

Portable
**SPEECH INPUT
EQUIPMENT**

22D



Western Electric

OUTSTANDING FEATURES

Real portable equipment—compact and light in weight.

Components	Approximate Dimensions	Approximate Weight
Amplifier-Control Unit	9" x 15" x 5"	15 lbs.
Battery Rack Assembly (Equipped)	7" x 15" x 5"	14 lbs.
AC Power Unit	7" x 12" x 5"	9½ lbs.
Carrying Cases (2 Required)	14" x 16¾" x 7¾"	12 lbs. ea.

Highly efficient performance—largely through use of stabilized feedback.

Operates from an impedance of 30 ohms and into 150 or 600 ohms. A maximum gain of approximately 92 db when operated between these impedances.

Frequency response uniform within ± 1 db from 30 to 10,000 cycles.

Low harmonic distortion. Low noise level.

Operates from either AC or battery power supply.

Flexible control—four paralleled mixers and a master gain control.

Contacts on output line keys short-circuit inputs of outgoing lines, enabling station operator to test the loops from master control.

Instantaneous interchange of program and order wire lines in emergencies.

New indirectly illuminated volume indicator gives output level in vu. Battery condition may be checked on volume indicator meter during operation.

Range switch for adjusting normal level indication of the volume indicator meter to correspond to output levels of +4, +6, +10, +12 or +14 vu (0 level calibration 1 milliwatt).

Non-glare "Alumilite" finish on control panel.

Mushroom type mixer knobs with skirts and raised pointers facilitate finger-tip control and eliminate cramped hands.

Accessibility—ready access to interior without disconnecting any connecting cords or wires, simply by removing rear cover.

Microphone receptacle mounting plate removable and readily adapted to substitution of other microphone receptacles.

Provision for two monitoring headsets.

Completely factory-wired and tested.

Rugged construction assures long service and dependability.



Western Electric Portable Speech Input Equipment

22D

A development of Bell Telephone Laboratories, the research laboratories of the American Telephone and Telegraph Company and the Western Electric Company.

WESTERN ELECTRIC'S 22D Portable Speech Input Equipment—a continuation and further development of the popular 22 type equipment—offers these added facilities:

1. Use of new vu volume indicator meter with either A or B scale.
2. Off position of output line keys equipped to close outgoing program loops so that master control can test the loop resistance prior to program transmission.

This equipment provides complete pick-up facilities for broadcast programs remote from the studio and serves exceptionally well as a permanent set-up in small broadcast studios. It is designed for fast set-up, is simple in operation and can be handled easily by one man.

Examples of the more permanent set-ups are its use to provide emergency facilities, supplementary services and for service where flexible program control facilities are required but space is limited.

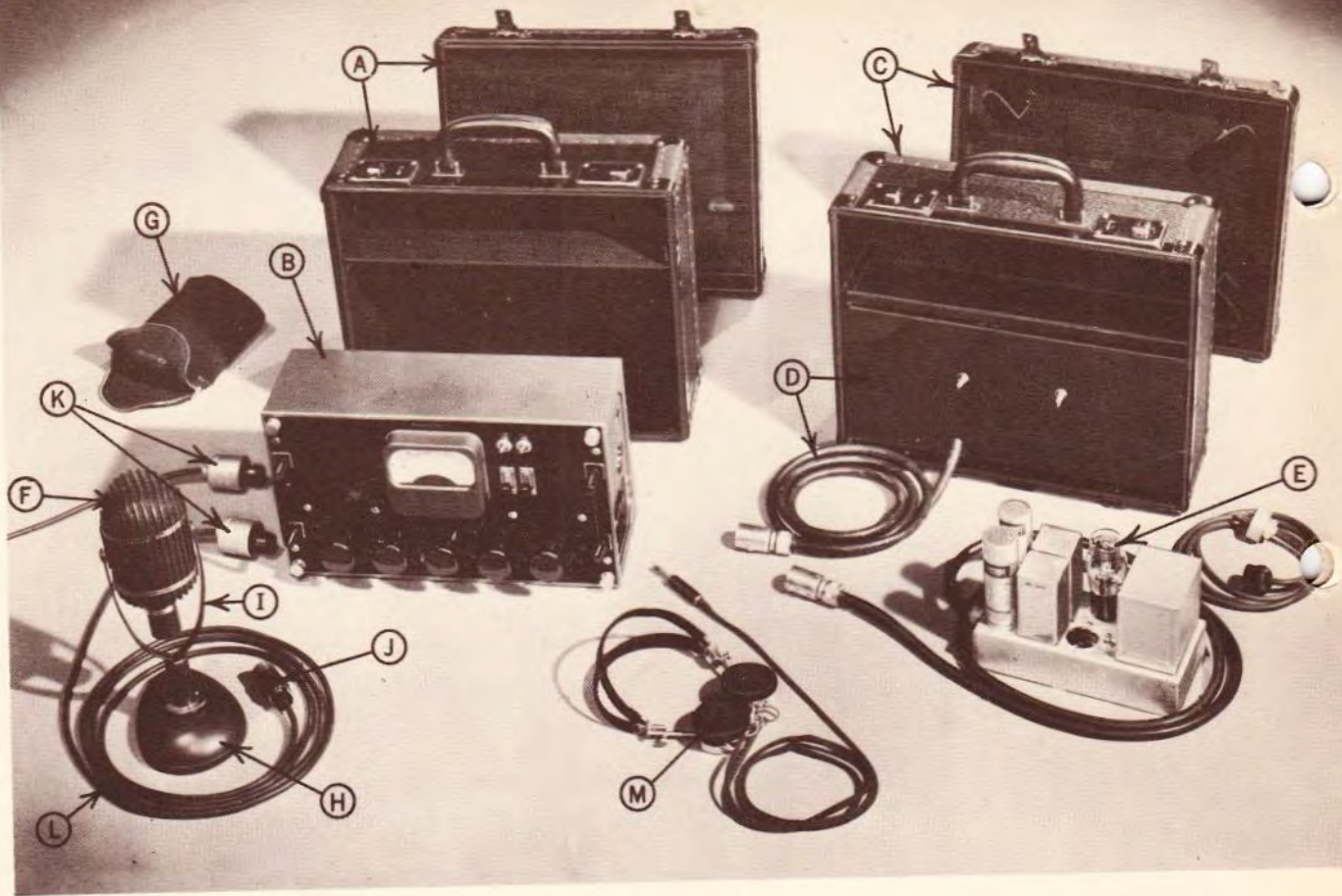
22D Portable Speech Input Equipment Components

The 22D consists of a combination Amplifier-Control Unit with a carrying case, a Rectifier Unit for AC operation and/or a Battery Rack Assembly with a carrying case, together with the necessary inter-connecting and power cords.

Controls and the volume indicator meter are on the front panel of the Amplifier-Control unit. Microphone input receptacles are at the left end and the output line terminals, monitoring headset jacks, order wire telephone set connections and power receptacle are at the right end. See illustration bottom of page 9.

Each carrying case is divided into two compartments, one houses the principal unit and the other houses accessories such as microphone, monitoring headsets, spare vacuum tubes and connecting cords. See illustration bottom of page 4. Each case measures approximately 14" high x 16 $\frac{3}{4}$ " long x 7 $\frac{3}{4}$ " deep, is made of plywood and covered with black fabrikoid.

The equipment is not only compact and light in weight, but it is also ruggedly constructed—a statement which can be confirmed by operators who have subjected it to actual, including unusual, operating conditions during a period as long as four years, or since the first model was introduced.



(A) Amplifier-Control Unit Carrying Case with Cover. (B) Amplifier-Control Unit. (C) Power Supply Carrying Case with Cover. (D) Battery Rack Assembly with cord and plug. (E) AC Power Unit with cord and plug. (F) 639 type Microphone. (G) KS-12000 Transmitter

Cover. (H) 24A Transmitter Mounting. (I) 11A Transmitter Attachment. (J) 442A Jack and 712A Adapter. (K) Microphone plugs (Hubbellock No. 23005 plug caps). (L) KS-7133 cordage. (M) 1002F Headset.



Western Electric

Each case is divided into two compartments. One holds the principal unit, the other holds the accessories.

EXCLUSIVE FEATURES—UNEXCELLED PERFORMANCE

Features Which Contribute to Unexcelled Performance

THE 22D Equipment includes a four-channel paralleled mixing circuit, designed to work with 30 ohm dynamic microphones or other 30 ohm sources of comparable level. The output circuit includes line isolation pads and is designed to work into an impedance of either 150 or 600 ohms, the selection of which is made by means of a screw driver adjustment. See circuit schematic on page 10.

When operated between the impedances mentioned above, namely, 30 and 150 or 600 ohms, the maximum overall net gain of the system approximates 92 db. Normal output levels between +6 vu and +14 vu can be obtained readily by using the master gain control located between the first and second stages which provides an attenuation up to 45 db and by using the four-channel mixing circuit which is ahead of the amplifier and furnishes an additional attenuation of as much as 45 db.

The frequency characteristic is uniform within ± 1 db, from 30 to 10,000 cycles which is much better than that of many accepted high-quality studio equipments which are considerably more expensive, more complicated, occupy greater space, weigh more, and the utility value of which is not so great. See typical response curve on page 7.

The harmonic distortion under normal operating conditions is less than one per cent, at output levels as high as +18 vu. The distortion curve is shown on page 8.

The noise level of the equipment is 48 db unweighted and 60 db weighted (as the ear would hear it) below normal program level measured at the output.

Other Features

Other important and outstanding features are:

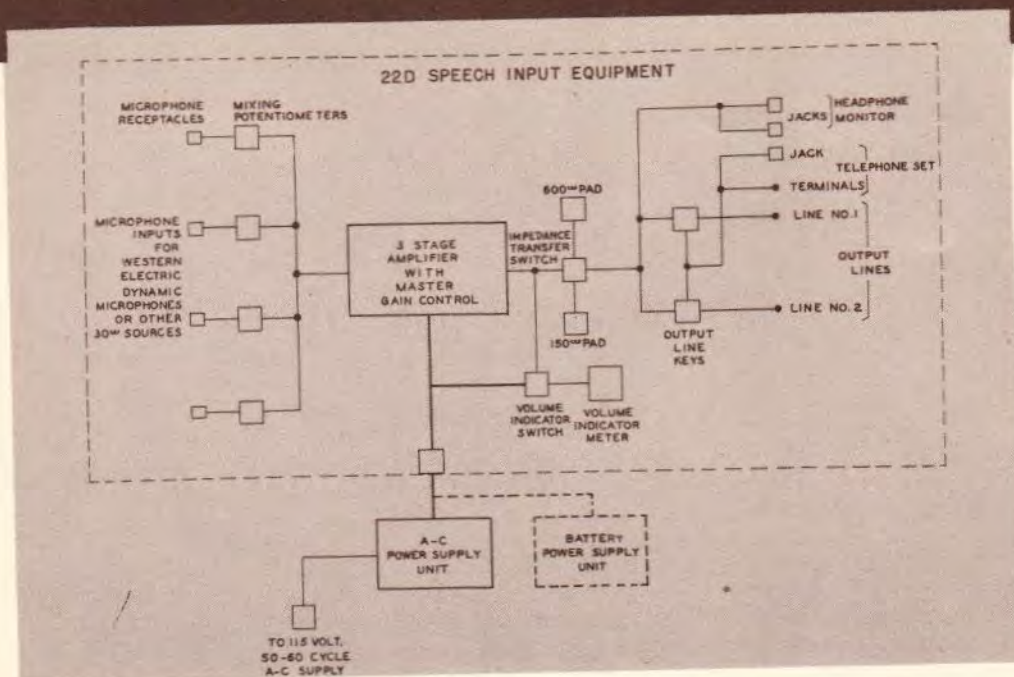
1. Provision for new vu volume indicator meters, either with A or B scales, such as the Western Electric KS-8208 or KS-8218 meters described in the section of this booklet entitled "Volume Indicator Meters."
2. The incorporation of output line keys equipped with contacts which short-circuit the inputs of the outgoing lines enabling the station operator to test the loops from master control and make certain that the lines are in order. This procedure permits the remote operator to proceed with his various other duties in preparation for a broadcast.
3. Two output lines with keys for connecting either the amplifier or the order wire telephone set to either line, thus permitting instantaneous interchange of program and order wire lines in emergencies.
4. Highly efficient performance—attained largely through use of stabilized feedback.
5. Operation from either a 110 volt, 50-60 cycle AC power supply, requiring 28 watts, or from batteries, requiring 1.4 amperes at 6 volts and 21 milliamperes at 180 volts.
6. Rugged construction—built to give long and dependable service.
7. Non-glare "Alumilite" finish on control panel—not only attractive but exceptionally hard and resistant to wear and abrasion.
8. Maximum flexibility and simplicity of controls.
9. Mushroom type mixer knobs with skirts and raised pointers to facilitate finger-tip control and to eliminate cramped hands.
10. Provision for two monitoring headsets, one for the operator and the other for the announcer.
11. Accessibility — ready access to interior by simply removing rear cover without disconnecting cords or wires.
12. Completely factory-wired and tested.



When packed, the 22 type Speech Input Equipment forms two balanced units, sufficiently light in weight to permit the operator to travel quickly and comfortably.

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PORTABLE SPEECH INPUT EQUIPMENT-22D



Amplifier-Control Unit

ALL apparatus and facilities for control and operation, except power supply, are contained in the Amplifier-Control unit—illustrated on page 4. The amplifier has three stages, 6J7 tubes being used for the 1st and 2nd stages and a 6F6 for the 3rd stage.

The non-reflecting face panel, finished in "Alumilite" is exceptionally hard and resistant to wear and abrasion. Considerable attention was given also to the location of the most frequently used controls and to the selection of the type of knobs—so that the necessary adjustments could be made with the least amount of eye and hand fatigue. As a result, mushroom shaped knobs with skirts and raised pointers and flat type key handles with concave finger surfaces were adopted. These permit quick identification of control positions by either touch or vision.

Two strong handles provide ready means for picking up and carrying the unit and, at the same time, add protection to the controls which project from the face of the panel.

The rear cover of the unit can be removed easily and quickly by simply releasing four small knobs and without disconnecting any of the cords. See illustration at top of page 9.

The unit is 9" high x 15" long x 5" deep and weighs approximately 15 pounds.

Input and Gain Control Circuits

The four-channel mixing circuit ahead of the amplifier is designed to work with 30 ohm dynamic microphones or other equivalent sources.

Microphones having an impedance of approximately 250 ohms can be used also, provided an external impedance matching coil such as the Western Electric 172A Repeating Coil is inserted between the microphone and the mixer. The 172A Repeating Coil has an impedance ratio of 250:30 ohms and was particularly designed for this purpose. Connections are made to the terminal plate which then is covered by means of a protective cap.

The microphone input circuits are connected through associated mixing potentiometers to the input of the amplifier. Each mixing potentiometer has an "Off" position and a total

STABILIZED FEEDBACK—AMPLE OPERATING MARGINS

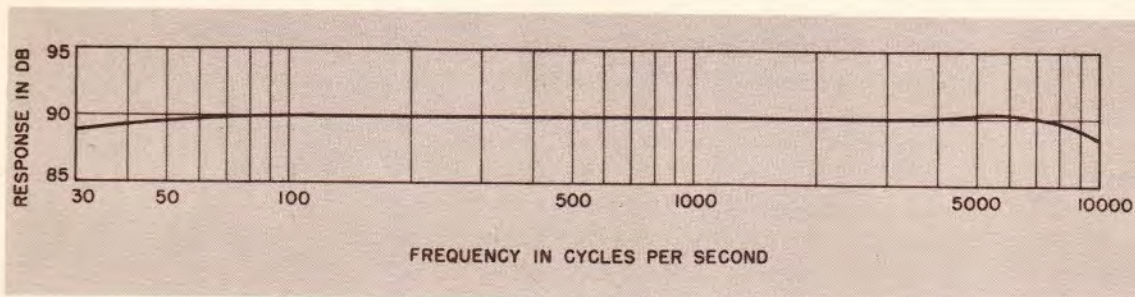
attenuation of 45 db in 20 steps, the first 12 of which have $1\frac{1}{2}$ db attenuation each; with the attenuation gradually increasing in the last eight steps to cut-off. The output of the mixing circuits is amplified through a single stage, terminating in the master gain control, which is followed by two additional stages of amplification. The master gain control has 20 steps of attenuation and an "Off" position. The first 17 steps from minimum attenuation have 2 db attenuation each, with increasing attenuation on the last three steps to cut-off.

Output Circuit

Two isolation pads are provided: one to match 150 ohms and the other, 600 ohms. The 600 ohm pad is the standard for use with equalized 600 ohm line circuits. The 150 ohm pad is furnished for use with short, unequalized cable pick-up circuits where the resulting impedance mismatch provides a beneficial equalizing effect, which tends to compensate for the frequency transmission characteristics of the line.

There are two lever type line keys. A program line may be connected to each of these keys through the line binding posts. By throwing either of these keys downward, connection is made between the line associated with that key and the output of the amplifier, thereby allowing program feed to that line or receipt of cue from master control on the monitor headphones. By throwing the key upward, connection is made with the line to the "Tel" jack or the paralleled pair of binding posts located on the end of the unit. In cases of emergency, the program and order wire lines can be immediately interchanged by simply reversing the key positions. When in the normal position, these keys short-circuit the program lines and enable a station operator to make loop tests.

In places where program lines terminate in jacks which accommodate the 47 type plug, a 630 type cord (5'6") equipped with a 47B plug is recommended. The other end of this cord is terminated with pin terminals which fit under the binding posts. The 630 type cord is supplied only when specifically ordered.



Typical frequency response characteristic of the 22D Speech Input Equipment.

Communication Facilities

When a telephone set, such as the Western Electric 301A, (see illustration on page 11) is plugged into the "Tel" jack by means of a 47 type or similar two-conductor plug or connected with the "Tel" binding posts, the line can be used for communication with the master control room.

While simultaneous program feed and communication cannot take place over a single line at the same time, the key-switching feature—which allows rapid interchange between the line of the telephone set for communication and the amplifier output for program transmission—considerably facilitates operation where only one line is available to the control point or radio transmitter.

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PORTABLE SPEECH INPUT EQUIPMENT-22D

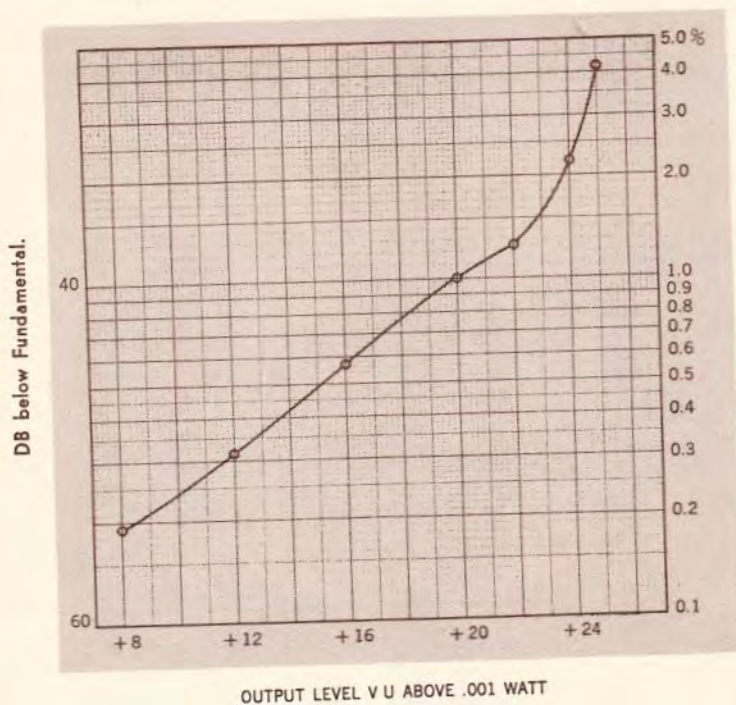
When two lines to the master control are available, one can be used for program feed or receipt of cue preceding transmission and the other for simultaneous communication. With this arrangement, the communication line can be substituted immediately for broadcast by throwing both keys into reverse positions and making a corresponding switch in the master control room. This rapid interchange feature between the two lines at the remote point provides a necessary safety factor, especially valuable when important programs are being broadcast.

If a telephone set is not readily available, it is possible to carry on communication by using the announcing microphone and the amplifier for outgoing speech and the monitor headset for incoming speech.

Monitoring Facilities

One or two headsets, such as the Western Electric 1002F, may be plugged into the jacks provided to monitor the output of the amplifier. With two separate headsets, the production man, announcer, or guest may listen in with the control engineer. Where loud-speaker monitoring or feed for the local public address system is desired, it can be obtained without disturbing

the regular program lines by plugging the input of a Western Electric 94 type, or similar bridging, amplifier into one of the monitor jacks, or by bridging across the output of the amplifier.



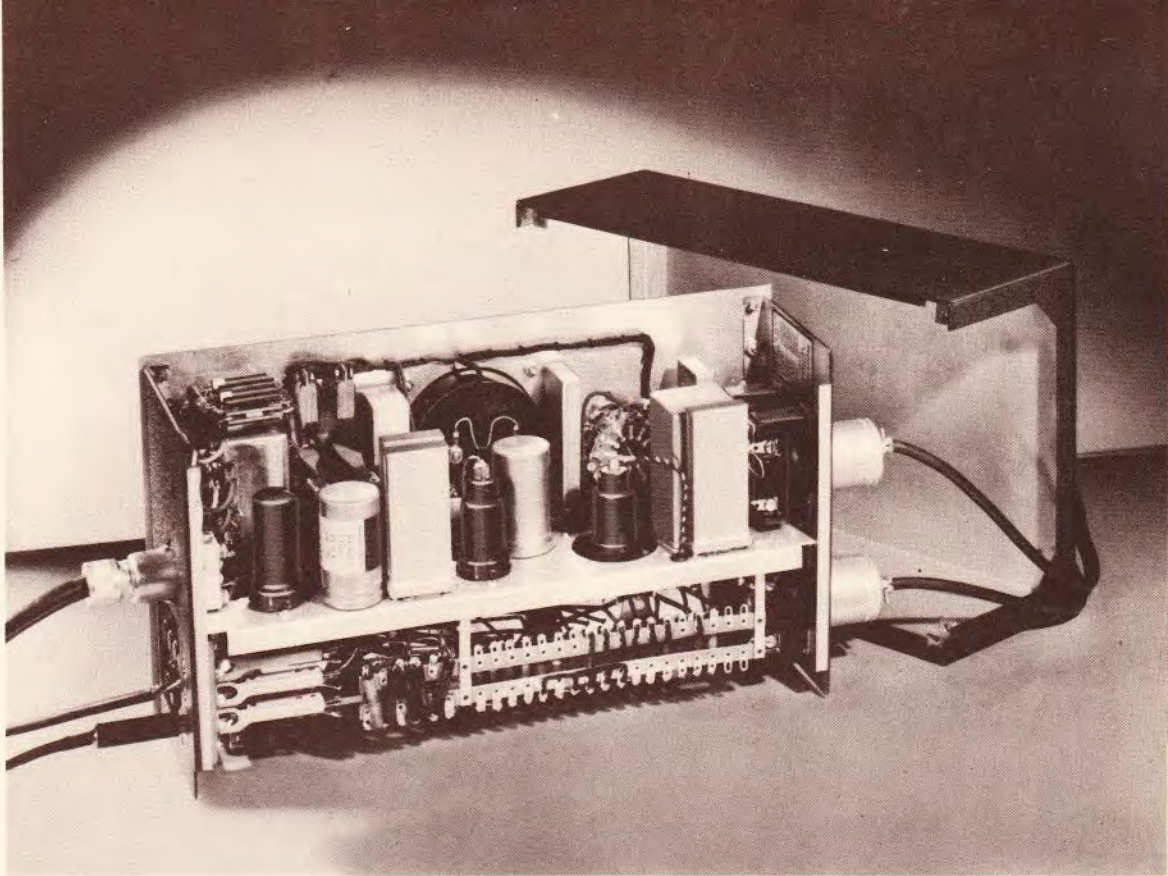
400 C.P.S. Harmonic Distortion of the 22D Speech Input Equipment.

Per Cent Distortion.
Frequency in Cycles Per Second

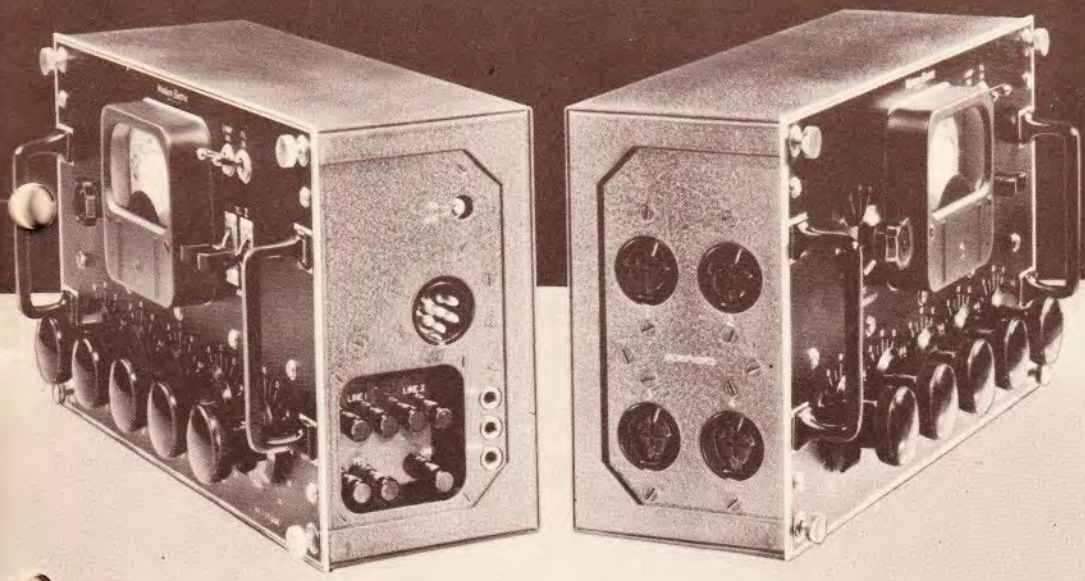
Microphone Outlets

The four microphone receptacles are Hubbellock No. 23000 each of which accommodates Hubbellock No. 23005 plug caps to which shielded microphone cordage is connected. These caps are rugged and positive in action, while the receptacles with spring-operated, self-closing bakelite doors

(Continued on page 11)

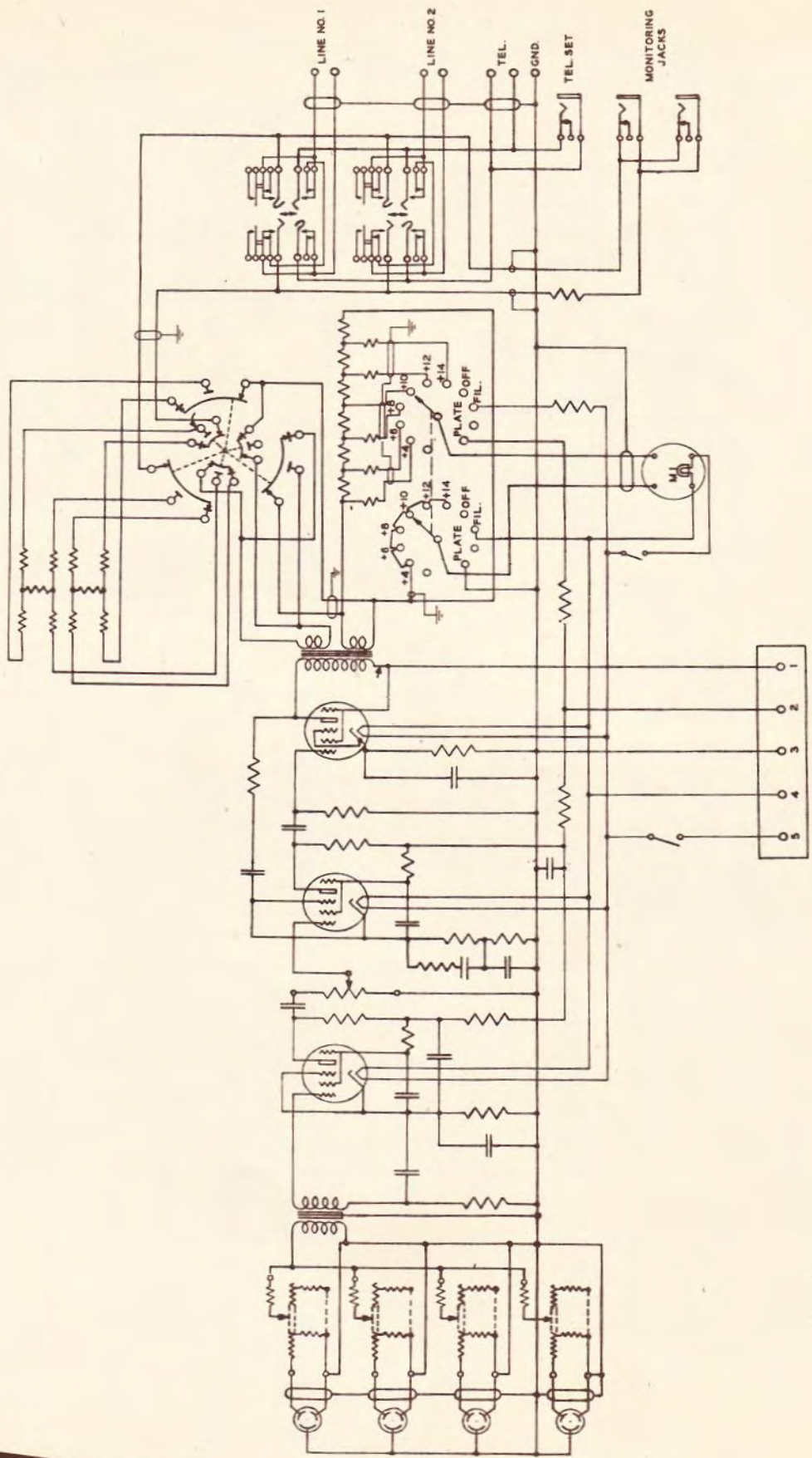


Cover is easily removed by releasing four small knobs. The interior then is readily accessible. Disconnecting the cords is unnecessary.



Microphone receptacles are on the left end of the Amplifier-Control Unit. Other terminals and connections are on the right end.

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Schematic of the 22D Speech Input Equipment.

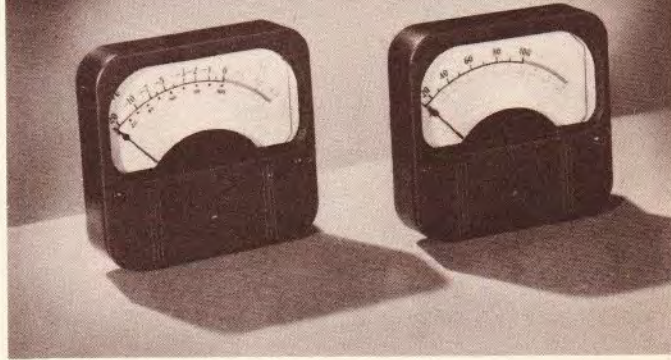
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IMPROVED CIRCUITS—VU METERS

Provision is made for use of either a Western Electric KS-8208 or KS-8218 Volume Indicator Meter.

shut out dirt and foreign matter and prevent partial connections because the plugs must be in locked positions before operation can start.

If another type of microphone receptacle is in use with existing microphone equipment, matching receptacles can be installed readily by a member of the station staff, by replacing the removable end plate receptacle mounting.



Volume Indicator Meters

The 22D Speech Input Equipment provides for the use of either a Western Electric KS-8208 or KS-8218 Volume Indicator Meter of the improved type, as illustrated, standardized for the measurement of volume levels in program circuits and transmission systems. These meters are available with either of two scales, the KS-8208 meter having the A scale, which is marked from -20 to +3 vu above the scale arc, with an arbitrary voltage scale 0 to 100 in small figures below the arc. The KS-8218 volume indicator meter has a B scale in which the 0 to 100 scale markings are in large figures above the arc of the meter scale, with -20 to +3 vu markings indicated below the arc. The 100 (0 vu) reference point of the meter is so located on the scale that approximately two-thirds of the available scale length is utilized.

The scale of the meter may be illuminated by operating the "Lamp" switch on the face of the Amplifier-Control unit which is connected to two small lamps mounted inside the meter front cover.

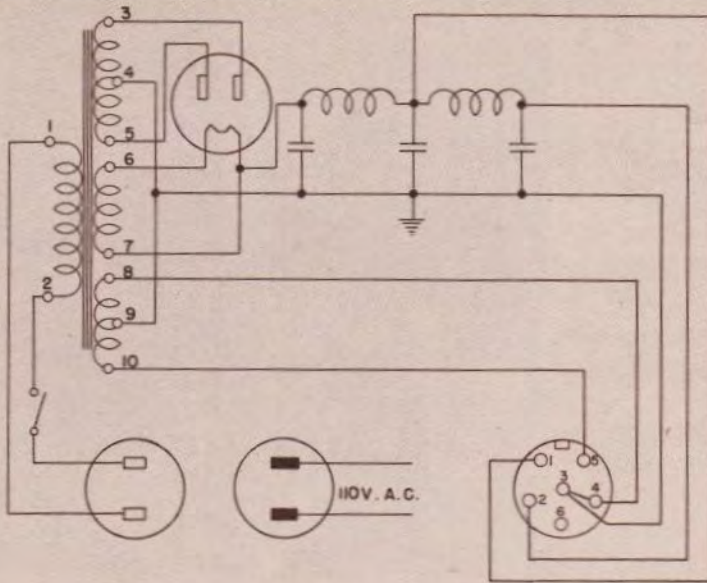
The normal indication (deflection to the 0 vu or 100 mark) of the meter can be set to correspond to levels to the outgoing line of +4, +6, +8, +10, +12, and +14 vu by means of the volume indicator range switch. Normally, a level of +8 or +10 vu will be required to supply program material to a program line. This range switch has an "Off" position and a "Plate" and a "Fil" position for checking plate and filament voltages. For the purpose of checking battery voltages, the 0 vu or 100 marking on the scale is used to indicate the minimum operating voltage. Checking may be done at any time, even during program transmission.



Western Electric 301A Portable Telephone Set.

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PORTABLE SPEECH INPUT EQUIPMENT-22D



Schematic of AC Power Unit.

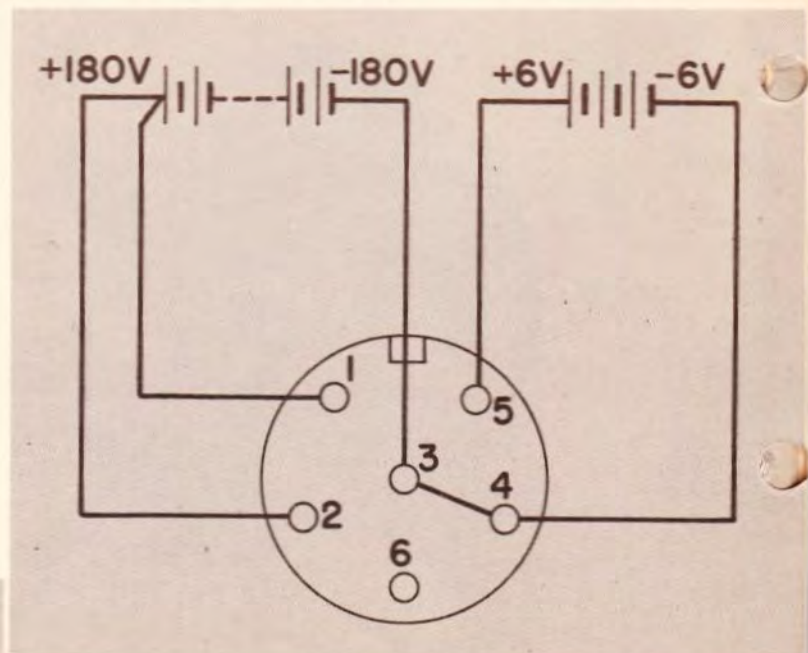
Power Supply Equipment

THE 22D Speech Input Equipment may be operated from either AC or battery supply. For AC operation, a 110-120 volt, 50-60 cycle commercial source capable of supplying approximately 28 watts is required. When operated from batteries, 1.4 amperes at 6 volts and 21 milliamperes at 180 volts are required.

The AC power unit and the battery rack assembly are each equipped with a heavy-duty cable terminating in a locking plug. To change from one power supply to another takes only a few seconds. The power unit measures approximately 7" high x 12" long x 5" deep and weighs about 9½ lbs. The battery rack assembly measures approximately 7" high x 15" long x 5" deep and weighs (equipped) about 14 lbs.

Rectifier Unit for AC Power Supply

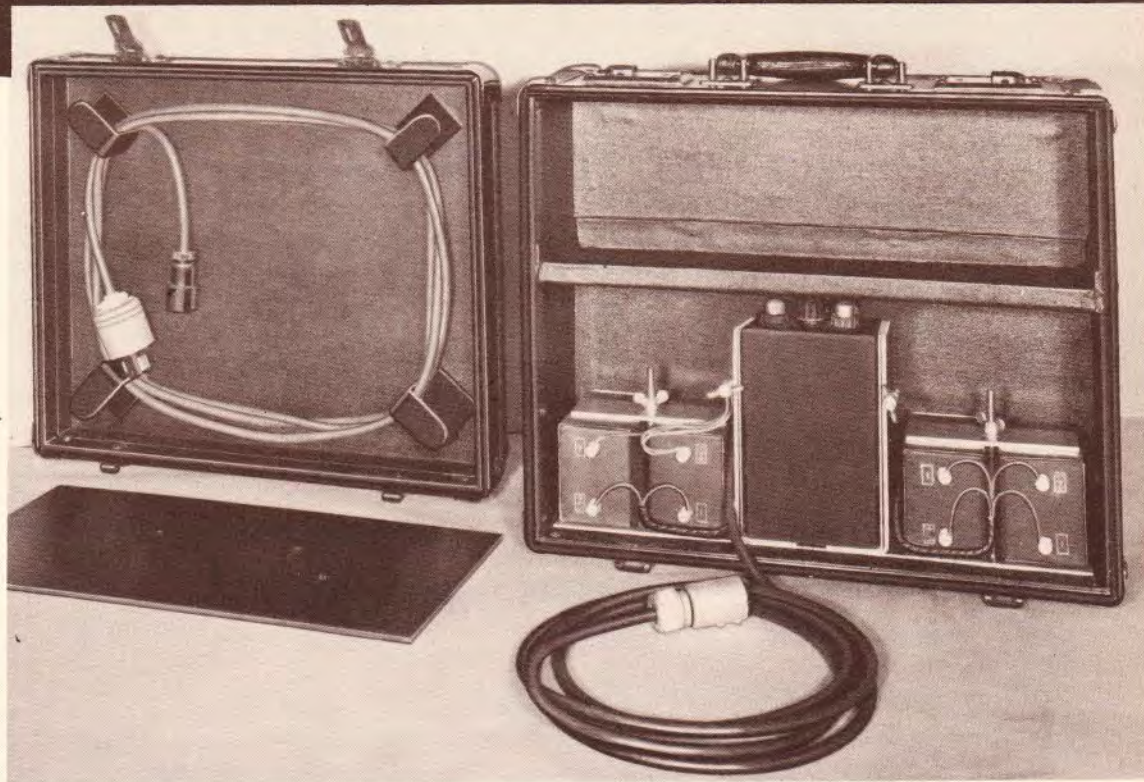
For AC operation, the power or rectifier filter unit provides all necessary power for filament and plate. One commercial, type 80, vacuum tube serves as the plate supply rectifier. All power connections to the Amplifier-Control unit are made with a single 6-foot, heavy-duty,



Battery Connections.

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AC-BATTERY OPERATION



Power supply carrying case is designed to hold the AC power unit or batteries. It has ample capacity to carry both at the same time, if desired, plus all connecting cords.

five-conductor cable. A plug cap is furnished in power unit socket for the purpose of connecting a length of rubber-covered cordage from an AC outlet.

Battery Operation

When the equipment is operated from batteries, the required battery rack fits into the lower compartment of the power supply carrying case. If both AC and battery supply are desired, the AC unit then is placed in the upper compartment. The battery rack holds a full complement of the following recommended or other suitable batteries.

Four Eveready No. 738 or Burgess Z-30-PX Batteries are required to provide the necessary 180 volts for plate. Based on semi-continuous operation 6 hours a day, these batteries should last for 12 hours or more. An Exide storage battery, 3-AC-7 per DB-22334-XA is recommended for filament voltage. This is a 6-volt, non-spillable, light-weight battery. The capacity of this battery is sufficient to operate the amplifier approximately $8\frac{1}{2}$ hours.

Use of Dry Cell Filament Batteries

Dry cell batteries also can be used in place of the storage battery as a source of filament supply.

Two Burgess 4F2H Batteries connected in series (instead of a storage battery) will provide the 6 volts for the filament supply. These batteries mount in the storage battery compartment of the battery rack.

The Burgess 4F2H Battery weighs approximately $2\frac{3}{4}$ pounds, while the Exide 3-AC-7 per DB-22334-XA Storage Battery weighs $6\frac{1}{2}$ pounds.

Where long, dry cell battery life is of paramount importance, low-filament type tubes may be substituted.

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PORTABLE SPEECH INPUT EQUIPMENT—22D

Carrying Cases

EACH equipment includes two carrying cases ruggedly constructed to withstand hard usage and to provide ample space for all components, including both battery and AC power supplies and cords. Storage space is provided for accessory items. The cases weigh approximately 12 lbs. each. When packed, the complete equipment forms two balanced units each weighing approximately 30 pounds—light enough to permit the operator to travel quickly and comfortably. The weight may be reduced by including only those operating units which will be required for the particular program.

Accessories

Some of the more popular accessories* of the 22 type Portable Speech Input Equipment are as follows:

Portable Telephone Set (301A)

For supervisory communication from the remote pick-up point to master control at the studio or transmitter, the remote operator will find the Western Electric 301A Portable Telephone Set extremely useful.

Monitoring Headset

One or two Western Electric 1002F Headsets are recommended for monitoring purposes. If the highest quality headset monitoring is desired, the Western Electric D97690 Headset (equipped with a D90944 cord and 47 type plug) is highly recommended.

Loud-Speaker Monitoring

When loud-speaker monitoring is desired, a Western Electric 94 type or equivalent amplifier should be employed together with a loud-speaker such as the Western Electric 751B. The 94 type amplifier has a high impedance bridging type input which can be bridged either directly across the outgoing line or plugged into one of the headset monitoring jacks of the 22 type equipment. A 47 type plug and a cord such as the 630 type referred to under heading "Output Circuit" on page 7, are recommended for this purpose. The 94 type amplifiers are capable of supplying up to 12 watts output (with minor conversions 20 watts) which is adequate for operating one or more speakers of the type mentioned.

Microphone and Accessories

Western Electric 618, 630, 633 or 639 type microphones are recommended for use with this equipment. Information pertaining to these microphones and to their accessories may be obtained from any Western Electric Distributor listed on the last page of this bulletin.

Hubbellock No. 23005 Plug Caps, in addition to those normally furnished as a part of 22 type Speech Input Equipment, should be ordered separately as required.

KS-7133 Shielded Microphone Cordage, recommended for use with Western Electric microphones or other low level or high quality program circuits, should be ordered separately as required.

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*Accessories should be ordered separately. They are not included as standard equipment with the 22D Speech Input Equipment.

ACCESSORIES—ORDERING GUIDE

Ordering Information

IN ordering, it is necessary to specify whether the 22D Speech Input Equipment is intended for AC or for battery operation, or for both, and whether the A or the B Volume Indicator Meter is desired.

Vacuum tubes, batteries and accessories should be ordered separately to meet the requirements imposed by the operating conditions selected:

For AC Operation

Tubes

2—6J7
1—6F6
1—No. 80 for AC Power Unit

Batteries

No batteries required

For Storage Battery Operation

2—6J7
1—6F6

4—Eveready No. 738 or 4 Burgess
No. Z-30-PX (for plate)
1—Exide No. 3-AC-7 per DB-22334-XA
(for filament)

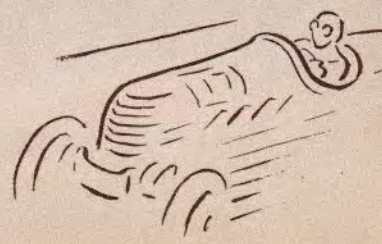
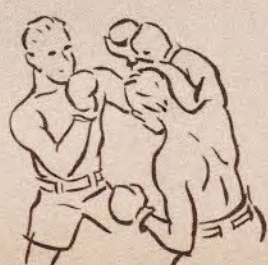
For Dry Cell Battery Operation

2—6J7 or 2—6W7G (0.15 amp. heater)
1—6F6 or 1—6G6G (0.15 amp. heater)

4—Eveready No. 738 or 4 Burgess
No. Z-30-PX (for plate)
2—Burgess No. 4F2H (for filament)

For Further Information

For further information regarding the 22D Speech Input Equipment and other Western Electric Speech Input Equipment or accessories, you are requested to address any Western Electric Distributor listed on the outside back cover of this bulletin.





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