

**TYPE N AND ON CARRIER REPEATERS — REPEATERED HIGH-FREQUENCY LINE
CARRIER LINE-UP — HIGH-FREQUENCY LINE MEASUREMENTS
TRANSISTORIZED REPEATER POINTS — INDIVIDUAL CARRIER OUTPUT**

Issue 2 of this section provides information for measuring the individual carriers at the output of an N carrier transistorized repeater.

The section provides two procedures for measuring the carriers at a repeater output to determine the frequency characteristics of the preceding high-frequency line. The recommended procedure is to measure the individual carriers with the repeater output terminated in 135 ohms. It should be remembered, however, when a high-frequency line is terminated and the carriers are removed from the system all of the repeaters following the termination will operate at top gain.

As a result, crosstalk could develop in other carrier systems in the same cable. This is of particular importance when N carrier systems are placed in K cables. Where experience has shown that terminating a repeater output may present a noise or crosstalk problem, bridged measurements should be made to obtain an approximate slope computation.

When it is impractical to make terminated measurements, it should be kept in mind that bridged measurements are unreliable when made at locations where:

- (1) Equalizers or other networks (except span pads) are placed at the repeater output.
- (2) The central office shield cable to the carrier terminal or central office main frame is more than about 50 feet in length.

The measurements are normally *only* made at powered repeater stations where power for the test sets is available. When an undesirable deviation in the high-frequency line characteristics is encountered, the trouble can be sectionalized by making measurements at pole-mounted repeaters using a portable power supply.

Caution should be exercised, when measuring on working systems, to avoid causing hits on systems carrying SAGE or telegraph transmissions.

APPARATUS:

- 1 — KS-15538, L1, L2 or L3 Carrier Frequency Voltmeter
- 1 — ED-92717-30 G4 Adapter, Modified (135-ohm termination for repeater)
- 1 — W20C Cord (used for connecting carrier frequency voltmeter to adapter and repeater switching jacks)

MEASUREMENTS WITH REPEATER OUTPUT TERMINATED IN 135 OHMS

STEP	PROCEDURE
1	Energize the carrier frequency voltmeter and allow 20 minutes for it to warm up. Calibrate the set according to the procedure described in the section covering the KS-15538 carrier frequency voltmeter.

STEP	PROCEDURE
2	Remove the connector from J2 and place the modified ED-92717-30 G4 adapter in J2. See Fig. 3 for modification.
3	Remove the remaining connector from J3 which is color coded yellow.
4	Connect the carrier frequency voltmeter to the adapter plug with a W20C cord.
5	Operate the selector switch to the W-E OUT or E-W OUT position as required.
6	Measure the channel carrier level for each channel at the frequencies given in Table I and record on the proper Form E-4558.
7	<p>Determine the repeater output slope using the method described in Section 362-400-510.</p> <p>Requirements:</p> <ul style="list-style-type: none"> (1) Each of the plotted individual channel carrier levels should be within approximately ± 3.0 db of the computed slope line ($Y_0 - Y_{12}$) plotted on Form E-4558. (2) The computed slope should be within approximately ± 3.0 db of the output slope for the repeater under test as specified by circuit order. <p>Note: The Transmission Engineer should be notified if these requirements cannot be met on initial line-up. On routine measurements the effect of temperature on carrier slopes or other natural causes may prevent the above requirements from being met on some systems. In these cases the tests will be considered acceptable if the difference in slope variations between two successive locally powered repeater points does not exceed ± 0.5 db.</p>
8	Replace one connector in J3 and remove the modified ED-92717-30 G4 adapter from J2. Replace the second connector in the vacant J2 jack.
BRIDGED MEASUREMENTS AT REPEATER OUTPUT	
STEP	PROCEDURE
1	Energize the carrier frequency voltmeter and allow 20 minutes for the set to stabilize. Calibrate the set according to the procedure described in the section covering the KS-15538 carrier frequency voltmeter.
2	Check that both connector plugs are in place in the J2 and J3 jacks. Remove one of the connector plugs. (When a plug-in equalizer is being used in the direction of transmission under test, remove the equalizer instead of the connector plug.)
3	Connect the carrier frequency voltmeter to the vacant J jack with a W20C cord.
4	Operate the voltmeter selector switch to the W-E OUT or E-W OUT position as required.

STEP	PROCEDURE
5	Measure the channel carrier level for each channel at the frequencies given in Table I and record on the proper Form E-4558.
6	Determine the repeater output slope using the method described in Section 362-400-510. Requirements: (1) Each of the plotted individual channel carrier levels should be within approximately ± 3.0 db of the computed slope line ($Y_0 - Y_{12}$). (2) The computed slope should be within approximately ± 3.0 db of the output slope for the repeater under test as specified by circuit order. Note: The Transmission Engineer should be notified if these requirements cannot be met on initial line-up. On subsequent routine measurements the effect of temperature on carrier slopes or other natural causes may prevent the requirements from being met. In these cases the tests will be considered acceptable if the difference in slope variations between two successive locally powered repeater points does not exceed ± 0.5 db.
7	Disconnect the carrier frequency voltmeter and insert a connector plug (or plug-in equalizer where required) in the vacant J jack.

TABLE I

N CHANNEL CARRIER FREQUENCIES AT REPEATER OUT IN KC

Channel Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Low Group Output	136	128	120	112	104	96	88	80	72	64	56	48	40
High Group Output	168	176	184	192	200	208	216	224	232	240	248	256	264

ON1 CARRIER FREQUENCIES AT REPEATER OUTPUT IN KC

Carrier Number	1	2	3	4	5	6	LCO	7	8	9	10
Low Group Output	132	124	112	104	92	84	76	72	64	52	44
High Group Output	172	180	192	200	212	220	228	232	240	252	260

ON2 CARRIER FREQUENCIES AT REPEATER OUT IN KC

Carrier Number	1	2	3	4	5	6	7	LCO	8	9	10	11	12
Low Group Output	128	120	112	104	96	88	80	76	72	64	56	48	40
High Group Output	176	184	192	200	208	216	224	228	232	240	248	256	264

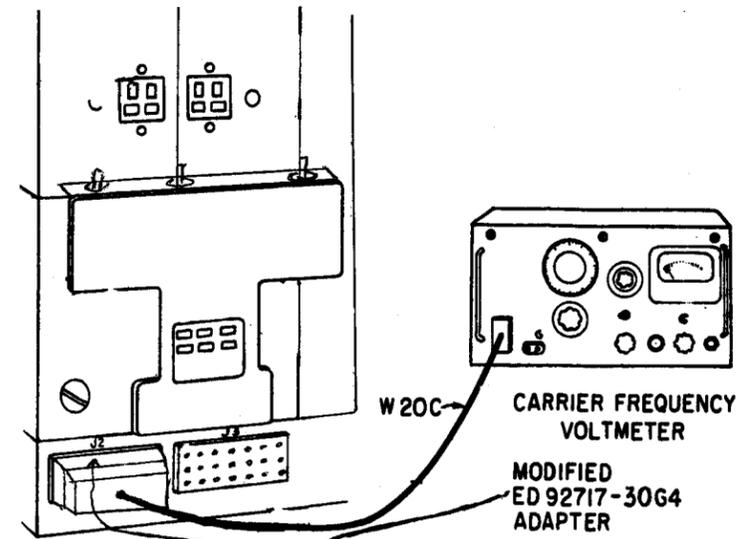


FIG. 1 TEST SETUP FOR 135 OHM TERMINATION MEASUREMENTS

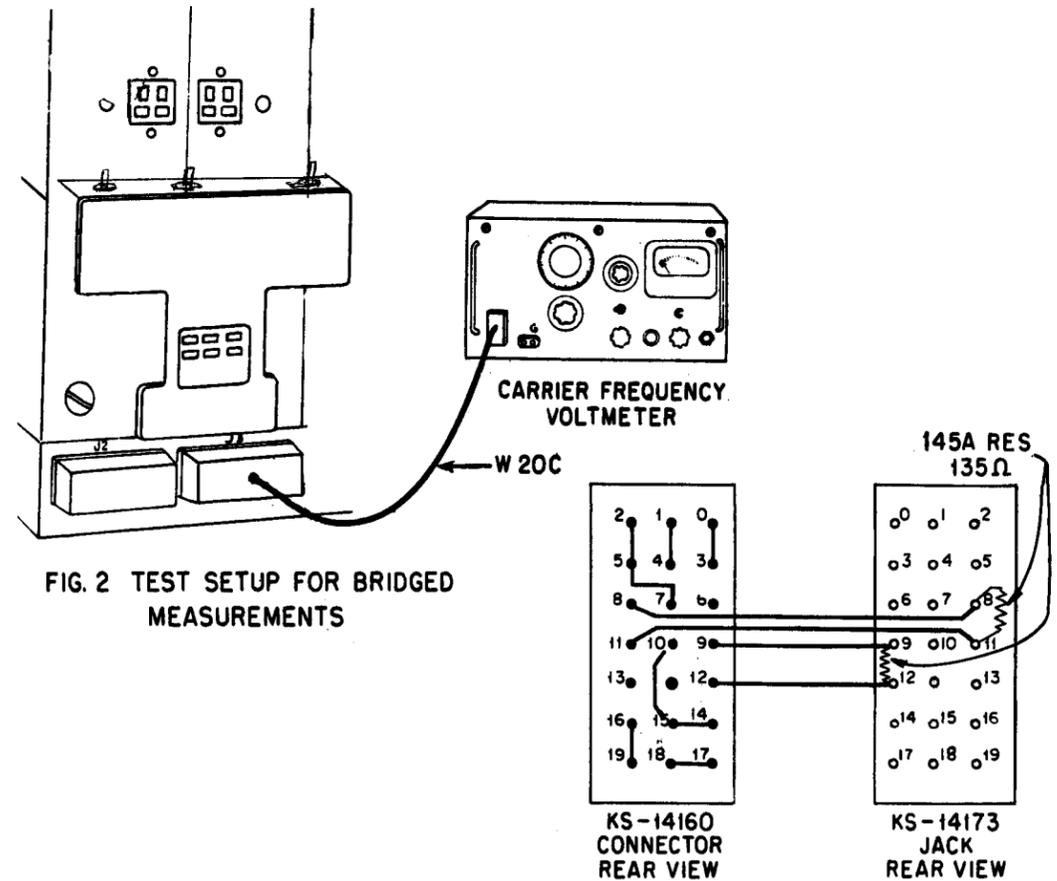


FIG. 2 TEST SETUP FOR BRIDGED MEASUREMENTS

FIG. 3 MODIFIED ED 92717-3064 ADAPTER FOR TERMINATING REPEATERS

TRANSISTORIZED REPEATER POINTS
INDIVIDUAL CARRIER OUTPUT