

TYPE K1 CARRIER SYSTEMS
DEVIATION REGULATOR

1. GENERAL

1.01 This Addendum to Section E34.561, Issue 3, dated September 1941, makes changes in procedures involving 120-type pilot filters in order to avoid possible damage due to excessive test power. Other changes have been made to bring the test requirements up to date and to make necessary changes in some of the procedures.

Page 4 Following Paragraph 1.09 add.

1.10 Excessive amounts of testing power may permanently damage the 120-type crystal filters used in the pilot pick-off circuit and the following caution should be observed.

Caution: When test frequencies of 12, 28 or 56 kc are used, care should be exercised so that test power greater than that specified in the procedures will not be employed. For any tests the input test power to the crystal filter should not be greater than +10 dbm.

4. TESTS AND ADJUSTMENTS OF DEVIATION REGULATOR

(C) Gain Measurement - Deviation Regulator

Page 26 Table IV Column 8 - 56 kc requirements. Change

From	To
1.6 + 0.6	2.8 + 0.6
1.5 ± 0.6	2.7 ± 0.6
1.5 ± 0.6	2.7 ± 0.6
1.2 ± 0.6	2.4 ± 0.6

5. TESTS AND ADJUSTMENTS OF CONTROL AND LIMITER CIRCUIT

(A) Maximum 60-Cycle Output Voltage

Page 39 Change Paragraph 5.01 to read.

5.01 The maximum 60-cycle a-c output voltage, measured at the A jacks, is obtained for a condition of no pilot input. Tap 4, 5 or 6 on the secondary winding of the 60-cycle transformer may be employed to meet the requirements for the a-c output voltage for each pilot. Different taps may be used for the control circuit of each pilot frequency as required to meet requirements.

Page 40 Change Item (4) to read.

(4) Measure and record the voltage at each A jack using tap 4, 5 or 6 on the secondary of the 60-cycle transformer to meet the output voltage requirements.

Requirement: The A-C output voltage should be within ± 0.5 volts of the value given below for the actual value of supply voltage.

Voltage of 55-Volt Supply	A-C Output Voltage
50	3.0
51	3.1
52	3.2
53	3.3
54	3.4
55	3.5
56	3.6
57	3.7
58	3.8
59	3.9
60	4.0

(B) Pilot Filter Characteristics

Pages 41, 42 and 45. Replace Paragraph 5.07 with the following:

5.07 Procedure - Pilot Filter Band Width - See Figs. 6 and 7.

(1) Remove the control circuit from the limiter circuit by inserting the 258C plugs into the three B jacks of the control circuit.

(2) Shunt terminals 1 and 2 of the TH thermistor of the line amplifier with 250-ohm test resistance. Shunt terminals 1 and 2 of the SL thermistor of the slope network and terminals 1 and 2 of the BU thermistor of the bulge network with 500 ohms test resistances.

Caution: Care should be exercised in connecting the shunt resistance to terminals 1 and 2 of the TH thermistor of the line amplifier as these terminals are 130 volts above ground potential.

(3) Remove vacuum tubes from the two tube positions which are not involved in the test, in this case tube positions 3 and 4, and insert 113A resistances in their places.

- (4) Lift off leads from terminals 3 and 4 of the TH thermistor on the line amplifier panel and connect to the removed leads the 200-ohm test resistance.
- (5) Set the 17B oscillator to the pilot frequency and patch from OSC OUT jacks to the POTENTIOMETER IN jacks of the 30A set.
- (6) Operate the test key of the 30A set to the COMPARE position and adjust the output of the 17B oscillator to give a reading of zero on the 30A set meter.
- (7) Set the attenuator of the 30A set to $(G + 11)$ db where G = the average gain of the deviation regulator under test, as measured in Part 4(C) with test resistances, at the pilot frequency being used.
- (8) Patch from the ATTENUATOR OUT jacks of the 30A set to the EQ jacks of the deviation regulator under test at the input sealed test terminal.
- (9) Patch from the V jack of the 0-5 voltmeter on the limiter panel to the A-56 jack of the control circuit.
- (10) Operate the test key of the 30A set to the ADJUST position and adjust the output of the 17B oscillator to give a reading of about 2 volts on the voltmeter.
- (11) Adjust the frequency of the oscillator to give a minimum voltmeter reading, leaving the CYCLES dial on "0." Note that two minima may be obtained with a normal filter, as indicated in Fig. 7. Either minimum point may be used for this test inasmuch as the primary object is to obtain a frequency within the pass band.
- (12) Readjust, if necessary, the output of the test oscillator until a reading of 2.0 volts is again obtained on the voltmeter.
- (13) Decrease the loss in the attenuator by 1.0 db. This will cause the voltmeter reading to decrease to a very low value.
- (14) Using the CYCLES dial of the oscillator, increase the frequency of the oscillator until a reading of 2.0 volts is again obtained on the voltmeter. This indicates that at this frequency the loss of the filter has increased by 1.0 db relative to its loss at the tuning point. Record this reading of the CYCLES dial.
- (15) Decrease the frequency of the oscillator below the tuning point, by means of the CYCLES dial, until the voltmeter reading again increases to 2.0 volts. The number of cycles by which the frequency is decreased may be either greater or less

than the number of cycles by which it was increased in the test above; this is to be expected in view of the typical filter characteristics, as indicated in Fig. 7. Also note that, if two minimum points occur in the filter characteristic, an increase of 0.6 db or less may be obtained in the filter loss between these two frequencies; since this increase in loss is less than 1.0 db in a normal filter, it will not affect this test.

- (16) Determine the total change in frequency between the 1 db points of the filter characteristic from the two above tests. This is taken as the filter band width.

Requirements:

<u>Pilot Frequency</u>	<u>Minimum Band Width</u>
56 kc	35 cycles
28 kc	35 cycles
12 kc	10 cycles

- (17) Proceed with pilot filter discrimination test of Paragraph 5.08 for particular pilot frequency being tested before changing to another pilot frequency or removing patches. Restore the attenuator setting to $(G + 11)$ db as in Item (7).

Page 46 Replace Paragraph 5.08 with the following:

5.08 Procedure - Pilot Filter Discrimination.

- (1) After the procedure for the band width test is completed, set the 17B oscillator to the pilot frequency and adjust the CYCLES dial until a minimum reading is obtained on the voltmeter.
- (2) Readjust, if necessary, the output of the 17B oscillator until a reading of 2.0 volts is again obtained on the voltmeter.
- (3) Increase the frequency of the oscillator by 500 cycles.
- (4) Remove 3/4 db from the 30A set attenuator and note the voltmeter reading.

Requirement: The voltage should be not less than 2.0 volts indicating a discrimination of at least 3/4 db at 500 cycles above the pilot frequency.

- (5) Restore the attenuator to its initial value by increasing the attenuator loss 3/4 db.

Caution: Do not return oscillator to the pilot frequency before restoring attenuator to its initial value to avoid possible damage to pick-off filter.

(6) Decrease the frequency of the 17B oscillator 1000 cycles from its last setting making it 500 cycles below the pilot frequency.

(7) Remove 34 db from the 30A set attenuator and note the voltmeter reading.

Requirements: The voltage should be not less than 2.0 volts indicating a discrimination of at least 34 db at 500 cycles below the pilot frequency.

(8) If the requirements of Items (4) and (7) are met, satisfactory discrimination at other frequencies outside the band is reasonably assured.

(9) Repeat Items (1) to (8) for the other two pilot frequencies.

(D) Regular Sensitivity and Regulation Accuracy

Page 50 Add to Paragraph 5.20

This test may indicate a filter trouble which has not been found by the performance requirement tests since at the time the performance tests are made, the pilot frequency from the line is not generally available and the 17B oscillator frequency cannot be synchronized with the pilot frequency as covered in Item (4) Paragraph 5.27. Due to this difference in frequency a shift in the resonant point of the filter may not be indicated until the sensitivity test is made.

Pages 51, 52, 54 and 55, Replace Paragraph 5.27 with the following:

5.27 Regulator Sensitivity Adjustment. See Fig. 8.

(1) Make a preliminary measurement of the gain of the auxiliary switching amplifier at the pilot frequency of test, as covered in Part 4(H). The average gain of the deviation regulator at the pilot frequencies should be available as measured in Part 4(C) with test resistances. This is used in Item (7).

(2) Insert 258C plugs into the three B jacks of the control circuit, after which insert a 258C plug into the FIL jack of the control circuit.

(3) Shunt terminals 1 and 2 of the TH thermistor of the line amplifier with the 250-ohm test resistance. Shunt terminals 1 and 2 of the SL thermistor of the slope

network and terminals 1 and 2 of the BU thermistor of the bulge network with the 500-ohm test resistances.

Caution: Care should be exercised in connecting the shunt resistance to terminals 1 and 2 of the TH thermistor of the line amplifier as these terminals are 130 volts above ground potential.

(4) Synchronize the frequency of the 17B oscillator to the pilot frequency (56, 28 or 12 kc) using as a reference the pilot frequency from another system. The reference pilot frequency may be obtained by using the 42A transmission measuring system in the following manner.

(a) Insert the four prong adapter plug, 312A, into the EQ-LINE jacks at the output sealed test terminal on the other system. At a terminal office insertion would be made into the REC AMP OUT - GR DEM IN jacks.

(b) Insert into the 312A plug the 308A plug on the LEV MEAS cord of the 42A transmission measuring system.

(c) At the PAD OUT or MEAS TRK OUT jacks, as provided, on the 42A measuring system patch to the 135 OHM jacks of one of the 135:600-ohm repeating coils in the 30A set.

(d) Patch from the 600 OHM jacks of the repeating coil to the TST AMP IN jacks in the 42A measuring system.

(e) Terminate the TST AMP OUT jacks of the 42A transmission measuring system by the 323A, 135 OHM plug.

(f) Insert into the 323A plug the 308A plug at one end of a W3R cord and connect the 305A plug at the other end of the cord to one set of T and R jacks on the portable a-c voltage test set J68602AH (0-4 volt scale). If the J68602AH test set is not available, the 0-5 volt a-c voltmeter on the limiter circuit panel may be used with suitable long cords.

(g) Patch from the other (multiple) T and R jacks on the voltage test set to the OSC OUT jacks of the 17B oscillator.

(h) Slowly adjust the frequency setting on the 17B oscillator until a beat is observed on the voltmeter for the particular pilot frequency under test. It may be necessary to change the output

of the 17B oscillator in order to observe a beat on the meter scale.

Requirements: A beat of less than two per second should be obtained.

(5) With the 17B oscillator now calibrated for the 56, 28, or 12 kc pilot frequency as desired, remove the patch cord from the OSC OUT jacks and patch from these jacks to the POTENTIOMETER IN jacks of the 30A set.

Note: This is a modification of the procedure shown in Fig. 8 of Section E34.561.

(6) Operate the test key of the 30A set to the COMPARE position and adjust the output of the 17B oscillator to give a reading of zero db on the 30A set meter.

(7) Set the attenuator of the 30A set to (G + 11) db where G = the average gain of the deviation regulator under test, as measured in Part 4(C) with test resistances, at the pilot frequency being used.

(8) Patch from the ATTENUATOR OUT jacks of the 30A set to the EQ jacks at the input sealed test terminal for the deviation regulator to be tested.

(9) Operate the test key of the 30A set to the ADJUST position.

(10) Patch from the EQ jacks at the output sealed test terminal, or REC AMP OUT jacks at a terminal office, to the 10 db PAD IN jacks of the 30A set.

(11) Patch from the 10 db PAD OUT jacks to the SW AMP IN jacks of the auxiliary switching amplifier.

(12) Patch from the SW AMP OUT jacks of this switching amplifier to the thermocouple jacks on the 30A set.

(13) Using a 2P1D cord, patch from the V jack of the 0-5 volt a-c voltmeter on the limiter panel to the A jack, corresponding to the pilot frequency of test, of the control circuit.

(14) Remove tube from, and place a 113A resistance in each of the tube positions in the control circuit of the two pilot frequencies not under test.

(15) Operate one 10db meter protection key associated with the 30A set thermocouple and adjust the output of the 17B oscillator to obtain the required reading on the 30A set meter.

Requirements: The meter reading should be (G-41) db where G is the

gain of the auxiliary switching amplifier as determined in Item (1). The output of the deviation regulator will then be -11.0 dbm.

(16) Remove the 258C plug from the FIL jack of the control circuit.

(17) Remove the resistance shunt from terminals 1 and 2 of the thermistor corresponding to the pilot frequency of test.

(18) Adjust the appropriate one of the gain bias potentiometers H, J or K; H for the 12 kc pilot, J for the 28 kc pilot and K for the 56 kc pilot to again obtain the reading of (G-41) db on the thermocouple meter with one 10 db protection key operated. The sensitivity is then adjusted to the normal -11.0 dbm at the output of the deviation regulator.

(19) Record the thermistor heater voltage. This is the heater voltage which gives a thermistor resistance equal to the test resistance of 250 or 500 ohms as used in this test.

(20) Proceed with the regulation accuracy measurement of Paragraph 5.28 for the particular frequency just adjusted for sensitivity, before changing to another pilot frequency.

(E) Limiter Circuit

(3) Deviation Regulator Gain Resulting From a Pilot Frequency Failure.

Page 60 Paragraph 5.40 Add to apparatus list.

- 1 - Locally assembled test cord with grid clip at one end and test clip at the other end.

Page 60 Paragraph 5.41 Change Item (2) to read.

- (2) Produce a failure in the control circuit by removing the grid clip from the grid of the appropriate one of tubes 2, 3 or 4 depending upon the pilot frequency under test and ground the grid of the tube using the locally assembled test cord.

6. DIRECT CURRENT TESTS

TABLE IX OHMMETER TESTS ON LINE AMPLIFIER

Page 68 First two lines of the 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.