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COMMON SYSTEMS
VOICE ALARM CIRCUIT
FOR ANNOUNCEMENT SYSTEMS

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides a means for checking for the presence of an announcement on the announcement bus and indicating to the associated connecting circuit when there is an absence of voice on the announcement bus.

2. GENERAL DESCRIPTION OF OPERATION

2.01 During circuit seizure with relay ST operated, if voice is present on the announcement bus, the ALM relay will remain unoperated. If, for some reason, a voice failure occurs, relay ALM will operate after a delay of 0, 6, 19, 24, 34, 40, 50, or 55 seconds depending upon the timing options used on capacitor D. The ALM relay provides various leads to the associated connecting circuit which can be used as required to indicate a voice alarm.

2.02 The contacts of relay ST which connect to the circuits shown in Section III, 4., may be used as desired. One example would be a verification to the connecting circuit that the ST relay has operated and the alarm circuit is monitoring the announcement bus.

2.03 If, after a voice failure with relay ALM operated, sound of sufficient level should reappear on the announcement bus, the ALM relay will release after a short delay.

2.04 The delay time (straps A, B, or C) used in the circuit should be determined by the length of the announcement and should always be less than the length of the announcement.

2.05 The recorded announcement should, if at all possible, never be less than 7 to 8 seconds in order to avoid masking out a voice failure with the 6-second delay furnished by the C strap. The use of a 0- time delay should not be used on voice recordings because false alarms might result from the normal pauses inherent in speech recordings.

2.06 In order to provide satisfactory operation of the circuit, the following conditions should be observed:

(a) The person making the recording should start talking immediately upon getting a "go ahead and dictate" signal.

(b) The person making the recording should speak at as constant a level as possible and should keep the pauses between words as short as is practicable.

(c) The person making the recording should stop the recorder, or use whatever means is used to end a recording, immediately after the last spoken word.

SECTION II - DETAILED DESCRIPTION

1. CIRCUIT IDLE

1.01 With the ST relay normal, the D capacitor is charged from ground through resistor G to the junction of resistor F and regulator diode C. The base of transistor B is at ground through the G resistor and is normally cut off.

2. CIRCUIT SEIZED

2.01 When ground is connected to lead ST by the connecting circuit, relay ST operates. The operated ST relay:

(a) Closes an operate path for relay A.

(b) Removes resistance ground from the positive side of capacitor D.

(c) Transfers the D lead from lead F to lead E for use as desired in the connecting circuit.

(d) Transfers the B lead from lead J to lead H for use as desired in the connecting circuit.

(e) Connects lead C to lead K for use as desired in the connecting circuit.

(f) Connects lead G to the G resistor for use as desired in the connecting circuit.

(g) Transfers the negative side of capacitor D from the junction of resistor F and diode C to the same point through relay A.

(h) With option Q, relay ST also connects the MU2 lead to the G resistor.

2.02 With option Q, the Announcement Circuit connects ground on the MU1 lead to the MU2 lead at the end of the reproduce sequence. The ground on the MU2 lead is connected through resistor G to the D capacitor to replenish the charge on the D capacitor. At the start of the next announcement cycle, the ground is removed from the MU2 lead, thus allowing the circuit to function in the normal manner. The primary purpose of option Q is to reset capacitor D during the dead space period between the end of an announcement and the start of a subsequent announcement. With a short timing interval (6 seconds, strap C), a long delay could cause a false alarm to be brought in even if voice is present during the announcement reproduce cycle.

VOICE PRESENT ON ANNOUNCEMENT BUS

2.03 The audio signal across the T and R leads is stepped up by transformer A, tapped off by potentiometer A, and applied to the base of transistor A.

2.04 The signal will be amplified and rectified by transistor A and will build up in steps across the C capacitor. This voltage (positive with respect to ground) is in such a direction as to keep transistor B cut off and relay A normal.

2.05 The signal will also be applied to the D capacitor which remains in its charged state.

ABSENCE OF VOICE ON ANNOUNCEMENT BUS

2.06 When a voice failure occurs, the C and D capacitors start to discharge. The C capacitor loses its positive charge very quickly and starts charging in the opposite direction at a rate equal to the discharge time of capacitor D. With capacitor C charging in a negative direction with respect to ground, the B transistor starts to conduct and current flows through the A relay.

2.07 The current through relay A increases exponentially (based essentially on the time constant of capacitor and resistor D) and, when the operate value of relay A is reached, it operates. The operated A relay:

(a) Operates relay ALM.

(b) Removes ground from the A lead for use as desired in the connecting circuit.

2.08 The operated ALM relay:

(a) Transfers the AL8 lead from the AL9 lead to the AL7 lead as a voice failure indication when W option is provided.

(b) Removes ground from the AL lead as a voice failure indication.

(c) Connects ground to the AL1 lead as a voice failure indication.

(d) Transfers the AL3 lead from the AL4 lead to the AL2 lead as a voice failure indication.

(e) Connects ground to the AL6 lead as a voice failure indication.

(f) Opens the circuit between the MJ lead and lead AL5 as a voice alarm indication.

(g) Connects ground to the MJ lead as a voice failure indication.

RESTORATION OF VOICE ON ANNOUNCEMENT BUS

2.09 When voice is restored to the announcement bus, the circuit functions as described in 2.03 through 2.05. The negative charge on capacitor C slowly drops to 0 and then the capacitor starts charging in the opposite direction. The current through the B transistor decays as capacitor C, in discharging, reduces the forward bias on the B transistor. Eventually the release value of relay A is reached and relay A releases. The time from restoration of voice to release of relay A takes approximately 15 seconds when the A, B, and C straps are used, and approximately 2 seconds when strap C is used. After relay A releases, the C and D capacitors continue to charge to their normal value and polarity, and transistor B is cut off. The released A relay:

(a) Releases relay ALM.

(b) Connects ground to the A lead as an indication that voice is present on the announcement bus.

2.10 The released ALM relay:

(a) Transfers the AL8 lead from the AL7 lead to the AL9 lead as an indication that voice has been restored when W option is provided.

(b) Connects ground to the AL lead as an indication that voice has been restored.

(c) Removes ground from the AL1 lead as an indication that voice has been restored.

(d) Transfers the AL3 lead from AL2 to lead AL4 as an indication that voice has been restored.

(e) Removes ground from lead AL6 as an indication that voice has been restored.

(f) Closes the circuit between the MJ and AL5 leads as an indication that voice has been restored.

(g) Removes ground from lead MJ as an indication that voice has been restored.

2.11 The circuit is now back to normal.

3. DISCONNECT

3.01 When the associated connecting circuit no longer requests service, ground is removed from lead ST and relay ST releases. The released ST relay:

(a) Opens the operate path for relay A.

(b) Connects ground through resistor G to the D capacitor to maintain the charge on the D capacitor. If this charge is not maintained, relay A operates after each operation of relay ST.

(c) Transfers the D lead from lead E to lead F as an indication that the circuit is idle.

(d) Transfers the B lead from lead H to lead J as an indication that the circuit is idle.

(e) Opens the circuit between leads C and K as an indication that the circuit is idle.

(f) Removes lead G from the G resistor.

(g) Transfers the negative side of capacitor D from the junction of resistor F and diode C directly through relay A to the junction of resistor F and diode C.

(h) With option Q, relay ST also removes lead MU2 from the G resistor.

4. TIME DELAY THERMISTOR ALM

4.01 In theory, the circuit functions as described in 2.03 through 2.05. In actual use, however, with the fluctuations and pauses inherent in speech, the circuit functions somewhat differently.

4.02 While monitoring speech, the B transistor is cut off while audio is present and conducts when a pause occurs. The current through the A relay is fluctuating in step with the recorded speech as indicated by the fluctuating needle of a voltmeter placed across the winding of the A relay.

4.03 As soon as the speech is interrupted, the current through the A relay reverses because the discharge current of capacitor D flows through the A relay. If the voice is not restored, the current through the A relay eventually reverses and climbs in the opposite direction as transistor B goes toward saturation.

4.04 During a long pause, as just explained, the current through the A relay approaches the operate value. If a strong signal follows the pause, a surge of current is sent through the D capacitor which, because relay A is in the charge circuit, adds for an instant to the existing current flow (provided by transistor B) and causes relay A to operate momentarily. The strong signal causes transistor B to cut off and releases relay A after capacitor C has charged.

4.05 To avoid false voice alarms, use is made of the time-delay feature of a thermistor which increases the operate time of relay ALM. Although the A relay may operate occasionally, it does not remain operated long enough to overcome the heating time of the ALM thermistor.

5. ALIGNMENT PROCEDURE

5.01 Strap A, B, or C is connected to capacitor D before starting alignment. In order to avoid a long delay, strap C is preferred. One of the following steps is then taken:

(a) A volume-level indicator (Davens specification 1866 or equivalent) is connected across the T and R leads.

(b) The dB meter of a 21A transmission measuring set (21A TMS) (DET IN 600 jacks) is connected across the T and R leads with a suitable patch cord.

(c) A Hewlett-Packard VTVM Model 400D is connected across the T and R leads.

5.02 A voltmeter (Simpson Model 269 or equivalent) is connected across relay A (dc volts). A VTVM should not be used unless the power is obtained from internal batteries.

5.03 Connection is made from the T and R leads to the announcement bus and 1000-Hz test tone is fed to the announcement amplifier.

5.04 Ground is placed on the ST lead or relay ST is blocked operated.

5.05 The gain of the announcement amplifier is adjusted to 4VU less than required when feeding voice as measured on the VLI meter. If the 21A TMS or the VTVM is used, the VU designation should be changed to dB and read directly on the dB scale of the 21A TMS or VTVM. For example, in the 5A announcement system the nominal level of voice on the bus is -11VU. For the above step the adjusted amplifier output should be -15VU, -15 dB, or -15 dB when read on the VLI, 21A TMS, or VTVM, respectively.

5.06 Potentiometer A is adjusted until a voltage range of 6 to 7 volts is obtained on the voltmeter across the A relay. The voltmeter needle should remain stationary between 6 and 7 volts for approximately 10 seconds.

CHECKING SETTING AFTER ALIGNMENT

5.07 The gain of the announcement amplifier is reduced to 6VU or 6 dB less than required when feeding voice (2VU or 2 dB less than in 5.05). The voltmeter reading across relay A should be greater than 8 volts when the circuit stabilizes. Relays A and ALM should be operated.

5.08 The gain of the announcement amplifier is increased to required output level with tone still applied (nominal voice level of particular system). The voltmeter reading should be less than 3 volts when the circuit stabilizes.

CHECKING SETTING WITH VOICE

5.09 Ground is removed from the ST lead, or the ST relay is unblocked.

5.10 The 1000-Hz test tone is removed.

5.11 With the circuit still connected to the announcement bus, a voice recording is fed into the announcement amplifier at the nominal level of the particular system.

5.12 Ground is connected to the ST lead or ST operated is blocked. The voltage across the A relay will probably fluctuate but relay ALM should not operate.

5.13 Output of the announcement amplifier is adjusted to 6VU or 6 dB less than required as measured on the VLI, 21A TMS, or VTVM. The A relay should operate after a short interval. The delay time will be greater than the time specified for the particular strap on capacitor D because the latter time is based on a reduction of 20VU below the nominal level.

Note: The average of the peak readings of the pointer constitutes a reading on the volume level indicating meter. The 21A TMS and the VTVM covered previously do not provide satisfactory results when used with voice output.

5.14 Required output from the announcement amplifier is applied. The A and ALM relays should release after a short delay.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

None.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Designation	Meaning
A	Alarm
ALM	Alarm (auxiliary)
ST	Start

3. FUNCTIONS

3.01 Provides for checking the presence or absence of voice on the announcement bus.

3.02 Provides means for actuating the office alarm system after a predetermined time delay.

3.03 Provides for automatically resetting itself if the voice is restored to the announcement bus.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a keysheet, the connecting information thereon is to be followed.

(a) Announcement Connecting Trunk Circuit - SD-27047-01.

(b) Auxiliary Permanent Signal Holding Trunk Circuit - SD-99329-01.

(c) Control and Alarm Circuit - SD-95967-01.

(d) Announcement System No. 3A Announcement Distributing Circuit - SD-96200-01.

(e) Trunk Distributing and Alarm Circuit - SD-95976-01.

(f) Announcement System No. 3A Subcenter Incoming Trunk and Control Circuit - SD-95975-01.

(g) Emergency Announcement System Control Circuit - SD-95388-01.

(h) Announcement System No. 3A Trunk Circuit Outgoing to Subcenter - SD-96250-01.

(i) Announcement Circuit - SD-95283-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 With battery and ground connected to the circuit, the following tests should be made to ensure the proper functioning of the circuit before shipping and installation.

(a) With strap A connected, block relay ST operated. The ALM relay should operate in approximately 30 seconds. Release relay ST.

(b) With strap B connected, block relay ST operated. The ALM relay should operate in approximately 15 seconds. Release relay ST.

(c) With strap C connected, block relay ST operated. The ALM relay should operate in approximately 5 seconds. Release relay ST.

(d) With strap C still connected, turn the A potentiometer to the extreme clockwise position. Provide a 1000-Hz test tone at a level of approximately 0.5 -1 volt ac. Connect one side of the supply, in series with a 400- to 600-ohm resistor, to the T lead and the other side of the supply to the R lead.

5.02 Block relay ST operated. The ALM relay should not operate. Wait at least 10 seconds before releasing relay ST.

5.03 Turn the A potentiometer to the extreme counterclockwise position. Block relay ST operated. The ALM relay should operate in approximately 5 to 6 seconds. With relay ALM operated, turn the A potentiometer back to the extreme counterclockwise position. Relay ALM should release within a few seconds. Release relay ST.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus (Components)

B.1 Superseded	Superseded By
KS-14337 - Capacitor A	KS-20362, L3 - Capacitor A

D. Description of Changes

D.1 Option Q is added to permit a relay on the KS-16765, L2 announcement set to "reset" the D capacitor at the end of each reproduce sequence. This will prevent a false voice alarm indication that can occur if a long dead space exists between the end of an announcement and the start of a subsequent announcement and the short time delay option (strap C on capacitor D) is used.

D.2 The KS-14337 A capacitor, which is Mfr Disc., is superseded by the KS-20362, L3 A capacitor which is added.

D.3 Note 104 is expanded in reference to the above.

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