

## CIRCUIT ORDER TESTS

### CIRCUIT UNITS

#### 1. GENERAL

1.01 This section gives the circuit order tests to be made on circuit units. As used in this section a circuit unit consists of line facilities and associated equipment (such, for example, as a regulator section of cable), which it has been found useful to line up and assign as an entity in making up over-all circuits.

1.02 Issue 4 of this section replaces Issue 3 to change the requirements for net loss tests.

1.03 A circuit unit includes all the equipment and repeaters associated with the line facilities except the repeaters at the terminals. However, when making net loss-frequency tests, a terminal repeater receiving from the circuit unit should be included in order to provide required equalization, and regulation in the case of regulating terminal repeaters. The use of this repeater may be advantageous for 1000-cycle net loss and for listening tests also.

1.04 Where the circuit order which establishes the circuit unit, or an associated circuit order, assigns the circuit unit for use as part of a circuit, the circuit unit tests should be made before the over-all circuit tests.

1.05 When a circuit unit becomes a part of an 18-channel v.f. carrier telegraph assignment, or is to be used in other special assignments, special equalization on that circuit unit may be required. Table IV is included in this section to give the requirements for circuit units under the conditions of its use for an 18-channel v.f. carrier telegraph assignment.

1.06 In the case of regulated circuit units, gain corrections as covered in Section 332-402-100 should be made if necessary. If practicable these should be made before the tests in Part 2 of this section.

1.07 If the test requirements cannot be met or if facility substitutions are necessary, the control office should be notified.

#### 2. TESTS AND REQUIREMENTS

##### Circuit Units Renumbered Only

2.01 When a circuit order merely renumbers a circuit unit, no tests are required.

##### All Other Circuit Unit Changes

2.02 Preliminary Passive Balance Tests: At each hybrid arrangement at which any changes are made in the network circuit, in the 2-wire line assignment, in the 2-wire line equipment, in the filters, or in the specified singing point, passive balance tests should be made.

Requirements: The balances should meet or exceed the singing point values specified on the circuit layout record card.

2.03 Net Loss Tests: Make net loss measurements in each direction of transmission at 1000, 500, 1500, 2500 and 1000 cycles (except that the 2500-cycle measurement is not made in those cases where Tables II and III indicate its omission). However, at the request of the circuit control office, a circuit unit which is to become a part of an 18-channel v.f. carrier telegraph assignment may be required instead to be tested at the frequencies given in Table IV or V. Similarly, special requirements and limits may be called for to meet other special assignments.

Requirements: The measured 1000-cycle value in each direction should meet the loss or gain specified on the circuit layout record card within the limits of Table I. In addition, the algebraic difference in the two directions should be within 1 db of the algebraic difference between the corresponding specified losses or gains. For limits at 500, 1500 and 2500 cycles, see Tables II through V. The final 1000-cycle measurement should not differ from the initial 1000-cycle measurement by more than +0.5 db or else the series of measurements should be repeated until this requirement is met or after any trouble is cleared.

2.04 Listening Check: If, during the other tests, excessive noise or crosstalk conditions are suspected, listening observations

should be made at approximately a -7 db level on the circuit unit for the purpose of noting excessive noise or babble or intelligible crosstalk. If it is not practicable to make observations at a -7 db level, allowances should be made for the effect of the actual level used.

Requirements: If, in the judgment of the tester, the noise or babble is excessive or if the crosstalk is intelligible at approximately -7 db level, it should be investigated as covered in the sections in the E2 and E3 divisions on investigation of excessive noise and crosstalk.

TABLE I

PERMISSIBLE DIFFERENCE BETWEEN MEASURED AND SPECIFIED 1000-CYCLE NET LOSS OR GAIN

<u>Circuit Unit Type</u>	<u>Permissible Deviation - db</u>
Open Wire	
400 mi. and under	+ 1.0
Over 400 mi.	+ 1.5
Cable	
Non-regulated	+ 1.5
1 Regulating Repeater	
(a) With non-compensated temperature variation of 1 db or more, or with V3 or V1 long section regulating networks, or both	5*
(b) All other	+ 1
2 Regulating Repeaters	
(a) With V3 or V1 long section regulating networks at one or both points	+ 2.0
(b) All other	+ 1.5

\* This value applies to the specified net loss for the regulator setting at the time of the measurement.

TABLE II

NET LOSS-FREQUENCY MEASUREMENTS  
4-WIRE CABLE CIRCUIT UNITS

Allowable Deviation in db from 1000-cycle Net Loss Measurement

Facility	500 Cycles			1500 Cycles			2500 Cycles		
	Min.	Norm.	Max.	Min.	Norm.	Max.	Min.	Norm.	Max.
<u>H-44-25-S&amp;P</u>									
1 V3 or V1 Reg. Rept.	-1.7	0	+1.7	-1.2	0	+1.2	-1.7	0	+1.7
1 44A1 Reg. Rept.	-1.2	0	+1.2	-1.2	0	+1.2	-1.7	0	+1.7
2 V3 or V1 Reg. Rept.	-2.1	0	+2.1	-1.5	0	+1.5	-2.1	0	+2.1
2 44A1 Reg. Rept.	-1.5	0	+1.5	-1.5	0	+1.5	-2.1	0	+2.1
Non-reg.; V3, V1, 44A1 or Mod. 22A	-0.9	0	+0.9	-0.5	0	+0.5	-0.5	0	+0.5
<u>H-88-50-S&amp;P</u>									
1 V3 or V1, or 44A1 Reg. Rept.	-1.2	0	+1.2	-1.2	0	+1.2	-1.7	0	+1.7
2 V3 or V1, or 44A1 Reg. Rept.	-1.5	0	+1.5	-1.5	0	+1.5	-2.1	0	+2.1
Non-reg.; V3, V1, 44A1 or Mod. 22A	-0.9	0	+0.9	-0.5	0	+0.5	-0.5	0	+0.5
<u>H-63-P</u>									
1 V3 or V1, or 44A1 Reg. Rept.	-1.2	0	+1.2	-1.1	0	+1.1	-1.9	0	+1.9
2 V3 or V1, or 44A1 Reg. Rept.	-1.5	0	+1.5	-1.4	0	+1.4	-2.1	0	+2.1
1 Reg. Reading Rept.	-1.5	0	+1.5	-1.5	0	+1.5	-	-	-
Non-reg.; V3, V1, 44A1 or Mod. 22A	-0.9	0	+0.9	-0.5	0	+0.5	-1.0	0	+1.0
Non-reg.; Reading Rept.	-1.5	0	+1.5	-1.5	0	+1.5	-	-	-
<u>H-172-S, H-174-S or H-106-P</u>									
1 V3 or V1, or 44A1 Reg. Rept.	-1.0	0	+1.0	-1.2	0	+1.2	-	-	-
2 V3 or V1, or 44A1 Reg. Rept.	-1.3	0	+1.3	-1.5	0	+1.5	-	-	-
1 Reg. Reading Rept.	-1.5	0	+1.5	-1.5	0	+1.5	-	-	-
Non-reg.; V3, V1, 44A1 or Mod. 22A	-0.7	0	+0.7	-0.7	0	+0.7	-	-	-
Non-reg.; Reading Rept.	-1.5	0	+1.5	-1.5	0	+1.5	-	-	-

"+" means more loss than the measured 1000-cycle loss, "-" associated with a number means less loss than the 1000-cycle loss, and "-" alone in the column means no limit is required.

For combinations of classifications, such as a circuit unit consisting of two regulators on H-44 cable, one with V1 regulating networks, and one with 44A1 regulating networks, obtain the tolerance for the combination by adding to the tolerance of the component with the larger tolerance  $1/4$  of the tolerance of the component with the smaller tolerance (e.g., for the case chosen, at 500 cycles,  $+1.7 + 1/4 (+1.2) = +2.0$ ).

TABLE III  
NET LOSS-FREQUENCY MEASUREMENTS  
2-WIRE CIRCUIT UNITS

Allowable Deviation in db from 1000-cycle Net Loss Measurement

Facility	500 Cycles			1500 Cycles			2500 Cycles			
	Min.	Norm.	Max.	Min.	Norm.	Max.	Min.	Norm.	Max.	
<u>H-14-25, H-88-50, B-88-50</u>										
V3 or V1 with 128A, or 22A with D93985	(No CX, No 135-cycle (All other	-0.8	0	+1.1	-0.6	0	+1.5	0	+0.9	+2.7
V3 or V1 with 128C, or 22A with 13C	(No CX, No 135-cycle (All other	-0.8	0	+1.1	-1.1	0	+1.5	-1.5	+0.9	+3.3
<u>H-63-P</u>										
V3 or V1 with 128C, or 22A with 13C		-3.4	-1.1	+1.3	-1.5	+0.9	+3.3	-	-	-
<u>H-172-S, H-174-S, H-106-P</u>										
V3 or V1 with 128B, or 22A with 13B		-4.6	-0.9	+2.8	-0.6	+2.4	+5.4	-	-	-
<u>Open Wire</u>										
Any Ga., 22A with 13C or) 1059B Filter or) V3 or V1 with ) 128C )		-0.8	+0.7	+2.2	-1.0	0	+1.0	+0.2	+2.4	+7.0
Any Ga., 22A with D93985) Filter, or V3 or) V1 with 128A )		-0.8	+0.7	+2.2	-1.0	0	-1.0	-1.5	0	+1.5

"+" means more loss than the measured 1000-cycle loss, "-" associated with a number means less loss than the 1000-cycle loss, and "-" alone in the column means no limit is required.

TABLE IV

## NET LOSS-FREQUENCY CHARACTERISTICS

H-44-25 Cable Circuit Units Suitable for  
18-channel V.F. Telegraph

Allowable Deviation from 1000-cycle Loss

<u>Frequency</u>	<u>Min.</u>	<u>Norm.</u>	<u>Max.</u>
1000		Ref.	
120	-2.0	0	-
200	-2.0	0	+1.0
250	-1.5	0	+1.0
425	-1.5	0	+1.0
500	-1.0	0	+1.0
2500	-1.0	0	+1.0
3000	-1.5	0	+1.5
3200	-1.5	0	+1.5
1000	-0.5	0	+0.5

"+" means more loss than the 1000-cycle loss, "-" associated with a number means less loss than the 1000-cycle loss, "-" alone in the column means no limit is required.

TABLE V

## NET LOSS-FREQUENCY CHARACTERISTICS

H-88-50 Cable Circuit Units Suitable for  
18-channel V.F. Telegraph

Allowable Deviation from 1000-cycle Loss

<u>Frequency</u>	<u>Min.</u>	<u>Norm.</u>	<u>Max.</u>
1000		Ref.	
200	-2.2	+0.6	+4.0
250	-1.6	+0.2	+2.5
300	-1.5	+0.1	+2.1
500	-1.0	0	+1.0
1500	-1.0	0	+1.0
2200	-1.3	0	+1.3
2700	-1.4	0	+1.5
3000	-1.6	+0.1	+1.9
3200	-1.6	+0.4	+2.5
1000	-0.5	0	+0.5

"+" means more loss than the 1000-cycle loss, "-" means less loss than the 1000-cycle loss.

## SUMMARY OF TESTS

## CIRCUIT UNITS

<u>Type of Circuit Order Change</u>	<u>Test</u>	<u>Par. Ref.</u>	<u>Requirements</u>
Circuit Unit Renumbered Only	None	2.01	-
All Other	Balance Test at each hybrid arrangement at which change af- fects balance	2.02	Specified value or more.
	Net Loss in each direction	2.03	Table I and meas. diff. in two directions within 1 db of specified diff.  Except for 18-channel v.f. Teleg.: Tables II and III.  For 18-channel v.f. Teleg., if required: Tables IV and V.
	Listening Check	2.04	Noise and Crosstalk OK.