

TYPE N3 CARRIER TELEPHONE SYSTEM SECONDARY CARRIER DISTRIBUTION CIRCUIT DESCRIPTION

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1. GENERAL

A. System Functions of the Secondary Carrier Distribution Circuit

1.01 This section describes the secondary carrier distribution circuit which provides a means for coupling the common N3 carrier supply to one or two N3 carrier terminals.

1.02 The secondary carrier distribution panel is located in the same bay as the N3 terminals and is connected to the N3 carrier supply by means of a cable. Particular attention is given to the polarity of the carrier signals to assure proper phasing of the composite transmitted signal.

1.03 The secondary distribution circuit when properly connected to the N3 carrier supply, supplies 16 single-frequency sinusoidal voltages with a high degree of purity and accurately controlled level and frequency characteristics for modulation and demodulation purposes in the N3 terminal.

B. Description and Features

1.04 The secondary carrier distribution panel, Fig. 1, is a 3-sided aluminum enclosure provided with brackets for mounting on a cable duct-type bay. It contains two tiers of printed wiring boards arranged vertically side by side for the entire width of the panel.

1.05 The boards are positioned in grooved cast aluminum shelves and are secured by Panduit cable duct assemblies placed at the front of the shelves.

1.06 All board terminals, both input and output, are wire-wrap type and are mounted along the leading vertical edge of each board.

1.07 Wiring to and from these terminals is contained in the Panduit cable ducts which are provided with snap-on covers.

1.08 The secondary distribution panel is to be located near the top of the N3 terminal bay where it occupies 10 inches of vertical bay space.

1.09 Nineteen cable pairs carrying 16 discrete frequencies are connected between the carrier supply and the secondary distribution panel, Fig. 2.

1.10 Twelve pairs carry channel carrier frequencies, one pair carries a translation frequency (256 kc), and the remaining two groups of three pairs each carry the group frequency and two channel group frequencies.

C. Transmission Features

1.11 All 19 inputs are connected to 0- to 1.5-db adjustable pads in the secondary distribution panel. These pads are adjustable in 0.5-db steps and compensate for the losses in the cable between the carrier supply and the secondary distribution panel. The input impedance of each pad is 115 ohms.

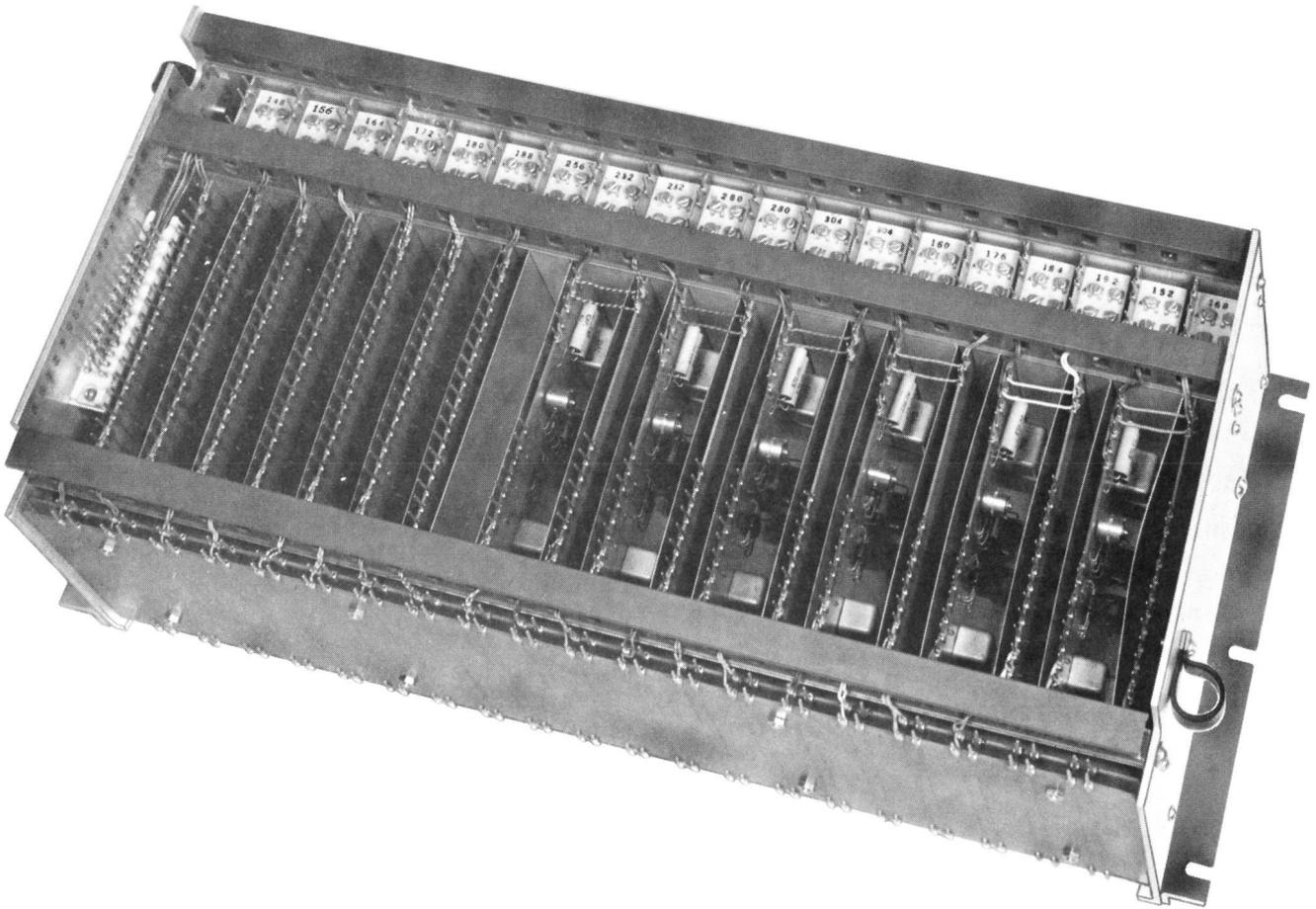


Fig. 1 -- Carrier Supply Secondary Distribution Panel

1.12 The four pads used for channel group frequencies (232 and 280 kc) have an impedance matching network which transforms the 115 ohms into 135 ohms with a loss of 3.5 db. The carriers leaving these networks are then connected directly to the N3 terminals, one pair for each channel-group modulator. The two pads used for the group frequency (304 kc) are connected directly to N3 terminals (one pair for each N3 terminal) at the 115-ohm impedance.

1.13 The remaining 13 carriers, after leaving the adjustable pads, go to distribution circuits. Twelve of these carriers, for channel carriers, are divided into two groups; i.e., odd (odd harmonics of 4 kc) and even (even harmonics of 4 kc) carriers. The odd carriers are 148, 156, 164, 172, 180, and 188 kc; and the even carriers are 152, 160, 168, 176, 184, and 192 kc.

1.14 The odd carriers and the translation carrier (256 kc) are connected to reactive coupling networks, each having eight balanced outputs. The distribution is accomplished by having the series capacitor of the network divided into eight separate capacitors. In order to obtain additional isolation between outputs, each output has a resistive pad between the capacitors and the N3 terminal connection.

1.15 The even carriers (transmitted) are connected to a carrier regulator and a distribution network. The distribution networks for frequency-control carriers (152 and 168 kc) have six outputs and the remaining networks have four outputs. Both networks have resistive pads between their outputs and the N3 terminal, as previously described. All the carrier regulators have four outputs which would normally supply two N3 terminals. If only one N3 terminal is to be

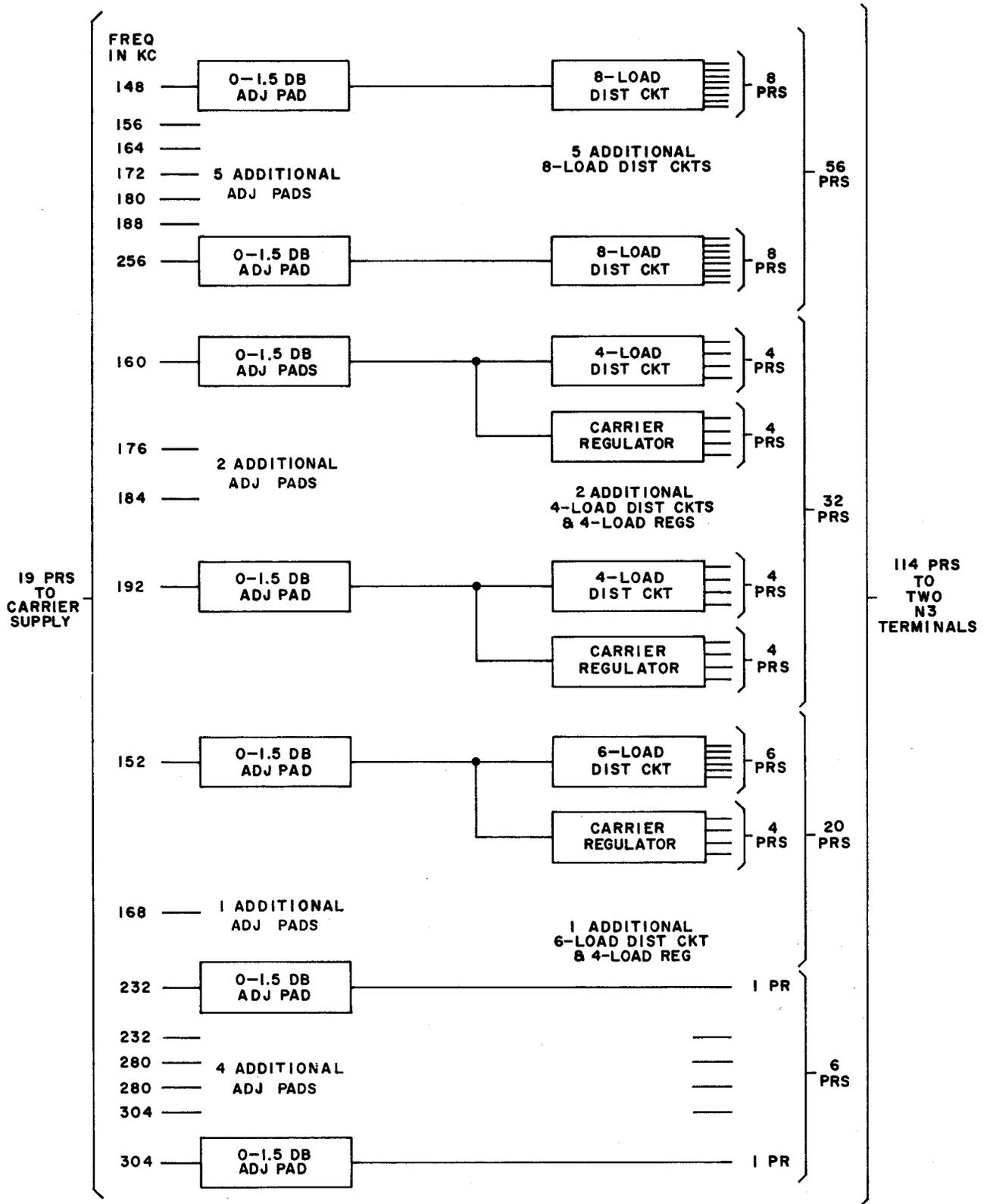


Fig. 2 - Secondary Carrier Distribution Circuit

located in the bay, dummy load resistors are connected across the unused output terminals. The outputs of the regulators do not change more than ± 0.03 db for a ± 1.0 db change in input level.

1.16 An option is provided so that the regulators may be replaced by four load distribution networks if the pilot carriers are not transmitted. Another facility provided is the capability of interrupting the carriers going to one terminal of an N3 bay. This feature is provided by wiring options on the distribution panel and is required when wideband data signals are to be transmitted over an N3 system. In such cases, certain individual carriers are required only for the remaining channel group.

2. DETAILED DESCRIPTION

A. Adjustable Loss Pads

2.01 The adjustable loss pads are balanced 115-ohm bridged T attenuators, as shown in Fig. 3(A).

2.02 The pad loss can be varied in 0.5-db steps from 0 to 1.5 db by opening or shorting out resistors with screw-type switches.

2.03 Each adjustable pad subassembly is stamped with an identifying number on the front above the screw-type switches. Although the pads themselves are independent of frequency, an inductor which is part of the distribution network is also located on 13 of the 19 subassemblies.

2.04 Four of the remaining six adjustable pads have 115- to 135-ohm impedance transformation networks, as shown in Fig. 3(B). These networks have a loss of 3.5 db and provide an impedance of 135 ohms to the N3 terminal channel group (232 and 280 kc) carrier frequency circuits.

2.05 The last two adjustable pads are identical to the pads shown in Fig. 3(A) and their outputs are connected directly to the N3 terminals at the 115-ohm impedance to provide line group carriers (304 kc).

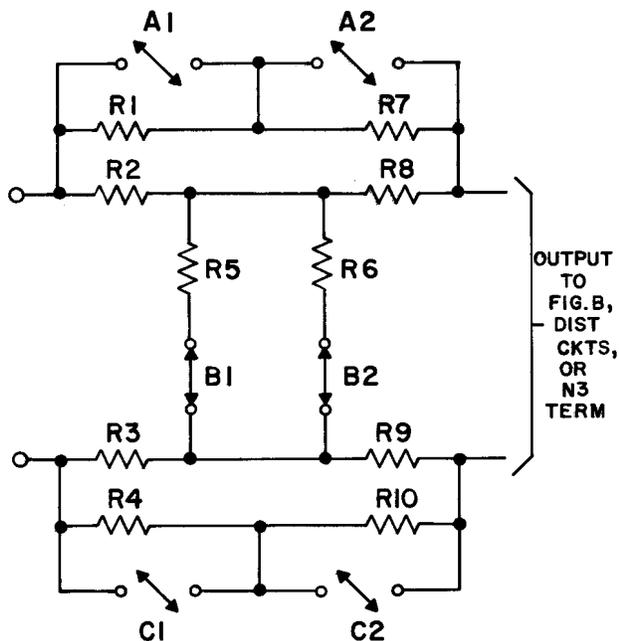


Fig. 3(A) - Adjustable Loss Pads

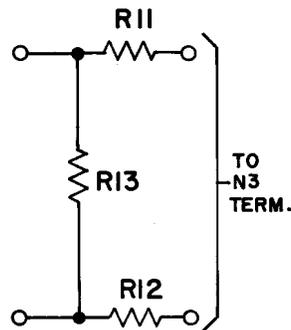


Fig. 3(B) - Impedance Transformation Network

B. Distribution Circuits

2.06 Thirteen distribution circuits are provided, one for each channel carrier frequency and one for the translation frequency (256 kc). All circuits are similar, except for the number of outputs and the provision of carrier regulators in some cases (see Fig. 2).

2.07 Seven of the circuits have eight output load points for connection to two N3 terminals.

- 2.08 Two of the circuits have six output load points for connection to two N3 terminals.
- 2.09 Four of the circuits have four output load points for connection to two N3 terminals.
- 2.10 The inputs to the 8-load distribution circuits are connected to the adjustable pads.
- 2.11 The 4- and 6-load distribution circuits have their inputs connected in parallel with associated channel carrier regulator inputs to the outputs of the adjustable pads (see Fig. 2).
- 2.12 The input power is divided between the regulator and the distribution circuit.
- 2.13 The load distribution networks in Fig. 2 are balanced reactive network sections, as shown in Fig. 4. The series from the total capacitance which resonates the inductor by capacitors are divided from the total capacitance which resonates the inductor by the required number of output circuits. The outputs are designed to operate into 135-ohm terminations.

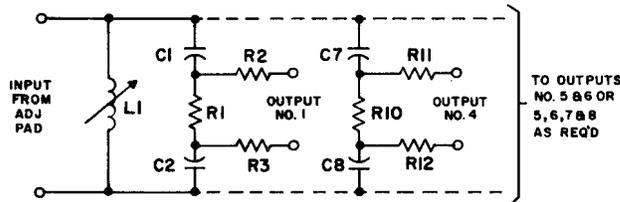


Fig. 4 - Load Distribution Network

- 2.14 In order to increase the isolation between outputs, a balanced 135-ohm pad is provided between each network output and its load.
- 2.15 The 6-load distribution circuit output pads have 4.5 db of loss, while the 4- and 8-load circuits have 6-db pads.
- 2.16 Block diagrams of the distribution circuits with input and output signal powers are shown in Fig. 5(A) and (B).

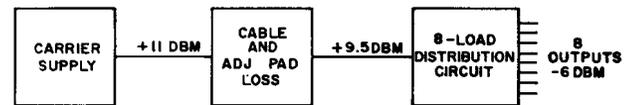


Fig. 5(A) - The 8-load Distribution Circuit

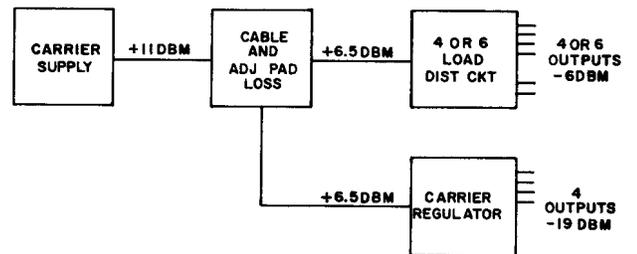


Fig. 5(B) - The 4- and 6-load Distribution Circuits

C. Carrier Regulator Circuit

- 2.17 The carrier regulator circuit is shown in Fig. 6.

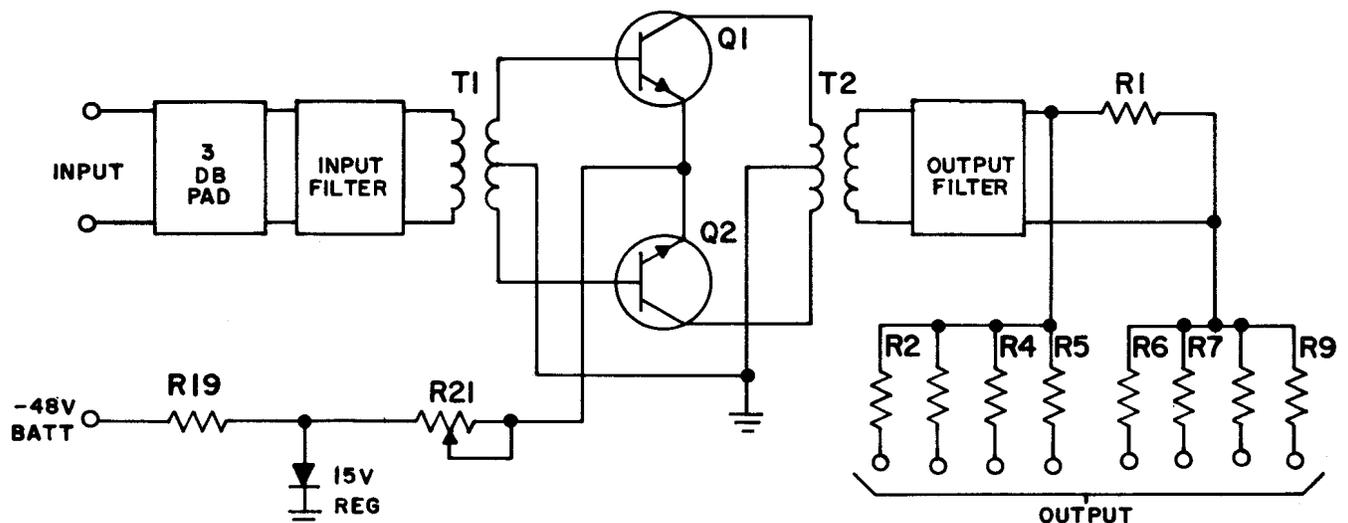


Fig. 6 - Carrier Regulator and Distribution Circuit

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2.18 The high degree of regulation is obtained by two transistors Q1 and Q2. They are connected in a push-pull circuit configuration.

2.19 The input signal is of an amplitude great enough to keep Q1 and Q2 either cut off or in a saturated conduction for each half-cycle, depending upon polarity.

2.20 The signal developed across T2 is a square wave of constant amplitude determined by the magnitude of the transistor-emitter current, which is set in the factory by adjustment of R21. This adjustment should not be made in the field.

2.21 The input circuit consists of a resistive pad for isolation and a filter to prevent harmonics generated in the regulator circuit from going back into other distribution circuits.

2.22 The output filter is a balanced shunt M derived low-pass filter with its peak attenuation at the third harmonic of the input signal.

2.23 The filtered output is a pure sine wave with distortion product more than 60 db below the fundamental.

2.24 The output of the filter is terminated in the shunt resistor R1 and the series isolating resistors R2 through R9 with the 135-ohm loads.

3. TESTING AND MAINTENANCE FEATURES

3.01 For testing purposes, all interconnecting wiring and input and output leads are available at the rear of the panel.

3.02 The cable duct mounting brackets ride in slotted holes in the panel and can be slid up or down out of the way when removal of any board is required.

3.03 All field testing is to be done on a transmission level basis by making bridging measurements at the input and output terminals.

4. TRANSMISSION PERFORMANCE

4.01 At the secondary distribution panel, the input powers of the carriers distributed from the N3 carrier supply will be between +11.5 and +9.0 dbm, depending upon the length of interconnecting cable and variations in the carrier supply output. The interconnecting cable should not exceed 700 feet.

4.02 The input impedance to the secondary distribution panel is 115 ohms balanced.

4.03 The output frequencies, power, and impedances are shown in Table A.

FREQUENCY	NUMBER OF OUTPUTS PER FREQUENCY	OUTPUT POWER	OUTPUT IMPEDANCE
kc		dbm	ohms
148, 156, 164, 172, 180, 188, and 256	8	-6 ±0.5	135
160, 176, 184, and 192	4	-6 ±0.5	135
152 and 168	6	-6 ±0.5	135
152, 160, 168, 176, 184, and 192	4	-19 ±0.05	135
232 and 280	2	+3.0 ±0.5	135
304	2	+6.5 ±0.5	115

5. REFERENCE LIST

5.01 Reference is made to the following:

SUBJECT	NUMBER
Secondary Carrier Distribution Circuit	SD-99736-01
Secondary Carrier Distribution Panel Assembly	J99300E