DAILY LINEUP PROCEDURES
TELEGRAPH CIRCUITS

CONTENTS

1. GENERAL

1.01 This section covers procedures for the daily lining up of all telegraph circuits and of circuits maintained as authorized layouts for emergency use in connection with such circuits.

1.02 The information contained in this section applies to manual telegraph circuits and to teletypewriter circuits of all speeds.

1.03 The practices covered in this section contemplate that each repeater office should complete the preliminary operations and tests prior to the time of the overall lineup and that the overall lineup should be conducted under the direction of the control office.

1.04 The practices covered in this section supplement tests prescribed in Bell System Practices covering the various types of repeaters and telegraph systems.

1.05 The forms available for recording the results of orientation range tests and for preparing the schedules of preliminary operations and tests at repeater offices and overall lineup work are listed below, and are described in detail in a section of this series.

Form E-2236 Test or Operating Record (Work Sheet)
Form E-2237 Lineup Schedule

A suggested arrangement of the work sheet for recording the progress of lineup work or other preliminary testing carried on at repeater offices also is included in the same section.

2. EXPLANATION OF TERMS

2.01 The following definitions are given as a guide in determining the type of lineup as covered in Parts 4 and 5 to be applied to the different portions of a circuit. When in the judgment of the circuit control office the layout of a circuit makes a departure from these definitions desirable, the circuit control office will specify the portions of the circuit to be included under Main Circuit and Side Legs, respectively, for lineup purposes.

2.02 Main Circuit

The main circuit is defined as:

(a) For circuits on which all stations are "two-way" (sending and receiving) stations, that portion of the circuit connecting the two offices serving the two stations most remote from a transmission coefficient standpoint.

(b) For circuits having two or more "two-way" (sending and receiving) stations and also one or more "receiving only" stations, that portion of the circuit connecting the two offices serving the "two-way" stations most remote from the transmission coefficient standpoint.

(c) For circuits having only one sending station and two or more "receiving only" stations, that portion of the circuit connecting the office serving the sending station and the radial office most remote from a transmission coefficient standpoint or, if the circuit does not include a radial office (see Paragraph 2.05), the office serving the station most remote from a transmission coefficient standpoint.

2.03 Side Legs

Side legs comprise extensions of the circuit from an office on the main circuit to repeater or terminal offices not on the main circuit.

2.04 Subscriber Loops

Subscriber loops comprise extensions from an office on the main circuit or side legs to the customer's office on a metallic, split loop or grounded basis.

2.05 Radial Office

A radial office is defined as:

(a) For circuits on which all stations are "two-way" (sending and receiving) or which have two or more "two-way" (sending and receiving) stations and also one or more "receiving only" stations, any office on a side leg at which two or more branches of the side leg are connected to the circuit.

(b) For circuits having only one "sending" station and two or more "receiving only" stations, any office other than the sending office at which two or more side legs are connected to the main circuit or to a side leg.

3. LINEUP SCHEDULES

3.01 Each control office should prepare a schedule covering the time and method of lineup on circuits under its control in order to secure proper coordination with and assistance of other offices involved. The lineup of individual circuits should be scheduled with a view to completing the work at least 30 minutes and not more than two hours prior to the time for start of service, or in the case of circuits operating on a 24 hour basis, all lineup work should be completed during the release period as established with the customers.

3.02 The schedule should be arranged so as to minimize the interoffice communication by taking advantage of sequence lineups between the same testing terminals on groups of circuits which have approximately the same starting time.

3.03 The control office should advise each repeater office of the overall lineup schedule of circuits in which the office is concerned. When changes in the circuit layout or hours of service are made, the schedule should be changed as required and the offices involved notified.

3.04 Each repeater office should prepare a schedule covering the work on repeater sets, system terminals, side legs and subscriber loops for which it is responsible to conform to the overall lineup specified by the control office. The schedules should be prepared with a view to completing the preliminary operations and tests not less than 30 minutes nor more than two hours prior to the time specified for the overall lineup.

4. PRELIMINARY OPERATIONS AND TESTS

4.01 The preliminary operations and tests outlined in the following paragraphs do not apply to circuits operated on a full time or 24 hour basis.

4.02 Not less than 30 minutes nor more than two hours prior to the time specified for the overall lineup each repeater office should determine that all circuits are established on the correct assignments, that the proper subscriber loops are connected and should complete all preliminary work required in connection with establishing the circuits. This should include a check to determine that all repeater keys and switches are properly operated, line currents are correct, balances are satisfactory and that the line sections are connected and carrier systems are in proper operating condition.

4.03 The various types of telegraph repeaters or system terminals require different procedures to determine if they are properly connected for service and are in proper operating condition. In Table I which covers the more common types of repeaters and system terminals, operations to be performed and the items to be checked are indicated by "X" for the various types of systems. The methods of making these tests under the particular service condition are contained in the practices covering the particular type of repeater or system terminal.

4.04 Each repeater office having subscriber loops or side legs should be responsible for lining up the side legs and for connecting the side legs and subscriber loops to the circuit. For side legs on manual telegraph circuits a contact or reversal lineup should be sufficient. For side legs on circuits used for teletypewriter service the type of lineup should be in accordance with the requirements of Table II. In general, side legs consisting of one carrier section only should not require an orientation range test; a manual telegraph contact lineup should be sufficient.

4.05 A repeater office responsible for connecting a side leg to the circuit should be responsible for taking action to establish service on the side leg. When trouble occurs prior to the service period, the repeater office should notify the circuit control office if subscriber loops are not connected due to trouble conditions not likely to be cleared prior to the service period, or if line facilities having higher section coefficients than the regularly assigned facilities were used for a temporary patch.

5. OVERALL LINEUP PROCEDURE

5.01 At the time designated by the circuit control office in the overall lineup schedule, the two offices between which the overall lineup is to be made should meet on the circuit and proceed with the type of lineup indicated in Table II, the main circuit only being considered.

5.02 In general, the overall lineup should be made between the circuit control office and the office on the main circuit which is most distant from a transmission coefficient standpoint. When a regenerative repeater is involved in the overall lineup, the sections of the circuit from each terminal to the regenerative repeater

TABLE I

Operation	Type of Repeaters or System Terminals: 1-Way Polar	SL Reptr.	2-Path Polar	BR DX	Diff. DX	Carrier VF (40)	Carrier HF (50)	2-W Metallic Term.	2-W Metallic Thru.	4-W Metallic Term.	4-W Metallic Thru.	Regenerative Repeater
Keys and switches properly operated	x	x	x	x	x	x	x	x	x	x	x	x
Proper line and loop connected	x	x	x	x	x	x	x	x	x	x	x	x
Dummy closed	x	x	x	x	x	x	x	x	x	x	x	x
Line balance	-	-	-	x	x	-	-	x	x	-	-	-
Line current	x	x	x	x	x	-	-	-	-	-	-	x
Loop current	x	-	x	x	x	x	x	x	-	x	-	-
Rectified current	-	-	-	-	-	x	x	-	-	-	-	-

should be lined up in accordance with Table II, prior to the time of the overall lineup. In any case, where because of the position of the circuit control office in the circuit, a different procedure seems desirable, the circuit control office should designate two offices between which the overall lineup should be made.

5.03 Lineup tests should be conducted between Telegraph Loop Terminals or their equivalent and should be made from the same position in the circuit as that occupied by the subscriber loop. The test set (Morse or teletypewriter) should be connected to the proper jack so that all signals transmitted to the line will pass through all subscriber loops.

5.04 Where the necessary communication facilities are available, no use should be made of the circuit under test for establishing contact or handling communications between offices during the lineup period.

5.05 Intermediate offices on the circuit should not participate in the overall lineup, except in cases of orientation range lineup, unless they have trouble or irregularities to report. They should, however, be available for call if trouble is experienced during the lineup.

5.06 On those circuits which require orientation range lineups, as shown by Table II, intermediate offices on the main circuit having side legs or transmitting equipment on subscriber loops should take readings and determine if the orientation range is satisfactory at that point in accordance with Table III of this section. If the orientation range is taken in both directions between the two offices conducting the overall lineup, intermediate offices should read the orientation range for both directions of transmission. A report of the orientation range obtained at the intermediate office is not necessary unless there is trouble. On circuits involving two-way and one-way transmitting sections, radial offices also should read margins if the circuit between either of the two offices between which the overall lineup is made and the radial office would, in accordance with Table II, require an orientation range lineup. The two offices conducting the overall lineup should advise each other of the results of the orientation range tests.

5.07 If, during a contact lineup of a group of circuits between two testing points, difficulty is experienced on one circuit, investigation of the circuit in trouble should be deferred until the lineup tests on the other circuits of the group are completed or should be referred to other attendants available for trouble location work. This should tend to minimize delays in handling subsequent lineup work with other testing points. If, during an orientation range lineup, trouble is encountered, the trouble should be sectionalized before proceeding with the tests on other circuits. In this connection, use should be made of the SPX circuits for patching out the section in trouble to avoid delay in starting service. The defect of the section can be investigated later.

5.08 Table II is furnished as a guide in the selection of the type of lineup to be used. Circuit control offices, however, may specify different procedures in the case of particular circuits when experience indicates this to be desirable.

TABLE II

Circuit Coefficient or Makeup	Lineup Requirements: Teletypewriter Circuit Orientation Range	Teletypewriter Circuit Contact	Morse Circuit Contact
Cf. 0- 3.0	-	Daily	Daily
" 3.1- 6.0	-	Daily	Daily
" 6.1- 8.0	Monthly	Daily	Daily
" 8.1- 10.0	Weekly	Daily	Daily
" 10.0-	Daily	-	Daily
Circuits of 5 rptr. sections or more between sending stations	Daily	-	Daily
Circuits containing regenerative repeaters	Daily	-	-

In the case of single section circuits where the preliminary tests insure that line current of the proper value is being received and the subscriber loops are closed and the loop current correctly adjusted, the contact lineup between telegraph boards may be omitted provided that the performance of the circuit over a period of time justifies such procedure.

5.09 Inherent stability of a circuit shown by orientation range tests over a period of time would indicate that consideration should be given to reducing the frequency or modifying the type of lineup. Frequent transmission difficulties indicated by lineup tests or variations resulting in excessive manual regulation would indicate the desirability of increasing the frequency or changing the type of test, or in some cases a complete lineup, similar to that used in establishing new layouts, may be necessary. If the desired improvement in circuit performance is not effected as the result of such changes in the lineup procedures, consideration should be given to the possibility of recommending changes in the facilities or method of operation.

5.10 A contact lineup consists of a continuity check of the circuit by transmitting Morse signals, reversals, or keyboard teletypewriter signals, and observing the correctness or quality of the received signals. Intermediate points are not involved in this type of lineup.

5.11 Where the necessary facilities are available, an orientation range lineup should consist of automatic transmission of teletypewriter signals on the circuit from two to five minutes, using a test sentence (see note) and measuring the orientation range of the received signals. In those cases where keyboard signals must be used for the purpose of the lineup, the test sentence should be transmitted at the normal operating speed in order to secure accurate results. Less accurate results may be obtained by transmitting the letters "RY" at uniform intervals so that the speed of operation is approximately normal. Single letter signals should be avoided as they are unsuitable for accurate results.

Note: Generally the following sentence is suitable:- A QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK 1234567890 *SENDING

* Office call letters to be inserted here.

5.12 The test sentence mentioned above provides for 80 teletypewriter operations of which 72 cause the teletypewriter to space, which forms a complete line on the page teletypewriter. The added operations for "letters" and "figures" provide for the proper operation of machines arranged for unshift on letters only as well as those arranged for unshift on both letters and space. The sentence should be transmitted to include the operations as follows:

A(sp)QUICK(sp)BROWN(sp)FOX(sp)JUMPED(sp)
OVER(sp)THE(sp)LAZY(sp)DOG(figs)'(ltrs)
S(sp)BACK(sp)(figs)1234567890(ltrs)(sp)
(sp)(*)(sp)(*)(sp)SENDING(c.r.)(c.r.)(l.f.)
(ltrs.)

* Office call letters to be inserted here.

6. LIMITS

6.01 For a given transmission coefficient between any two points on a circuit as shown on the circuit layout record card, the reduction in orientation range (scale divisions) should not exceed the values shown in Column 2 of Table III. Also the maximum reduction at either limit should not exceed the values shown in Column 3 of Table III.

TABLE III

Circuit Coefficient	Maximum Reduction in Orientation Range Scale Divisions *	Maximum Reduction of Either Limit of Range Scale Divisions *
0-3	10	8
3.1-6	15	12
6.1-8	20	16
Over -8	25	20

* Assumes use of 14 or 15-type teletypewriter.

7. PROCEDURE WHEN LIMITS ARE EXCEEDED

7.01 When the limits specified in Part 6 are exceeded supplementary tests should be made in order to sectionalize the trouble.

7.02 When the repeater section in trouble is determined, it should be turned over to the office controlling the section for correction of the condition. In order to minimize delays the faulty section should be patched out, using similar types of facilities where practicable.