

**Aerial-photographic device for Arriflex 35.**

*Silicon Rectifier for Projection*

A Silicon Rectifier, a product of Takana Electric Works Co., Tokyo, especially designed for d-c output exceeding 100 v, has been installed in the Iino Hall at Uchisaiwai-cho Chiyoda-ku, Tokyo. In announcing this product it was noted that silicon was used as long ago as 1904 as a



**Silicon rectifier for projection.**

detector in radio receivers. Although this application was by-passed by the development of the vacuum tube, the development of the silicon transistor in 1948 and the silicon rectifier in 1956, suggested new applications. The new rectifier was constructed to be shockproof and resistant to heat, cold and humidity.

**Advanced Studio Sound Facilities in India**

By P. A. PESTON JAMAS

A FACT NOT ALWAYS recognized is that India is one of the largest film-producing countries in the world, and has over fifty film studios; a few of them quite modern.

One such studio is Rajkamal Kalamandir of Bombay, which has been the recipient of five awards for sound recording. The sound department, recently modernized and expanded, is of special importance because vocal and orchestral music form an important part of all full-length Indian pictures. Hardly a picture is made that does not have a generous quota of music and songs. Multichannel control of music recording was decided upon so that balance, between sections of the orchestra could be conveniently altered following the original recording, or a song replace a song in another language. Other considerations were flexibility; economy (achieved by reducing the recording time of the live orchestra); and adaptability to processes such as CinemaScope (achieved by provision for the addition of some units without making obsolete the recently installed equipment).

Multilanguage use is provided for by the "International Track" facility.

*General*

The modernization plan was carried out

A contribution submitted on March 20, 1961, by P. A. Peston Jamas, Westrex Co. India, Metro House, Esplanade Rd., Bombay 1, India.

by Westrex, India. Most of the equipment was manufactured in the United States except for special items designed and fabricated in India.

The new installation includes a six-track 35mm magnetic system consisting of an RA-1552-C-6 recorder, a modified RA-1565-D transmission cabinet and an RA-1551-E-6 reproducer. The multichannel mixing equipment consists of two RA-1524-G mixers, one RA-1543-A equalizer, one input selector unit, and one output mixing unit. The last two items were designed and fabricated in India. The mixing equipment is assembled in a locally made console installed in the monitoring room.

The studio also contains an 1100 series 35mm magnetic single-track system, and a 735 Deluxe 35mm photographic system, currently used as a transfer channel (Fig. 1). The re-recording mixer has six input positions, fed from four RR3S re-recorders (fitted with high-speed rewinds and looping cabinets), and two R-7 soundheads which form part of the RR-7230 sound projection equipment. The re-recording mixer is a four-position console with a two-position attachment, made in India and containing facilities for the addition of an "International Track" channel to provide re-recording in other languages, in the future (Fig. 2).

The motor system for the re-recorders as well as the six-track magnetic recorder, and the six-track magnetic reproducer is of the multipurpose type using RA-1409 and RA-1519-A motors. Wall-mounted motor control and motor starting boxes were made in Hollywood for use with the re-recorders and soundheads.

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An RA-1558-A Volume Indicator Projector is used adjacent to the projection screen for visual metering of the audio levels during re-recording.

## Six-Channel Recording System

Equipment for track substitution is particularly important in India where the problem of multilanguage picture production exists; for example, it is often desirable to use the same orchestral accompaniment to several different language versions of a song.

Also provided for is the making of multi-channel stereophonic recordings for processes, such as CinemaScope, by adding equipment with the necessary circuit alteration to the present installation. Provision for six-channel loudspeaker monitoring is incorporated in the system, although at present single-speaker monitoring is used.

During a recording session, up to five microphone inputs from the various orchestral and vocal sections are selected at the input selector unit; fed to the inputs of the two multichannel mixers; and recorded separately as five tracks on a single 35mm film on the six-track magnetic recorder. The five monitor lines from the associated transmission cabinet are routed to the output mixing unit via the equalizer unit. Both units are located on the mixer console. These monitor lines are thus equalized, or filtered, then mixed and monitored, and eventually fed to the sixth input of the multichannel mixer combination to be recorded simultaneously as the composite sixth track on the same 35mm film. This sixth track serves as a guiding track for making the final balanced, corrected and equalized master magnetic track for transfer to photographic. To make the master magnetic track, the film is run on the six-track reproducer, from whence the signals are routed through the equalizer unit and the multichannel mixers. The composite track is then re-recorded.

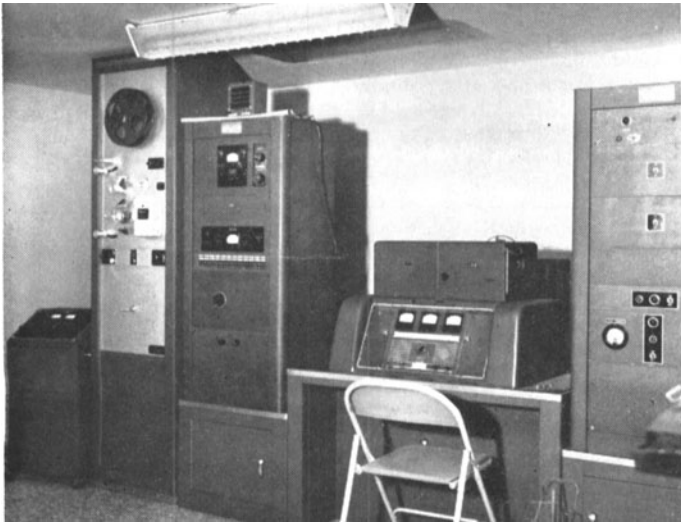
In substituting, for example, a song in another language, all the original individual tracks, except the original vocal and composite, are re-recorded. During this process, the relative vocal channel key at the input selector unit is operated to the 30-ohm microphone input to pick up and record the live substituted song in the new language. The cue to the vocalist is provided by the music through a headset system. The sixth new composite track with any music equalization or filtering, and including the new vocal, is also recorded simultaneously.

The transfer to photographic release negative is invariably made from the final master magnetic composite track. Six 30-w monitor amplifiers supply the power for the six-channel loudspeaker monitoring system and the headset distribution system.

## Input Selector Unit

All microphone 30-ohm outputs and 600-ohm lines terminate on a jack patch bay of the input selector unit. Six selected outputs of the several 30- and 600-ohm sources are brought to six three-position selector keys. Each key provides selection of a 30- or a 600-ohm source or a 30-ohm terminating resistor with one leg of a test oscillator bridging mesh across it. These keys simplify patching problems.

The test oscillator mesh bridges a 600-



**Fig. 1. The RA-1551-E-6 Magnetic Reproducer beside the 735 Photographic Recording System.**



**Fig. 2. Six-channel multitrack recording and mixing console. The two units on either end of the console as well as the console structure were fabricated in India.**

ohm terminated oscillator output and furnishes a low-level bridging signal simultaneously to the six, 30-ohm resistors which come across the mixer inputs when the keys are in "Test" position. Any key or keys can be manipulated without affecting the oscillator levels in the other channels. A recorded or visual check of the gain and frequency characteristics of all six channels can be made in one operation when the keys are in the "Test" position.

If the oscillator is patched out, the 30-ohm mixer input terminating resistors at the "Test" key positions are used to provide "arbitrary" noise level readings for each mixer input, also in one operation.

Mixer inputs and various other low-level circuits such as the disc recorder input, disc outputs, photographic recorder input, etc., appear on the patch bay of this unit. The six photographic re-recorder outputs are also routed via this patch bay to the re-recording mixer located in the auditorium.

The unit also contains a universal low-impedance-matching and bridging network with provision for amplification of 40 or 50 db when desired, of a low-level, low-impedance source. The amplifier output, controlled by a variable attenuator installed before the amplifier, is available at 30- or 600-ohm impedance. The attenuator can also be used separately if required, with or without the matching transformer, for attenuating any relatively high-level input.

#### *The Multichannel Mixers*

Two RA-1524-G mixers are combined to provide six inputs to six channels. These incorporate linear drive slide attenuator controls. Only simple switching or plugging is required for various modes, such as up to eight inputs, to one through six channels. The two mixers can also be adapted for twelve inputs to one channel operation.

#### *RA-1543-A Equalizer Unit*

All high-level monitoring lines (direct/film) from the transmission cabinet are routed to the inputs of the equalizer unit in the mixer console, and are then fed to the output mixing unit. The equalizer unit contains three "Hi-Lo" program equalizers

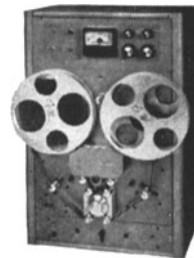
and three high-pass and low-pass filters, "telephone"- and "radio"-effects filters, circuit transfer switches, effects-channel combining network, and a Pan-Pot (the latter two for stereo recording). All facilities are available on a self-contained patch strip.

#### *Output Mixing Unit*

The five monitor lines equalized or filtered by the equalizer unit are mixed into a single channel in the output mixing unit.

This is done by bridging the emerging lines from the equalizer and then mixing them, thus permitting well over 40 db isolation between the individual channels comprising the composite channel. The equalizer lines find their termination at the monitor ON/OFF switches and the loudspeaker monitor amplifiers. This crosstalk figure of over 40 db was necessitated by the requirement that each of the equalized or filtered equalizer outputs making up the composite mixed

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channel, be selectively monitored on a speaker and simultaneously inspected on a V.I. meter. Switches are provided to introduce or disconnect any of the bridged lines in the bridging-mixing network without disturbing any circuit impedance.

The sixth composite channel can be also metered and monitored at the output mixing unit.

The signal of this mixed single channel is eventually fed into the sixth position of the multichannel mixer combination for recording simultaneously on the same 35mm film, the sixth and composite track. The mixed composite channel can alternately be fed into a separate photographic or magnetic recording system input. This facility permits recording of six individual inputs on the multitrack recorder and the seventh composite track on a separate outside recording system. The recording bus level of such an outside system can also be metered and monitored. All these metering and monitoring functions are available by selection of various points on a rotary switch.

#### Re-Recording Components

The re-recording equipment is essentially designed for single-track release. The projection booth houses the four re-recorders and the two-machine review re-recording system. The re-recording mixer with its two-position attachment is installed in the review/re-recording theater. This mixer combination accepts the six re-recorder outputs. These are mixed to provide two separate and simultaneous channels. One can contain up to all six of the re-recorder signals, and the other up to four of the same

signals with a view to excluding dialogue. Recordings are made simultaneously from these channels. The second "dialogueless" record is kept for use for re-recording of multilanguage versions.

Multipurpose motors are used throughout. Motor control boxes offer the motors for selection between two interlock buses or controlled-torque starting as ordinary 3-phase synchronous motors, individually. The motors can also be run fast-forward for cuing when desired.

The motor starting box installed in one interlock bus permits starting in interlock of all motors selected with the control box. The transmission equipment cabinet of the review re-recording system includes two film loss equalizers and a re-recording monitor input with an associated equalizer. The 30-w theater amplifier can be switched to the theater speaker system, or a dummy load across which is provided the facility of a V.I. meter for day-to-day film transmission check-ups.

Another facility provided in the equipment is an arrangement by which the original magnetic recording from the six-track film can be played back through the theater system in the review room to simulate standard "optical-recording" theater quality.

The main review re-recording theater (also used for music recording) and a second smaller review room are interconnected by a window. Extensive rotary and drop-over wall sections in the main theater are used to adjust the acoustics. The multichannel mixer equipment is in the monitoring room where a glass window affords a

view into the main re-recording theater, and one of the two vocalists' rooms.

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Three wall-mounted continuous troughs or channels of sheet iron, one each for "low-level speech," "high-level speech" and "power" run through and interconnect every room. Results achieved by installation of the new equipment surpass early expectations.

The credit for furnishing basic operational requirements of the system is due to V. Padmakar, Chief Technician, M. Parmar and Mangesh Desai of Radjkamal Kalamandir studio. The installation also owes its success to the cooperative and diligent work of Westrex engineers and the studio staff.



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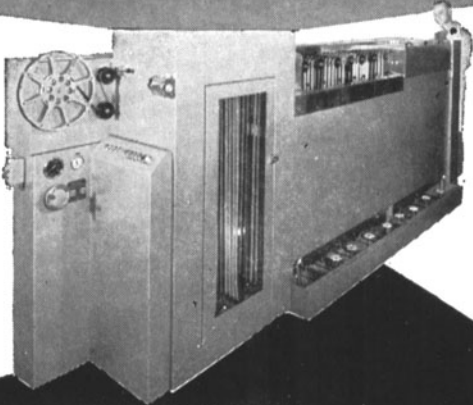
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