

P1 CARRIER TELEPHONE SYSTEM  
ALTERNATE SYSTEM LINE-UP  
GENERAL INFORMATION AND TEST EQUIPMENT

1.00 GENERAL



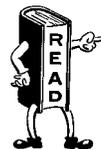
*The following sections are to be used for system line-up procedures when only repeater and remote terminal locations are provided by engineer. When all equalizers, pad values, and carrier levels are specified, Section 363-101-100 plus associated sections **must be used**.*

- 363-104-100 GENERAL INFORMATION AND TEST EQUIPMENT
- 363-104-501 PREPARATION
- 363-104-502 NONREPEATERED SYSTEMS
- 363-104-503 REGULATED REPEATER SYSTEMS
- 363-104-504 LEVEL COORDINATION
- 363-104-505 TABLE 1 — HIGH-GROUP REPEATER INPUT POWER
- 363-104-506 TABLE 2 — HIGH-GROUP REPEATER OUTPUT POWER
- 363-104-507 TABLE 3 — TEMPERATURE CORRECTION FOR HIGH-GROUP OUTPUT POWER
- 363-104-508 TABLE 4 — HIGH-GROUP REGULATOR VOLTS
- 363-104-509 TABLE 5 — TEMPERATURE CORRECTION FOR OUTPUT POWER AT —40 F

- 363-104-510 TABLE 6 — DESIRED LOW-GROUP OUTPUT POWER
- 363-104-511 TABLE 7 — LOW-GROUP REGULATOR VOLTS
- 363-104-512 TABLE 8 — TEMPERATURE CORRECTION FOR OUTPUT POWER

**1.01** The line-up consists of a series of tests and adjustments to be made at various points in the system with the terminal and repeater equipment installed at their in-service locations. The purpose of the system line-up is to adjust the equipment to the line by proper placement of pads and equalizers and proper adjustment of carrier and voice-frequency power in the system to ensure satisfactory operation with weather variation.

**1.02** The general procedure used in the system line-up is:



*Check Section 363-104-504 for procedure if two or more P1 carrier systems follow the same route for part of their length.*

1. Install central office terminals. Connect these terminals to carrier line.
2. Install the repeater nearest central office. Connect this repeater to line and adjust its

## SECTION 363-104-100

output (pads, 337-type equalizer, regulator, etc) in central office to remote terminal direction of transmission.

3. Repeat Step 2 for all other repeaters in the system.
  4. Install the remote terminal nearest the last repeater and connect this terminal to carrier line.
  5. Repeat Step 4 for all other remote terminals in turn from last repeater to most distant remote terminal.
  6. Install carrier line termination if required.
  7. Measure transmitted and received carrier power at remote terminals. Install IN and OUT pads in terminal.
  8. Repeat Step 7 in order from most distant remote terminal toward central office.
  9. Continue to repeater farthest from central office. Measure repeater output power toward central office for each channel. Determine proper remote terminal output pads and, if changes are required, install proper output pads in the terminals.
  10. Return to repeater farthest from the office and adjust its output toward central office. If system is pilot regulated, disconnect line toward remote terminals and adjust output of pilot oscillator. Reconnect line toward remote terminals.
  11. Adjust, in turn, output of the other repeaters in remote terminal to central office direction.
  12. Make end-to-end measurements (received carrier power, net loss, ringing check, etc) in both directions of transmission.
- 1.03** After system line-up is completed, place customer lines in service.
- 1.04** Terminal and repeater maintenance is covered in Sections 363-101-100 through 363-101-509 and 363-102-502 through 363-102-507. Over-all system trouble location is covered in Section 363-103-505.
- 1.05** When a channel is added to an existing non-repeated system, make end-to-end measurements on this channel.

**1.06** When a channel is added to a regulated repeated system, the repeater output in the total-power-regulated direction of transmission of each repeater must be readjusted. No adjustments are required at repeaters in pilot-regulated direction of transmission. End-to-end measurements of this channel must be made.

**1.07** The trouble-locating information consists of a series of tests to aid in isolating trouble to a particular terminal, repeater, or line section and should be used after it has been determined that the trouble is located in the carrier plant and not in the voice-frequency circuits, station sets, or other plant. See the section entitled Rural Carrier Telephone Systems, Testing Methods.

## 2.00 APPARATUS

**2.01** The following apparatus is required when performing the system line-up:

- 24 — Clips, Alligator, small (Mueller Electric Company No. 30 or equivalent), to be soldered on resistor leads
- 1 — Cord, 1W13B, equipped with two KS-6259 clips or equivalent, used for grounding test set
- 3 — Cords (shorting straps), W1Y
- 1 — Hand Set, 1011B or equivalent
- 1 — Milliwatt source, 1000 cycle, 600 ohm, such as 19C oscillator, 21A transmission measuring set, central office 1000-cycle milliwatt supply, etc (the oscillator must be a 600-ohm device or built out to be a 600-ohm device)
- 1 — Network, 800AF (dummy regulator)
- 4 — Plugs (dummy plugs), 258C, central office use only (required only if central office mounting is equipped with jacks)
- 1 — Resistor, KS-8512, List 5 or equivalent, 3900 ohm, 10 watt, for remote terminal use only
- 2 — Resistors, 145A, 135 ohm
- 6 — Resistors, 145A, 600 ohm (include four for each additional system along this route)

- 1 — Telephone Set, 500 type
- 1 — Test Set, P1 Carrier, J98707F, List 1
- 1 — Voltmeter, Carrier Frequency, KS-15538, List 3 (Sierra)
- 1 — Voltmeter, Vacuum Tube (VTVM), such as Hewlett-Packard 400C or D
- 1 — Volt-Ohm-Milliammeter, KS-14510, List 1 (use same meter for all voltage readings on repeaters)

**2.02** In addition to the above apparatus, an assortment of 337-type equalizers and 29-type pads are required.

### **3.00 ALGEBRAIC ADDITION AND SUBTRACTION**

**3.01** Computation made during system line-up as covered in the following point sections of this series requires the use of algebraic addition and subtraction.

**3.02** The basic rules for algebraic addition and subtraction are given below:

#### **Algebraic Addition:**

*Rule 1:* When adding two numbers with the same sign, add the numbers and prefix the common sign.

$$\begin{aligned} \text{Example: } (+3) + (+2) &= +5 \\ (-3) + (-1) &= -4 \end{aligned}$$

*Rule 2:* When adding two numbers with different signs, subtract the smaller from the larger and prefix the sign of the larger.

$$\begin{aligned} \text{Example: } (+3) + (-2) &= +1 \\ (-3) + (+2) &= -1 \end{aligned}$$

#### **Algebraic Subtraction:**

*Rule 1:* When one number is to be subtracted from another, change the sign of the number to be subtracted and add algebraically.

$$\begin{aligned} \text{Example: } (+3) - (-2) &= (+3) + (+2) = +5 \\ (+4) - (+2) &= (+4) + (-2) = +2 \\ (-3) - (-4) &= (-3) + (+4) = +1 \end{aligned}$$