays for control.
- **S6RPTX** - A rack-mounted S6 transport for Record and Playback with the addition of torque motors using manually operated switches for control.
- **S6PTX** - A rack-mounted S6 transport for Playback with the addition of torque motors using manually operated switches for control.
MICROPHONE PREAMPLIFIER

The Model AM-6 microphone preamplifier incorporates two Stancil-Hoffman Model AL-3 plug-in low impedance preamplifiers which have individual gain controls and are preset at either 50 ohms or 200 ohms microphone impedance. They are extremely quiet, low microphonic amplifiers offering flat frequency response and "long shot" high gain amplification. A selector switch is included on each AL-3 to change the gain approximately 13 dB so that if more sensitivity is desired, it may be placed in a high gain position. The controls on the plug-in preamplifiers, plus the master control, bring the microphone levels up to a high level 600 ohm line. The mixer then may be used at any distance from the recorder without impairing quality. A very important additional feature is the built-in push-button operated dynamic microphone for recording scene number identification at the beginning of each "take". For intercommunication between the mixer and the recordist, full facilities are available for 2-way buzzers and sound powered telephones along with a signal light. All audio power and signaling is handled by a single 12-wire shielded and jacketed transmission cable terminated in military approved 12-pin connectors. A "high pass" filter is included to change from a flat response desirable for music to a reduced low frequency response for dialogue recording. The illuminated volume indicator, which is included, is calibrated in VU and percentage. The Model AM-6 is powered by the associated S6 equipment.

SPECIFICATIONS

Extremely high gain for "long shot" microphone pickups.
2 microphone channels ± 2 dB, 40 to 15,000 cycles.
Output - 600 ohms at 0° VU (+4 DBM).
Plate - 230V DC, 18 milliampere.
Monitor standard at 20,000 ohms, or special with 2 - 50 ohm outputs for the mixer and the "boom man". The 600 ohm line may also be used for monitor.
Filaments - 24V DC, 450 milliampere
Noise and hum less than -120 DBM
Distortion less than 1% total harmonic
Size: 14-1/2" x 10-3/4" x 8"
Net weight: 21 lbs.

Remote Control

It is possible to completely control the S6B system from the AM-6 mixer with only the addition of a remote control box. The buzzer system is disconnected and the button of the AM-6 panel is used to actuate an impulse relay for the sequences of RECORD and STOP. In the RECORD position, the red light on the AM-6 is illuminated offering visual evidence of recording.

To record a scene, the operator presses the button, turns the "LIVE-TAPE" switch to TAPE to listen for the first section of recorded material, and then mixes in the LIVE position for the balance of the scene. A check would probably be made at the end of the scene in the TAPE position. This procedure offers both a visual and aural check of recording quality.

The Model CU-24 remote control box is inserted in the cable connections between the ARP6 and the S6 transport case. Jumper connections are made in the AM-6 and ARP6 to electrically accommodate the remote control.

RECORDING AND PLAYBACK AMPLIFIER SYSTEM

The Model ARP6 recording and playback amplifier system consists of the Model AR-34 recording amplifier and the Model AP-34 playback amplifier. Each of these units is mounted on individual chassis 4-5/8" x 7-7/8". By loosening 4 screws, the underside of the chassis-plate holding the AR-34 or the AP-34 may be exposed for maintenance. As in all Stancil-Hoffman amplifiers, each resistor and condenser is soldered to silver-plated tie-points assuring a corrosion-free mechanically rigid connection. To prevent maintenance problems, noise-free and conservatively voltage-rated components are used regardless of cost or bulk. The ARP6 offers individual gain controls for both the recording and the playback amplifier. The film may be monitored either LIVE or TAPE during recording. The illuminated volume control indicator, which is calibrated
in VU percentage, may also be switched to read BIAS or B+ for maintenance purposes. To prevent accidental double recording, the RECORD push-button and the red warning light are located on the ARP6 and electrically interlocked with the 86 film transport.

The Model AR34 recording amplifier uses 3 tubes operating on a 24V DC filament string. The bridging input is accomplished by a wide range 20,000 ohm input bridging transformer. A push-pull bias oscillator operates at above 80 kilocycles. Excellent low distortion rejection filters are built in to trap the bias out of the audio portion of the amplifier and to eliminate any distortion of the bias waveform.

The equalization used on record is chosen to approximate the amounts used by various manufacturers. The primary function of a recording system is to store audio frequencies faithfully. The top frequency response has been set to be well above all film requirements. At 50 cycles approximately 6 dB of pre-equalization is used as this offers a greater dynamic range on playback.

The recording amplifier has a fraction of a percent of harmonic distortion and the only distortion that can be measured is created in the process of magnetizing the film. Since this becomes a function of the recording level in reference to film saturation, the recording level is set approximately 13 to 15 dB below saturation at 400 cycles. In effect, this means that any frequency recorded in the field and studio at the normal levels, as shown by the volume indicator, will be well below 2% distortion with a dynamic range of 55 DB or more.

The Model AP34 playback amplifier, like the AR34, is ruggedly constructed and designed for maximum performance. Four tubes are used on a 24V DC string. The input tube type 1620 was chosen as one having the least microphonics and internal noise. It, and the second stage, are mounted on a separate assembly.

The equalization is set to provide flat response from the AR34 as well as to fall fairly close to the average of all manufacturers. The push-pull output drives a 600 ohm transformer which may be balanced or unbalanced as desired. The distortion-free output level is set to "0" VU.

SPECIFICATIONS

Overall response: 16mm standard speed ± 2 DB, 50 to 12,000 cycles. 17.5mm at 45 feet per second ± 2 DB, 50 to 12,000 cycles. At 90 feet per minute ± 2 DB, 50 to 15,000 cycles. Noise and hum down at least 55 DB. Distortion less than 2% total harmonic. Input recording amplifier 20,000 ohms transformer bridging at a minimum of -22 DB. Output playback amplifier 600 ohms at a maximum of +3 VU. Filaments 24V DC less than 1 ampere. Plate - 250V DC, 70 milliamperes. Power consumption - 117V, 70W.

Size: 14-1/2" x 10-3/4" x 8".

Net weight: 18 lbs.

RECORDING AND PLAYBACK AMPLIFIER SYSTEM

The Model ARP23 recording and playback amplifier system consists of a recording amplifier with automatic gain control, Model AC23, a playback amplifier, Model AP23, and a bias oscillator and equalization stage, Model AR23. The three amplifiers are printed on cards using transistors in place of vacuum tubes. They are extremely compact and light weight, and are of plug-in design. The use of transistors throughout reduces the drain from the battery system to absolute minimum. The total current consumed at 12V is less than 50 milliamperes (0.050 amps). Even a pilot light to indicate that the amplifiers were energized would draw more current than the total amplifier system.

Our engineers have developed one of the first complete magnetic recording systems using transistors, and extensive tests have been made to thoroughly prove the system so that we can be assured of absolute success in the very exacting field of motion picture recording. In practically every respect, transistors have exceeded the performance of vacuum tubes. The transistors lend themselves very well for our type of equipment, which must stand abuse encountered in portable and mobile activity, as they are so compact and not subject to the usual problems of "microphonics" and mechanical abuse so often a bother in portable recording. Furthermore, their reliability and low current drain answers a problem that has confronted us for years.
The only precaution that we can state concerning these amplifiers is that they must not be operated in temperatures above 180° F. We do not feel that this is much of a restriction because certainly the camera equipment and other equipment will not be subject to such abuse. A description of the three individual components is as follows:

**PREAMPLIFIER AUTOMATIC GAIN CONTROL, MODEL AG23**

**Function:** A microphone preamplifier to operate from a 50 ohm dynamic microphone. The AGC feature permits close speaking into a microphone, and yet it has sufficient sensitivity to furnish full recording level from at least 10 feet distance. In this tremendous range, the amplifier automatically holds the level to within 4 or 5 dB. Actually, with a signal increase of 30 to 40 dB, the increase of recording level is only 4 to 5 dB.

**Gain:** Approximately 90 dB. Increasing the input level to -40 or -45, the automatic feature will hold the output within 5 dB and no "thumping" is observed with a very smooth control. We have arbitrarily set the release time of the compression feature to a second or slightly more, and the attack time of the compression is immediate. This makes it possible to accommodate gun shots, loud hand claps, or other shock impulses without experiencing overload or distortion.

**Transistors:** Seven - The input stages are all push-pull, and from these stages is taken voltage which is rectified and fed back to the input to obtain the automatic feature. **Input:** 50 ohms, **Output:** approximately 1,000 ohms at "0" level. **Frequency response:** flat from 50 to approximately 16,000 cycles. **Distortion:** at any range between -45 to -90 DB input, less than 1-1/2% total harmonic. **Current Drain:** .020 amperes at 12V. **Size:** 3-1/2" x 6". **Weight:** 8 oz. **Construction:** housed in a metal enclosure with printed circuit connector. **Dimensions:** 1" x 3-1/2" x 6".

**BIAS OSCILLATOR AND EQUALIZATION UNIT, MODEL AR23**

**Function:** A transistor unit to furnish bias and equalization for recording. **Bias Frequency:** 60 kilocycles. **Equalization:** to provide standard recording curve. (Note: the curve is set as a compromise between dialogue and music recording). **Transistors:** 2 **Drain:** .020 amperes at 12V. **Size:** 2" x 6". **Weight:** 5 oz. **Construction:** housed in metal enclosure approximately 1" x 2" x 6", with connector.

**REPRODUCE OR PLAYBACK AMPLIFIER, MODEL AP23**

**Function:** A transistor playback amplifier operating directly from a magnetic head containing suitable equalization for Stancil-Hoffman Model S6 film recorder. **Gain:** approx. 85 DB. **Output:** "0" level at approx. 1,000 ohms. **Signal-to-Noise:** better than 60 DB. **Frequency response:** a function of film speed - flat to 9,000 for 16mm. **Transistors:** 3. **Drain:** .0066 amperes at 12V. **Distortion:** less than 1-1/2% total harmonic. **Size:** 2" x 6". **Weight:** 4 oz. **Construction:** housed in metal enclosure 1" x 2" x 6" with printed connector.

**Battery Supply for Model AR23**

To keep weight at a minimum, and to eliminate the heat and other problems which result from the use of AC power supplies, we have found it most expedient to use a battery power supply for the transistor amplifiers. Their drain is so low that one set of batteries should last several months with absolutely no attention.

We use "mercury" cells designated as Model RM12. Ten of these cells are placed within a battery tube 1-1/4" long x 3/4" diameter, which is held in the rear of the S6. The mercury cells have indefinite shelf life and are rated at approximately 3.6 ampere hours. Since our total drain is less than 0.050 amperes, it is obvious that long battery life is to be expected. It is recommended that one or two sets of batteries be obtained at the time of purchase as they are very small, light-weight, and inexpensive.

**ACCESSORY EQUIPMENT**

**Sound-Powered Telephones**

In the 3-case system, Model S6B, the microphone preamplifier mixer may be located several
hundred feet away from the electronic section and the recordist. Accordingly, some means of communications must be available between the two positions. The cabling system between the mixer and the recording position have facilities for sound-powered telephones, and the Model H601B is the type chosen. Both the A16 mixer and the S6 have push-button buzzers to signal when to start or stop recording, and to signal for use of the sound-powered telephones.

Sound-Powered Telephones: Model H601B  Size: 9" x 2-1/2" x 4"  Weight: 16 oz.

Microphone

We recommend a Dynamic microphone with a wind screen for exterior shots. The model most generally used with the S6 is the American Microphone, Model D44, with windscreen. Net Wt. 7 oz.

Microphone

For studio use and working in sets or enclosures, it is desirable to have a highly directional pattern. The American Microphone, DR330, which has selectable patterns with the cardiod pattern extremely sharp for directional purposes, was chosen. Net Weight: 20 oz.

Cables

Since each customer has his own requirements as to the length of microphone cables, we have attached a separate sheet listing the principal lengths generally used.

Monitor Headphones - Crystal

A crystal headphone set has very good quality; however, these headphones are subject to temperature and will deteriorate if exposed to excessive temperature and humidity.

Monitor Headphones - Crystal: Model EA-1  Net Weight: 5 oz.

Monitor Headphones - Dynamic

Since the S6 system may possibly be used in areas of high humidity and extreme temperature, Dynamic monitor headphones are necessary for dependable operation.

Monitor Headphones - Dynamic: Model DH8  Net Weight: 1 lb. 1 oz.

Open Flange Reel Set and Guides

Steel reels are generally available for 16mm film; however, 17.5mm film reels are difficult to obtain. There is a split reel which can be used for 17.5mm satisfactorily, although many of the producers prefer our open flange reel and guide set so that the bulk film may be placed directly on the reel without taking time to transfer the bulk film to a special reel.

Reel Flange Set: Model DFF  Net Weight: 1 lb. 8 oz.  Flange Size: 10.5

Reversal Kit

The design of the S6 transport system was kept as simple, maintenance-free, and as light-weight as possible with minimum power consumption. Accordingly, no provision was made for a reversal system other than a reversal switch on the motor. If it is desired to wind back to the beginning of a take for immediate playback, the RD6 reversal kit may be installed at the factory to afford this facility. By means of an ingenious clutch arrangement, the motor may be switched to reverse operation and the take-up spool so operated as to tightly wind the film without rethreading.

Reversal Kit: Model RD6F (factory installed)  Net Weight: 15 oz.

Note: This unit will not operate with 230V 3-phase AC at 90 FPM

Power Amplifier

We have had numerous requests for a power amplifier-speaker which could be used either on the stage or in the field for portable work. In some instances, it is desired to play back recorded
"takes" over a small speaker system. Very often it is desired to make a "pre-score", and play the music back for dances or dubbed-in dialogue and singing. Obviously, an AC operated version of such a unit presented no problem, but we also wanted to make it battery-operated for field use. The power amplifier-speaker unit is mounted in an identical case to the Model S6 and is available for either 110V 50/60 cycles AC only, or 24V DC or a combination for AC/DC.

A high quality bridging transformer feeds the push-pull stages. This input is ungrounded so that it may be bridged across any circuit and achieve full performance. When the power input plug is connected to the 24V battery, the circuitry is automatically arranged for battery operation. Likewise, when the cable is plugged in AC, the appropriate connections are made. While it was necessary to keep the weight down, the efficiency, nevertheless, is high. We achieve a clean 7-1/2 to 10W of audio power with a frequency response of from 30 to 17,500 cycles. Actually, the 6" x 9" oval speaker in such a small enclosure is not very effective under 100 cycles, although sufficient response is furnished to insure quality over the entire spectrum. Many times recordings are played back to check for hum or low frequency noises, and the speaker is sufficiently effective to permit observations in this range. A jack is available so that large external speakers may be driven from this unit, if desired.

**Power Amplifier: Model AM7**

Net Weight in Case: 22 lbs.  Size: 14-1/2" x 10-3/4 x 8"

**Bulk Eraser**

This bulk eraser was specifically designed as a part of the S6 system so that it could handle the size of the reels used on the S6 with the minimum size and weight and power consumption. The reels of magnetic film are simply placed on the bulk eraser and slowly rotated to eliminate any trace of previous recording and condition film for re-use.

**Bulk Eraser: Model BE3**

Size: 6" x 6" x 12"  Net Weight: 27 lbs.

Power Consumption: 550W; reel capacity: 10-1/2"

**Power Supply**

It was first intended to have the electronic power supply a part of the ARP6 electronic section, but it was then found more desirable to keep the power supply separate to reduce the electronic section weight and to make a quicker change between AC and DC operation. Accordingly, the Model P24C power supply is encased as a separate unit and used in conjunction with the ARP6 electronic section. It contains the transformers and chokes for the B supply of the amplifiers and the rectifiers to establish a 24V supply for the DC filaments of the amplifiers. It is an extremely well filtered unit to provide hum-free operation.

**Power Supply: 115V AC input, Model P24C**

Size: 5" x 12" x 7"  Net Weight: 13-1/2 lbs.

(220V AC input on special order)

**Dynamotor**

This light-weight but efficient dynamotor is encased identically to our AC power supply, Model P24C, and it is so arranged that it may be used in place of the P24C when in the field. There are no mechanical or cabling changes to be made in switching from AC to DC by this system. Incorporated with the dynamotor is an effective filter to eliminate all commutator hash of the dynamotor along with a separate filter system to handle a vibrator inverter which may be used to power the camera from battery sources.

**Dynamotor: Model NL-250C**

Size: 5" x 12" x 7"  Net Weight: 5 lbs.

**Vibrator Inverter, 24V DC to 115V AC**

This 24 lb. unit will furnish a maximum of 150W output at 60 cycles for both the S6 and a 16mm camera. We have incorporated filtering systems in our S6 power supply so that when the vibrator inverter is used in conjunction with the S6, the low noise is not jeopardized. The vibrator is, perhaps, the least expensive solution to a DC to AC power source for field use. It does not permit overcranking and undercranking, but is very simple and dependable. However, there are certain types of highly inductive motors used on cameras which cannot be satisfactorily powered by the vibrator inverter without permanent damage to the vibrator. Always feel free
to consult Stancil-Hoffman Corporation for any assistance in the choice of such a power supply.

**Vibrator Inverter:** Model V150 24V DC to 115V AC - 60 cycles (50 cycles on special order)

Maximum power output: 150W  
Size: 11" x 8-1/4" x 7"  
Net Wt. 24 lbs.

**Rotary Converter, 24V to 230V 3-phase AC**

To provide a portable power supply for the Mitchell NC or BNC 3-phase camera motors, we have designed the Model N3-2 which operates from 24V DC. The rotary converter has been designed to supply approximately 230V to a loaded camera and the S6 under normal temperature conditions. It has ample reserve capacity to furnish up to 270V under extreme cold weather by using 30V instead of 24V. It is conservatively designed to handle inputs up to 900W or more. It is necessary to use a "camera control" to establish the speed, and such is covered under Camera Control, Model CC5, and others.

- Model N3-2 230V 3-phase 60 cycle output
- Model N3-2A 230V 3-phase 50 cycle output
- Size: 10-5/8" long 6" diameter
- Connector box mounted on motor: 5-1/2" x 5" x 3"
- Net Weight: 35 lbs.

**Rotary Converter 24V DC to 115V AC**

This unit is a 24V DC to 117V single phase AC unit to handle the many single phase cameras and recorders that are in use. Most of the single phase camera motors are designed for 16mm camera; however, there are a few applications wherein single phase motors are used on the Mitchell 35mm and 16mm and other similar types of equipment. For this reason, the Model N3R has been designed with ample power capacity to handle these cameras under the coldest and cruelest elemental conditions. It has an optimum speed range centering around 60 cycles (50 cycle Model N3R-2A). However, we provide a Camera Control to manually set the speed for 24 frames a second or higher and lower speeds for "undercranking" and "overcranking". It has ample reserve capacity to furnish up to 135V under extreme cold weather by using 30V instead of 24V. It is conservatively designed to handle inputs up to 750W or more.

- Model N3R-2 117V single phase 60 cycles output
- Model N3R-2A 117V single phase 50 cycles output
- Size: 10-1/2" long 6" diameter
- Connector box mounted on motor: 5-1/2" x 5" x 3"
- Net Weight: 35 lbs.

**Camera Control**

The rotary converters may be adjusted over a range of film speeds. To control and indicate the speed, a "camera control" is used. The basic model is CC5, with "A" designating 50 cycle output instead of 60 cycles and "V" indicating the addition of a voltmeter to show the condition of the battery under load. The addition of "R" designates a camera control for use with N3R-2.

The camera control contains a switch to energize the rotary converter, a potentiometer to control the speed, and an indicator consisting of 9 frequency reeds calibrated in "frames per second" as follows: 16 - 18 - 20 - 22 - 23 - 23.5 - 24 - 24.5 - 25.

As 6-wire cables terminated in P6 Cannon connectors are relatively standard in Hollywood for field work, both the rotary converter and the camera control are so equipped. Any reasonable length of cable may be used between the camera and control, and between the control and converter.

- Size: 8" x 12" x 6"
- Weight: 10 lbs.

**Battery**

24V storage batteries are used to furnish camera and filament power for location and portable operation of the S6 system. It was felt that the most efficient batteries obtainable should be used in the S6 system, and the U.S. Air Force approved batteries offered the solution.
These batteries are housed in a cast aluminum case with a rubber-sealed removable lid. Both the battery caps and the lid provide non-spill features. Most customers obtain two batteries; one for operation, and one for a spare and use the spare for filament power.

<table>
<thead>
<tr>
<th>Battery:</th>
<th>Air Force Type, Model AN3151</th>
<th>Battery:</th>
<th>Air Force Type, Model AN3154</th>
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<tr>
<td>Discharge Rate:</td>
<td>5 amps for 17 hours</td>
<td>Discharge Rate:</td>
<td>5 amps for 11 hours</td>
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<tr>
<td>Size:</td>
<td>10-1/4&quot; x 13-5/16&quot; x 8-3/4&quot;</td>
<td>Size:</td>
<td>8-1/4&quot; x 8-1/4&quot; x 7-3/4&quot;</td>
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<tr>
<td>Net Weight:</td>
<td>56 lbs.</td>
<td>Net Weight:</td>
<td>34 lbs.</td>
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(Note: For air shipment, these batteries are dry-charged without electrolyte)

**Bridging Amplifier**

This plug-in unit is interchangeable with the microphone preamplifier, Model AL3, so that should it be necessary to re-record from high level sources, such as phonograph records, film phonographs, or radios, the microphone preamplifier may be removed from the AM6 mixer and the Model AH3 bridging unit inserted in its place. The input impedance is above 5,000 ohms so that it may be bridged across any one of these sound sources, and fed into the recording system of the S6.

**Bridging Amplifier: Model AH3**  
**Size:** 5-1/2" x 4" x 1-3/4"  
**Net Weight:** 1 lb.

**Fish Pole**

The Model MP-2 is a lightweight microphone boom or "fish-pole". Made of sturdy Dural tubing, this two-piece fish pole collapses to 5' in length and extends to approximately 10'. We have made a gear attachment which suspends the microphone from the boom to furnish a controllable orientation or facing of the microphone from the boom. Net Weight: 3-1/2 lbs.

**Test Oscillator**

This is an interchangeable plug-in unit with the AL3 or the AH3, and it is designed to feed signals through the electronic section for maintenance and test purposes. The frequencies have extremely low distortion and are within 1/2 DB from each other so that a complete frequency run may be made in the field.

The frequencies are: 100 cycles, 400 cycles, 1,000 cycles, 3,000 cycles, 5,000 cycles, 7500 cycles, 9,000 cycles, and 13,500 cycles. These are controlled by a switch which may select any one or progressively all of the frequencies in the audio spectrum for frequency runs, gain level tests and alignment purposes. A "must" for field recording.

**Audio Oscillator: Model AO9**  
**Size:** 5-1/2" x 4" x 1-3/4"

**Oscillator Wand**

Many processing laboratories desire a 1,000 cycle tone to be recorded at the beginning of each magnetic roll of film. We have accordingly designed the oscillator wand, Model A011, as a source of 1,000 cycles for studio or field use. The wand is a self-contained unit weighing 9 oz. and it may be inserted in the input of a microphone preamplifier. This transistorized oscillator will provide either 1,000 cycles or 8,000 cycles as selected. The 8,000 cycles may be recorded on the film as a means of establishing a tone for head alignment or a high frequency check.

In addition to its being inserted in a microphone preamplifier position, it is so designed to induce the 1,000 cycle or 8,000 cycle tone into a playback head for check purposes. Many times it is desired to check a playback amplifier or a film phonograph to see whether the head is connected or the amplifier turned on. In this case, the oscillator wand may be placed in proximity to a playback head and the two tones induced to verify the playback head and amplifier condition. This is a most important maintenance tool. It also may be used to induce signals in the dynamic microphones.

**Oscillator Wand: Model A011**  
**Size:** 8" x 1/1/4"  
**Net Weight:** 9 oz.
Head Demagnetizer

It is absolutely essential that the magnetic heads be "demagnetized" at frequent intervals. If the heads become magnetized from any source, it is a simple matter to use the prong type demagnetizer to correct the condition in a matter of a few seconds whether you are in the field or in a studio. A magnetized head is evident by a gurgling noise, hiss, and distortion.

Prong Head Demagnetizer: Model HD1  Net Weight: 10 oz.

Battery Charger

The battery charger is designed to operate from 110V to 250V AC and to provide up to 5 amperes of a charging current to a 24V battery. It incorporates a "variac" so that the unit may also be used as a voltage booster to operate the S6 under low AC voltage conditions. The Variac provides continuously variable charging rates from 0 up to 5 amperes, or it will provide up to 135V of AC from a 110V AC source. It may also be used to step the voltage up for radio or other equipment that might be carried in the field and which might not operate satisfactorily under low voltage conditions.

Battery Charger: Model BC2  Size: 12-1/2" x 8" x 8-3/4"  Net Weight: 22 lbs.

Frequency Alignment Film

The actual maintenance of magnetic film recording and reproducing systems is relatively simple. A "Standard" should be established when the equipment is first received and then weekly or monthly checks made on the equipment to see that it is kept within this standard. A frequency alignment film will greatly assist in this procedure, as it contains a relatively long recording of a high frequency tone for head alignment purposes. It then has a lower frequency which represents the standard recording level. Other frequencies are furnished throughout the audio spectrum to check the equalization.

Frequency Alignment Film: Type SSF-16mm S for single perforation, edge track, Net Weight: 11 oz.
Type SSF-16mm D for double perforation, center track, Net Weight: 11 oz.
Type SSF-17mm at 45 RPM, Net Weight: 11 oz.
Type SSF-17mm at 90 RPM, Net Weight: 14 oz.
S6 CABLE SHEET

With the exception of the S6D, which is the single case system, the S6 basic equipment includes the cables between the ARP6 electronic section and the S6 transport section along with the power connections to the P240 power supply and/or the NL-250C dynamotor supply, when necessary. Also, the cables are included between the rotary converter and the battery, but "camera cables" are necessary to connect the rotary converter to the camera through the camera control.

Unless ordered otherwise, all microphone fittings are Cannon XL.

**CABLES**

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