

3A ANNOUNCEMENT SYSTEM TRANSMISSION DESIGN CONSIDERATIONS

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existing systems are likely to remain in service for many years. Several rearrangements and changes are available which provide for modernization of the system and make it possible to meet system objectives for transmission levels.

1.03 Forecasts, received from the United States Weather Bureau, are recorded on recorder-reproducer equipment and distributed over a permanent network from the main center via subcenter trunks to subcenters in other local offices. When a call is made from the local office in which the main center is located, the subscriber is connected directly to the main center busbar via an announcement trunk circuit. When a subscriber calls from another office, he may be connected directly to the subcenter nearest him, providing substantial savings in interoffice trunk plant. A block diagram of the system is shown in Fig. 1.

1.04 There are three vintages of equipment in 3A systems and two transmission designs. All revisions or additions to 3A systems should be based on the latest equipment design which permits better maintenance, better performance, more satisfactory transmission levels, and greater capacity. The revised transmission design provides transmission levels to subscriber lines that compare more favorably with levels found on other local calls.

1.05 Other practices of interest are:

SECTION	TITLE
852-520-100	— Announcement Systems—General Transmission Design
AA388.044	— Equipment and Ordering Information
201-507-501	— Line-up and Maintenance Practices
201-507-502	
201-507-503	
034-352-701	
034-700-801	
034-700-802	
034-700-803	

1. GENERAL

1.01 This section discusses transmission features of the 3A Announcement System designed for weather bulletins or other announcements sponsored by the telephone company. This is a complete revision of Issue 1, and arrows indicating changes are therefore omitted.

1.02 New weather announcement installations will use the 9A Announcement System. Due to the substantial investment in 3A systems, however,

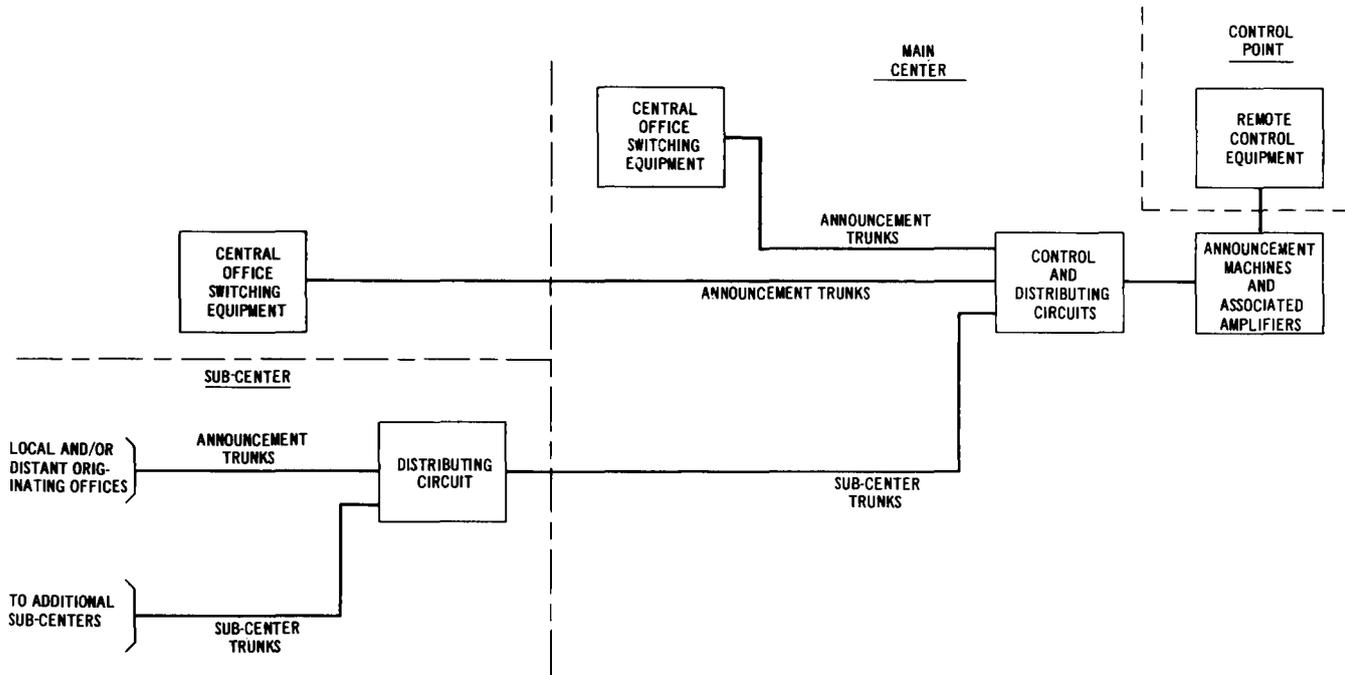


Fig. 1—3A Announcement System (Weather) Block Diagram

1.06 Drawing and equipment units are listed in Table I.

1.07 General transmission design considerations for announcement systems are found in Section 852-520-100. A glossary of terms is also contained in that section.

2. CONTROL POINT

A. Equipment Arrangements

2.01 The control point is usually located in the same building as the main center. Two versions of control point equipment have been made available. The original equipment is the Control and Recording Desk per SD-96199-01. The revised equipment is the KS-16536 Operator's Control Unit per SD-95265-01 and the KS-16537 Amplifier Control Unit per SD-95266-01. The revised equipment should be used for installations, additions, and replacements. The equipment per SD-96199-01 is now manufacture discontinued.

2.02 The simplified diagram of the original equipment is shown in Fig. 2. The equipment is arranged to record on two recorder-reproducers simultaneously. Each can then be monitored individually for level, text, accuracy, etc. One reproducer is then connected to the distribution system, with the other standing by as a spare.

2.03 After the announcement has been recorded, each tape recorder is played back and the speech checked for volume, quality, text, etc. For this monitoring condition, the tape amplifier of each machine is reversed, the input being connected to the output of the recorder and the output connected through a pad to the input of a power amplifier. The output of this amplifier is connected to a resistance network which simulates the impedance of the group of trunk circuits making up the distribution network. A special voice-operated device is connected for the purpose of indicating to the operator checking the recording whether or not the volume requirements have been met as indicated by lamps mounted in the turret. The voice-operated device has several functions and is

TABLE I			CIRCUIT	TITLE	EQUIPMENT
CIRCUIT	TITLE	EQUIPMENT			
	A. T. & T. Standard				
SD-96200-01	Distributing Circuit	J95411AP J95411AR J95411AS	SD-96268-01	Incoming Trunk Circuit	J95411W
SD-96202-01	Incoming Trunk Circuit	J95411T	SD-96279-01	Incoming Trunk Circuit	J95411P
SD-96249-01	Subcenter Control Circuit	J95411AF J95411AN	SD-95777-01	Incoming Trunk Circuit	J95411S
SD-96250-01	Outgoing Trunk Circuit	J95411AJ J95411AM	SD-95959-01	Voice Alarm	J95415G
SD-96258-01	Incoming Trunk Circuit	J95411AH	SD-95255-01	Application Schematic-KS-16534 Recorder-Reproducer and Assoc. Audio Facilities	J95419S
SD-96259-01	Alarm Circuit	J95411AK J95411AL J95411AU		Mfr. Disc.	
SD-95974-01	Outgoing Trunk Circuit	J95411AW	SD-96199-01	Control Circuit	J95411AA
SD-95975-01	Incoming Trunk Circuit	J95411AY	SD-96203-01	Volume Indicator	J95411AE
				A & M Only	
			SD-96257-01	Timing Circuit	
			SD-96267-01	Manual Trunk Circuit	

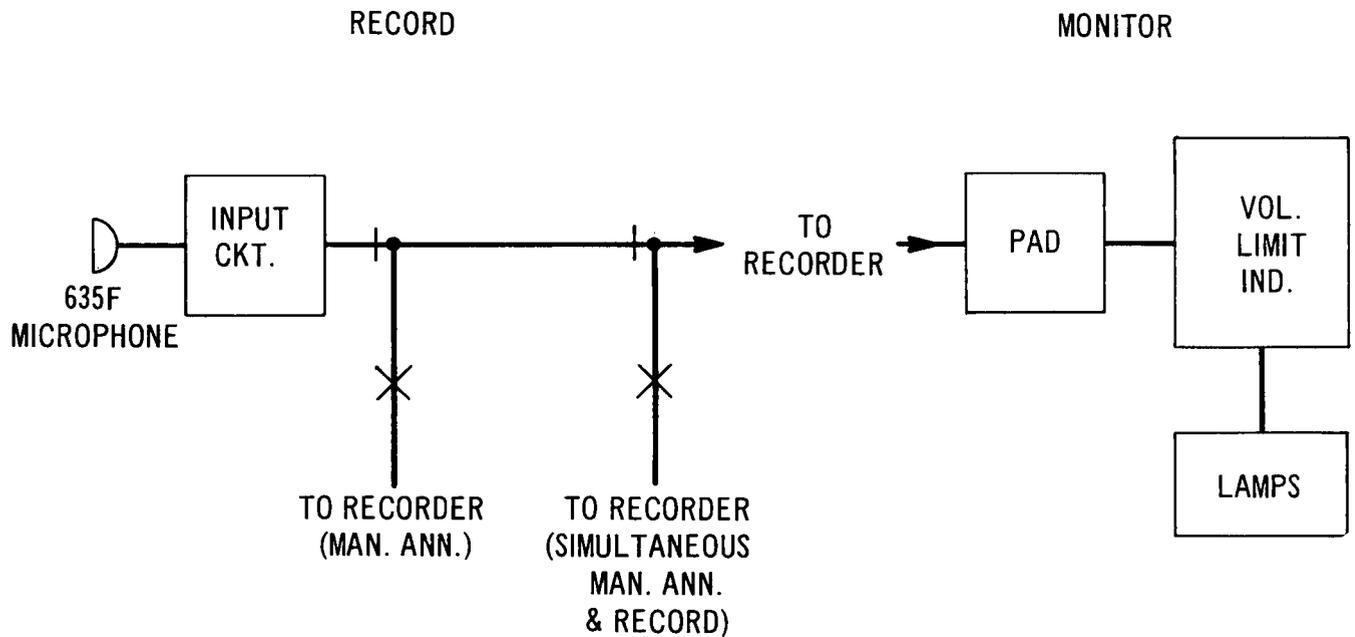


Fig. 2-3A Annunciation System Control and Recording Desk Part of SD-96199-01

SECTION TITLE

referred to as a "Volume Limit Indicator." If the recording meets the requirements set in the volume limit indicator, the recorder and amplifiers associated with it may be cut in on the distribution network of the announcement system. If the recording fails to meet these requirements, the apparatus cannot be cut in service, and the operator must make a new recording.

2.04 When the cut-in key located in the panel is operated, one channel is put in service and the other is used as a standby. The tape recorder and associated amplifiers which are in service are connected through a pad to the busbar to which all of the weather bureau announcement trunks are connected.

2.05 The arrangements for the revised equipment are shown in Fig. 3. They provide substantially the same operating features as the original equipment. Several changes in the announcement trunk circuits have also been made to synchronize cut-through functions to the announcement cycle and increase traffic handling capacity.

B. Transmission Features

2.06 The equipment is normally arranged to deliver a voice level of -24 vu to the amplifier in the recorder-reproducer unit, or -30 vu with KS-specification equipment. After the recording is made, it can then be connected to the busbar and reversed for monitor purposes. Shunt resistors are applied to simulate full loads for the monitor test.

2.07 Recording room noise must be kept at a low level so it will not be the controlling noise factor in the system. Room noise as measured

SECTION TITLE

with a sound meter should not exceed 40 to 45 db R.A.P. when using a 40-db weighting network.

3. MAIN CENTERS

A. Equipment Arrangements

3.01 There are three vintages of main center equipment. The original equipment is shown in Fig. 4. Two types of recorder-reproducers have been used. A revised arrangement which provided further improvements in recorder-reproducer machines and greater traffic handling capacity is shown in Fig. 5. A 1000-cycle supply is also furnished for testing purposes. A third revision to adjust transmission levels resulted in changes in equipment units as indicated in Fig. 6.

3.02 The arrangement per Fig. 6 is preferred, because the later model recorder-reproducers give better announcement quality, are more trouble free, and have more stable outputs. It also permits reductions in transmission levels to design objectives as stated in Section 852-520-100, and it is capable of greater capacity.

3.03 It has been customary to "borrow" a spare recorder-reproducer from the 3A system for use in emergency announcements. This practice cannot be followed with the KS-specification equipment per Fig. 5 or Fig. 6. Permanent recorder-reproducers are available for use with emergency systems.

3.04 The revisions per Fig. 6 consist primarily of removal of the 146J coil connecting the KS-16508 amplifier to the busbar and readjustment of "A" resistors in the subscriber trunk circuits. These operations may be done locally.

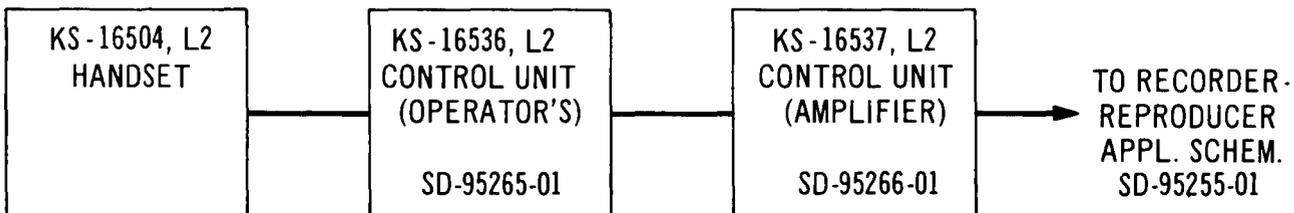


Fig. 3—3A Announcement System Control and Recording Equipment per SD-95255-01

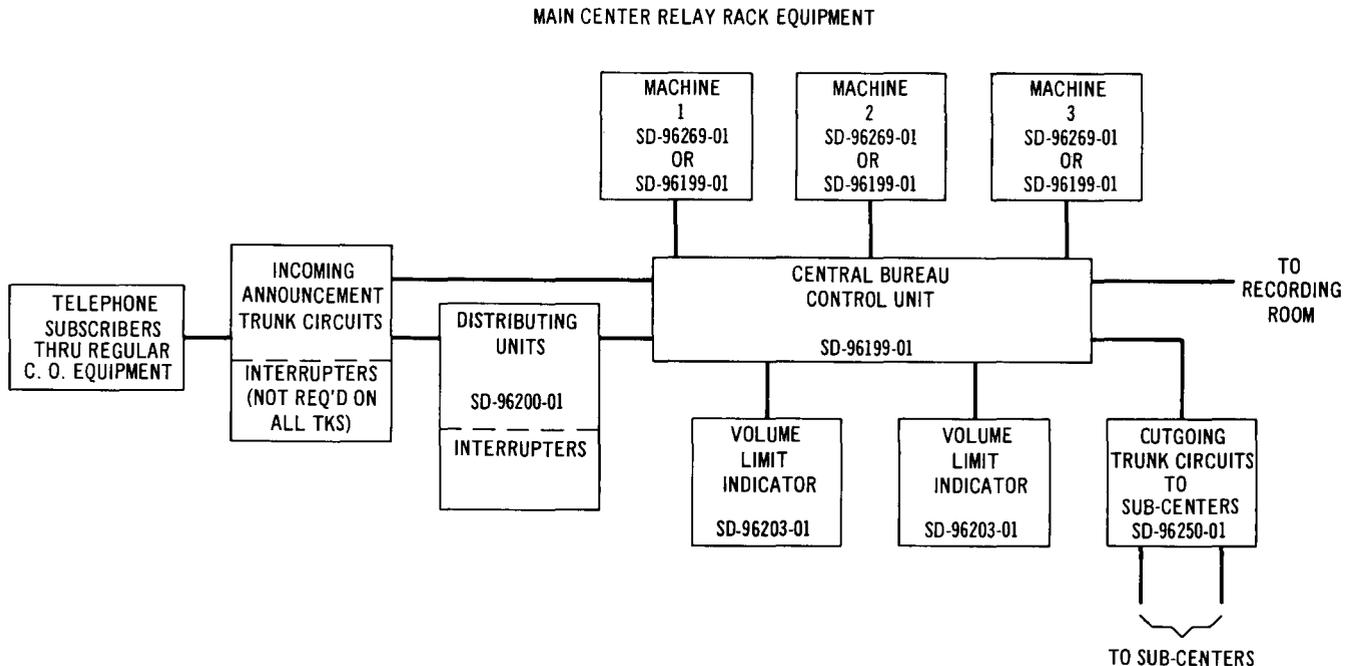


Fig. 4—3A Announcement System Main Center with Original Equipment Arrangement

B. Transmission Features

3.05 Figure 7 shows transmission levels for original equipment with automatic announcement. Resistance A in each announcement trunk circuit is adjusted in accordance with Part 3C to provide suitable levels into connected subscriber lines. The busbar impedance should be computed as discussed in Section 852-520-100. Resistance D should then be strapped to bring the busbar impedance down to 14 ohms. These adjustments should be made whenever trunk circuits are added or removed. After this work is done, transmission levels may be established. The recorder-reproducer should receive voice levels of -24 vu on recording, or -30 vu with KS-specification equipment. On automatic announcement, the recorder-reproducer should deliver the same levels to the power amplifier. The power amplifier is adjusted to provide voice level readings of $+9$ vu across the busbar as indicated with a standard vu meter. The volume limit indicator may then be adjusted to reduce amplifier output when it reaches $+9$ vu and to increase output when it drops to $+3$ vu.

3.06 Figure 8 shows transmission levels for original equipment arranged for manual announcement with simultaneous recording.

Adjustments are made as in 3.05; but, in addition, the control equipment should be adjusted to deliver -24 vu to the power amplifier. The recording circuit should be padded to simultaneously deliver -24 vu to the recorder.

3.07 When the main center is aligned in accordance with the above steps, a level reading of $+9$ vu at the busbar should produce a level of about -12 vu at the input of connected subscriber lines. The average loss of announcement trunk circuits plus trunks is adjusted to be about 21 db.

3.08 Figure 9 shows transmission levels for KS-specification equipment arranged for automatic announcement. Comparison with Fig. 7 shows that the line-up is essentially unchanged, except that the output of the recorder-reproducer is -30 vu.

3.09 Systems aligned in accordance with the above procedures do not meet system transmission objectives. The busbar levels and the levels delivered to subscriber lines are rather high. Arrangements may be made locally to meet system objectives. It is necessary to remove the 146J coil (SD-96200-01, Fig. 10) connecting the power amplifier to the busbar. The system may then be

MAIN CENTER RELAY RACK EQUIPMENT

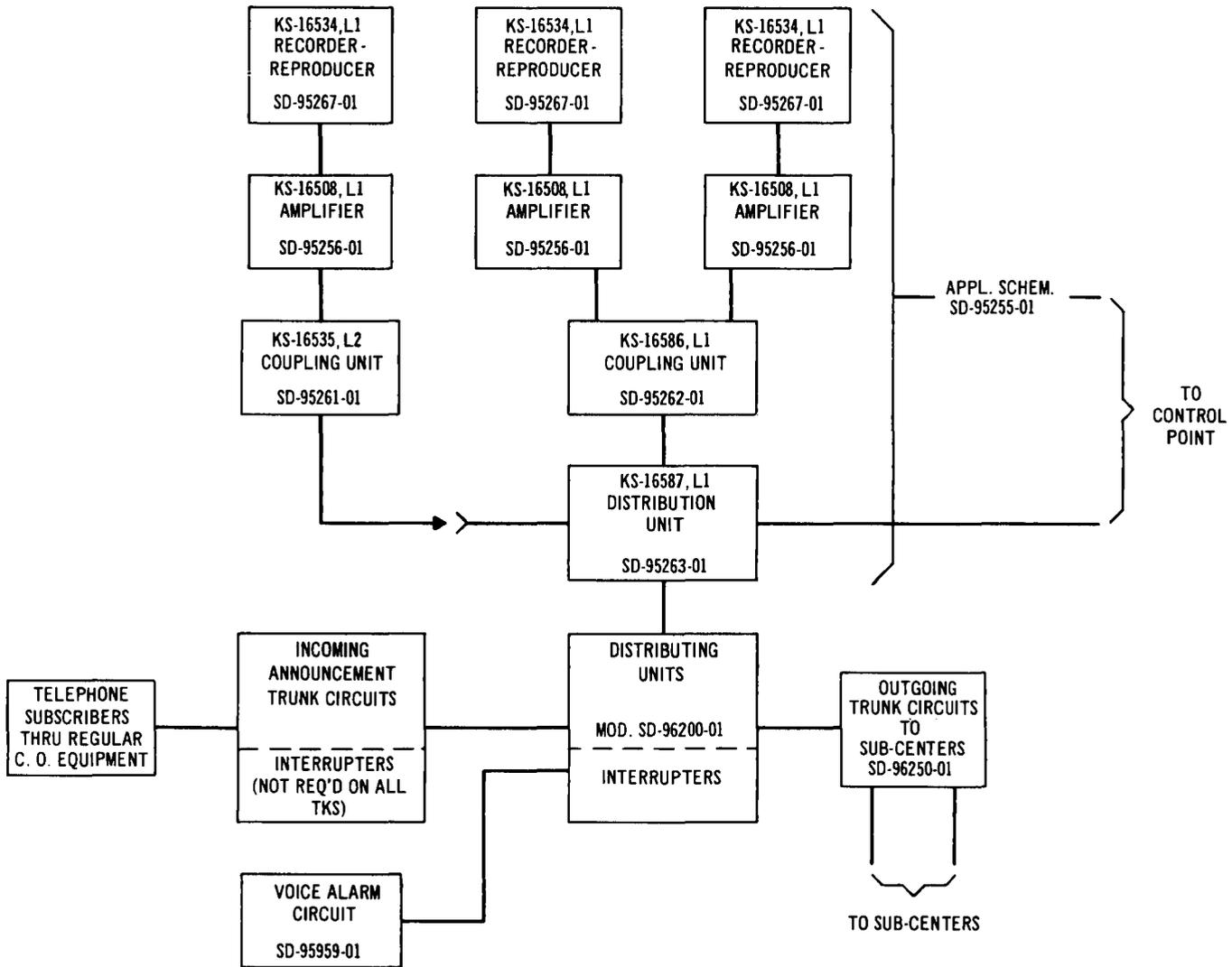


Fig. 5—3A Annunciation System Main Center with Replacement Equipment Arrangement

aligned to produce 0 vu as measured across the busbar. It is also necessary to readjust the alarm circuit to function at the lower level. The "A" resistances in the announcement trunk circuits must be restrapped in accordance with 3.16.

3.10 The speech volume at the busbar is checked by a volume limit indicator. When this volume limit indicator is connected across the busbar, it has associated with it means for adjusting the speech volume and for sounding an alarm in case

the speech volume falls below the "alarm" limit. If the volume at the busbar falls below the "transmission" limit for which this indicator has been set, a 3-db pad will be removed and the speech volume, as measured across the distributing busbar will be increased by about 3 db. If the speech volume drops below the "alarm" limit (6 db below the "transmission" limit), the tape recorder and the amplifier associated with it will be removed, and the standby recorder and amplifiers will be switched into service. The 3-db pad will be switched

MAIN CENTER RELAY RACK EQUIPMENT

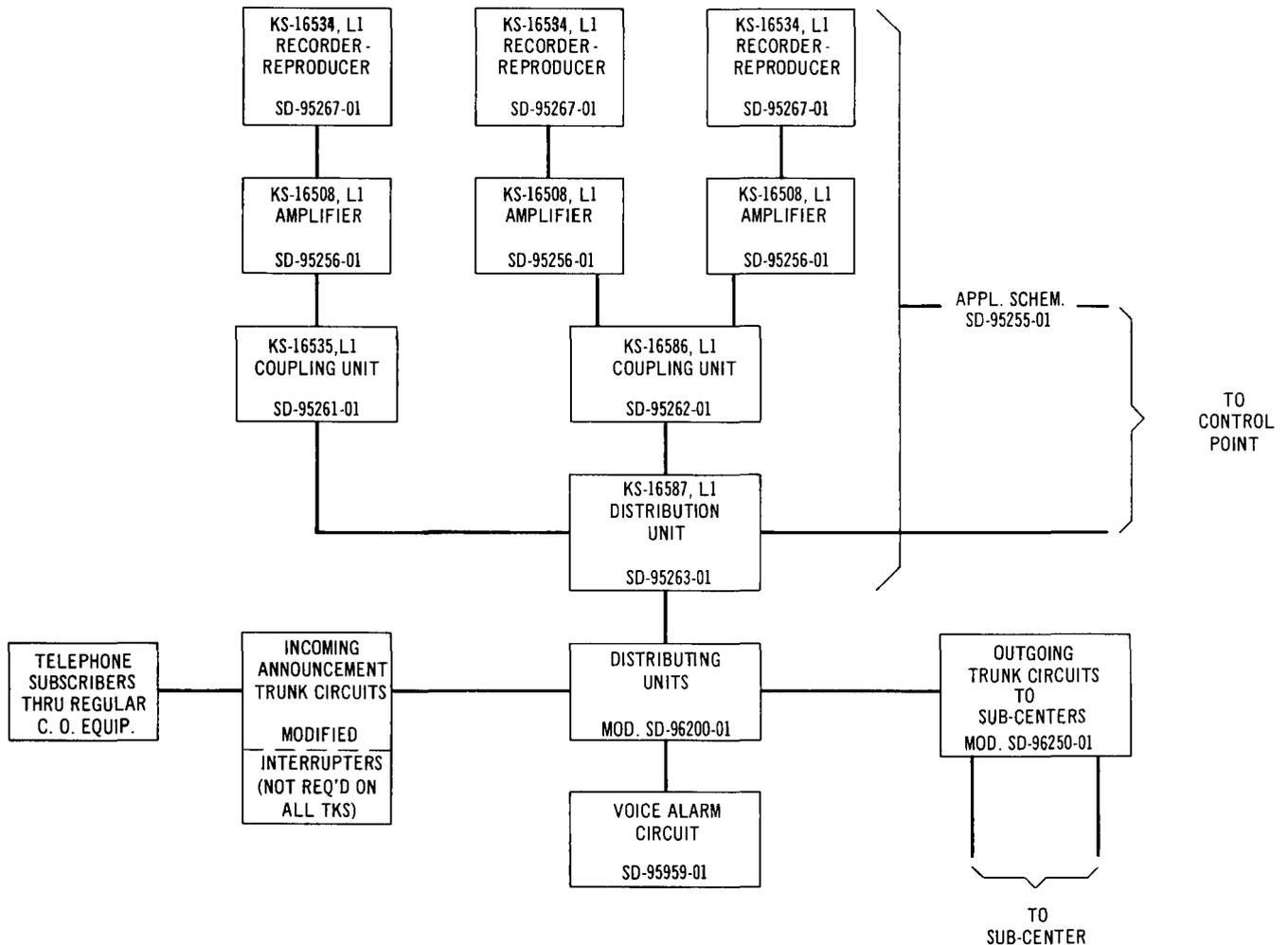


Fig. 6—3A Announcement System Main Center Modified for Revised Transmission Levels

back again when this second channel is put in service so that conditions will be the same as before except that in this case there is no standby. Should the volume on the busbar then fall below the transmission limit for which the circuit control has been set, the 3-db pad will again be removed. Following this, if the volume on the bus falls below the limit for which the alarm has been set, an alarm will be sounded. This alarm will notify the operating force that an equipment failure has occurred. In case of failure, an operator will announce manually until a satisfactory recording can be made from one of her announcements.

3.11 When transmission levels are adjusted to meet system objectives, the volume limit

indicator per SD-95959-01 should be adjusted to allow operation at the lower levels.

C. Regulation

3.12 The load that may be connected to the busbar must be controlled in order to prevent excessive change in level between no-load and full-load conditions. The procedure for controlling regulation in main centers lined up to +9 vu are contained in 3.13 through 3.15

3.13 The load factors for announcement trunk circuits are based on the strapping of the "A" resistor in the trunk circuit (SD-96279-01) as shown in Table II.

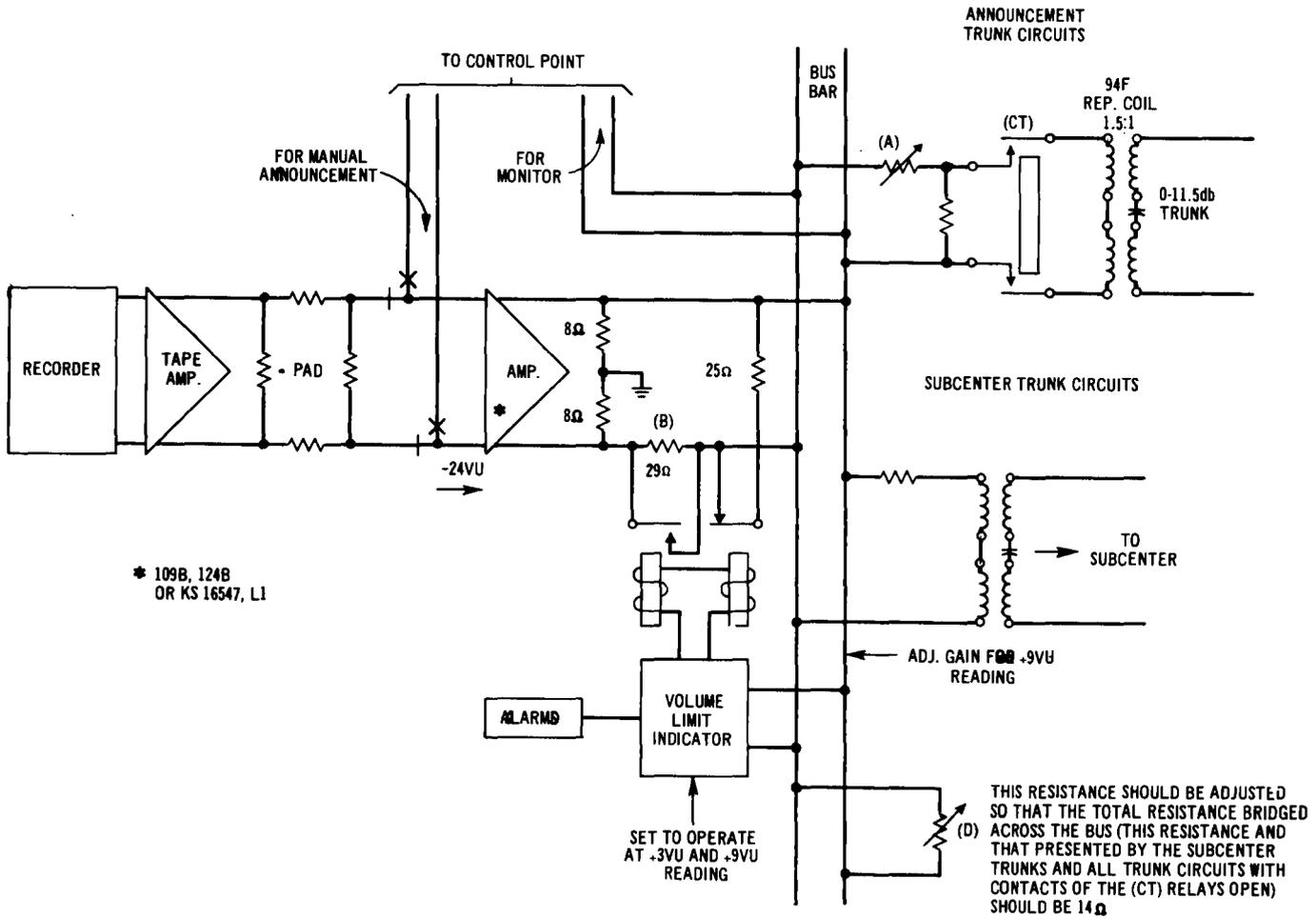


Fig. 7—3A Announcement System Transmission Diagram for Main Center with Original Equipment Arranged for Machine Announcement

3.14 The trunks are grouped either with regard to the 1000-cycle loss of the individual announcement trunks or with regard to the strapping of the (A) resistance in the associated announcement trunk circuit. The total number of allowable trunks is determined by multiplying the number of trunks in each group by the multiplying factor of the

group and by adding these products. The sum of these products should not exceed K, a constant, the value of which depends upon the number of subcenters associated with the distributing system. The constant, K, is 800. It is reduced by 17 for each additional subcenter.

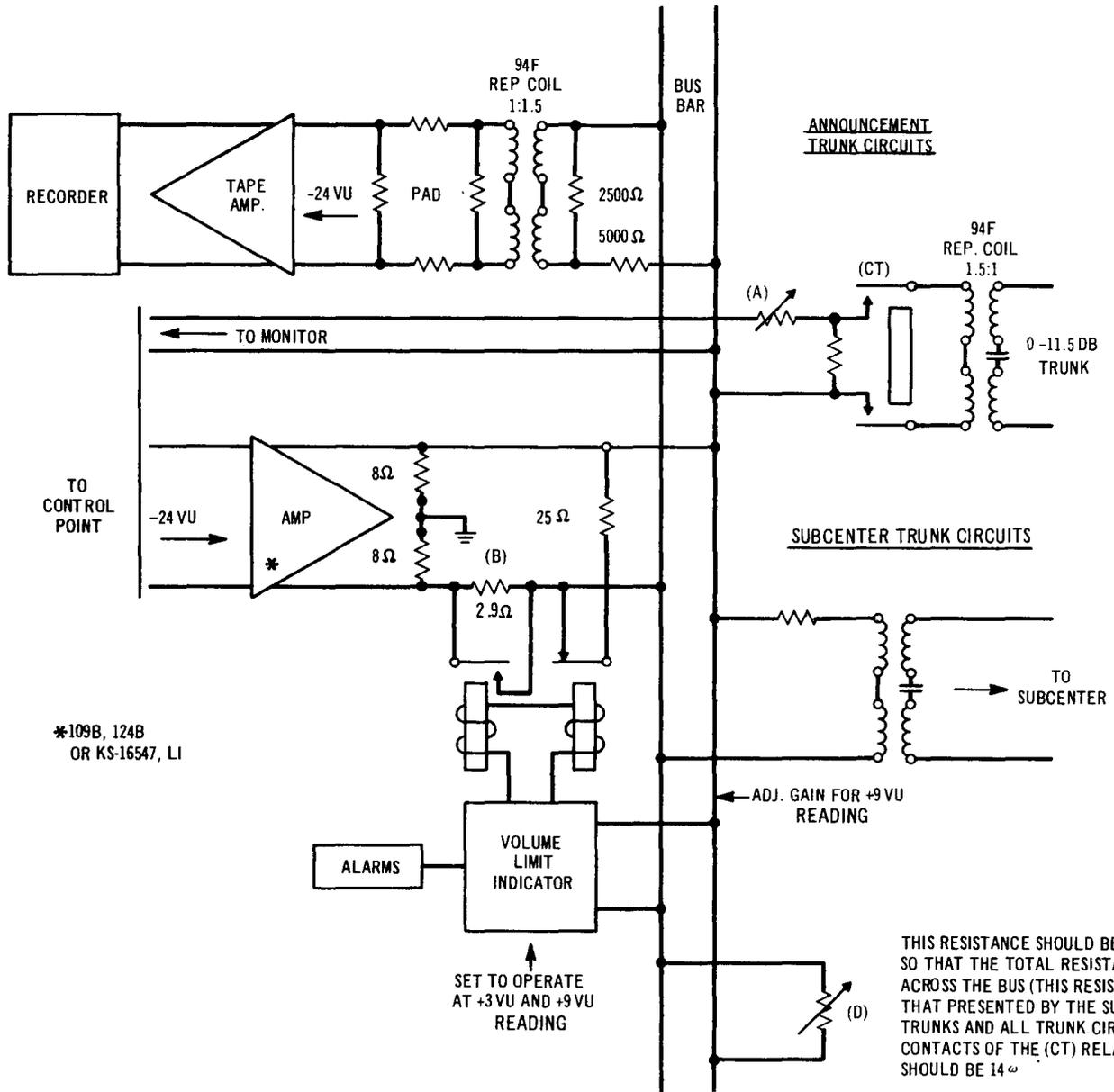


Fig. 8—3A Announcement System Transmission Diagram for Main Center with Original Equipment Arranged for Manual Announcement and Record

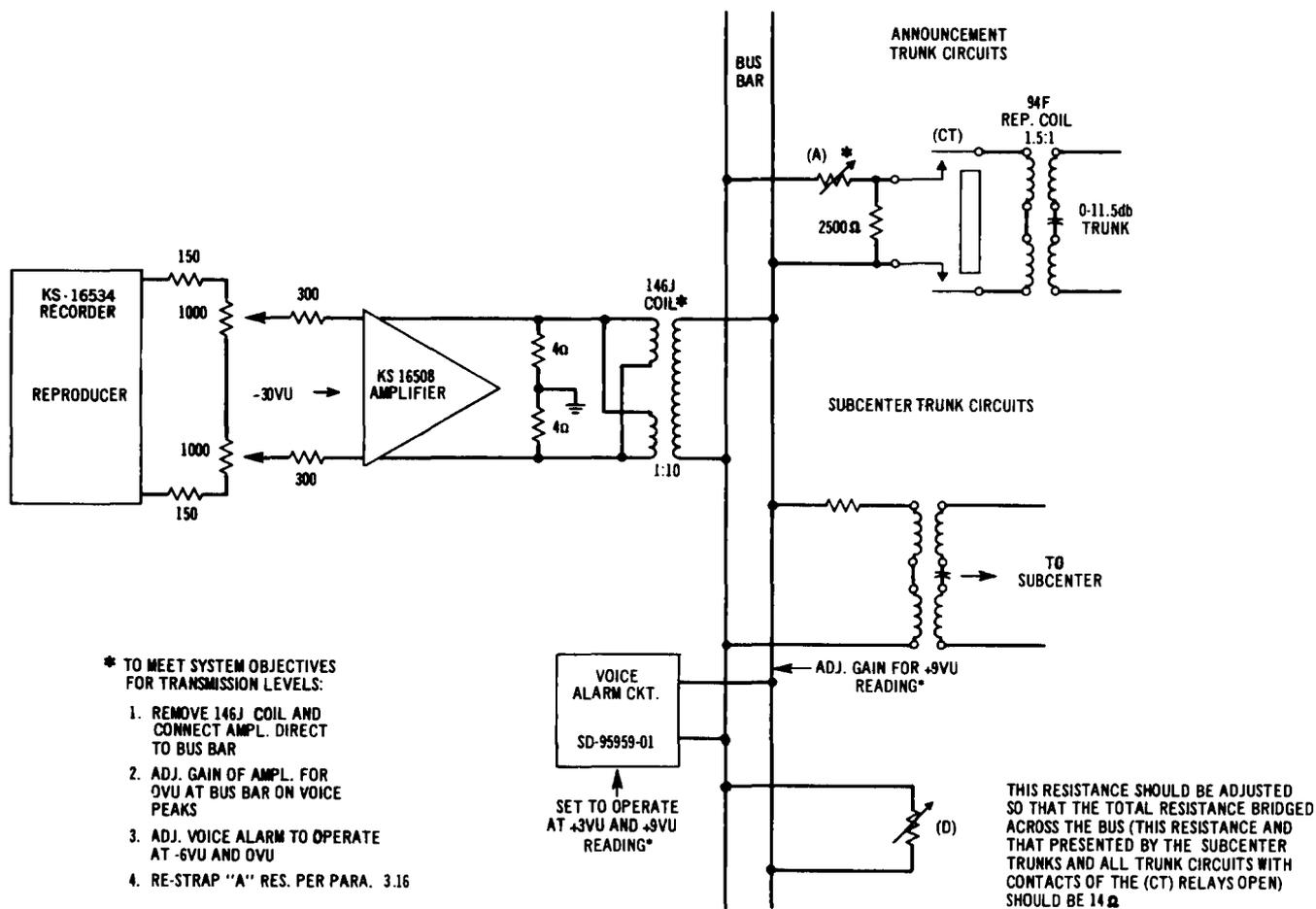


Fig. 9—3A Announcement System Transmission Diagram for Revised Equipment Arranged for Machine Announcement

TABLE II

TRUNK LOSS — DB	STRAPPING 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

3.15 An example of the method is given below:

Assume that it is desired to employ an announcement system consisting of 3 subcenters, and the main center will serve:

250	trunks	having	an	effective	loss	of	0.5	db
50	"	"	"	"	"	"	4.0	db
50	"	"	"	"	"	"	6.0	db
50	"	"	"	"	"	"	10.0	db

From Table II the following is obtained:

$$K = 250 + (1.5 \times 50) + (2 \times 50) + (3 \times 50) = 575$$

Since the sum should be equal to or less than 800, this arrangement would be satisfactory.

3.16 When the system is rearranged to meet system objective transmission levels, the "A" resistors in the announcement trunk circuits are restrapped, and the load factors are based on Table III. The trunks are grouped as before, and the maximum product sum of all trunks times their load factors must not exceed 800, including the first three pairs of tandem trunks. The factor of 800 is reduced by 17 for each additional pair of subcenter trunks.

TABLE III

TRUNK LOSS — DB	STRAPPING OF (A) RESISTANCE — OHMS	MULTIPLYING FACTOR
0-0.9	3500	1.3
1.0-1.9	3000	1.5
2.0-3.0	2500	1.7
3.1-4.8	2000	2.0
4.9-6.7	1500	2.4

3.17 When the above steps are followed, variations between no-load and full-load should not exceed about 1 db.

4. SUBCENTERS

A. Equipment Arrangements

4.01 Equipment arrangements as originally designed for subcenters are shown in Fig. 10A. Figure 10B indicates the units for which modifications have been provided to (1) permit reaching system objective transmission levels, (2) permit synchronization of cut-through functions to the announcement cycle for better handling of traffic, and (3) make use of loaded cable pairs and short-haul carrier channels as subcenter trunks.

4.02 The announcement trunk circuits connected to the subcenter are the same as those connected to the main center. The same transmission considerations will apply.

B. Transmission Features

4.03 A transmission level diagram for the subcenter using original equipment arrangements is shown in Fig. 11. The equipment is arranged to accept the voice levels delivered from the main center, amplify and combine signals from the dual subcenter trunks, and deliver the combined signals to the subcenter busbar at a level reading of +9 vu. The combining arrangement is used so the system will continue to operate, but at levels 6 db

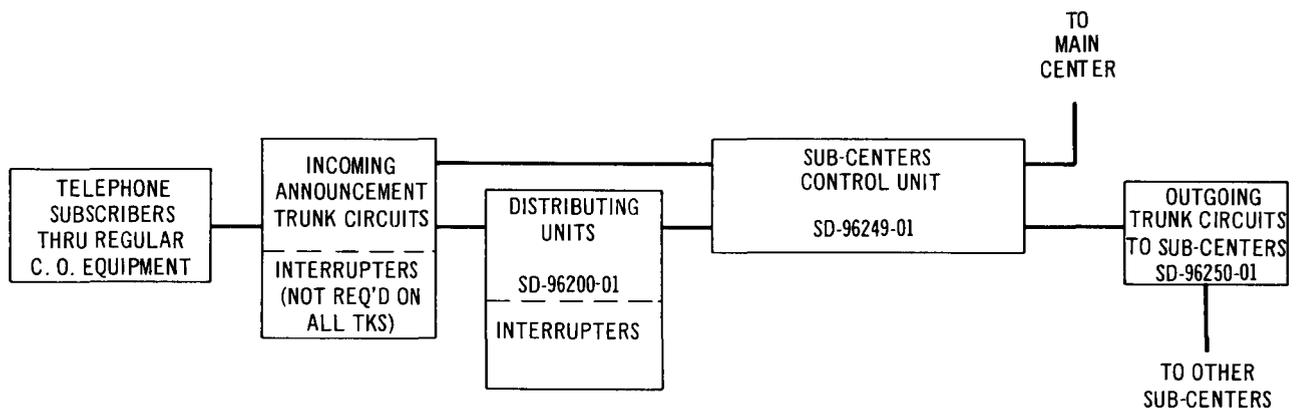


Fig. 10A—3A Announcement System Original Subcenter Equipment Arrangement

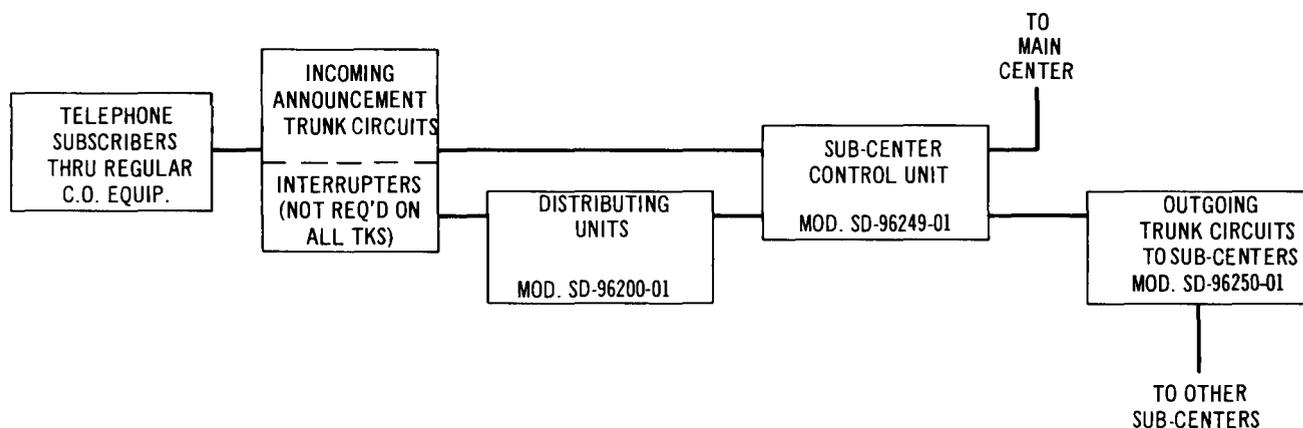


Fig. 10B—3A Announcement System Subcenter Equipment Modified for Improved Transmission and Traffic Handling

lower, if one of the amplifiers or subcenter trunks should fail.

4.04 In subcenters equipped with 23A equalizers, the equalizers should be adjusted in accordance with the appropriate section. The frequency response of the trunk with equalizer should meet the requirements established in Section 852-520-100. Where subcenter trunk circuits have been revised per Fig. 12, the equalizer can be eliminated. Subcenter transmission measurements should be made only after the requirements are met at the preceding subcenter and/or main center.

4.05 A modified arrangement is shown in Fig. 12. Rearrangement of the subcenter trunk terminations as discussed in Section 852-520-100 permits the use of loaded or nonloaded cable pairs (SD-95546-01) as well as short-haul carrier channels (SD-95975-01) and eliminates the need for 23A equalizers.

4.06 When main centers are rearranged to reduce main center busbar level readings from +9 vu and 0 vu, this should automatically reduce busbar level readings at the subcenters from +9 vu to 0 vu, because subcenter trunk transmission levels will be reduced. When these changes occur, the "A" resistances in the announcement trunk circuits at the subcenter should be restrapped per 3.16. When a subcenter serves as a tandem center for other subcenters, the transmission levels should also be adjusted at the other subcenters by restrapping the "A" resistors in the associated announcement trunk circuits per 3.16.

C. Regulation

4.07 The regulation requirements at subcenters are the same as those at distribution centers. For calculation of maximum connections at subcenters, Section 3C may be used.

5. SUBCENTER TRUNK DESIGN

5.01 The original announcement equipment provides only for the use of nonloaded cable facilities. A 23A equalizer is provided at the receiving end to permit the trunk being equalized so the loss up to 3000 cycles is not more than 1 db in excess of the loss at 1000 cycles. Trunk circuits for nonloaded facilities can be rearranged locally as discussed in Section 852-520-100. This will eliminate the need for the 23A equalizer, and it can be disconnected.

5.02 Loaded cable facilities and short-haul carrier channels may also be provided as discussed in the section mentioned above. When carrier channels are used, a 1C pad is required between the distributing equipment and the carrier channel to prevent overloading the carrier channel. When 3A systems are rearranged to reduce the busbar level reading from +9 vu to 0 vu, the 1C pad should be reduced in value by 9 db. These arrangements may also be accomplished by using the subcenters' trunk circuits for the 9A Announcement System.

5.03 The limitations and design consideration discussed in the general design section apply to subcenter trunks in 3A Announcement Systems.

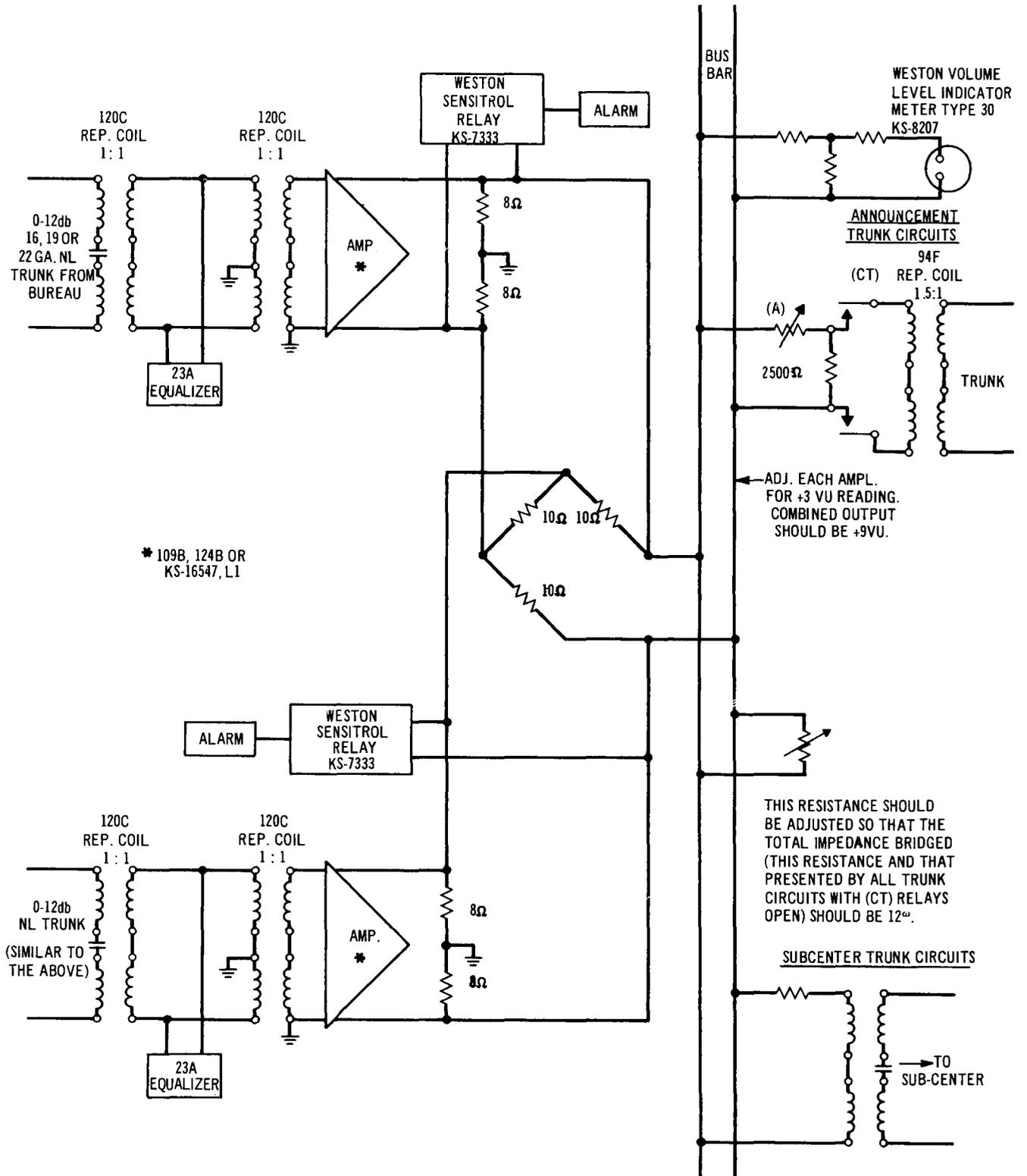


Fig. 11—3A Announcement System Transmission Diagram for Subcenter with Original Equipment Arrangements

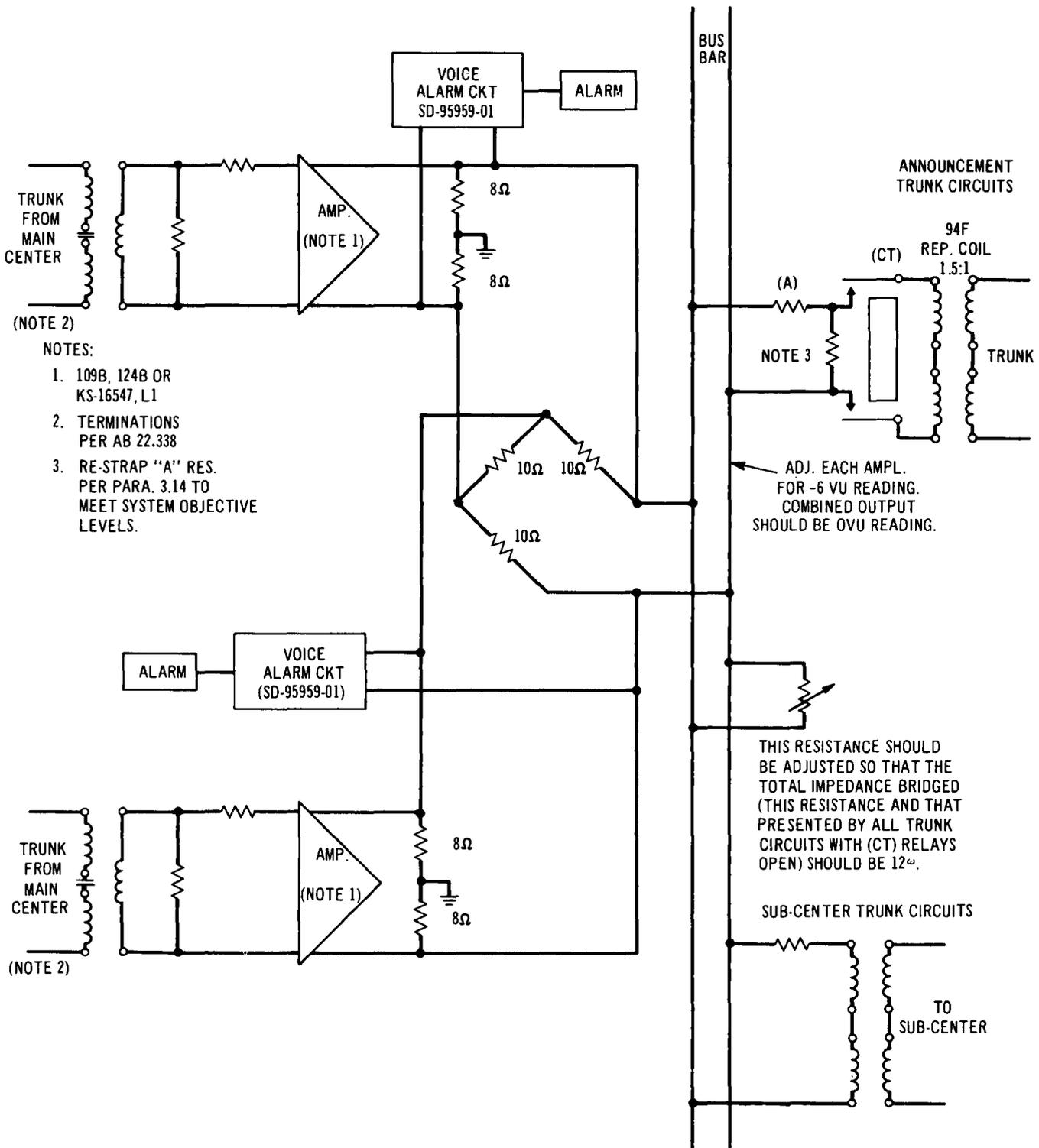


Fig. 12—3A Announcement System Transmission Diagram for Subcenter with Revised Equipment Arrangements

SECTION	TITLE	SECTION	TITLE
5.04	The number of subcenter trunks connected to a main center or subcenter affect the total connections that can simultaneously be made to the center busbar. For limitations, see Part 3C.		studies should be made as discussed in Section 852-520-100 and in accordance with Section 852-100-101 and sections of the AB61 series. In general, excessive crosstalk of this type will not occur if speech levels into cable pairs do not exceed 0 vu, and staggered twist cable is used. Cables including program circuits should be avoided if possible.
6.	ANNOUNCEMENT TRUNK DESIGN	8.	VOLUME
6.01	Announcement trunks to local offices, to local tandem offices, or to toll offices, meet the transmission design objectives for toll-connecting trunks.	8.01	Weather recordings are made while observing volume indicators and voice levels are controlled to keep signals as nearly as possible within a range of about 6 vu. Signals measured at distribution centers should range from about +3 vu to +9 vu, or -6 vu to 0 vu if the center has been modified to meet system objectives.
6.02	The number of announcement trunk circuits connected to a main center or subcenter affect the total connections that can simultaneously be made to the center busbar. For limitations, see Part 3C.	8.02	Due to additional variations in announcement trunk circuits, the range of variation may be increased to about 10 vu at the input to subscriber lines.
7.	CROSSTALK	8.03	Subcenter trunks are designed with the objective of obtaining a frequency response reasonably flat up to 3000 cycles. Dual channels are closely matched so cancellation can not occur at the higher frequencies. If subcenter trunk designs and subcentering policies are followed as specified in Section 852-520-100, volume variations should not increase to a point unacceptable to the subscriber.
7.01	Excessive crosstalk may occur in two forms. One apparent form is "talk-through" and occurs when a customer listening to the announcement also hears conversation from another simultaneously connected line. The "talk-through" loss is affected by the strapping of the "A" resistance in the announcement trunk circuit. Talk-through loss is greater than 60 db for trunk adjustments per 3.13, and nearly 60 db for adjustments per 3.16.		
7.02	Excessive crosstalk may occur due to the assignment of several announcement trunks or tandem trunks to a single cable. Crosstalk		