

KS-16534 RECORDER-REPRODUCER AND ASSOCIATED AUDIO FACILITIES ADJUSTING PROCEDURES

1. GENERAL

1.01 This section describes the method for adjusting the maximum available recording time; the tangency of the magnetic record-reproduce head; the voice-operated relay circuit; and the speech levels in the single-channel arrangement, SD-95254-01, and the dual-channel arrangement, SD-95255-01, of the KS-16534 recorder-reproducer and associated audio facilities. All of these adjustments are to be made at the time of installation of the announcement equipment. Some of the adjustments will be required when the maximum available recording time is changed, when components such as electron tubes are replaced, or when compensation must be made for normal variations and aging of the electron tubes in the record-reproduce amplifier.

1.02 The following adjustment procedures are described:

Single and Dual Channel

A. Maximum Available Recording Time:

This adjustment is made on the KS-16534 recorder-reproducer mechanism and involves positioning the head traverse rod limit switch, S6, to establish the maximum length of the announcement which can be recorded.

B. Dictate Lamp Flashing Interval: This adjustment is made on the KS-16534 recorder-reproducer mechanism and involves positioning the mercury switch, S5, to establish the point in the record cycle at which the local and remote dictate lamps begin to flash. Flashing of these lamps serves as a warning of the approach of the end of the available recording time.

C. Tangency of Record-Reproduce Head:

This adjustment is made on the KS-16534 recorder-reproducer mechanism and involves positioning the record-reproduce head in order to obtain optimum recording and reproducing characteristics.

D. Voice-Operated Relay Circuit: This adjustment is made on the KS-16508 amplifier and involves setting the OPERATE and RELEASE potentiometers to establish the working range of the voice-operated relay K2.

E. Record and Reproduce Speech Levels:

This adjustment is made on the KS-16508 amplifier and involves setting the RECORD GAIN and REPRODUCE GAIN potentiometers to establish the recording and reproducing speech levels for the announcement equipment.

Single Channel Only

F. Remote Speech Level: This adjustment is made on the KS-16535 coupling unit and involves setting the remote speech level potentiometer R14.

G. Local Speech Level: This adjustment is made on the KS-16535 coupling unit and involves setting the head telephone set speech level potentiometer R5.

Dual Channel Only

H. Dubbing Level: This adjustment is made on the KS-16586 coupling unit and involves setting the dubbing level potentiometer R12.

I. Remote Speech Level: This adjustment is made on the KS-16586 coupling unit and involves setting the remote speech level potentiometers R17 and R22.

J. Local Speech Level: This adjustment is made on the KS-16586 coupling unit and involves setting the head telephone set speech level potentiometer R9.

1.03 Some of the adjustments at the announcement equipment must be coordinated with procedures at the station control equipment. These are described in the Minor Station Sys-

tems section of the Station Operations Manual under the title, 8A and 9A Announcement Systems, Station Control Apparatus, Installation, Connections, Line-Up, and Maintenance.

1.04 Adjustment of the remote speech level will require two people, one at the announcement equipment in the central office and one at the sponsor's station control equipment. Telephone communication between the two people will be necessary.

1.05 For new installations it will be necessary to perform all of the adjustments described herein in the order shown.

1.06 In a previously adjusted system, Adjustments A, B, F, G, H, I, and J may be made independently. However, Adjustments C, D, and E affect all of the adjustments which follow them. In most cases when Adjustment A is made, it will be necessary to perform Adjustment B.

1.07 *Hazardous voltages* are present in the KS-16508 amplifier. The power switch in

the amplifier should be operated to the OFF position when making test connections.

1.08 When the amplifier power has been turned off for an appreciable length of time, a 5-minute warmup period should be provided before proceeding with the adjustment. For power interruptions of short duration, a shorter warm-up period should be satisfactory.

1.09 The abbreviations CW and CCW denote clockwise and counterclockwise respectively; VIM denotes the volume-indicating meter on the KS-16535 or KS-16586 coupling unit. In all cases, VIM readings referred to are on the upper scale of the meter.

2. APPARATUS

2.01 The apparatus required for each test is shown in Table I. The details of each item are covered in the paragraph indicated by the number in parentheses. In every case the equivalent of the specified apparatus may be used.

TABLE I

| APPARATUS | ADJUSTMENT | | | | | | | | | |
|-------------------------|------------|---|---|---|---|----|---|---|----|---|
| | A | B | C | D | E | F* | G | H | I* | J |
| Tool (2.02) | ✓ | ✓ | — | — | — | — | — | — | — | — |
| Stop Watch (2.03) | ✓ | ✓ | — | ✓ | — | — | — | — | — | — |
| Oscillator (2.04) | — | — | ✓ | — | — | — | — | — | — | — |
| Cord (2.05) | — | — | ✓ | — | — | — | — | — | — | — |
| Meter (2.06) | — | — | ✓ | — | — | — | — | — | — | — |
| Cord (2.07) | — | — | ✓ | — | — | — | — | — | — | — |
| Tool (2.08) | — | — | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Meter (2.09) | — | — | — | ✓ | — | — | — | — | — | — |
| Cord (2.10) | — | — | — | ✓ | — | — | — | — | — | — |
| Tool (2.11) | — | — | — | ✓ | — | — | — | — | — | — |
| Tool (2.12) | — | — | — | ✓ | — | — | — | — | — | — |
| 1000~ —80 Source (2.13) | — | — | — | ✓ | ✓ | — | — | ✓ | — | — |
| Cord (2.14) | — | — | — | ✓ | ✓ | — | — | ✓ | — | — |
| Resistor (2.15) | — | — | — | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Head Telephone Set | — | — | — | — | — | — | ✓ | — | — | ✓ |

* Refer to the section mentioned in 1.03 for apparatus required at the station control equipment location.

- 2.02 R-2485 Allen socket screw wrench.
- 2.03 KS-3008 stop watch.
- 2.04 Oscillator, Hewlett-Packard, 200-type.
- 2.05 Testing cord equipped with a No. 327A plug at one end and terminated as required at other end (for connecting oscillator to EXTERNAL SPEECH jacks on coupling unit).
- 2.06 Electronic voltmeter, Ballantine, Model 300, or Hewlett-Packard, 400-type.
- 2.07 Testing cord (for connecting electronic voltmeter to oscillator).
- 2.08 3-inch C screwdriver (for potentiometer shaft).
- 2.09 KS-14510, List 1 volt-ohm-milliammeter or
20,000 ohms-per-volt voltmeter
(for measuring less than 10 volts dc) and a continuity tester (for checking relay contact operation).
- 2.10 Testing cord (for connecting KS-14510, List 1 meter to wiring terminals of U-type relay).
- 2.11 No. 47 tool (for potentiometer shaft lock-nut).
- 2.12 4-inch screwdriver (for amplifier cover mounting screws).
- 2.13 1000-cycle supply attenuator circuit, J95419S (SD-95254-01, Fig. 12, or SD-95255-01, Fig. 13). This unit provides a fixed 1000-cycle signal at a level of -30 dbm (0.025 volt).
- 2.14 Patching cord, P4H cord, 6 feet long, equipped with two No. 327A plugs (No. 4P18C cord) (for patching 1000~ -30 jacks on attenuator unit to EXTERNAL SPEECH jacks on coupling unit).
- 2.15 KS-14603, List 1A, 1.96-ohm resistor (± 5 per cent, 5 watts).

Note: This resistor is required under the following conditions:

Single Channel — If office records show that the equivalent load impedance on the T and R leads (terminals 22 and 23 on TB1 in the KS-16535 coupling unit) to the Distributing Circuit is less than 5 ohms at 1000 cycles.

Dual Channel — If terminals 43 and 71 on TB1 in the KS-16586 coupling unit are strapped.

3. PREPARATION

All Adjustments

3.01 Take the announcement equipment out of service and arrange for local control. Operate ALARM DISABLE key(s) on coupling unit.

Adjustments D, E, F, G, H, I, and J

3.02 If 1.96-ohm resistor is required (see 2.15):

Single Channel — Connect resistor across terminals 65 and 66 on terminal board TB1 in KS-16535 coupling unit. Connections shall be made solidly to eliminate contact resistance.

Dual Channel — Connect resistor across terminals 53 and 54 on terminal board TB1 in KS-16586 coupling unit. Connections shall be made solidly to eliminate contact resistance.

4. METHOD

A. Maximum Available Recording Time

4.01 The maximum available recording time is determined by the position of the head traverse rod limit switch, S6, on the calibrated mounting strip (left side as viewed from the rear) to which it is assembled. Each division on the mounting strip corresponds to approximately 1/2 minute of recording time. The maximum available time is adjustable for intervals corresponding to an integral number of revolutions of the recording drum. One drum revolution requires approximately 6-1/2 seconds.

4.02 Remove mechanism rear cover and, using the R-2485 wrench, loosen the two socket head screws and slide S6 switch assembly to a

position which causes the rear edge of the clamping plate to intersect the scale on the mounting strip at the point corresponding to the desired maximum recording time. Tighten the screws.

4.03 Initiate a record cycle (operate DICTATE key on coupling unit to BARGE-IN position) and time the length of the cycle from the time the DICTATE lamp lights until the cycle is terminated by the operation of switch S6. Re-adjust the position of S6 switch assembly slightly, if necessary.

Note: It is important in dual-channel installations that this adjustment be made in such a way that:

(a) The maximum available recording time is at least one drum revolution longer than the longest announcement to be encountered in service. Operation of switch S6 during either recording or reproducing in dual-channel operation will establish an alarm condition.

(b) The maximum time setting on both mechanisms results in exactly the same number of revolutions of the recording drum. If this requirement is not met, a false alarm condition may be established during a dubbing operation.

B. Dictate Lamp Flashing Interval

4.04 The mercury switch, S5, is mounted on the calibrated mounting strip at the right side of the mechanism as viewed from the rear. It is actuated by the permanent magnet which is part of the variable limit switch assembly.

4.05 With mechanism rear cover removed, loosen the two socket head screws, using the R-2485 wrench, and position the S5 switch assembly clamping plate slightly toward the rear of the mechanism with respect to limit switch S6 clamping plate.

4.06 Initiate a record cycle (operate DICTATE key on the coupling unit to BARGE-IN position) and time the interval between the first flash of the DICTATE lamp and the end of the record cycle. (The DICTATE lamp flashes 6 times per revolution of the drum or approxi-

mately once per second.) Suggested intervals are shown in Table II. Continue adjusting and timing until the desired flashing interval is obtained.

TABLE II

| MAXIMUM AVAILABLE RECORDING TIME | | DICTATE LAMP FLASHING INTERVAL |
|----------------------------------|------------------|--------------------------------|
| Seconds (Approx) | Drum Revolutions | Seconds (Approx) |
| 19 | 3 | 10 |
| 26-58 | 4-9 | 15 |
| 65-117 | 10-18 | 20 |
| over 117 | over 18 | 25 |

4.07 Tighten the two screws and replace the mechanism rear cover.

4.08 Repeat the adjustment for the second mechanism in dual-channel installations.

C. Tangency of Record-Reproduce Head

4.09 For optimum recording and reproducing characteristics, it is essential that the record-reproduce head be accurately positioned with respect to the recording band on which it rests. The head will be approximately in the correct position if an imaginary vertical center line through it is perpendicular to the band at the point of tangency.

4.10 Remove the mechanism front cover and, with the mechanism idle, observe the position of the head. If necessary, carefully turn the thumbscrew on the head assembly in or out to bring the head as close as possible to the required position.

4.11 Connect the oscillator to the EXTERNAL SPEECH jacks in the coupling unit and adjust to 3000 cycles. Adjust the signal level to approximately 0.025 volt.

4.12 Remove the plug buttons from the access holes for the RECORD GAIN and REPRODUCE GAIN controls in the front cover of the amplifier.

4.13 Operate DICTATE key (associated with channel 1 or 2 in dual-channel installations to BARGE-IN position. After DICTATE lamp lights, adjust RECORD GAIN control to give a reading of 0 on VIM. Record for approximately 5 drum revolutions; release DICTATE key.

4.14 Operate ANNOUNCE key, and after ANNOUNCE lamp lights, adjust REPRODUCE GAIN CONTROL to give a reading of approximately -6 on VIM.

Note: If this reading cannot be obtained, repeat the tangency adjustment procedures outlined in 4.9 and 4.10, rerecord the 3000-cycle tone as outlined in 4.13, and initiate another announce cycle.

4.15 While the announce cycle is in progress, turn the head-adjusting thumbscrew to obtain a maximum reading on VIM. If VIM needle goes off scale, turn REPRODUCE GAIN control CCW to bring the needle on scale. The best tangency adjustment is obtained when VIM reading is reduced by an equal amount for equal rotation of the thumbscrew in either direction.

4.16 *Single Channel* — Release ANNOUNCE key, disconnect oscillator, and replace the mechanism front cover.

Dual Channel — Release ANNOUNCE key and replace the mechanism front cover. Operate LOCAL CONTROL key to the other channel and repeat the adjustment for the second mechanism. Release ANNOUNCE key, disconnect oscillator, and replace the mechanism front cover.

D. Voice-Operated Relay Circuit

4.17 The level controls, which are identified by the stampings OPERATE and RELEASE, are accessible from the rear for KS-16508, List 1 amplifiers and from the front (with cover removed) for list 2 amplifiers.

Caution: Hazardous voltages on relay winding and other components of the amplifier. Operate power switch to OFF position before proceeding.

4.18 Remove the amplifier front cover. Using the No. 47 tool, loosen the locknuts on the shafts of both potentiometers. Turn both shafts to extreme CCW position.

4.19 Connect the KS-14510 meter across terminals 2BR and 5TF of relay K2 in the amplifier. Terminal 5TF is the positive terminal.

4.20 Operate power switch to ON position and allow amplifier to warm up. Slowly turn RELEASE control CW until a voltmeter reading of 3.5 volts dc is obtained. (Set the voltmeter to a low voltage scale in order to obtain an accurate adjustment.) Lock RELEASE control at this setting by tightening the locknut on the shaft. Verify that voltmeter reading is 3.5 ± 0.1 volts after locking shaft.

4.21 Operate power switch to OFF and disconnect the meter from winding terminals of relay K2. With the selector switch set for OHMS, connect the meter to terminals 11 and 12 of terminal strip TB2. Operate power switch to ON.

4.22 Remove mechanism front cover; with the 1000-cycle supply patched to EXTERNAL SPEECH jacks, operate DICTATE key to BARGE-IN position. After DICTATE lamp lights, operate PWR switch on the mechanism to OFF position. Adjust amplifier RECORD GAIN control to give a reading of -6 on VIM.

4.23 *Very slowly* turn OPERATE control CW until relay K2 just operates as indicated by short circuit across terminals 11 and 12.

4.24 Rapidly turn RECORD GAIN control to CCW to OFF position. After an interval of 8 to 14 seconds, relay K2 shall release as indicated by an open circuit between terminals 11 and 12.

4.25 *Very slowly* turn RECORD GAIN control CW to give a reading of -7 on VIM. Relay K2 shall not operate. If relay K2 operates for -7 reading, turn RECORD GAIN control CCW to release K2, turn OPERATE control CCW a small amount, readjust RECORD GAIN control to give a reading of -6 on VIM, observe

that K2 does not operate, and repeat 4.23, 4.24, and 4.25.

Note: In making this adjustment, care should be taken to avoid overshooting the -7 reading, as this may result in operation of relay K2. If this happens, reduce gain, wait for relay to release, and *very slowly* readjust gain to -7.

4.26 *Very slowly* continue turning RECORD GAIN control CW until VIM reads -5. Relay K2 shall operate. If relay K2 does not operate, readjust RECORD GAIN control to give a reading of -6 on VIM and repeat 4.23, 4.24, and 4.25.

4.27 Turn RECORD GAIN control CW until VIM reads 0. After a few seconds, rapidly turn RECORD GAIN control CCW until VIM reads between -10 and -20. Relay K2 shall release in 8 to 14 seconds.

4.28 Lock OPERATE control at this setting by tightening the locknut on the shaft, being careful not to disturb the setting.

4.29 Operate PWR switch of the recorder-reproducer mechanism to ON position. Release DICTATE key. Disconnect meter and replace the amplifier and mechanism covers.

4.30 Repeat the adjustment for the second channel in dual-channel installations.

E. Record and Reproduce Speech Levels

Note: In dual-channel installations, the channel being adjusted should be in the "on-line" condition.

4.31 With the 1000-cycle supply patched to EXTERNAL SPEECH jacks, operate DICTATE key to BARGE-IN position. When DICTATE lamp lights, adjust RECORD GAIN control to give a reading of 0 on VIM.

4.32 With RECORD GAIN control adjusted, release DICTATE key momentarily and reoperate to BARGE-IN position. Record the 1000-cycle tone for approximately 5 drum revolutions and release DICTATE key.

4.33 Operate ANNOUNCE key and adjust REPRODUCE GAIN control so that the maximum deflections of the VIM needle just reach the 0 mark. Release ANNOUNCE key, remove patching cord, and replace plug buttons in amplifier front cover.

4.34 In dual-channel installations, operate TRANSFER key to BARGE-IN position momentarily to transfer the second channel to the "on-line" condition and repeat the adjustment for this channel.

F. Remote Speech Level (Single Channel)

4.35 Potentiometer R14 is mounted on a bracket at the top of the coupling unit behind the hinged front panel.

4.36 This adjustment must be coordinated with the adjusting procedure at the station control equipment (see 1.03).

4.37 With key on coupling unit in REMOTE CONTROL position, advise the person at the remote location to record 1000-cycle tone. While recording is in progress, adjust potentiometer R14 to give a reading of 0 on VIM.

Note: The reading on the recording-level indicator of the operator control unit will vary if R14 is adjusted over a wide range, and readjustment of the signal level at the station control equipment will be required.

4.38 Repeat the recording procedure and verify that VIM reads 0 without readjusting R14.

Note: False alarm conditions may be established during operation unless this requirement is met.

4.39 Record a test announcement from the station control equipment. Alignment is correct if speech peaks, which deflect the needle of the recording level indicator in the operator control unit to the boundary line between the green and upper red regions, cause the VIM needle to deflect to the 0 mark.

G. Local Speech Level (Single Channel)

4.40 Potentiometer R5 is mounted on a bracket at the top of the coupling unit behind the hinged front panel.

4.41 Plug the head telephone set into the OPERATORS HEADSET jacks in the coupling unit. With key in LOCAL CONTROL position, operate DICTATE key to BARGE-IN position, and after the DICTATE lamp lights, record an announcement using the head telephone set transmitter. While observing the VIM needle deflections during the record cycle, adjust R5 until needle deflects to 0 mark on strong syllables, with occasional peak deflections (one every several seconds) going beyond the 0 mark.

4.42 Remove the head telephone set, secure the coupling unit front panel, and disconnect the 1.96-ohm resistor, if provided, from terminals 65 and 66 of terminal board TB1 in the coupling unit.

H. Dubbing Level (Dual Channel)

4.43 Potentiometer R12 is mounted on a bracket at the top of the coupling unit behind the hinged front panel.

4.44 Determine that both channels meet the requirements of Adjustment E.

4.45 With channel 1 on line and LOCAL CONTROL key in CHANNEL 1 position, operate DICTATE key to BARGE-IN position and record the 1000-cycle tone for approximately 5 drum revolutions. VIM should read 0 during recording.

4.46 Release DICTATE key and operate ANNOUNCE key. Maximum deflections of VIM needle should be to 0 mark. Release ANNOUNCE key.

4.47 Operate LOCAL CONTROL key to CHANNEL 2 position, and operate DUBBING key momentarily to dub the channel 1 recorded tone on channel 2. During the dubbing cycle, adjust potentiometer R12 to give a maximum needle deflection of 0 on VIM. At end of dubbing cycle, operate channel 2 ANNOUNCE key and observe that the level of the dubbed

signal results in a maximum needle deflection of 0 on VIM. Release ANNOUNCE key.

4.48 With channel 2 on line, record the 1000-cycle tone on channel 2 and dub it on channel 1. VIM should read $0 \pm 1/2$ db during recording and dubbing without requiring readjustment of R12. Since needle deflections outside these limits may cause false alarm conditions to be established during operation, this requirement must be met.

I. Remote Speech Level (Dual Channel)

4.49 Potentiometers R17 and R22 are mounted on a bracket at the top of the coupling unit behind the hinged front panel.

4.50 The adjustment of potentiometer R22 must be coordinated with the adjusting procedure at the station control equipment (see 1.03).

4.51 With key in REMOTE CONTROL position, LOCAL CONTROL key in CHANNEL 1 position, and channel 1 locked on line, advise the person at the remote location to record 1000-cycle tone. While recording is in progress, adjust potentiometer R22 to give a reading of 0 on VIM.

Note: The reading on the recording level indicator in the operator control unit will vary if R22 is adjusted over a wide range, and readjustment of the signal level at the station control equipment will be required.

4.52 Repeat the recording procedure and verify that VIM reads 0 without readjusting R22.

Note: False alarm conditions may be established during operation unless this requirement is met.

4.53 Potentiometer R17 controls the monitoring speech level at the station control equipment. Adjustment of R17 is made under direction of the person at the station control equipment while reproducing the 1000-cycle tone which met the requirement of 4.52. Observe that the VIM needle deflects to a maximum of 0.

4.54 With channel 2 locked on line, repeat the procedure without readjusting R22 as a check on the performance of the second channel. VIM should read $0 \pm 1/2$ db during recording.

4.55 Record a test announcement from the station control equipment. Alignment is correct if speech peaks, which deflect the needle of the recording level indicator of the operator control unit to the boundary line between the green and upper red regions, cause the VIM needle to deflect to the 0 mark.

J. Local Speech Level (Dual Channel)

4.56 Potentiometer R9 is mounted on a bracket at the top of the coupling unit behind the hinged front panel.

4.57 Plug the head telephone set into the OPERATORS HEADSET jacks in the coupling unit. Operate LOCAL CONTROL key

to either one of the channels and, with key in LOCAL CONTROL position, operate DICTATE key to BARGE-IN position. After DICTATE lamp lights, record an announcement using the head telephone set transmitter. While observing the VIM needle deflections during the record cycle, adjust R9 until the needle deflects to the 0 mark on strong syllables with occasional peak deflections (one every several seconds) going beyond the 0 mark.

4.58 Remove the head telephone set, secure the coupling unit front panel, and disconnect the 1.96-ohm resistor, if provided, from terminals 53 and 54 of terminal board TB1 in the coupling unit.