

LINE AND TWIST AMPLIFIERS

PILOT WIRE REGULATION

TYPE K1 CARRIER SYSTEMS

1. GENERAL

1.01 This Addendum to Section E34.560, Issue 5, dated September 1941, makes changes in the gain requirements for the line and twist amplifier and makes other changes to bring the procedures and requirements up to date.

3. GAIN MEASUREMENT AND ADJUSTMENT

(B) Gain Measurement - General

Page 8 Change Paragraph 3.08 to read:

3.08 When it is necessary to adjust the gain regulating condenser of the 100A regulator to give a particular setting for test purposes, the procedures covered in the A438 sections, Central Office Maintenance should be followed. Autosyn motors are equipped with bearings which may be damaged if the motor is not carefully operated as outlined in the A438 sections.

Note: In line with the above paragraph the caution now appearing in Item (2) Paragraphs 3.12, 3.25, 3.27 and Item (3) Paragraph 4.02 of the section should be changed to read:

Caution: See Paragraph 3.08

(D) Gain Measurement - Line and Twist Amplifiers

In order to provide revised requirements for the 12kc and 28kc gain tests of the line and twist amplifiers as included on TABLE III, replace Pages 9 and 10 of the section with the following revised pages attached to this addendum.

Pages 9 and 10 Revised March 1943.

Attached:

Pages 9 and 10 Revised March, 1943.

(E) Working Gain Measurement Line Amplifier at Non-Twist Point - Line and Twist Amplifiers

Page 12 Paragraph 3.17 Change Item (2) Requirements to read:

Requirements: Corrected gain should be within 0.4 db of the gain measured at time of system line-up for the line-up controller step.

Page 12 Paragraph 3.18 Change Item (2) Requirements to read:

Requirements: Corrected gain should be within 0.6 db of the gain measured at time of system line-up for the line-up flat gain and twist controller steps.

5. DIRECT CURRENT TESTS

Page 22 TABLE VIII OHMMETER TESTS ON LINE AMPLIFIER SD-64337-011

In the 5th and 6th lines of this table change the limits for the measurement from terminals 2 and 3 of IN Input Trans to the Panel

From: Min. Open                      Max. Open  
To Read: Min. 4000 ohms.      Max. 6000 ohms.

Page 24 TABLE X OHMMETER TESTS ON LINE AMPLIFIER SD-64328-011

In the 4th and 5th lines of this table change the limits for the measurement from terminals 2 and 3 of IN Input Trans to the Panel

From: Min. Open                      Max. Open  
To Read: Min. 4000 ohms.      Max. 6000 ohms.

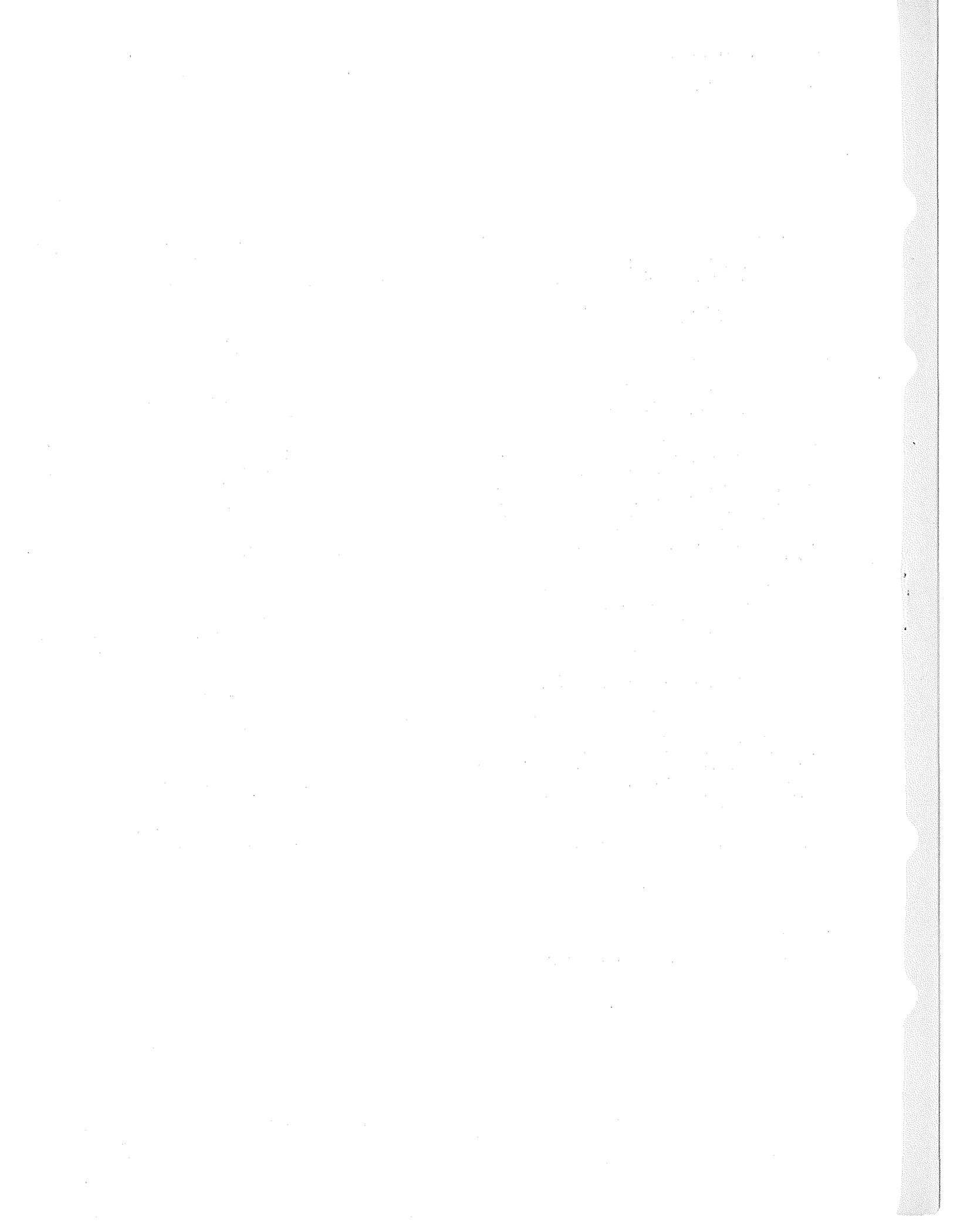


TABLE III

DECREASE IN GAIN (db) OF AMPLIFIERS AT 12KC AND 28KC FROM MEASURED GAIN AT 60KC

GC Condenser Min., GR Condenser Step 30, Twist Amplifier Regulator Step 22

Freq. KC	30 Type Equal.	Line Ampl. Only	Line and Twist Amplifier and 151A Network				
			No 34 or 50A Equal.	34C, D Equal.	34A, C, D Equal.	34B, C, D Equal.	50A Equal. Note 1
12	30D	24.6 ± 1.1	24.6 ± 1.7	24.8 ± 1.9	24.8 ± 1.9	24.8 ± 1.9	24.5 ± 1.9
12	30B	21.5 ± 0.9	21.5 ± 1.4	21.7 ± 1.7	21.7 ± 1.7	21.7 ± 1.7	21.4 ± 1.7
12	30A	18.7 ± 0.7	18.7 ± 1.2	18.9 ± 1.5	18.9 ± 1.5	18.9 ± 1.5	18.6 ± 1.5
12	30C	15.6 ± 0.7	15.6 ± 1.2	15.8 ± 1.5	15.8 ± 1.5	15.8 ± 1.5	15.5 ± 1.5
28	30D	15.8 ± 1.0	15.7 ± 1.4	16.9 ± 1.7	17.9 ± 1.7	15.9 ± 1.7	See Table Below
28	30B	13.7 ± 0.8	13.6 ± 1.2	14.8 ± 1.5	15.8 ± 1.5	13.8 ± 1.5	
28	30A	12.1 ± 0.6	12.0 ± 1.0	13.2 ± 1.3	14.2 ± 1.3	12.2 ± 1.3	
28	30C	9.9 ± 0.6	9.8 ± 1.0	11.0 ± 1.3	12.0 ± 1.3	10.0 ± 1.3	

All Values Below are at 28KC

30 Type Equal.	Line and Twist Amplifier, 151A Network, 50A Equal.					
	Nor-Max.	Nor-Nor.	Nor-Min.	Half-Max.	Half-Nor.	Half-Min.
30D	16.6 ± 1.7	16.6 ± 1.7	16.6 ± 1.7	16.0 ± 1.7	16.0 ± 1.7	16.0 ± 1.7
30B	14.5 ± 1.5	14.5 ± 1.5	14.5 ± 1.5	13.9 ± 1.5	13.9 ± 1.5	13.9 ± 1.5
30A	12.9 ± 1.3	12.9 ± 1.3	12.9 ± 1.3	12.3 ± 1.3	12.3 ± 1.3	12.3 ± 1.3
30C	10.7 ± 1.3	10.7 ± 1.3	10.7 ± 1.3	10.1 ± 1.3	10.1 ± 1.3	10.1 ± 1.3
30D	Line and Twist Amplifier, 151A Network, 34A and 50A Equal.					
	17.6 ± 1.7	17.6 ± 1.7	17.6 ± 1.7	17.0 ± 1.7	17.0 ± 1.7	17.0 ± 1.7
30B	15.5 ± 1.5	15.5 ± 1.5	15.5 ± 1.5	14.9 ± 1.5	14.9 ± 1.5	14.9 ± 1.5
30A	13.9 ± 1.3	13.9 ± 1.3	13.9 ± 1.3	13.3 ± 1.3	13.3 ± 1.3	13.3 ± 1.3
30C	11.7 ± 1.3	11.7 ± 1.3	11.7 ± 1.3	11.1 ± 1.3	11.1 ± 1.3	11.1 ± 1.3
30D	Line and Twist Amplifier, 151A Network, 34B and 50A Equal.					
	15.6 ± 1.7	15.6 ± 1.7	15.6 ± 1.7	15.0 ± 1.7	15.0 ± 1.7	15.0 ± 1.7
30B	13.5 ± 1.5	13.5 ± 1.5	13.5 ± 1.5	12.9 ± 1.5	12.9 ± 1.5	12.9 ± 1.5
30A	11.9 ± 1.3	11.9 ± 1.3	11.9 ± 1.3	11.3 ± 1.3	11.3 ± 1.3	11.3 ± 1.3
30C	9.7 ± 1.3	9.7 ± 1.3	9.7 ± 1.3	9.1 ± 1.3	9.1 ± 1.3	9.1 ± 1.3

Note 1: At 12KC the values given apply to all the connections of the 50A equalizer as well as to the 50A equalizer alone or in combination with the 34A or 34B equalizer.

(D) Gain Measurement - Line and Twist Amplifiers

## 3.13 Apparatus:

- 30A Transmission Measuring Set
- 17B Oscillator
- 1 - 554A Tool
- 3 - P3P Cords equipped with 305A Plugs (3P20B)
- 1 - Decade Resistance Box or  $173.2 \pm 0.3$  Ohms Resistance

## 3.14 Procedure:

- (1) Set the GC condenser for minimum amplifier gain, that is, extreme counter-clockwise position. Use the 554A tool.

Caution: Do not force the condenser to make the zero on the 554A tool and the minimum stop of the condenser agree as this will injure the condenser.

- (2) Set the GR condenser on step 30.

Caution: See Paragraph 3.08.

- (3) Set the twist regulator on Step 22 for the network under test. If this cannot be done without disturbing working systems, remove the connections to terminals 6 and 7 on the twist regulating 151A network and substitute a resistance of  $173.2 \pm 0.3$  ohms. A decade resistance box or 18-type resistances may be used. The 110-type resistances must be present in all sockets of the 151A network and the proper value of 5A or 6A pads must be connected in the circuit.

- (4) Measure the gain at 60, 28 and 12 kc between the EQ jacks at the input sealed test terminal and the EQ jacks at the output sealed test terminal. At a terminal office the equivalent jacks are designated EQ and REC AMP OUT. See Paragraph 3.10 for test procedure.

Requirements: The gain at 60 kc should be within 2.0 db of the value obtained from Table II for the line and twist amplifier and 151A network and combinations of the 34-type or 50A equalizers. The gain at 12 and 28 kc should be less than the gain measured at 60 kc by the amounts given in Table III.

(E) Working Gain Measurement - Line Amplifier at Non-Twist Point - Line and Twist Amplifiers

- 3.15 The working gain is measured with the flat gain and twist controllers on their working step. Measurements made subsequent to the system line-up can be compared to the results obtained at the time of line-up by correcting the results for the difference in controller steps. The method of correcting for the difference in controller step is as follows:

- (1) The db correction for the difference between the flat gain controller step at a subsequent test and the step at the system line-up is the difference in steps multiplied by .255 db per step. The correction should be added to the measured gain when the step is below the line-up step and subtracted when above the line-up step.

- (2) The db correction for the difference between the twist controller step at subsequent test and the step at the system line-up is dependent upon the coefficient control "C" resistance, and the length control "L" resistance, since the value of these resistances determine the db per step of the twist controller.

- (3) Note the value of the coefficient control resistance "C" used in the twist regulating network. From Fig. 3 determine the maximum db per twist step at 28 kc for the particular value of "C" employed. Denote the db value by  $M_{28}$ .

- (4) Note the value of the length control resistance "L" used in the twist regulating network. From Fig. 4 determine the length control factor for the particular value of "L" employed. Denote the control factor by LF.

- (5) The db per twist step at 28 kc is equal to  $M_{28} \times LF$ .

- (6) The total db correction for the difference between the twist controller step at subsequent test and the step at system line-up is equal to twist step difference  $\times M_{28} \times LF$ .

- (7) The correction should be subtracted from the measured gain when the step is below the line-up step and added when above the line-up step.

## 3.16 Apparatus:

- 30A Transmission Measuring Set
- 17B Oscillator
- 3 - P3P Cords equipped with 305A Plugs (3P20B)

## 3.17 Procedure - Line Amplifier at Non-Twist Point:

- (1) Measure the gain at 28 kc between the EQ jacks of the input sealed test terminal and the EQ jacks of the output sealed test terminal. Note the flat gain controller step. See Paragraph 3.10 for test procedure.

- (2) Correct the measured gain for the difference between the flat gain controller step noted in Item (1) and the system line-up step. See Paragraph 3.15.