4A TIME ANNOUNCEMENT SYSTEM

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1. INTRODUCTION

1.01 This practice describes the transmission features of the 4A Time Announcement System and includes information on levels, number of trunks that can be connected to the system, transmission testing, and crosstalk considerations. For information on circuit details reference should be made to the appropriate AA Division of practices and associated circuit drawings.

2. DESCRIPTION

2.01 ***General:*** The 4A Time Announcement System is intended for time announcements at 10-second intervals over time announcement trunks which may be connected directly to calling subscribers' lines or over interoffice or tandem trunks. The trunk circuits are similar to those used in the 3A Weather Announcement System. Trunks may be connected to subcenters, where through amplifiers the time announcements may be redistributed to other lines or trunks.

2.02 ***Incoming Calls:*** An incoming call is routed to the announcement bus at the central bureau or at a subcenter and the caller, along with others calling at the same time, is held until the announcement system is ready to begin its time announcement. In this waiting period, which may last a maximum of 10 seconds, audible ringing signals are sent back to the caller. When the machine is ready to start an announcement, the callers are cut through to the machine and hear the announcement.

2.03 ***Length of Call:*** Should the caller not hang up at the end of the first announcement, he is held and will hear succeeding announcements depending on the type of central office equipment; when he is disconnected from the bus, he receives a dial tone. During the time that the subscribers are connected to the announcement bus, the circuits are so arranged that the loss between them is about 60 db, thus preventing any cross-conversations which might be disturbing.

2.04 ***Announcement Equipment:*** The essential parts of the 4A Announcement System are the Audichron machine, distributing and alarm units, and trunk circuits. The Audichron machine is a precision timekeeping device arranged for reproducing sound from film at accurately timed periods.

2.05 ***Number of Machines:*** The system may be furnished with either single or dual announcement machines and associated amplifiers. When a dual machine is furnished, the low volume alarm is arranged to automatically transfer the distributing bus to the spare machine and its associated amplifier and brings in an audible or visual alarm. A key is provided by means of which the announcement bus may be switched to an amplifier and operator announcement circuit for emergency use. When a single channel machine is used, low volume brings in an alarm and automatically transfers the trunk circuits through an amplifier to an emergency announcement trunk over which announcements can be made by an operator.

2.06 ***Circuit Drawings:*** Transmission schematic drawings for the single and dual machines are shown in Figures 1 and 2.

2.07 ***Transmission Levels:*** The system has been designed so that the grade of transmission received by a subscriber calling the system is comparable to that received on calls within his own central office area provided his line is switched directly to the announcement trunk terminals. The

transmission on traffic routed via tandem will necessarily be modified by the tandem plant.

(a) ***Normal Level:*** When the level at the output of the machine is adjusted as described in Section 6, the level delivered to a subscriber's loop at a central office served directly from the central bureau should be about -15 ± 8 vu. For central offices served through a subcenter, the level should be about -15 ± 10 vu.

(b) ***Variation in Levels:*** Since the successive time announcements are reproduced from different film strips, there will be variation in level between individual announcements. Every effort is made at the time the recordings are made to keep such variations at a minimum and except for loss of level due to film fading the overall levels can be expected to fall within the ranges indicated above.

(c) ***Time Tone Level:*** The level of the time tones will also vary from strip to strip and this is of importance when adjusting levels at subcenters, as covered in Part 7.

3. DETAILS OF CENTRAL BUREAU

3.01 ***Monitoring Arrangements:*** Monitoring jacks are connected across the output of the power amplifier associated with each automatic announcement channel. In general, these jacks are used to monitor the announcement from the machines with a crystal receiver supplied with the Audichron equipment. With the dual machine, a hand set receiver is connected through two series resistances to the announcement bus for monitoring purposes.

3.02 ***Low Volume Alarm:*** A low volume alarm circuit continuously monitors the output of the power amplifier associated with each channel of the Audichron machine. This alarm circuit functions when the output volume drops about 9 db below its nominal value. In the case of the dual machine, if the channel carrying the announcement fails, the load is transferred automatically to the other channel.

3.03 ***Vocal Operation—Dual Machine:*** An arrangement for giving time announcements vocally can be connected to the distributing bus in place of the automatic facilities by the operation of a key or relay. In the dual machine, transfer to vocal operation is accomplished by means of a key. When the key is operated, the volume indicator is bridged across the announcement bus. The volume output of the power amplifier used for vocal operation should be adjusted so that the meter pointer swings between -5 and $+5$ on the peaks of the operator's speech. Transfer from automatic to vocal operation involves about one-minute delay because the heaters of this amplifier are not energized until the key for vocal announcement is operated.

3.04 ***Vocal Operation—Single Machine:*** In the case of the single Audichron machine, transfer from automatic to vocal announcement is made by means of the emergency transfer relay. No volume indicator is provided for adjusting the gain control of the power amplifier used for vocal announcement in this arrangement. However, a portable volume indicator can be connected to the meter monitor jacks prior to operation of the emergency transfer relay and the gain of this amplifier adjusted for the speech of a typical talker. If a standard volume indicator (calibrated in vu) is connected to the meter monitor jacks, it should read (without correction for the impedance across which it is bridged) $+6 \pm 5$ vu on speech peaks. (See Part 6.)

3.05 ***Room Noise:*** If the noise in the room where vocal announcements are made is held to about 45 dba, as measured with a sound level meter (40 db weighting network), it should not be particularly noticeable to a subscriber listening to announcements made over the system.

3.06 ***Trunk Circuits:*** The trunk circuits at the central bureau serve to connect the announcement bus to the trunks which supply the outlying points of the system. There are two general types of trunk circuits: announcement trunk circuits and subcenter trunk circuits. These are covered in SD-95533-01 and SD-95538-01, respectively. Both types are illustrated in Fig. 1. Announcement trunks from the central bureau terminate in central offices or in tandem offices. A subscriber's loop can be joined to the terminals of an announcement trunk either at the subscriber's own central office or through a tandem office. For reliability, two subcenter trunks are used to connect each subcenter with the central bureau.

3.07 ***Trunk Load:*** The load consisting of all the trunk circuits connected to the announcement

bus at the central bureau should have an impedance not less than about 5.3 ohms when the CT (cut through) contacts of the relays in all trunk circuits are closed. The trunk circuit used with zero or very short trunks has an impedance of about 5900 ohms with the CT relay contacts closed. Thus, 1100 very short trunk circuits can be connected to the distributing bus. However, trunk circuits for use with longer trunks and for trunks to other distributing centers have impedances lower than 5900 ohms. These trunks are, therefore, equivalent to more than one of the circuits associated with zero trunks. This difference can be taken into account by means of multiplying factors. Multiplying factors for the various trunk circuits, referred to the zero trunk arrangement, are shown in Table 1.

3.08 ***Check for Maximum Trunk Load:*** To check to see that the maximum trunk load is not exceeded, the following procedure should be used:

> Multiply the number of each type of trunk by its multiplying factor, add the results, and compare the total with 1100, which should not be exceeded. For example, assume 500 trunks of 0.5 db, 100 trunks of 10.0 db and 5 distributing centers.

$$\begin{aligned} 500 \times 1 &= 500 \\ 100 \times 3 &= 300 \\ 5 \times 35 &= \underline{175} \\ &\quad 975 \end{aligned}$$

> This is a safe load since it is less than the 1100 allowable.

4. DETAILS OF SUBCENTER

4.01 ***General:*** The subcenter of the 4A Time Announcement System is an intermediate distributing center located between the central bureau and the local or tandem offices. It is covered by SD-95546-01. Subcenters are used where it is found to be economical to distribute time announcements from a point other than that at which the central bureau is located. Distribution is provided from a subcenter to local or tandem offices by means of announcement trunks similar to those associated with the central bureau. The subcenter is connected to the central bureau by two trunks operating simultaneously. These two trunks should be equalized over the voice-frequency range. Each subcenter can accommodate slightly more than half the number of announcement trunks which can be operated from the central bureau. A transmission schematic of the circuits between the distributing bus at the central bureau and the disbributing bus at the subcenter is shown in Fig. 3.

4.02 ***Volume Level:*** The speech volume across the distributing bus at the subcenter is about 1-db higher than that across the distributing bus at the central bureau. To check the volume at the subcenter, a volume indicator calibrated in vu is mounted on the control panel. By means of pushbuttons, this meter can be connected across the output of either one of the two amplifiers or across the distributing bus as it is shown connected in Fig. 3. The pad associated with this meter is designed so that when the meter is bridged across the ouput of either amplifier or across the distributing bus the meter should read between −10 and 0 on peaks of speech occurring during normal operation. If one of the two circuits connecting the central bureau to the subcenter fails, the other circuit will carry the load at the subcenter with about 6-db loss in volume.

4.03 ***Operation:*** Subcenter circuits are designed to allow the outputs of two amplifiers to be connected together and at the same time to provide an alarm in case one of them fails. The outputs of the amplifiers are joined to the opposite terminals of a bridge circuit as shown in Fig. 3. The arms of this bridge consist of three 10-ohm resistances and a distributing bus which may vary in impedance from 6 to 12 ohms depending upon the number of announcement trunks connected to this bus and upon whether the trunks are busy or idle. When the bridge is balanced properly, the operation of the alarm relay connected across the output of one amplifier is practically independent of the output of the other amplifier. Due to the variation in impedance of the trunk circuits, it is generally not practicable to achieve perfect balance. If the variable resistance bridged across the distributing bus is properly adjusted, however, the balance will be sufficiently good to provide at least 20-db loss between the output of one amplifier and that of the other amplifier. For example, should complete failure occur in the trunk or in the amplifier of one of these two channels, the speech volume measured across the output of the

amplifier of this channel would drop about 30 db below the normal operating volume for a bus impedance of 12 ohms and about 23 db for a bus impedance of 6 ohms. Loss of volume of this order of magnitude is adequate to operate the sensitrol relay and bring in an alarm.

4.04 ***Phase Relationship:*** Since the outputs at the subcenter of the two amplifiers are bridged, it is necessary that the correct phase relationship be maintained. The correct relationship can be determined by reversing the leads to the bridge circuit from one of the amplifiers. The correct phase relationship exists with the connection giving the maximum measured output across the distributing bus. For example, if the gains of the two amplifiers are adjusted to give equal output levels, the volume measured across the bus will be about equal to that of the output of each amplifier when the impedance of the bus is 12 ohms. For a bus impedance of 6 ohms, the volume at the bus is about 1-db down from that across the output of each amplifier. If phase relationship is incorrect, the volume on the bus will be down at least 10 db from that of the output of either amplifier.

4.05 ***Trunk Load:*** The impedance of the load connected across the distributing bus at the subcenter consists of the impedances of all trunk circuits combined in parallel with the value of the variable resistor designated in Fig. 3 as the load impedance circuit. As mentioned, the total load impedance bridged across the bus should be between 12 and 6 ohms in order to balance the resistance bridge adequately for operation of the alarm circuits. The 12-ohm value represents the impedance without trunk load when the contacts of the CT relays in all trunk circuits are open. The variable resistance which is bridged across the announcement bus should be adjusted so that its resistance in parallel with the combination of all trunk circuits with CT relay contacts open provides a termination of about 12 ohms. From this it can be seen that the maximum load across the distributing bus at the subcenter should not be less than 12 ohms or proper balance will not be possible. For short trunks, the trunk circuits with their CT relay contacts open will look like about 7500 ohms. Hence, about 625 short trunk circuits can be bridged on the bus. The load maximum on the distributing bus at the subcenter can be computed in a manner similar to that for the central bureau except that 625 is used instead of 1100 as the design figure.

4.06 ***Circuit Drawings:*** A transmission schematic drawing for the subcenter is shown in Fig. 3.

4.07 ***Trunks from the Central Bureau:***

(a) ***Distances under 18 miles:*** Nonloaded trunks can be used between the central bureau and the subcenter for distances up to about 18 miles. The trunk circuit which connects these nonloaded trunks to the distributing bus at the central bureau consists of a 120C repeating coil having a 100-ohm resistance in series with the winding facing the bus. This is the standard arrangement and the one shown in Fig. 3.

(b) ***Distances over 18 miles:*** For distances between the central bureau and the subcenter over 18 miles, certain high cutoff loaded facilities may be used. The trunk circuit connected to the bus at the central bureau should be arranged to reduce the reflection effects at the central bureau end of the trunk. This is necessary because, in some cases, variations of at least 5 db in amplitude will appear in the transmission frequency characteristics if the 1.1 repeating coil specified for nonloaded facilities is used. To match the impedance, the low windings of a 120D repeating coil can be connected in parallel for a 1:6 step-up ratio from the distributing bus to the subcenter trunk. Further matching can be arranged by changing the series resistance. For example, a 100-ohm resistance will be satisfactory for 19 H-44 trunks; and a 200-ohm resistance for 19 B-88 trunks as illustrated by B and C, respectively, in Fig. 4.

4.08 ***Phase Distortion:*** Because two channels operating simultaneously serve to carry the announcement between the distributing bus at the bureau and the bus at the subcenter, a difference in propagation time of one channel with respect to the other can introduce serious phase distortion. For this reason, both trunks must be of the same general type of facility and must be about the same physical length. The permissible difference in length between the two trunks is given in Fig. 4 for various types of facility.

4.09 ***Equalization:*** Figure 4 shows the equalization possible for trunks between the bureau and the subcenter.

5. CROSSTALK

5.01 ***General:*** The crosstalk considerations covered in Section 852-523-100 in connection with the 3A Weather Announcement System apply also to the 4A Time Announcement System. However, the speech volume across the announcement bus at the central bureau of the 4A system is generally about 3-db lower than that of the 3A system, and this difference should be taken into account in any consideration of crosstalk.

6. MEASUREMENT OF LEVELS

6.01 ***Volume Indicator:*** The volume indicator meter provided with the Audichron equipment has a meter scale reading from −10 to +6 db based upon a 6-milliwatt reference power. It calibrates on 0 when connected across a 600-ohm resistance dissipating a 1000-cycle power of 6 milliwatts. As a voltmeter, it should read 0 ±0.5 db when 1.9 volts of 1000-cycle tone (7.8 db above 0.775 volt) is connected across the meter terminals. Its dynamic characteristics differ noticeably from those of the standard volume indicator calibrated in vu.

6.02 ***Measurements—Central Bureau:*** The volume measured across the announcement bus should cause the pointer of the volume indicator supplied with the Audichron machine to swing between −5 and +5 db on the peaks of speech or tone occurring during normal operation. The gain of the amplifier should be adjusted for this condition.

(If a Bell System Standard volume indicator calibrated in vu were connected across the bus, it should read on speech peaks without correction for the impedance of the bus +6 ±6 vu. The difference in calibration between the db and vu volume indicator is 7.8 db. If 1.8 db is taken as the difference in dynamic characteristics between the two meters, then on speech when the Audichron "db" meter reads 0 db the reading of a standard volume indicator should be +6 ±1 vu. For the service under consideration this is approximately correct.)

6.03 ***Measurements other than Central Bureau:*** When the speech voltage delivered across the main announcement bus causes the pointer of the volume indicator supplied with the Audichron machine to swing between +5 and −5 db, the volume delivered to a subscriber's loop at a central office served directly from the bureau should be −15 ±8 vu. For central offices served through a subcenter, this volume should be within −15 ±10 vu.

7. TRANSMISSION TESTS

7.01 ***General:*** As a check on 4A systems, occasional test calls may be made from various local offices that supply the service. These tests are desirable to keep the 4A system in alignment and to check the volume output.

7.02 ***Central Bureau:*** If there are no subcenters, test calls along with the volume indicator readings in the bureau should be sufficient. The volume indicator in the bureau which is supplied with the Audichron equipment should read between −5 and +5 on speech peaks.

7.03 ***Subcenters:*** The volume output of the two amplifiers in the subcenter should be as close to the same value as possible. This can be checked by the volume indicator mounted in the subcenter or by measuring the speech volume across the subcenter bus and lining that up with the main bureau. When lining up a subcenter by means of the Audichron machine at the central bureau, a specific time tone signal should be used for reasons mentioned under 2.07. The following method of lineup is suggested:

(1) ***At the Main Bureau***

(a) If there is a dual channel Audichron machine, the channel having the highest volume of time signal tone compared to the speech volume, as measured on the volume indicator meter provided with the Audichron equipment, should be used.

(b) Adjust the volume control of the power amplifier associated with this Audichron machine so that the time signal tone following the minute announcement on either the odd or even minute (specify which) reads +2 on the volume indicator meter.

(2) ***At the Subcenter:*** Check, and if necessary, tone following the minute announcement either on the odd or even minute whichever has been specified. The volume indicator in the subcenter when bridged across the output of

either amplifier should read −3 on this tone, which occurs every two minutes.

(3) ***At the Main Bureau:*** When all checks and adjustments have been completed in the subcenters, readjust the gain of the power amplifier associated with the Audichron machine so that the pointer of the volume indicator swings between +5 and −5 db on the peaks of speech and tone.

Note: During the testing period, speech peaks may swing the pointer of the volume indicator off scale. This may produce distortion in the system, but such distortion should not be objectionable as far as a listening subscriber is concerned. However, the testing period should be made as short as possible.

TABLE 1

Effective Trunk Loss - Db	Value of (A) Resistance-Ohms	Multiplying Factor
0 - 0.8	5000	1.0
0.9 - 1.7	4500	1.1
1.8 - 2.7	4000	1.2
2.8 - 3.7	3500	1.3
3.8 - 4.7	3000	1.5
4.8 - 5.8	2500	1.7
5.9 - 7.6	2000	2.0
7.7 - 9.5	1500	2.4
9.6 - 11.5	1000	3.0
Each Subcenter (2 trunks)		35.0

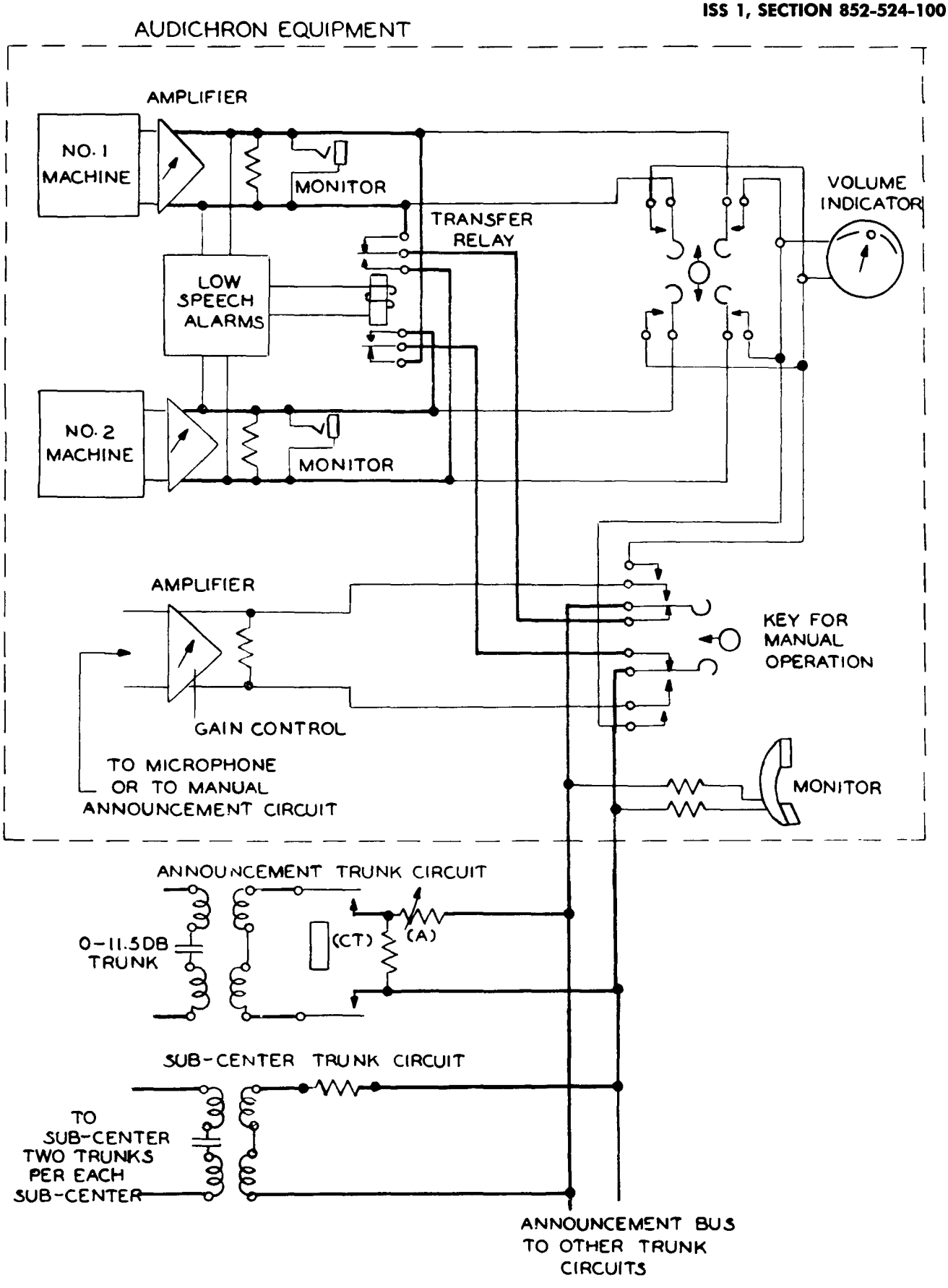

Fig. 1—Time Announcement System 4A — Dual Audichron Machine Transmission Schematic

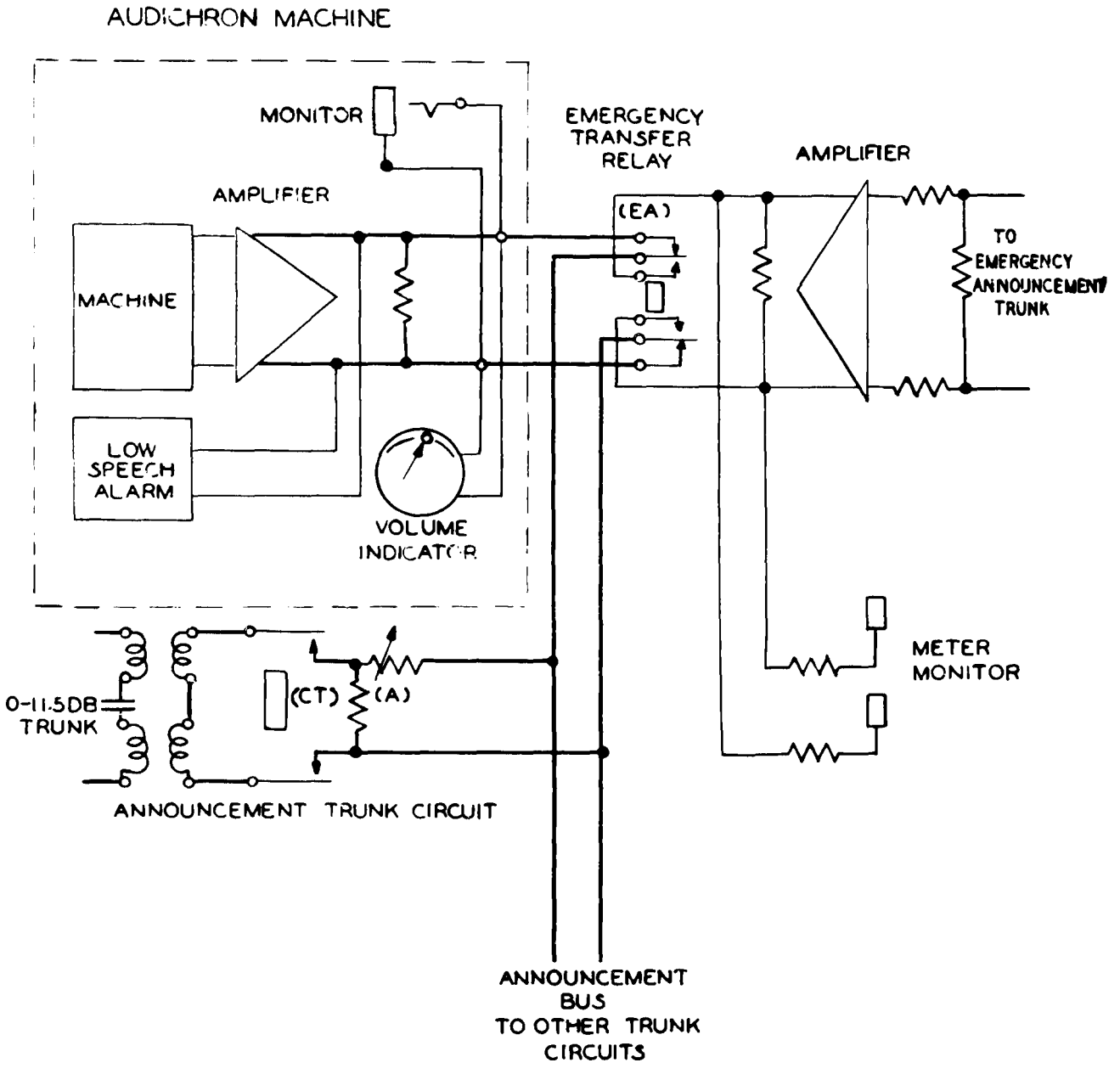

Fig. 2—Time Announcement System 4A — Single Channel Audichron Machine Transmision Schematic

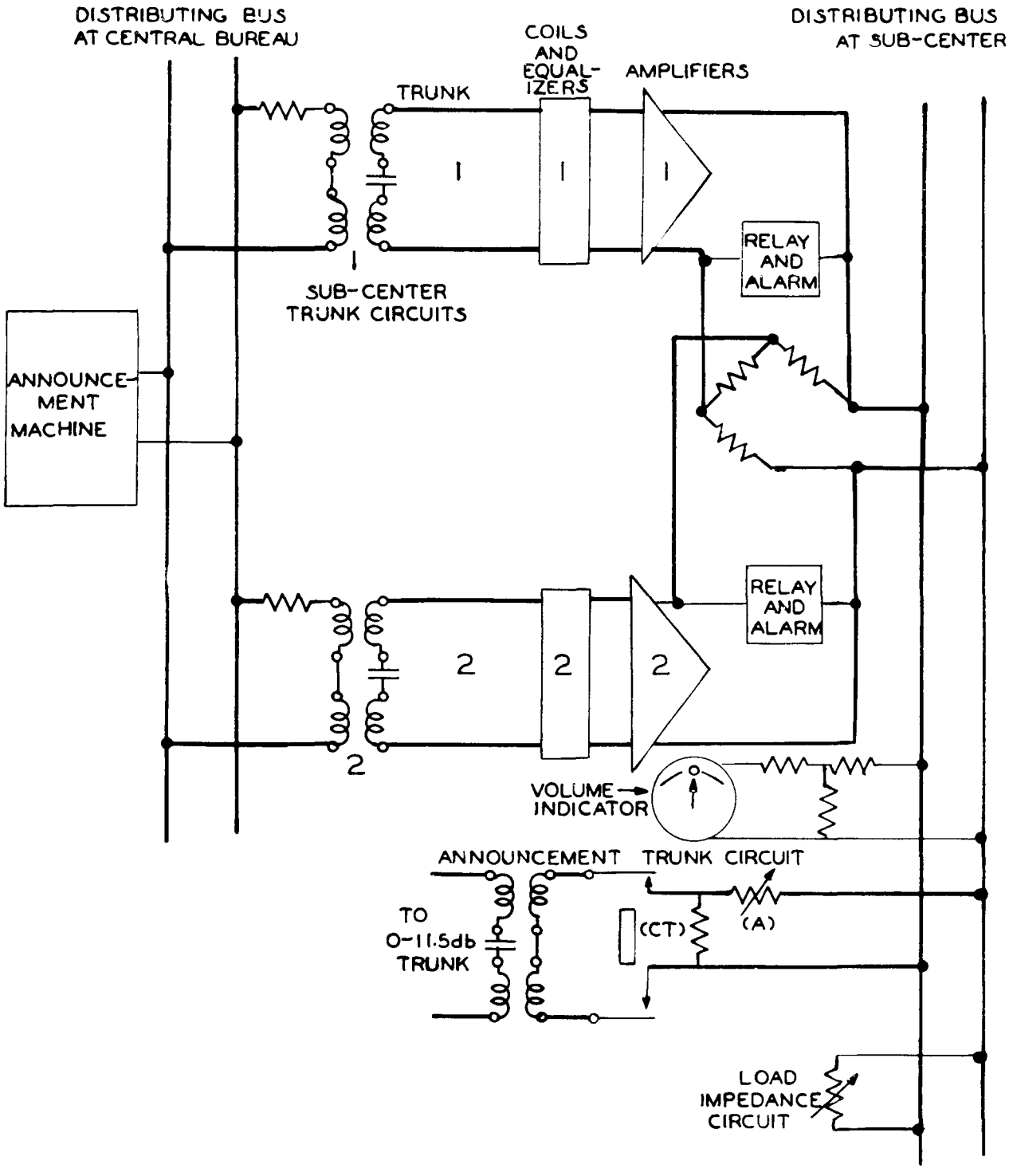

Fig. 3—Time Announcement System 4A — Distribution Through Subcenters

Facility	Length Miles	Equalized to 2 db Between	Trunk Ckt. Used At Announcement Bureau	Equalizer*	Permissible Difference In Length Between the 2 Trunks of Each Sub-Center in Miles**
22 NL	0-2.5	200-5000	Fig. A	None	4
22 NL	2.5-7	200-5000	Fig. A	23A	4
22 NL	7-8	200-4000	Fig. A	23A	4
19 NL	0-3	200-5000	Fig. A	None	4
19 NL	3-10	200-5000	Fig. A	23A	4
19 NL	10-12	200-4000	Fig. A	23A	4
16 NL	0-3.5	200-5000	Fig. A	None	4
16 NL	3.5-16	200-5000	Fig. A	23A	4
16 NL	16-18	200-4000	Fig. A	23A	4
19-H-44	0-2	200-4500	Fig. B	None	1
19-H-44	2-4.5	200-4500	Fig. B	23A	1
19-H-44	4.5-24	200-4000	Fig. B	23A	1
19-B-88	0-2	200-4500	Fig. C	None	1/2
19-B-88	2-4	200-4500	Fig. C	23A	1/2
19-B-88	4-24	200-4000	Fig. C	23A	1/2
19-H-88	0-2	200-3000	Fig. C	None	1/10
19-H-88	2-20	200-3000	Fig. C	23A	1/10

* To adjust equalizer see B.S.P. E47.168

** For non-loaded trunks any combination of gauges is permissible. For loaded trunks same type of loading must be used in both circuits.

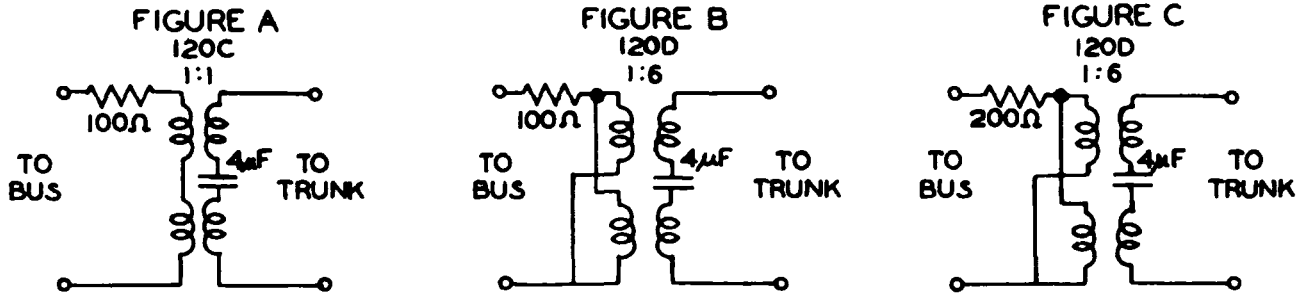

Fig. 4—Equalization of Trunks Between Announcement Bureau and Subcenter