Sixteen-Channel Audio Mixing System

Type 2991



View of typical system incorporating additional cubicle containing distribution and talkback facilities.

FEATURES

* Suitable for use in either television or sound studios
* Sixteen microphone input channels with provision for switching seven high level (0dBm) inputs.
* Facilities for two group operation with independent group faders giving two independent outputs if required.
* Variable level output for echo feed can be taken from eight channels.
* Foldback and public address outputs can be taken from each channel.
* Channel faders and group faders give maximum flexibility for fading and mixing inputs.
* Balance attenuation for equalising all incoming signals prior to mixing and fading.
* Lever type channel faders for rapid channel selection and mixing.
* Meter and aural prefade monitoring on all channels.
* Internal tone generator for test and calibration.
* Large illuminated peak programme (or volume units) meter.
* Simplicity of design and emergency circuits ensure continuous operation.
* Jackfield system for patching all important stages and all inputs and outputs of amplifiers.
* Can accept signals from a remote source for visual and aural monitoring.
* Fourteen built-in push-buttons can be used to operate remote video relays for selection of a picture signal for video monitoring.
* The system is flexible and extra equipment may be added.
* Built-in controls and loudspeaker for connection to existing talkback and loudspeaker systems.

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USES

The sixteen-channel audio mixing unit has been designed primarily for use in television broadcasting stations, but is equally suitable for application to sound broadcasting or complex public address systems.

The comprehensive facilities available cover all the requirements of a modern studio installation, and the grouping of all the controls at one desk enables one operator to control the complete system. All the amplifiers and power units etc., are mounted in a separate cubicle assembly at a remote position.

Sixteen microphones can be connected to the input lines of sixteen channels and after amplification and level setting, fed out as follows:-

1. In two groups as independent transmission circuits (dual operation), or
2. As one or two groups, applied, to one transmission circuit (single operation).

The groups may be formed by any combination of the signal channels.

Independent channel faders for each channel permit the operator to fade microphones in and out as desired, while two separate group faders permit fading of the combined outputs from several channels.

The dual operation feature makes it possible to control two separate transmissions simultaneously from the control desk. The two group faders, when used on single operation, permit fading from one group to another and provide a very simple means for collective control of a large number of microphones.

Full monitoring facilities are provided for all signals regardless of whether they are selected for transmission or not, thus giving the operator the opportunity of checking each function prior to transmission. Switches on the operator's desk permit any of the sixteen channels to be connected, via level controls and amplifiers, to the foldback and public address systems.

High level outputs can be taken from eight of the channels for feeding to an echo machine or chamber, the output of which may be applied to channel 10 and used for effects.

Four channels have input selectors which permit the control of high level inputs. Five high level inputs are fed to channels eight and nine and cross fading can be performed between any two high-level points. In addition to the high level echo signal fed to channel 10, a further high level input may be applied to channel 7.

Four tie lines, connected between a spare jackfield in the cabinet and jacks in the control console, provide programme routing for extra facilities which may be required to be under the direct control of the audio mixer. For television applications, a row of push-buttons is incorporated in the control console and is intended to be used in conjunction with the vision control unit for monitoring up to sixteen vision channels on a picture monitor situated in the audio control room.

The sixteen channel system will accept inputs from microphones of either 30 ohm or 600 ohm impedance, the desired impedance for each microphone channel being selected by means of a toggle switch at the relevant channel input amplifier.



Audio-Mixing Unit type 3003 mounted on Desk Unit 742765: Draw-leaf in desk provides additional desk area.

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DESCRIPTION

Introduction

This equipment has been designed to meet most of the basic requirements of a medium size sound broadcasting or television installation and consists of a control consolette containing all the control equipment, and an equipment cubicle in which the amplifiers, power units, relays and jackfields are accommodated. The two units are inter-connected by means of a set of cables, the length of which is to be given by the customer. In addition to the inter-connecting cables, a complete set of multi-way connectors is provided for the incoming and outgoing circuitry and for the a. c. power connection.

The equipment arrangement is such that progressive expansion is possible, all distribution amplifiers and talkback units being contained in a separate cabinet arranged to meet the requirements of individual customers.

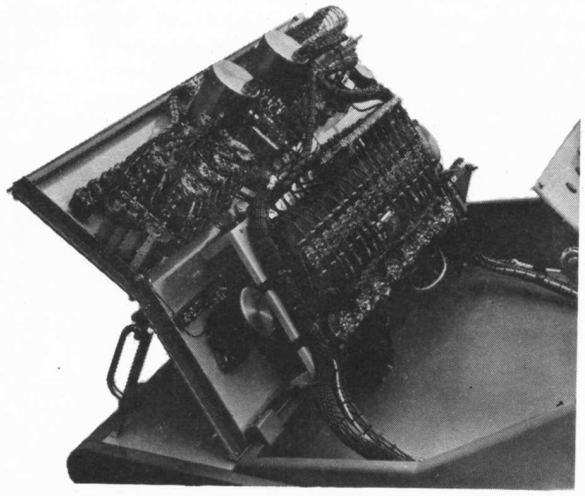
The control consolette, which is designated Audio Mixing Unit Type 3003, may be mounted in either a standard Pye desk unit or in a desk unit of the customer's own design. The unit has been constructed for the greatest simplicity of both operation and maintenance. The consolette controls are mounted on three panels which are inclined so that all the controls are within easy reach of the operator. The three panels are hinged to give easy access to the wiring during inspection and maintenance operations.

In order to preserve the clean lines of the unit all incoming and outgoing cables are routed through a cable exit in the rear of the base plate, access to the terminating connectors being readily available on removing two rear panels.

The complementary desk unit, which is of modern design, has similar arrangements for concealing the cables by means of false back panels. The desk top is fitted with a flush mounted ash-tray and has two pull-out leaves which provide additional desk top area for scripts etc.

The lower of the three panels mounted on the control consolette is used to accommodate sixteen quadrant type faders in a nearly horizontal position, a position which has proved most suitable for controls of this type. An illuminated visual monitoring instrument is mounted on the rearmost panel in an almost upright position, and is just below eye level to permit monitoring to be maintained with the minimum of strain. Associated operational controls are colour-coded for easy identification. An illuminated channel designation strip has been incorporated so that faders may be easily identified, even in the dark conditions often encountered in television studios.

The cubicle, designated 'Cubicle Type 3002', contains all the amplifiers, changeover relays, jackfields, and power units, associated with the basic system. The amplifiers are all of the plug-in type, a total of 27 being mounted on three frames secured to the front corner posts of the cubicle. The remainder of the units are built on standard 19 inch (48cm) panels and are secured in the normal manner. Front and rear doors are fitted. On opening the rear door internal illumination is automatically switched on. Provision is made for connecting the cubicle to an air extraction trunking system for internal cooling. As an alternative to this method of cooling, an air extractor fan and mounting assembly, obtainable as extras, may be fitted.



View of Audio-Mixing Unit type 3003 showing high degree of internal accessibility.

System

The system permits the simultaneous control of up to sixteen audio inputs. Each channel is provided with an associated microphone amplifier and on four channels a selector switch is incorporated to permit the insertion of high level (0dBm) inputs. Through two of these channels are routed the two high level sources most commonly used (i. e. announcer's microphone and echo return). The remaining two channels provided with high level selection may be connected to five high-level inputs common to both channels.

Channel control is maintained by means of quadrant-type faders, and on each channel is an associated balance control to permit the equalisation of channel levels, prior to fading and mixing.

On eight channels there is provision for the application of echo feed. A mixture control is provided to regulate the signal level fed to the echo device in relation to that being sent direct to the programme. The content of the mixed signal may be varied from full programme to full echo. The echo feeds are mixed together and fed to a common echo amplifier which supplies echo at high level for feeding to an echo machine or chamber.

The sixteen channel outputs are so arranged that they may be switched to either of two groups, the gains of which are independently controlled. The output of these two groups is available in two ways depending on how the equipment is set up.

In one mode of operation individual groups may be fed directly out to line as independent sources - in effect two independent mixing equipments are being utilized. In this way a programme may be routed through one group while a rehearsal takes place which is being fully controlled by the second group. To obtain these facilities a rotary type selector is switched to 'Dual Output'. An additional advantage of this system is that in the event of a failure occurring in the main output amplifier during a transmission the rehearsal group main output amplifier may be substituted immediately.

The alternative mode of operation ensures that when the output selector is switched to 'Single Output' the two groups are mixed prior to the final group amplifiers. With this arrangement a group of microphones may be faded down by the operation of one control; this facility is particularly useful for the control of orchestras, or where it is desirable to reduce the volume of the outputs derived from several microphones simultaneously. The arrangement is also very suitable for the addition of a spoken commentary, the control of the complete programme being easily reduced permitting the spoken commentary to be effectively superimposed.

Prefade

Prefade listening facilities are provided on each channel and it is possible to monitor the output of any channel prior to fading up. The prefade circuit includes a prefade amplifier and a prefade level control.

Foldback and Public Address

A system of channel selection is available on all channels for both foldback and public address feeds. The selection in each case is followed by a gain control and an amplifier to provide an output at approximately 0dBm. The faders operate a warning lamp on the consolette immediately on being moved beyond the zero signal output position.

The public address output is provided for application to the studio public address equipment in order to improve arrangements for "audience participation" programmes.

The foldback arrangement is provided in order that background effects, recorded music for dancing etc., which form part of a programme, may be heard in the studio. The ability of players to hear such foldback signals assists in the production of complex programmes.

Monitoring

Adequate push-button monitoring facilities are provided permitting the switching of both the visual and aural sound monitoring to all high level inputs and outputs independently. The loudspeaker and headphone outlets may be switched to two additional sources. Provision is made for controlling the output level of the loudspeaker by means of a level control and a switch (L. S. Dim). The switch permits the introduction of a fixed amount of attenuation for use during telephone conversations etc.

Spare push-buttons are provided for monitoring the output of external audio equipment used in conjunction with the mixing system.

Tone Generator

A 900c/s tone generator is incorporated in the equipment and provides three separate outputs, wired as follows:-

(A) Output No. 1.

This output is applied to the contacts of a Rehearse/Transmit switch and can be routed to the transmission circuit and used as a test signal to line, without interfering with full local facilities, and allowing rehearsals to take place until immediately prior to transmission.

(B) Output No. 2.

This output is connected to a three-position switch at the control unit and is used as a test signal for checking and calibrating the display meter.

(C) Output No. 3.

The third output is not wired but is readily available if required at microphone level.

Cueing Circuits

Several cueing circuits are incorporated in the equipment and energise coloured indicator lamps to show the exact operational state of the circuits. The cue lights indicate the selected groups, single or dual operation, rehearse or transmit, censor, foldback, P. A. operation and telephone call. A studio cueing circuit, comprising two indicator lamps and four switches is embodied for linking up with the studio system, permitting the showing of two incoming cues and sending of four outgoing cues.

Emergency Circuits

Comprehensive emergency facilities are available to permit a transmission to continue should any part of the equipment become unserviceable. In addition to these facilities, the availability of sixteen input circuits will often permit at least one to be allocated as a spare so that should a channel develop a fault an alternative channel is quickly available.

The employment of plug-in type amplifiers for all programme and ancillary channels reduces the number of spares and permits quick interchangeability in the event of a breakdown. Jackfields in the input and output circuits of all amplifiers also assist rapid interchangeability of similar amplifiers. For example, if number one microphone amplifier fails, an unused amplifier in another channel can be quickly patched across the faulty unit. The jackfield system provides the greatest operational flexibility as it permits extra circuits to be jacked into the system for special requirements. A failure in the programme and output amplifiers is covered by the provision of changeover switches at the control desk which operate relays for switching over the input and output connections of the group amplifiers. Thus, if an amplifier in group 'A' fails its opposite amplifier in group 'B' can be switched to take its place.

Three identical power units are located in the cubicle and space is available for the fitting of a spare unit.

The various emergency facilities are included in the design of the mixing unit because of the great importance attached to keeping a programme on the air during commercial transmissions and on other occasions. The equipment has proved to have a consistently high degree of reliability under all conditions of operation.

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Maintenance

Considerable attention has been devoted to the problem of easy maintenance, and very wide practical experience in this field has resulted in the incorporation of many features which greatly reduce the amount of time wasted during fault rectification due to lack of accessibility etc.

Ready access to all components, without having to dismantle any part of the equipment has been the aim of the design team. Accessibility has been facilitated by the use of quick-release cover panels and the hinge mounting of the control panels. All the amplifiers in the cubicle are built on small sub-chassis which can be removed from the cubicle by simply turning a single fixing screw. A faulty unit can thus be readily replaced. Workshops or maintenance rooms can be provided with jigs for the testing and servicing of these plug-in type amplifiers.

All the channel faders and the group faders are of the plug-in type, and can be quickly removed for cleaning and repair. A kit containing cleaning and lubrication materials for these components is supplied with each equipment. Kits of spare valves and kits of spare components are also available as extras. The part numbers of these extra items are given in the specification under the heading ACCESSORIES.

SPECIFICATION

Input Connections

Wired at input jackfield

Input Impedance

Balanced: 600 or 30 ohms ± 10% switchable, a reactive component of less than 20% from 60 c/s to 8 kc/s

Input Levels

All channels, microphone level
optional high level inputs (switchable) on 4 channels.

Balance Attenuators

0-30dB, variation in 3dB steps.

Maximum Gain (600 ohms input and 600 ohms load)

Without echo ... >112dB

With echo ... >109dB

Frequency Response (relative to level at 1 kc/s)

Within ± 0.5dB from 60 c/s to 8 kc/s, and

Within ± 2.0dB from 20 c/s to 20 kc/s.

Distortion

At + 18 dBm: less than 0.5% at 30 c/s and 1 kc/s.

At + 24 dBm: less than 1.0% at 30 c/s and 1 kc/s.

Noise

Less than 6dB above the fundamental Johnson noise level.

Output Impedances

600 ohms ± 10% with a reactive component of less than 20% from 60 c/s to 8 kc/s.

Maximum Output

+ 24 dBm

Power Input Connection

Wired in at a mains distribution panel at the lower end of the cubicle.

Power Supplies

85-125V and 170-250V a.c., 47-70 c/s.
Range and voltage tappings adjustable on individual power unit transformers.

Power Consumption

600 watts, approximately.

Overall Dimensions

Audio Mixing Unit

Height	16 inches (41cm)
Width	42 inches (107cm)
Depth	25 inches (64cm)

Cabinet

Height	88 inches(223cm)
Width	21½ inches (55 cm)
Depth	28½ inches(72 cm)

Weights

Audio Mixing Unit (less desk)	202 lb. (92.5 kg).
Cabinet	260 lb. (118 kg).

Finish

Audio Mixing Unit

Light and dark blue enamel

Cabinet

Dark blue enamel and bright chrome finished handles.

Part No. 842991 includes:-	Part No.
1 Audio Mixing Unit	843003
1 Cubicle with equipment	843002
*1 Set of interconnecting cables and all valves	744502

* Conforming with general practice, up to 50ft. of interconnecting cables are included in the price of the unit, such cables being between the A. M. U. and the cabinet.
Cables exceeding 50ft will be subject to an additional charge. In all cases the cable lengths should be specified when ordering.
Mating connectors are included for all outlets for which cables are not normally supplied:-

ACCESSORIES		Part No.
Kit of spares		
Cubicle	...	5310
Audio Mixing Unit	...	5312
Fader Servicing Kit	...	712076
Desk ...	...	742765

PYE LIMITED CAMBRIDGE ENGLAND
Telegrams and Cables: Pyrad Cambridge Telex
Telephone: Cambridge 58985 Telex 81105

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