

**TYPE N-ON CARRIER REPEATERS**  
**REPEATERED HIGH-FREQUENCY LINE**  
**SECTIONALIZING PROCEDURE FOR**  
**INVESTIGATING FREQUENCY DRIFT**

Section 362-125-501 describes a procedure for a test on twin channel units of O and ON carrier systems to check for excessive deviation of the received carrier frequency. If the received carrier frequency deviates too far from its nominal value, serious variations in the channel net gain occur in both channels associated with the twin channel unit. The cumulative frequency drift will change with temperature changes.

The purpose of this section is to provide test instructions to locate the trouble when frequency drift occurs on a repeatered line. The amount of effort necessary will generally be reduced by sectionalizing the system to determine the section of the line contributing large frequency deviations. If this can be determined, it may only be necessary to check the frequency of the individual repeater oscillators in this section. The individual repeater 304-kHz oscillators can be checked as described in Section 362-410-503 (N1, N1A, and ON repeaters) or Section 362-465-503 (N2 repeaters).

Any one of the line carriers can be measured at the sectionalizing point to determine whether excessive cumulative frequency deviation is present. If the sectionalizing point is the midpoint of the repeatered line, the frequency deviation should not exceed one-half of the overall deviation for the type of carrier system under test. The overall requirements are specified in Section 362-125-501. Similarly, the maximum allowable deviation at any point along the repeatered line can be determined by proportioning the overall permissible deviation according to the point of measurement. However, these limits should be used only as guides and not as absolute system criteria, since the amount of deviation will change as the temperature varies. The KS-19750 N line deviation test set will eventually be provided with a jack for connection to a frequency counter, and this combination can be used to measure the frequency of an individual line carrier at the point of measurement. Until this arrangement becomes available, separately provided filters may be used to sample selected carriers of the low-high (L-H) and high-low (H-L) line repeaters. The filter assembly can be fabricated locally or constructed by a Western Electric Company distributing house upon request. The filter assembly selects either the 104-kHz carrier (H-L repeater) or 192-kHz carrier (L-H repeater) for measurement. These frequencies were selected since they are common to N1, N2, ON1, ON2, and N3 systems. ON carrier systems are affected by the frequency shift problem more than type N systems. Although these procedures are more necessary for ON carrier, they can also be used for type N systems, but this will generally not be required.

Most commercial electronic counters now available for frequency measurement are ac-powered, although battery-type counters may be available in the future. This necessitates the use of a portable power source unless these measurements can be made at a location where ac power is normally available.

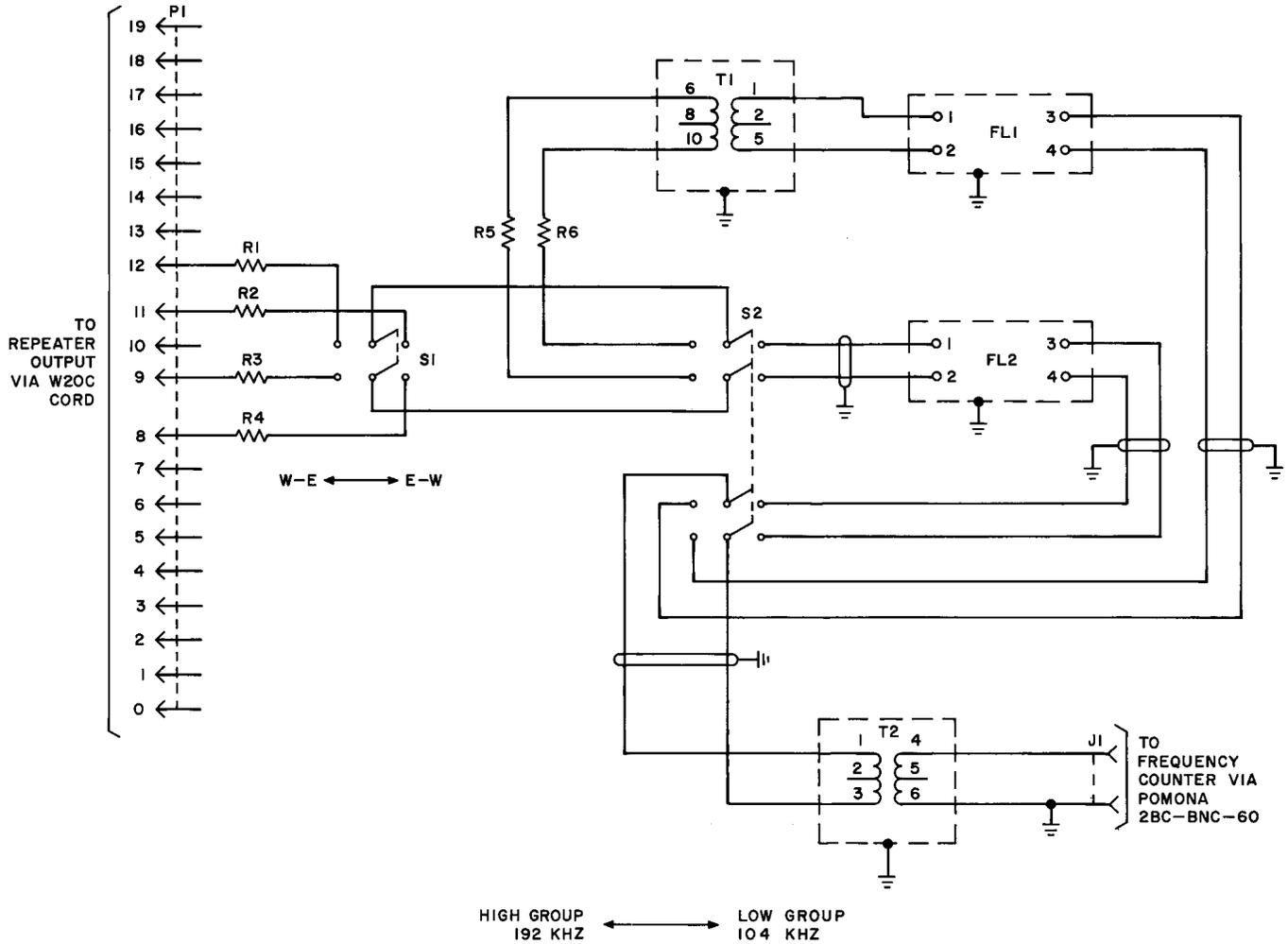
Repeaters need not be removed from service for these measurements since the bridging loss of the filter assembly is negligible.

**APPARATUS:**

- 1 — Hewlett-Packard Model 5232A or 5532A Electronic Counter, or Equivalent
- 1 — Filter Assembly (Fabricated as shown in Fig. 1)
- 1 — Pomona 2BC-BNC-60 Coaxial Cable (Banana Plug and BNC Male Connector)
- 1 — W20C Cord

STEP	PROCEDURE
	<p style="text-align: center;"><b>A. H-L Line Repeater Measurement</b></p> <p>1 Energize the electronic counter and allow an adequate warmup period before making the following measurement. The counter should be checked for accuracy in accordance with the specifications of the manufacturer.</p> <p>2 At the repeater, verify the presence of connectors in jacks J2 and J3. Remove the connector from jack J3.</p> <p>3 On the filter assembly (shown in Fig. 1), set switch S1 to W-E or E-W, as required, and set switch S2 to the H-L position.</p> <p>4 Connect the filter assembly to the electronic counter with the Pomona 2BC-BNC-60 cable.</p> <p>5 Connect the filter assembly to repeater jack J3 with the W20C cord.</p> <p>6 Set the counter time base to 1 second, and measure the selected line carrier frequency.</p> <p><b>Requirement:</b> The counter should indicate 104 kHz <math>\pm</math>48 Hz at the three-quarter point (from the transmitting terminal) of the repeatered line, 104 kHz <math>\pm</math>33 Hz at the mid-point of the repeatered line, or 104 kHz <math>\pm</math>16 Hz at the one-quarter point of the repeatered line. (These requirements are based on an overall deviation limit of <math>\pm</math>65 Hz at the receiving terminal of an ON carrier system and are to be interpreted as guides and not as absolute limits.)</p> <p>7 If the measurements in Step 6 indicate excessive frequency deviation, check the oscillator frequency of each individual repeater between the transmitting terminal and the sectionalizing point. In a long system, it may be necessary to make measurements at another sectionalizing point nearer to the transmitting terminal.</p> <p>8 Remove the test cord from jack J3 on the repeater and replace the normal connector in the jack. Remove the Pomona 2BC-BNC-60 cable from the filter assembly to the electronic counter.</p>

STEP	PROCEDURE
<b>B. L-H Line Repeater Measurement</b>	
1	Energize the electronic counter and allow an adequate warmup period before making the following measurement. The counter should be checked for accuracy in accordance with the specifications of the manufacturer.
2	At the repeater, verify the presence of connectors in jacks J2 and J3. Remove the connector from jack J3.
3	On the filter assembly (shown in Fig. 1), set switch S1 to W-E or E-W, as required, and set switch S2 to the L-H position.
4	Connect the filter assembly to the electronic counter input with the Pomona 2BC-BNC-60 cable.
5	Connect the filter assembly to repeater jack J3 with the W20C cord.
6	Set the counter time base to 1 second, and measure the selected line carrier frequency.
<p><b>Requirement:</b> The counter should indicate 192 kHz <math>\pm</math>48 Hz at the three-quarter point (from the transmitting terminal) of the repeatered line, 192 kHz <math>\pm</math>33 Hz at the midpoint of the repeatered line, or 192 kHz <math>\pm</math>16 Hz at the one-quarter point of the repeatered line. (These requirements are based on an overall deviation limit of <math>\pm</math>65 Hz at the receiving terminal of an ON carrier system and are to be interpreted as guides and not as absolute limits.)</p>	
7	If measurements in Step 6 indicate excessive frequency deviation, check the oscillator frequency of each individual repeater between the transmitting terminal and the sectionalizing point. In a long system, it may be necessary to make measurements at another sectionalizing point nearer to the transmitting terminal.
8	Remove the test cord from jack J3 on the repeater and replace the normal connector in the jack. Remove the Pomona 2BC-BNC-60 cable from the filter assembly to the electronic counter.



PART	DESCRIPTION
R1, R2, R3, R4	Resistor, 422 ohms, 221A type
R5, R6	Resistor, 1050 ohms, 221A type
T1	Transformer, 2591H
T2	Transformer, 2507A
FL1	Filter, 646M
FL2	Filter, 136R
P1	Plug, KS-14160, L1
J1	Jack, Pair, Banana (5-way binding posts spaced 3/4 inch)
S1	Switch, Toggle, DPDT
S2	Switch, Toggle, 4PDT

Fig. 1 — Filter Assembly