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BELL TELEPHONE LABORATORIES, INC.

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TOLL SYSTEMS  
BROADBAND CARRIER TELEPHONE  
CARRIER SUPPLY  
KEY SHEET

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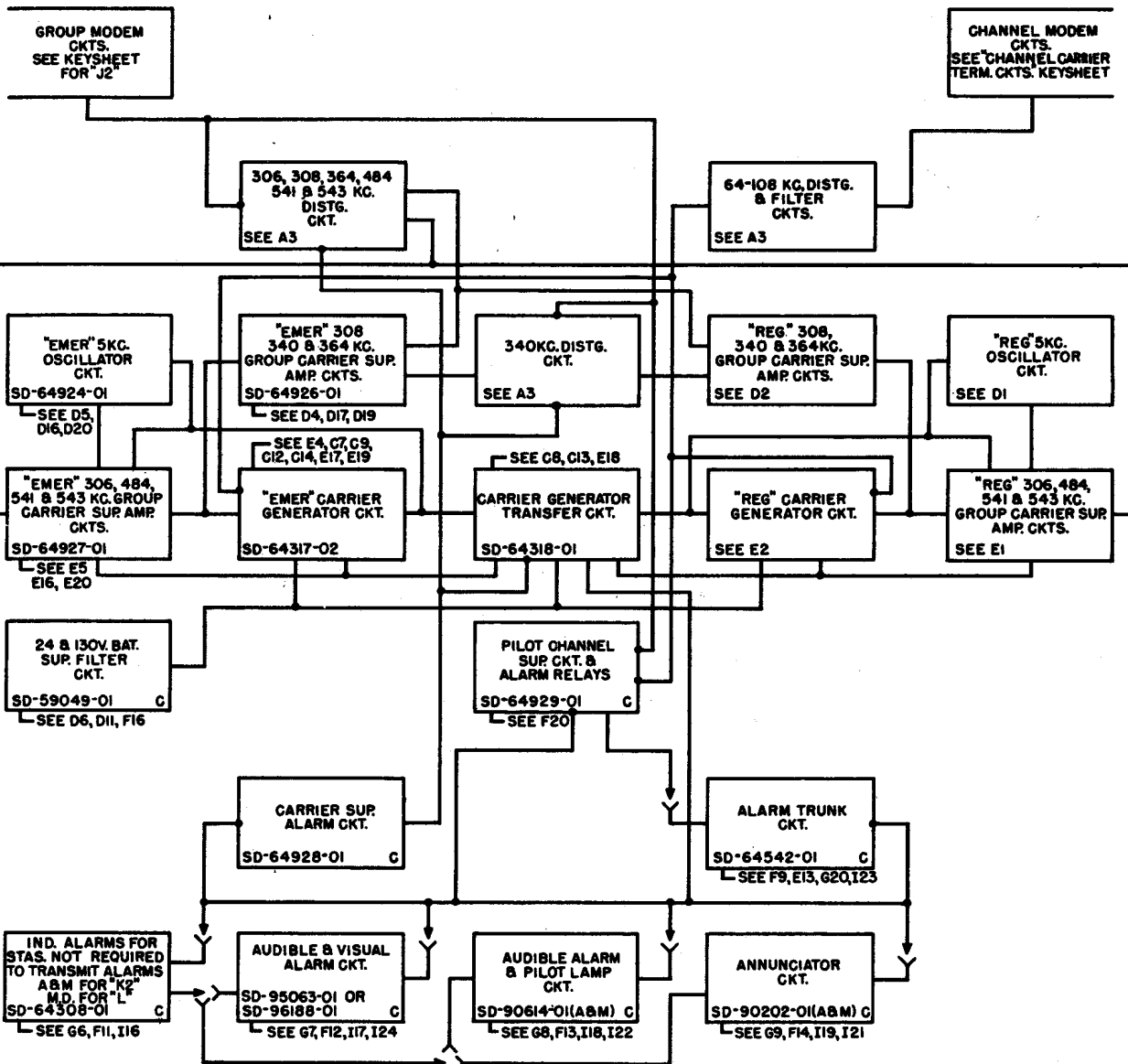
FOR EXPLANATION OF CONVENTIONS, SEE  
MASTER KEY SHEET SD-90250-01.  
FOR TRANS. MEAS. KEY SHEET, SEE SD-95021-01.

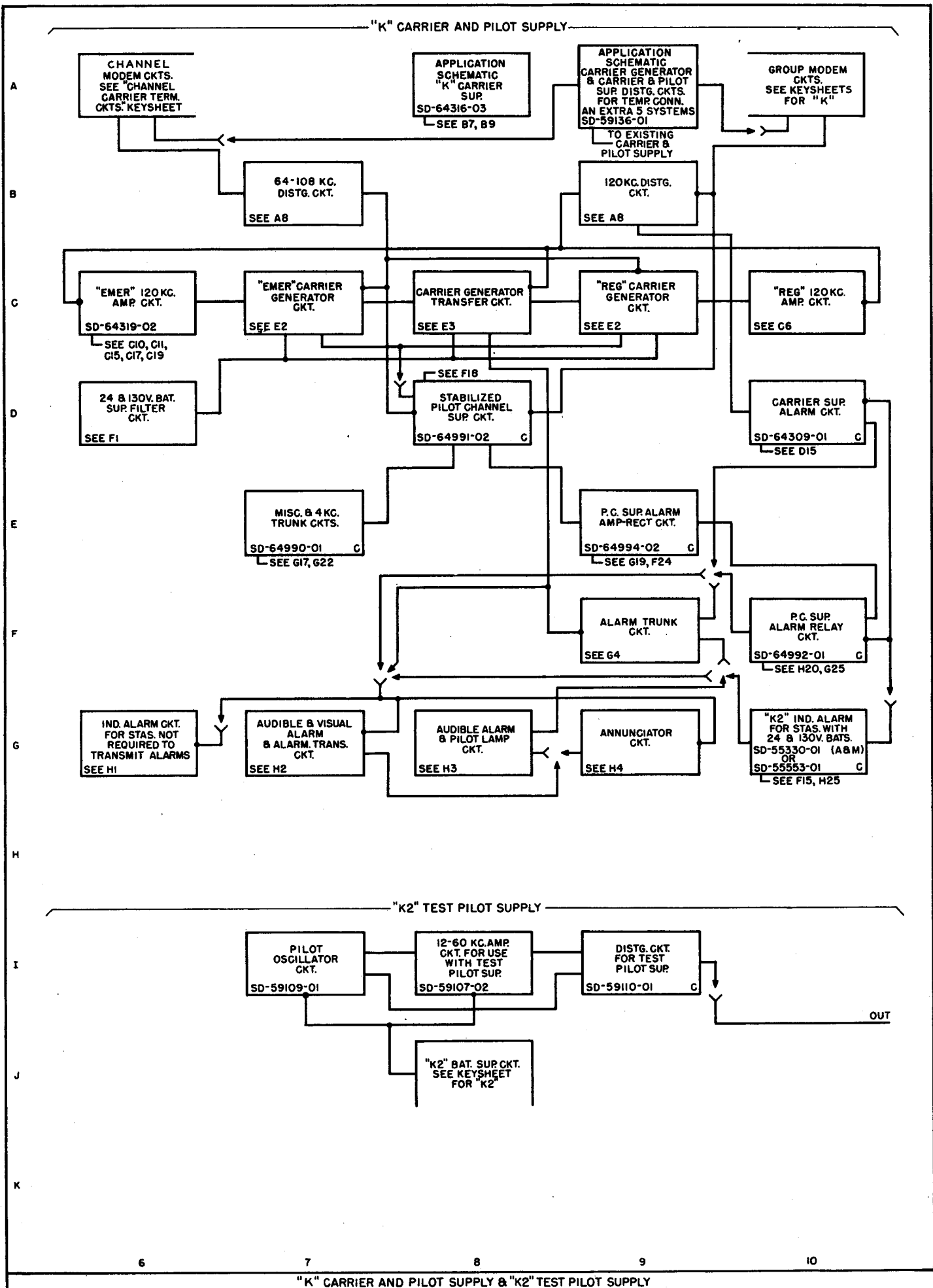
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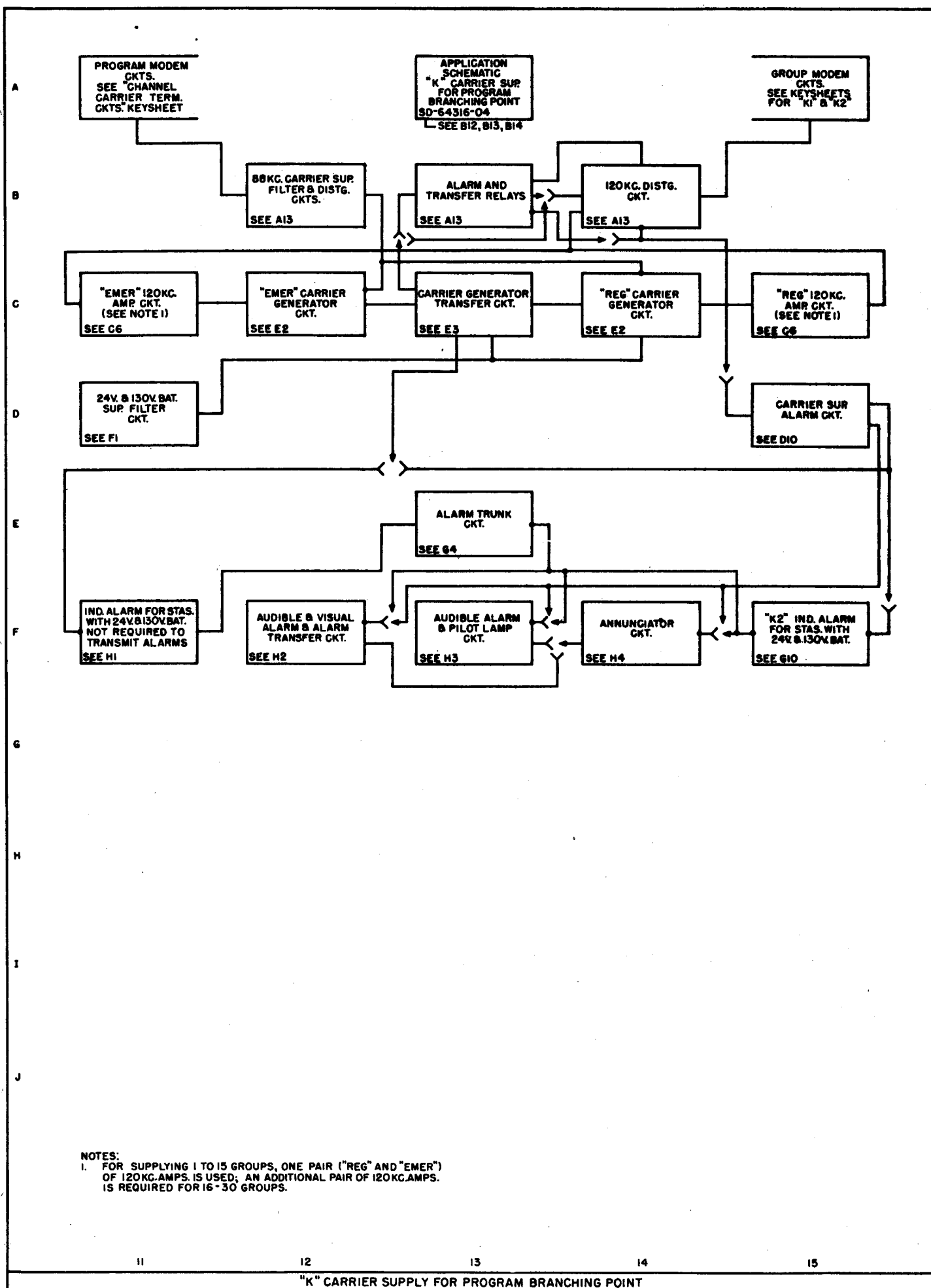
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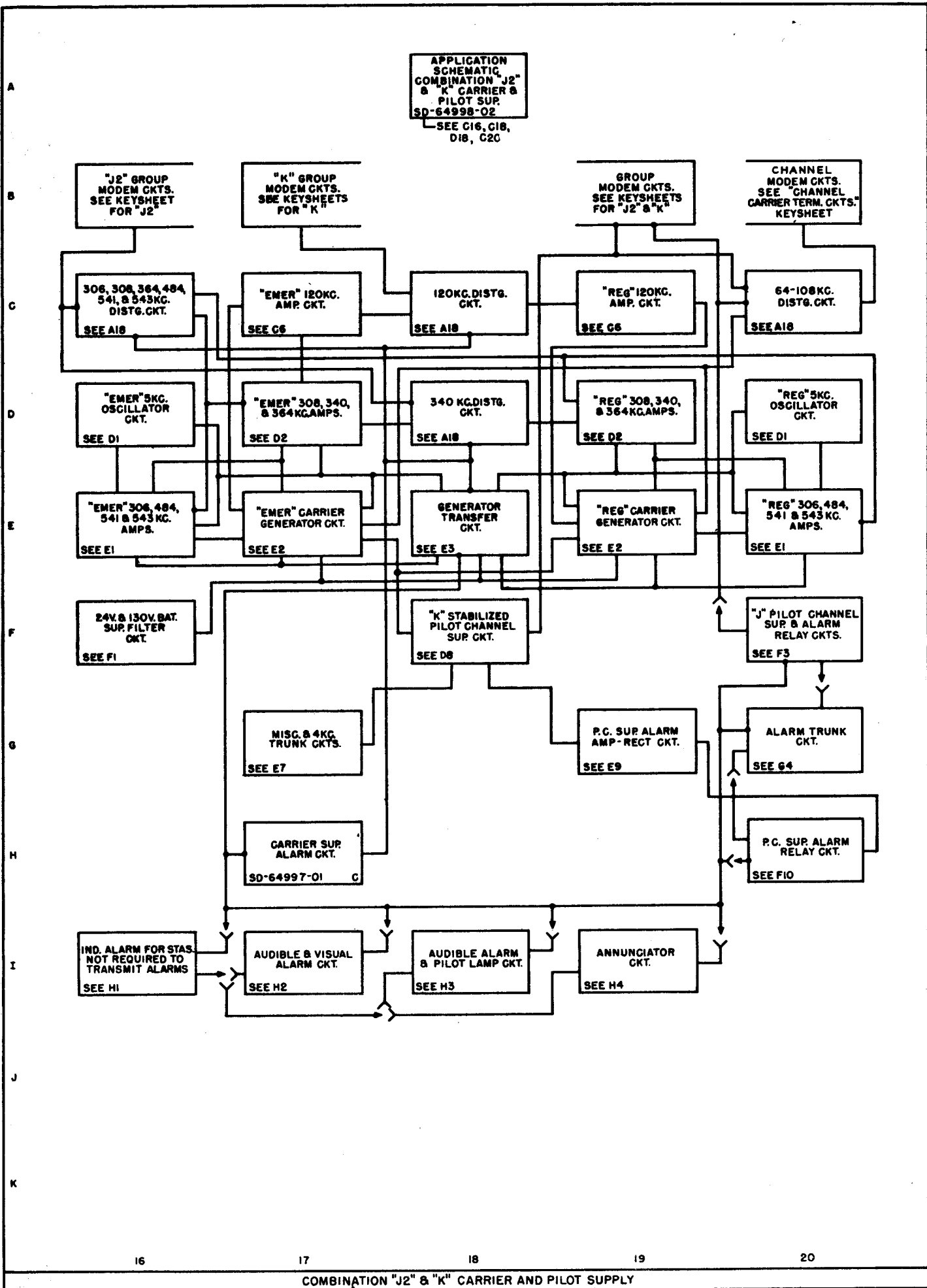
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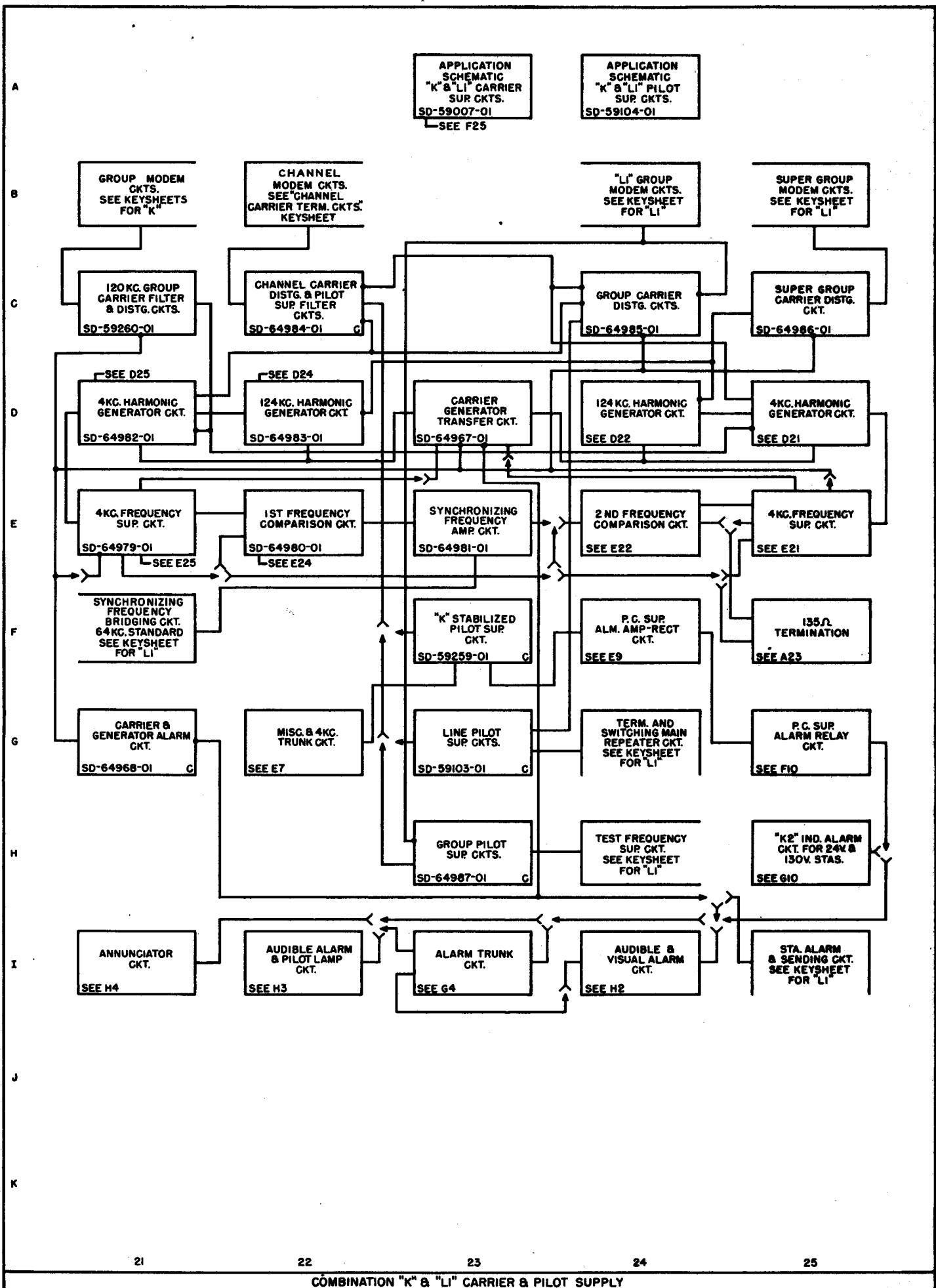
APPLICATION  
SCHEMATIC  
J2" CARRIER  
SUPPLY CKT.  
SD-64925-02  
SEE C2, C4, D3











[illegible]

1. REGULATED BATTERY.
2. NON-REGULATED BATTERY.
3. THIS -24V. DRAIN IS DUE TO THE SPACE CURRENT OF THE '374A'S FLOWING INTO THE -24 V. LEAD TO GROUND.
4. WHEN SUPPLYING 1-15 PROGRAM TERMINALS.
5. WHEN SUPPLYING 16-30 PROGRAM TERMINALS.

## GENERAL DESCRIPTION

In the "J2" Carrier Supply, a crystal controlled oscillator generates a fundamental frequency of 4 kc. Harmonics of this fundamental are produced for the channel carrier supply. The 64-108 kc distributing circuit includes hybrid coils, filters, and protective resistances for distributing the twelve channel carrier frequencies to each of ten or fifteen systems.

The group carrier frequencies of 308-, 340-, 364-, and 484-kc are also produced as harmonics of 4-kc. In addition, the output of the 5-kc oscillator, which is of the tuning fork type, modulates with other harmonics of 4-kc to produce the group frequencies of 306-, 541-, and 543-kc.

Two carrier generators are always supplied. They are referred to as the "regular" and "emergency" generators. Both are connected to the carrier frequency load through the distributing circuits, but the output of the emergency generator is normally blocked by a high negative bias on the control tube of its amplifier, while a normal grid bias on the control tube of the regular generator allows it to supply the load.

A failure of one or more of the group frequencies supplied from the regular generator causes a gas tube in the generator transfer circuit to break down. This, in turn, causes an interchange of grid biases on the control tubes of the two generators which blocks the output of the regular generator and releases the output of the emergency generator.

Since this automatic transfer process is not reversible, the normal operating condition (emergency generator blocked) must be restored manually. The generators may also be transferred manually (either way) and either generator may be locked in disabling the transfer circuit, while the other is being tested.

A 24- and 130-volt battery supply filter prevents false transfer of the generators due to disturbances in the battery supply circuits.

Two sets of protective resistances are used with the group distributing circuits. Each set is connected to the output of one of the two group frequency amplifiers by separate "bus bars". This not only prevents trouble on one system from affecting the carrier supply of the other systems, but also eliminates, as far as practicable, the possibility of a failure of the carrier supply for all systems supplied due to shorts or grounds in the distributing circuits.

The 64-104 kc pilot channel supply obtains its carrier supply from the 64- and 104-kc harmonics of the channel supply and is required only at west terminals. The 58-109 kc and 60-111 kc pilot channel supplies develop their own carrier frequencies by means of crystal controlled oscillators. The 58-109 kc supply is required at east terminals for NB and SB systems; the 60-111 kc supply is required at east terminals for NA and SA systems.

The "K" Carrier and Pilot Supply employs the same type of carrier generator, generator transfer, battery supply filter, and 64-108 kc distributing circuits as is used in the "J2" carrier supply.

In this supply, a 120-kc amplifier and filter is associated with each carrier generator. The filter selects the 120-kc frequency and the amplifier raises it to the level required by the group modulators and demodulators.

The 120-kc distributing circuit provides the carrier supply for the "K" carrier group terminals and has two sets of protective resistances (for reasons mentioned above).

The carrier supply alarm circuit gives a major alarm should the 120-kc supply fail entirely. This would occur only if both generators failed at one time or if one generator failed while the transfer circuit was not operating.

Certain channel carrier frequencies, after being passed through stabilizing equipment, are used for the pilot frequencies of 64-, 92- and 108-kc. These frequencies are used for regulating "K" carrier systems as well as for making in-service level measurements on the systems.

Means are provided for manually transferring from the stabilized supply to an alternate, unstabilized supply obtained directly from the generator circuit through padding resistors. The output of the supply not being used is connected to a measuring trunk for adjusting the levels of the pilots before switching.

The pilot channel alarm relay equipment is actuated by a small portion of amplified and rectified current taken from the pilot supply bus. Alarms are originated when the supply falls outside of the predetermined level limits.

The "K2" Test Pilot Supply consists, basically, of an oscillator, a combination amplifier-oscillator, and associated distributing equipment.



Three crystal controlled oscillators generate the pilot frequencies of 12-, 28-, and 56-kc. The output at each frequency may be set to the desired level by means of potentiometers.

The test pilot amplifier, in addition to amplifying the above-mentioned frequencies, generates another pilot frequency of 60-kc. It is a fixed gain amplifier operating on the inverse feedback principle; it employs an oscillator path similar to that used in the "K2" transmitting amplifier.

This equipment is used to make tests of pilot channel operation and to make transmission tests on out-of-service lines.

A "K" Carrier Supply for Program Branching Point is available for supplying carrier program equipment only. The circuit is arranged to provide carrier frequencies of 88 KC and 120 KC only, for a total of 1-15 or 16 to 30 program terminals and 1-15 or 16 to 30 branch modulators and demodulators, and thus is capable of furnishing carriers for 15 through branching or 30 end branching equipments. When the carrier supply is to provide more than 15 sets of branching point modulators and demodulators (up to a total of 30 sets), a second pair of 120-KC amplifiers is added.

Protective resistances in the 88-kc distributing circuit prevent trouble on a program circuit from affecting the carrier supply of other circuits. They are arranged in a manner similar to that used in the 120-kc distributing circuit, mentioned above.

The Combination "J2" and "K" Carrier Supply provides group carrier and pilot frequencies to the "J2" and "K" group circuits in a group connecting office and also the frequencies needed for the channel modems. This supply combines most of the features of the "J2" and "K" carrier supplies, discussed previously.

In addition, the carrier supply alarm circuit is used in a group connecting office for causing the following alarms: A major office alarm in the event of a complete failure of the carrier supply or of the main "J2" and "K" carrier frequencies of 340- and 120-kc, respectively; a minor office alarm in the event of failure of the 306-, 308-, 364-, 484-, 541-, or 543-kc carrier frequencies. The carrier supply alarm circuit also translates a failure of any of the above-mentioned frequencies into an interruption of the 120-kc frequency to the carrier generator transfer circuit so that this circuit operates to change over to the emergency carrier generator without interruption of service.

In the "K" & "L1" Carrier and Pilot Supply, bridge-stabilized, crystal controlled, 128-kc oscillators supply energy to sub-multiple generator circuits which produce frequencies of 64- and 4-kc. The frequencies of the oscillators may be adjusted over a small range by means of a variable condenser which may be hand-operated or motor-driven, as required.

The synchronizing frequency amplifier receives a wide band signal from the sync frequency bridging circuit, selects the 64-kc pilot, and amplifies it. In the frequency comparison circuits, the pilot frequency and the 64-kc output frequency currents are modulated and the difference frequency is supplied to a four-phase motor which drives the variable condenser in the oscillator so as to reduce the error.

The 4-kc output is used to produce odd and even harmonics which are supplied to the channel and group carrier distributing circuits, the stabilized pilot supply circuit, and the 124-kc harmonic generators. The latter generate the harmonic frequencies needed to supply the supergroup equipment.

Generally speaking, the carrier generator transfer circuit performs the same functions as those discussed previously. However, in the "L1" carrier supply arrangements neither generator is designated a regular, and a transfer from either generator to the other will take place automatically.

The channel carrier distributing circuits supply the necessary pilot frequencies to the group, line, and stabilized pilot supplies, as required.

In the group carrier distributing circuits, filters select the desired harmonics of 4-kc. The carrier is then amplified by two adjustable gain amplifiers, in parallel, so that the failure of either amplifier will not seriously affect service, and then the carrier is delivered to a bus bar equipped with protective resistances. The other group and supergroup distributing circuits are essentially similar in operation.

A copper-oxide rectifier in each of the above distributing circuits converts a part of the carrier to a d-c which operates a relay in the alarm circuit. When the carrier supply is functioning normally, each of the group and supergroup distributing circuits holds a relay operated in the carrier and generator alarm circuit. If any relay releases, the transfer circuit interchanges 4-kc harmonic generators and also turns in a minor alarm. If, after the transfer, all the group or all the supergroup relays release, the transfer circuit will change the generators back to the

first condition. Should all the group or all the supergroup alarm relays remain released, a major alarm is given.

The current drain data is to be used in determining the size of the toll power plant and the power leads. These data shall be used in all cases except for

those deviations specifically authorized by the Bell Telephone Laboratories, Inc. in accordance with the routine procedure covering special practices.

The drain given for each circuit represents the average throughout the busy hour for all equipment shown on that circuit.

# INDEX OF DRAWINGS

<u>Dwg. No.</u>	<u>Description</u>	<u>Loca- tion</u>	<u>Dwg. No.</u>	<u>Description</u>	<u>Loca- tion</u>
SD-55330-01	"K" Individual Alarm Ckt.	G10	SD-64319-02	"K" 120 KC Amp. Ckt.	C6
SD-55553-01	"K2" Individual Alarm Ckt.	G10	SD-64542-01	Alarm Trunk Ckt.	G4
SD-59007-01*	"K" & "L1" Carrier Supply Ckts.	A23	SD-64924-01	"J" 5 KC Oscillator Ckt.	D1
SD-59049-01	Battery Supply Filter Ckt.	F1	SD-64925-02*	"J2" Carrier Supply Ckt.	A3
SD-59103-01	Line Pilot Supply Ckt.	G23	SD-64926-01	"J" 308, 340 & 364 KC Amps.	D2
SD-59104-01*	"K" & "L1" Pilot Supply Ckts.	A24	SD-64927-01	"J" 306, 484, 541 & 543 KC Amps.	E1
SD-59107-02	"K2" Test Pilot Amp. Ckt.	I8	SD-64928-01	"J" Carr. Sup. Alarm Ckt.	G2
SD-59109-01	"K2" Test Pilot Osc. Ckt.	I7	SD-64929-01	"J" Pilot Channel Supply Ckt.	F3
SD-59110-01	"K2" Test Pilot Distg. Ckt.	I9	SD-64967-01	"L1" Carr. Gen. Transfer Ckt.	D23
SD-59136-01*	"K" Carr. Gen. & Carr. & Pilot Sup. For Temporarily Conn. an Additional 5 Sys. to Carr. & Pilot Sups.	A9	SD-64968-01	"K" & "L1" Carr. & Gen. Alarm Ckt.	G21
SD-59259-01	"K" Pilot Chan. Sup. for Obtaining Pilot Sup. from "L1" Carr. Bays	F23	SD-64979-01	"L1" 4 KC Freq. Sup. Ckt.	E21
SD-59260-01	"K" & "L1" 120 KC Group Carr. Distg. Ckt. for Obtaining 120 KC Carr. from "L1" Carr. Sup.	C21	SD-64980-01	"L" Freq. Comparison Ckt.	E22
SD-64308-01	Individual Alarm for Stations Not Required to Transmit Alarms	H1	SD-64981-01	"L" Synchronizing Freq. Amp. Ckt.	E23
SD-64309-01	"K" Carrier Supply Alarm Ckt.	D10	SD-64982-01	"L" 4 KC Harmonic Gen. Ckt.	D21
SD-64316-03*	"K" Carrier Supply	A8	SD-64983-01	"L" 124 KC Harmonic Gen. Ckt.	D22
SD-64316-04*	"K" Carrier Supply for Program Branching Point	A13	SD-64984-01	"L" Channel Carr. Distg. Ckt.	C22
SD-64317-02	"J" & "K" Carrier Generator Ckt.	E2	SD-64985-01	"L" Group Carr. Distg. Ckt.	C24
SD-64318-01	"J" & "K" Carrier Gen. Transfer Ckt.	E3	SD-64986-01	"L" Supergroup Carr. Distg. Ckt.	C25
			SD-64987-01	"L" Group Pilot Sup. Ckts.	H23
			SD-64990-01	Misc. & 4 KC Trunk Ckts.	E7
			SD-64991-02	"K" Stabilized Pilot Chan. Sup. Ckt.	D8
			SD-64992-01	"K" Pilot Chan. Sup. Alarm Relay Ckt.	F10

\*Application Schematic

<u>Dwg. No.</u>	<u>Description</u>	<u>Location</u>	<u>Dwg. No.</u>	<u>Description</u>	<u>Location</u>
SD-64994-02	"K" Pilot Chan. Sup. Alm. Amp.- Rect. Ckt.	E9	SD-90202-01	Annunciator Ckt.	H4
			SD-90614-01	Audible Alarm & Pilot Lamp Ckt.	H3
SD-64997-01	"J-K" Carr. Sup. Alarm Ckt.	H17	SD-95063-01	Audible & Visual Alarm Ckt.	H2
SD-64998-02*	"J2" & "K" Carrier Supply Ckt.	A18	SD-96188-01	Audible & Visual Alarm Ckt.	H2

\*Application Schematic