SECTION 320-240-100
Issue 1, November, 1940
AT&TCo Standard
Reprinted November 1984**

# MONITORING ARRANGEMENTS FOR HIGH QUALITY PROGRAM CIRCUITS DESCRIPTION

CONTENTS PAGE

1. GENERAL . . . . . 1

2. 711A HEAD RECEIVER . . . . . 1

(A) General . . . . . 1
(B) Monitoring Levels . . . . . 2
(C) Application . . . . . 2

One-Way B-22 Circuits Equipped with 12C Amplifiers . . . . . 2
Reversible B-22 Circuits Equipped with 12C Amplifiers . . 2
Reversible and One-Way B-22 or Open Wire Circuits Equipped with 14C Amplifiers . . . . . 2
Reversible and One-Way Open Wire Circuits Equipped with 14A and 14B Amplifiers . . . . . 3

(D) Circuit and Equipment Arrangements . . . . . 3
(E) Operating Considerations . . . . . 4

3. 751B LOUD SPEAKING TELEPHONE . . . . . 5

(A) General . . . . . 5
(B) Monitoring Levels . . . . . 5
(C) Application . . . . . 6

Reversible and One-Way B-22 Cable Circuits Equipped with 12C Amplifiers . . . . . 6
Reversible and One-Way B-22 or Open Wire Circuits Equipped with 14C Amplifiers . . . . . 6
Reversible and One-Way Open Wire Circuits Equipped with 14A or 14B Amplifiers . . . . . 6

(D) Circuit and Equipment Arrangements . . . . . 7

4. GENERAL CONSIDERATIONS . . . . . 8

(A) G Type Bridge - Monitoring Circuit Connections . . . . . 8
(B) Monitoring Amplifier - Operating Gains and Wiring Requirements . . . . . 10
(C) Stray Fields from A-C Operated Monitoring Amplifiers . . . . . 10
(D) Miscellaneous Former Monitoring Arrangements . . . . . 10

5. LIST OF DRAWINGS . . . . . 10

## 1. GENERAL

1.01 This section describes arrangements for monitoring high grade program facilities. A head receiver arrangement employing the 711A receiver and associated apparatus, and a loud speaker arrangement utilizing the 751B loud speaking telephone and associated equipment are considered in some detail. Some discussion is also included of earlier types of monitoring facilities which are still in service, and whose characteristics are such that they are still satisfactory for the types of monitoring to which they are applied.

1.02 General information on the derivation of monitoring taps is covered in other sections of Practices dealing with various program systems.

1.03 For the use of either arrangement on open wire circuits, it will be necessary to employ a low-pass filter in the circuit preceding the monitoring equipment for the purpose of removing those frequencies above the normal program band in a manner similar to that employed in any loop fed from an open wire circuit. Where an 8-kc band is being transmitted a 66A filter (or D-92091) can be employed for this purpose. Where predistortion is employed on an open wire network, it will be necessary to employ a restoring network between the low-pass filter and the monitoring facilities. These arrangements are shown on the standard schematic circuit drawings covering open wire program circuits. Either monitoring arrangement can be used readily in connection with B-22 cable circuits, without the additional equipment described above for open wire, by connecting to any appropriate monitoring point in the circuit. Where a 5-kc program band is transmitted over either open wire or cable circuits, the 69B, 83A or the D-86013 filter can be used for removing any frequencies above the program band which might interfere with monitoring.

## 2. 711A HEAD RECEIVER

### (A) General

2.01 The 711A receiver is a high quality moving coil type head receiver fitted with a large, soft ear cap, designed to permit an effective seal of the space between the diaphragms of the receiver and of the ear upon which the receiver is worn. When properly worn (Paragraph 2.18) the receiver

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will provide a response within the limits of about ± 5 db over a band of from about 100 to 7500 cycles. One or two may be used, two giving a greater sense of realism. The use of the 711A receiver requires an associated monitoring circuit consisting of means for adjusting the volume to the desired value, an inequality ratio repeating coil for impedance correction, and a varistor arranged to mitigate excessive acoustic disturbances which otherwise might be undesirable for the monitoring attendant and might damage the head receiver. The circuit which is discussed in Part 2 (D) is arranged to permit the use of either single or double unit head receivers without circuit changes.

(B) Monitoring Levels

2.02 It is expected that a volume of -7 vu into a single head receiver will be the maximum normally required for quality monitoring and as low as -17 vu for continuity monitoring under average room noise conditions at program monitoring positions, assuming personnel possessing average ear response. In general, it is thought that the monitoring attendants will operate the double head receivers at somewhat lower levels. Since the optimum levels will vary with individuals and local conditions, volume adjusting pads are provided which permit adjustment of volume in 5 db steps. It is of particular importance to note that the circuit design is such that volumes somewhat higher than -2 vu into a single receiver and in the order of 5 db lower than this level into a double receiver set will caus the protective varistor to introduce distortion into what is heard in the receivers. This distortion increases with the level and is the result of the varistor's action of leveling off the program peaks. The point at which noticeable distortion occurs has been designed, however, with the view to furnishing a maximum of protection while still permitting a margin above the level at which monitoring is normally expected to be done.

CAUTION: The maximum volume which can be delivered to the monitoring circuit using the 711A receiver without the possibility of damaging the receiver is +14 vu. Care should be taken, therefore, that the volume at no time be permitted to exceed a value of +14 vu when all of the volume control pads are removed from the circuit.

(C) Application

2.03 On the basis of the monitoring receiver level considerations discussed above, the receiver can be used in connection with various types of program circuits as follows:

Note: In the following applications, it is assumed that B-22 cable and open wire circuits are being operated at normal amplifier output levels of +8 vu and +14 vu respectively. These levels are the maxima which are likely to be encountered at any point in the program circuit. At cable points, the level may be lower than +8 vu at times depending on the temperature. If the normal operating levels into cable or open wire are changed, appropriate level corrections can be made where necessary.

One-Way B-22 Circuits Equipped with 12C Amplifiers

2.04 At points employing C, D or F type bridges, a level sufficient for quality monitoring can be obtained from the output of a spare 12C secondary amplifier (+8 vu) or from a suitable auxiliary amplifier associated with a spare bridge outlet for the purpose. For continuity monitoring, it will be satisfactory to connect the monitoring circuit to any available 12C amplifier monitoring winding (-12 vu).

Reversible B-22 circuits equipped with 12C amplifiers

2.05 At points employing D or F type bridges the high level outputs of the primary amplifiers (+8 vu) are available for monitoring purposes, each amplifier associated with the bridge feeding the monitoring circuit in turn during the time it is operating as a primary amplifier. At points employing C type bridges, a level sufficient for quality monitoring can be obtained from the output of a spare secondary amplifier (+8 vu) or from an auxiliary amplifier associated with a spare bridge outlet for the purpose. As in Paragraph 2.04 the use of the 12C amplifier monitoring taps are satisfactory for continuity monitoring.

Reversible and one-way B-22 or open wire circuits equipped with 14C amplifiers

2.06 The monitoring circuit may be connected to any of the outgoing legs of the G type bridge associated with the amplifier (+14 vu for open wire outlets or +8 vu for cable outlets). Where the 14C amplifier through its associated bridge feeds one or more open wire circuits, the 14C amplifier monitoring winding will provide a level of -12 vu which may be used to feed the 711A receiver monitoring circuit directly for continuity monitoring and through an auxiliary amplifier for quality monitoring.

2.07 There will be cases where a 14C amplifier will be used with a G-4-0 bridge to feed into cable. In this case, the bridge auto-transformer is omitted and the high level bridge legs which would normally deliver +14 vu into open wire are operated so as to deliver +8 vu into cable by a reduction in

amplifier gain. A spare bridge leg in this case will provide +8 vu for monitoring. The 14C amplifier monitoring winding output, however, will provide a level of -18 vu when operated in this manner which is ordinarily too low, even for continuity monitoring, and an auxiliary amplifier will be required for monitoring at this point.

2.08 Where a reversible G bridge is used and not operated with an "X" leg, the monitoring circuit can be used in place of the 600-ohm bridge termination which is placed on any leg of the bridge when the particular circuit associated with that leg is sending into the bridge. If all circuits connected to a G bridge are open wire only or cable only, the use of the monitoring circuit in this way will not result in any monitoring level change when different circuits are incoming. If both open wire and cable circuits, however, connect to the G bridge, a loss circuit, as described later, may be provided in association with the monitoring circuit, which will introduce a 6 db loss on any occasion that an open wire circuit is incoming and thus its particular high level bridge outlet is connected to the monitoring circuit.

Reversible and one-way open wire circuits equipped with 14A and 14B amplifiers

2.09 The monitoring circuit can be connected directly (i.e., without secondary amplifier) to a leg of a C bridge (-4 vu), or to the amplifier monitoring winding (-16 vu) through an auxiliary amplifier or spare 14A or 14B amplifier.

2.10 Auxiliary amplifiers referred to in the foregoing discussion for quality monitoring include 12 and 14 type program amplifiers as well as any other amplifiers having a comparable transmission frequency characteristic at least over an 8-kc band and a level carrying capacity equal to at least that of the 12 type amplifier. If higher level for continuity monitoring is desired than is available at the monitoring windings of standard program amplifiers, the J93802G amplifier can be used for this purpose. With the input transformer of this amplifier set on the maximum step 8, the amplifier will provide an 8 db gain when connected across the 600-ohm monitoring winding terminated in 600 ohms. If the monitoring winding is not terminated, a gain of 14 db is provided. Each successive step downward on the input transformer reduces the gain approximately 3.5 db. In any case, this amplifier should not be used in any manner that will result in a level of more than 0 vu in its output. Because of deficiencies in the frequency characteristic of this amplifier at the upper and lower ends of the 8-kc band, this amplifier is not suitable for quality monitoring over this band.

(D) Circuit and Equipment Arrangements

2.11 Fig. 1 shows single and double head receiver combinations and the required monitoring circuit arrangements for use with these receivers. The basic circuit shown in Fig. 1C consists of three key controlled 600-ohm pads of 5, 10 and 15 db values giving a range of 30 db in 5 db steps which are provided for an adjustment of volume, a 166A inequality ratio repeating coil (600 ohms to 36 ohms) for correcting the impedance between that of the 600-ohm input circuit and that of the single receiver (25 ohms) or pair of receivers (50 ohms), and a 33A varistor arranged to reduce the effect of excessive peaks of energy. Complete circuit details are shown on Drawing SD-64816-01.

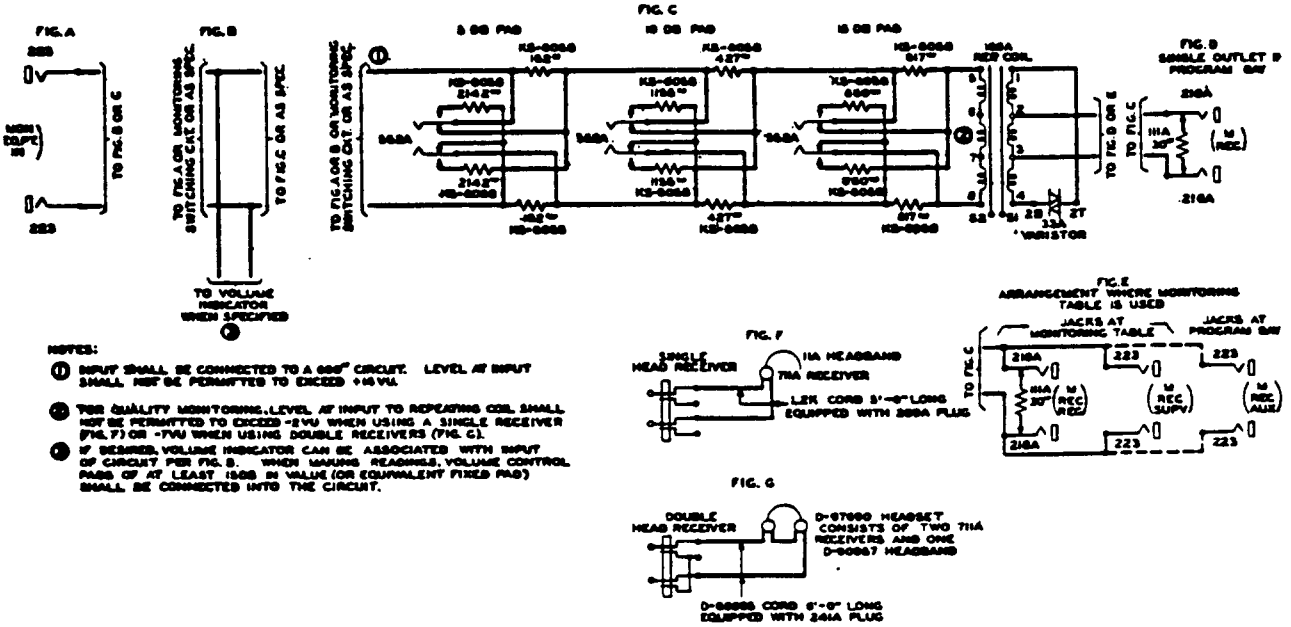



Fig. 1 - 711A Head Receiver Monitoring Circuit

2.12 The input of the circuit is arranged to be jack ended for convenience in patching to any source or it can be connected into a monitoring switching circuit (SD-64569-01) which provides for changing monitoring connections by means of keys. Keys for controlling the input pads are of the turn key variety (552A) where mounted in jack fields. A lever type key (C1) can also be used for other mounting arrangements. A volume indicator if provided can be associated with the monitoring circuit by the connection shown in Fig. 1B.

2.13 Two output arrangements are shown in Figs. 1D and 1E, one for a single outlet located in the program bay and one consisting of a multiple arrangement to be used in connection with a monitoring table or other special monitoring position. In the multiple outlet arrangement in Fig. 1E, jacks are provided which permit a monitoring attendant to connect his receiver to the monitoring circuit for regular use by means of the M REC REG jacks and in addition permits a supervisor to connect in parallel to the same monitoring circuit for special monitoring by means of the M REC SUPV jacks. An appearance of the same monitoring circuit can be provided at a program bay for use of the attendant during lineup operations (during which time no other receivers would normally be in use) by a simple parallel extension shown in the figure as M REC AUX jacks.

2.14 Figs. 1F and 1G show cord and plug arrangements for single and double head receivers, respectively.

2.15 The equipment required for the monitoring circuit will ordinarily be mounted in program bay space intended for miscellaneous equipment, although in the case of installations employing a monitoring table, other equipment arrangements may be employed. In any case the varistor is always located adjacent to the 166A repeating coil to obtain minimum length of leads between varistor and repeating coil.

## (E) Operating Considerations

2.16 Due to the fact that the 711A receiver has good response over a wide band of frequencies, combined with an efficiency which permits use of the receiver at well below program levels provided by standard program amplifiers, its fundamental design necessarily differs from that of ordinary receivers, with the result that it is more susceptible to mechanical damage. Reasonable care, therefore, should be exercised in handling the receivers such as would be observed, for instance, in handling any high grade electrical meter.

CAUTION:

(1) The receivers should not be placed with soft cap down or against any unyielding flat surface such as a writing shelf or table top because of the possibility of compressing air against the diaphragm at the moment of contact and rupturing it.

(2) A receiver should not be permitted to strike its edge forcibly against any surface because of the possibility of displacing the inner assembly.

2.17 If a receiver is accidently damaged, requiring removal from service, satisfactory continuity monitoring can be provided on a temporary basis by the use of a 528 receiver connected to the same monitoring circuit provided for use with the 711A receiver. This use of the 528 receiver may be convenient also in cases where a program switching operator requires a receiver occasionally for merely receiving switching cues.

2.18 In order to obtain the full benefits of the performance of the 711A receiver when checking program quality, it is necessary to wear the receiver directly over the ear and snugly against the head so as to obtain an air seal between the soft receiver cap and the head. If any appreciable air leakage is permitted, the low frequency response from the receiver will be materially impaired.

CAUTION: When the receiver has been in use in proper position over the ear, care should be taken in removing the receiver by first sliding the receiver across the head until the air seal is broken and then lifting it off. In no case should the receiver be drawn sharply straight away from the head.

2.19 If during periods of warm weather, or any other time, any discomfort is experienced from moisture under the receiver cap, this can be alleviated by the use of standard receiver cap paper shields. Each shield consists of four single thicknesses of soft absorbent paper and is intended to be placed between the receiver cap and the head. These paper shields will absorb any moisture as it collects and can be replaced as often as desired. If one shield (four single thicknesses) is used at a time there will be no appreciable effect on quality, but if more than one is used the higher frequencies will be appreciably attenuated. In this case, accordingly, it will be desirable to cut a 1/2" to 3/4" round hole in the center of all the sheets before placing the paper against the ear cap in order to prevent this effect. In removing the material from the center of the paper it should be cut out so as to leave a clean edge. If the center is torn out, a rough edge will result and with repeated renewal of the papers the loose paper fibers resulting from the

tearing will tend to filter through the holes in the center metal protective dome and collect against the diaphragm.

2.20 If discomfort is experienced in wearing the 11A head band, a 1/2" offset can be bent into the wires near the receiver end of the head band so as to set the receiver retaining prongs out from the head thereby affording a better fit to the head. This results from the fact that this distance is greater for the 711A receiver than that for the 528 receiver for which the head band was originally designed.

2.21 Improved realism in checking program quality results from the use of the D-97690 double head set, which consists of two 711A receivers in series. For best results it is essential that the two receivers in series be properly phased, that is, so connected that the two diaphragms move inward and outward simultaneously. This can be readily checked as follows: Connect the monitoring circuit to a source of 1 milliwatt of 1000-cycle tone and remove all key controlled level adjusting pads in the input side of the 166A coil. Then with the head set held in the hands, note response in free air. Then bring the soft ear caps of the two receivers together so that they touch on the far edge but are separated by 1/16" to 1/8" at the near edge. If the response is appreciably reinforced when the receivers are thus brought together, the receivers are properly phased. If the response is not reinforced they are not properly phased and the wires connected to one of the units should be reversed. It would be of advantage in offices having several single receiver head sets to have the poling of all units the same so that the observer could readily employ two single units to gain the advantage in realism of the double head set for special cases of monitoring. Single units may all be checked by using one unit as a standard and performing the above-described phasing test either in series or in parallel with each of the other single units against the first reference unit.

2.22 Where a volume indicator is associated with the input of the monitoring circuit, some precaution must be observed to obtain a proper termination for the volume indicator. Since the 166A repeating coil employed has an impedance ratio of 600 to 36 (input to receiver winding) one or more of the 25-ohm receiver units connected in any combination to the low impedance side of the repeating coil will make the impedance seen through the input side of the coil other than 600 ohms.

2.23 In addition, the repeating coil and varistor combination as arranged in the monitoring circuit has a characteristic such that, as the volume exceeds -2 vu in increasing amounts at the input side of the coil, the impedance of the monitoring circuit beyond the repeating coil becomes correspondingly lower. Under these conditions, if there are no pads in the circuit preceding the repeating coil an improper termination would be provided for the volume indicator and its reading would be in error.

2.24 In order to minimize the effects of improper termination on volume indicator readings it will be desirable to have a minimum of 15 db of volume control pads (or equivalent fixed pad) connected into the monitoring circuit following the point where the volume indicator is bridged. This ordinarily will not cause any operating inconvenience since the usual monitoring source across which the volume indicator would be bridged, will be of such level as to require at least 15 db of pad in the monitoring circuit. Where a volume indicator of sufficient sensitivity such as the 1G is to be used across an amplifier monitoring winding, 15 db of volume control pads should be connected into the monitoring circuit during the time volume indicator readings are being made when the head receiver monitoring circuit is connected to the amplifier monitoring tap at the same time.

2.25 If circuit noise observations are to be made at line amplifier output level with no program on the circuit, all monitoring circuit pads will ordinarily be cut out of the circuit. At the conclusion of such tests the monitoring pads in the monitoring circuit should be restored to normal values in order that subsequent volume indicator readings will not be in error.

## 3. 751B LOUD SPEAKING TELEPHONE

### (A) General

3.01 The 751B loud speaking telephone has been designed for quality monitoring on high quality program transmission facilities in those cases where a loud speaker is specified.

3.02 The 751B loud speaker consists of a moving coil, permanent magnet type loud speaker unit employing a duralumin diaphragm, mounted in an internally sound treated wooden enclosure which is arranged to mount between relay rack uprights on 19-1/2" centers. This acoustic enclosure is finished in gray lacquer, weighs about 40 pounds complete with loud speaker unit, and is approximately 16-7/8" by 23-3/4" by 13-3/8" in size. The 751B loud speaker provides a substantially uniform response over a 10-kc program band.

### (B) Monitoring Levels

3.03 The level at which the 751B loud speaker is operated depends on many factors such as room size, acoustics of the room, noise level in room, nature of the program, purpose

for which monitoring is being done, etc. There are certain maximum levels which may not be exceeded if distortion resulting from overloading is to be avoided. These maximum levels are given below for the various operating conditions likely to be encountered. The operating personnel will ordinarily adjust the monitoring level to some value below these maxima sufficient to provide satisfactory monitoring for the particular room conditions, keeping the level as low as consistent with the job to minimize disturbance to other personnel in the office. In this connection, monitoring levels used when simply observing continuity need not be as high as when making careful program quality observations. Where loud speaker continuity monitoring in the open test room may be used, such as in small through offices particularly on open wire routes, a maximum available level of +14 vu which can be obtained from program amplifiers will ordinarily be adequate. A level of +14 vu may be adequate also for quality monitoring on program material in the smaller monitoring rooms or in quiet offices, although in the usual case a higher level may be required. For monitoring rooms of moderate size a maximum available level of from +20 to +24 vu will suffice. For the larger monitoring rooms, especially where large audiences, including the public, may be present, a maximum level of +30 vu will be required to assure satisfactory performance under all conditions. When used for program monitoring, it is not desirable to operate the 751B loud speaker at a level above +30 vu. In monitoring with this loud speaker, best results will be obtained from a position directly in front of the speaker, i.e., a position along the line of the axis

(C) Application

3.04 On the basis of the monitoring level considerations discussed above, the 751B loud speaker can be used in connection with various types of program circuits as follows:

Note: In the following applications, it is assumed that B-22 cable and open wire circuits are being operated at normal amplifier output levels of +8 vu and +14 vu respectively. These levels are the maxima which are likely to be encountered at any point in the program circuit. At cable points, the level may be lower than +8 vu at times depending on the temperature. If the normal operating levels into cable or open wire are changed, appropriate level corrections can be made where necessary.

Reversible and one-way B-22 cable circuits equipped with 12C amplifiers

3.05 In order to operate the loud speaker, an auxiliary amplifier will be required. The 124B amplifier or other amplifiers having similar characteristics will be suitable for this purpose. When the 124B amplifier is used and connected to the line output of a spare secondary amplifier at one-way bridging points (+8 vu) or to the high level monitoring outlet of a primary reversible 12C amplifier at bridging points (+8 vu), it will be necessary to have the 20 db pad contained in the amplifier itself connected into the amplifier input circuit so as to reduce the level into the input repeating coil. This is necessary to avoid production of harmonics by the coil itself which would result if the level exceeds 0 vu. Other points which can be used as monitoring sources are: the monitoring winding of any 12C amplifier (-12 vu), a spare leg of any type of monitoring coil bridge (lowest level D-6-R bridge -28 vu), a spare leg of any C-4 to C-8 bridge (-10 vu), or a spare leg of a C type bridge operated as it sometimes is, through a 16 db pad (-26 vu). For these latter cases, connection can be made directly to the repeating coil in the amplifier input without utilizing the 20 db pad.

Reversible and one-way B-22 or open wire circuits equipped with 14C amplifiers

3.06 If a high level (+14 vu) leg can be provided for monitoring on any G bridge, the loud speaker can be connected to the particular leg, through key controlled 3 and 6 db pads, for monitoring when the maximum level does not need to exceed +14 vu. Where a G bridge feeds open wire circuits only and the bridge is not operated with an "X" leg, a maximum monitoring level of +14 vu can be obtained by employing the loud speaker and volume adjusting pad circuit in place of the 600-ohm bridge termination which is placed on any leg of the bridge when the particular open wire circuit associated with that leg is incoming. If a G bridge connects to cable circuits only, this same arrangement can be employed with the addition of an auxiliary amplifier to drive the loud speaker. This arrangement can also be used where a G bridge connects to both open wire and cable with the difference that an auxiliary amplifier will be required, together with a loss circuit (Paragraph 4.01) arranged to introduce a 6 db loss when an open wire circuit is receiving program. Use of the 124B amplifier permits connection to other monitoring sources such as a low level G bridge leg (+8 vu) or a 14C amplifier monitoring tap (-12 vu). A spare 14C amplifier arranged for 40-ohm output, as required for operating into a G bridge, can also be used for connection through an auto-transformer to the loud speaker for a maximum output volume of +22 vu.

Reversible and one-way open wire circuits equipped with 14A or 14B amplifiers

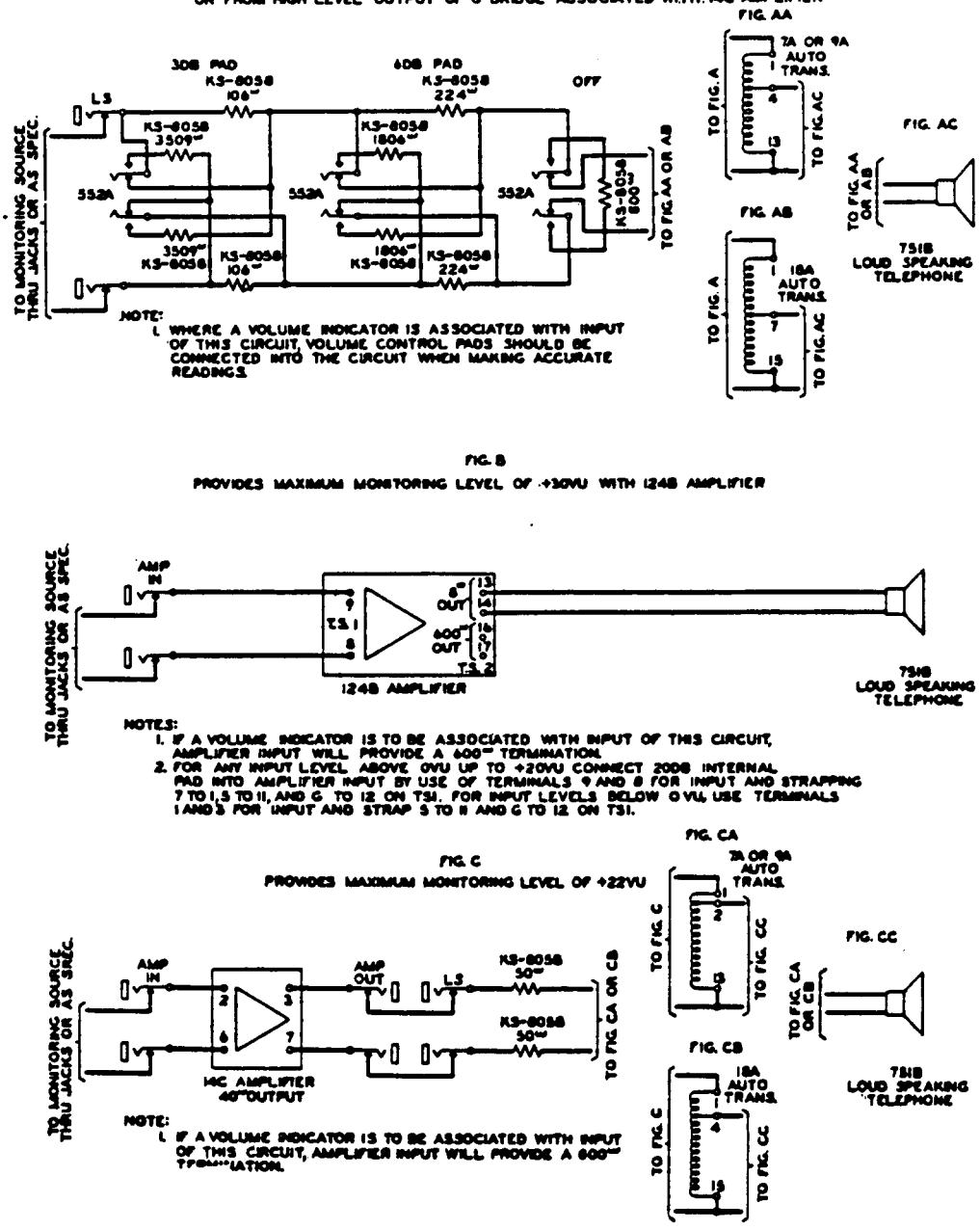



Fig. 2 - Program Circuit Monitoring Arrangements Employing the 751B Loud Speaking Telephone

3.07 The line output of any monitoring or secondary amplifier can be connected to the 751B loud speaker through key controlled 3 and 6 db pads and an auto-transformer for monitoring at a maximum level of +14 vu.

(D) Circuit and Equipment Arrangements

3.08 Fig. 2 shows several circuit arrangements designed to permit the use of the 751B loud speaker for program circuit monitoring.

3.09 Fig. 2A illustrates the standard circuit arrangement to be employed where the loud speaker is to be operated from the output of a 14A or 14B amplifier, from a high level outlet of a G bridge associated with a 14C amplifier, or from other sources of 600-ohm impedance. An auto-transformer is used to correct

the impedance to that of the loud speaker. Key controlled pads of 3 and 6 db are provided for volume adjustments. An additional key provides an off condition for the loud speaker. Where a volume indicator is associated with the input of this circuit, the volume control pads should be connected into the circuit when making accurate measurements during any time the loud speaker is in operation in order to provide a proper termination. This will not be necessary when the loud speaker OFF key is operated since under this condition a 600-ohm termination is substituted for the auto-transformer and loud speaker.

3.10 Fig. 2B covers the arrangement where a separate auxiliary amplifier is furnished as part of the monitoring equipment and critical quality observations are to be made. This arrangement consists of a 124B amplifier and loud speaker, connected directly to the 8-ohm amplifier output terminals. If a volume indicator is to be associated with the input of this circuit, the amplifier input provides a 600-ohm termination.

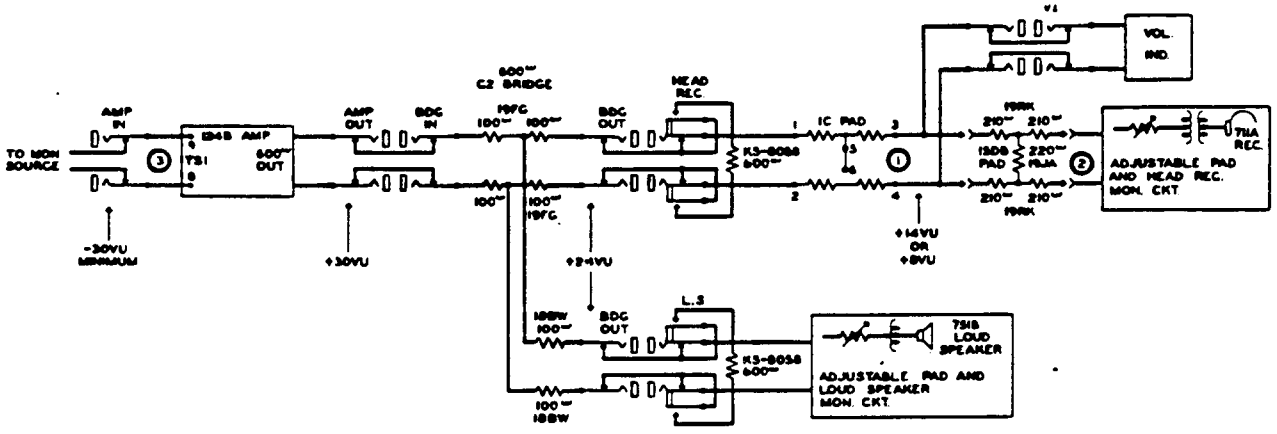
3.11 Fig. 2C illustrates an arrangement for obtaining a maximum level of +22 vu by connecting directly to the 40-ohm output of a 14C amplifier. An auto-transformer, together with series resistors, is used for impedance correction. The input of the 14C amplifier must be connected to a monitoring source not lower than a level of about -14 vu in order to realize the maximum output level of +22 vu. If a volume indicator is to be associated with the input of this circuit, the amplifier input provides a 600-ohm termination.

3.12 An additional arrangement employing a 124B amplifier to feed both head receiver and loud speaker simultaneously is shown in Fig. 3. In this arrangement, the 600-ohm output of the amplifier feeds a C-2 bridge, the two outgoing legs of which feed the head receiver monitoring circuit (Fig. 1) with associated volume indicator, and the loud speaker monitoring circuit (Fig. 2A) respectively. An adjustable pad is provided in the leg associated with the head receiver circuit, which permits adjustment of the level to convenient operating values at the point where the volume indicator is bridged. The volume indicator termination furnished by the head receiver circuit is subject here to the same requirements as covered in Paragraphs 2.22 to 2.24, inclusive.

## 4. GENERAL CONSIDERATIONS

### (A) G Type Bridge - Monitoring Circuit Connections

4.01 Fig. 4 illustrates the fundamental circuit scheme of the arrangement wherein either a head receiver or loud speaker monitoring circuit is used as a termination for any G bridge outlet when the program circuit associated with the particular outlet is operating as an incoming line. When the bridge connects to open wire only or to cable only and is not operated with an "X" leg, the monitoring circuit connection is as shown in Fig. 4B. Where both open wire and cable circuits are involved, means are furnished for correcting for the difference in monitoring levels when an open wire circuit is receiving program, thus providing a +14 vu bridge leg for monitoring instead




NOTES

① WITH IC PAD SET FOR 10 OR 16 DB LOSS FOR LEVELS OF +14 OR +8VU RESPECTIVELY AT THIS POINT, ADJUST POTENTIOMETER ON 124B AMP TO STEP WHICH WILL BRING VOL IND READING NEAREST TO DESIRED VALUE. CLOSER ADJUSTMENT CAN THEN BE MADE BY SMALL CHANGE IN IC PAD.

② IF THIS PAD IS NOT FURNISHED, VOLUME CONTROL PADS IN HEAD RECEIVER CKT OF AT LEAST 15 DB IN VALUE SHALL BE CONNECTED INTO THE CKT WHEN MAKING ACCURATE VOL IND READINGS.

③ FOR ANY INPUT LEVEL ABOVE 0 VU UP TO +20 VU CONNECT 200B INTERNAL PAD INTO AMPLIFIER INPUT BY USE OF TERMINALS 9 AND 8 FOR INPUT AND STRAPPING 7 TO 1, 5 TO 11, AND 6 TO 12 ON TSI. FOR INPUT LEVELS BELOW 0 VU, USE TERMINALS 1 AND 3 FOR INPUT AND STRAP 5 TO 11 AND 6 TO 12 ON TSI.

Fig. 3 - Program Circuit Monitoring - Combined Head Receiver and Loud Speaker Arrangement Employing a Single 124B Amplifier for Supply

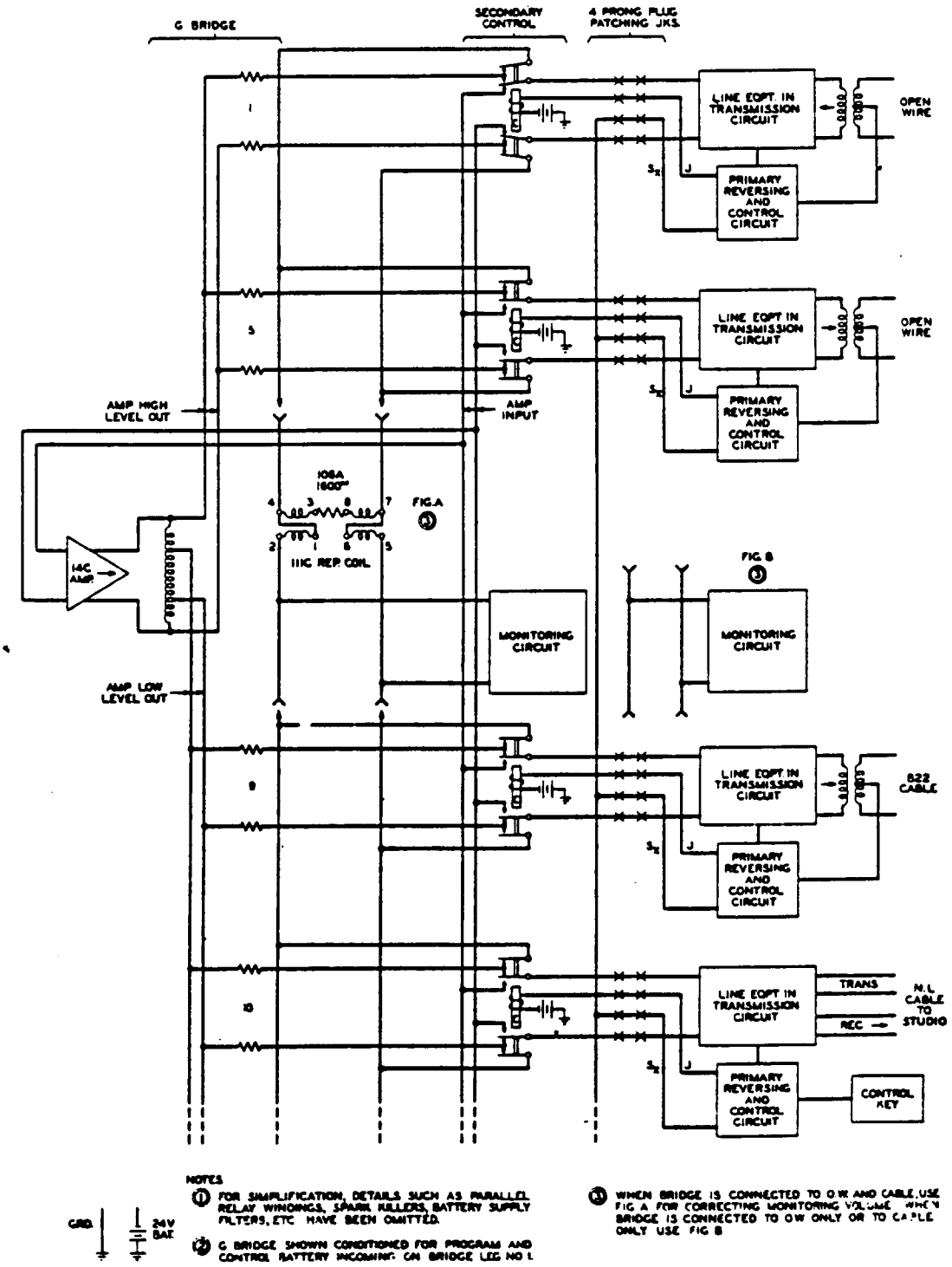



Fig. 4 - Remotely Controlled Reversible Program Circuits - Bridging Point Employing 14C Amplifier and G Type Bridge - Monitoring Circuit Connections

of a +8 vu bridge leg provided when a cable circuit is receiving program. This is accomplished by means of the repeating coil and resistance arrangement shown in Fig. 4A. The repeating coil connected as an auto-transformer, together with the resistance provides approximately a 6 db loss between any +14 vu bridge leg and the monitoring circuit. When a +8 vu bridge leg is connected to the monitoring circuit, the higher level side of the

repeating coil arrangement stands at open circuit. On the lower level side, however, all the coil windings in series aiding connection, together with the mid-point resistance, are bridged across the monitoring circuit. This loss is negligible. The maximum volume at the input of the monitoring circuit therefore, remains constant whether an open wire or cable circuit is incoming. Accordingly, a volume indicator associated with the monitoring circuit at this point can be operated normally on a single setting. For a combination of tandem 14C amplifiers, only one loss circuit is required. Details of the uses of this scheme are shown on standard program system drawings.

(B) Monitoring Amplifier - Operating Gains and Wiring Requirements

4.02 In applying the 124B amplifier for monitoring use, it would be of advantage from the crosstalk and noise standpoints to select an amplifier input monitoring source of sufficient level so as to require only moderate values of monitoring amplifier gain to attain the required monitoring level at the amplifier output, rather than to make use of a monitoring source low enough in level to require near maximum gain. Thus, with a given crosstalk pickup in amplifier input wiring, the greater the gain necessary to bring the program up to the operating monitoring level the greater the possibility of bringing up the crosstalk to values which would become objectionable during quiet periods in the program.

4.03 One pair of a 500 CL cable will ordinarily be used (with remaining 3 pairs left unused) for as much of the amplifier input wiring as possible for crosstalk protection. Due to the fact that the amplifier will generally be closely associated with the loud speaker and separated from other program amplifiers, no serious exposure of output wiring to other low level wiring is expected. However, in those cases where it is not possible to associate closely the amplifier and loud speaker, the same treatment for output wiring as suggested above for input wiring will ordinarily be used.

(C) Stray Fields from A-C Operated Monitoring Amplifiers

4.04 Because of their stray fields, power transformers and filter coils employed in the power supply circuits of a-c operated amplifiers, and usually mounted as a part of the amplifier assemblies, are sources of noise which may affect program amplifiers. If any type of a-c operated amplifier is used for monitoring, therefore, its stray field is ordinarily taken into consideration in mounting such an amplifier near to program amplifiers or telephone repeaters as covered in standard practices.

(D) Miscellaneous Former Monitoring Arrangements

4.05 Monitoring arrangements employing single unit 595 or 573 loud speakers, two-unit loud speaker combinations made up of the 595 or 573 with a small high frequency unit, such as the 596, and a double set of head receivers consisting of two separate types of receivers, 563A and D-94053, have been used previously in the field and are still in service at various points. Various auxiliary amplifiers have been used with these monitoring facilities, the applications being covered in detail on reference Drawings SD-64711-01 and SD-64721-01.

4.06 In assigning these older monitoring arrangements for present services, their performance as compared to the 711A receiver and 751B loud speaker should be kept in mind. For example, the two-unit loud speaker combination gives essentially the same results as the 751B loud speaker and will be useful for quality monitoring where transmission up to 8 kc is involved. On the other hand, the characteristics of the single 573 or 595 loud speakers are suitable for monitoring only over a 5-kc band. The former double head receiver set made up of one each of the 563A and D-94053 head receivers might continue to be useful for noise trouble observations but aside from this the 711A head receiver both singly and in pairs has superior characteristics to all other head receiver arrangements in the field for quality monitoring even over a 5-kc band.

## 5. LIST OF DRAWINGS

5.01 Drawings for Reference

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|---|---|
| Head Receiver Monitoring Circuit | SD-64816-01 |
| G Type Bridge - Monitoring Circuit Connections | SD-64755-01 |
| Monitoring Switching Circuit | SD-64569-01 |
| Loud Speaker and Head Receiver Monitoring Circuits | SD-64711-01 |
| Monitoring and Local Loop Circuits | SD-64721-01 |
| Loud Speaker Monitoring Circuit | SD-55140-01 |