

**TYPES J AND K TERMINALS
CARRIER AND PILOT SUPPLY
TYPE J2, K, AND COMBINED J2 AND K
GENERAL MAINTENANCE CONSIDERATIONS**

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TABLE A
TEST AND TEST INTERVALS OF
CARRIER AND PILOT SUPPLY

TEST	TEST INTERVAL*	REFERENCES †	
		J2 SUPPLY, SECTION 356-030-505	K SUPPLY, SECTION 356-030-510
Electron Tube Tests	2M	X	X
Switching of Regular and Emergency Carrier Supplies	AR	X	X
4-KHZ Carrier Generator Output	AR	X	X
5-KHZ Oscillator Output	AR	X	X
Synchronization of Carrier Supply	A	X	X
Check of 5-KHZ Oscillator Frequency	AR‡	X	
Carrier Supply Output at Test Jacks	6M	X	X
Carrier Supply Bus Bar Output	AR	X	X
Ionization of Gas Tubes in Generator Transfer Circuit	AR	X	X
Operation of Carrier Generator Transfer Circuit	AR	X	X
Voltage of Transfer and Alarm Circuit	AR	X	X
Pilot Level Adjustments of 64-, 92-, and 108-KHZ Stabilized Pilots — Type K	AR		X
Gain Adjustment of Pilot Supply Alarm — Type K	AR		X
Pilot Output Level and Tuning — Type J	AR	X	

* 2M — bimonthly; 6M — semiannually; A — annually; AR — as required.

† For combined J2 and K carrier and pilot supply, refer to the appropriate test under J2 or K.

‡ This test is made only when schedule A or B program is assigned to a channel group operating from the carrier supply.

for a longer period than necessary; that is, transfer to the regular supply as promptly as conditions will permit. This is necessary because no automatic transfer feature is provided for transferring from the emergency to the regular supply in case of trouble in the emergency supply.

Caution: *Before a manual switch is made to the emergency carrier supply, the output of the emergency supply should be checked in order to avoid interruptions to service in case the emergency supply is not operating properly. The output should be measured at the TST jacks as covered in Sections 356-030-505 and 356-030-510.*

3.02 The number of transfers from one carrier supply to another should be kept at a minimum because of possible interference to working circuits. Where type J2 and K terminals are working from the same carrier supply, manual transfers should be coordinated with respect to the two types of systems.

Caution: *Do not remove the panel cover for tests or adjustments on the carrier supply circuits unless the green lamp (idle indicator) on the panel to be tested is lighted.*

3.04 When it is necessary to test the regular supply, the following action should be taken.

- (1) Transfer to the emergency supply.
- (2) As soon as the tests on the regular supply have been completed, transfer the systems to the regular supply by operating the black RLS key.

3.05 When it is necessary to test the emergency supply, the following action should be taken.

- (1) Lock in the regular supply to prevent a possible automatic transfer.
- (2) As soon as the tests on the emergency supply have been completed, release the lock-in feature of the regular supply.

B. Pilot Supply (Type K Stabilized Pilot)

3.06 The type K carrier systems should be operated on the regular stabilized pilot supply

at all times except when transferred to the alternate supply because of trouble or for testing purposes. When operating on the alternate supply, the transfer to the regular supply should be made as soon as conditions permit. This is desirable since the alternate supply is not stabilized and the pilot output levels are not as closely adjusted as those of the regular supply. Transfers from regular to alternate and from alternate to regular are made manually and, as there is no automatic transfer, the transfer should be made promptly when a pilot supply failure alarm is noted.

C. Carrier Generator Transfer Circuit

3.07 If the carrier generator transfer circuit is not operating in a normal manner, it is possible for the regular and emergency carrier supplies to be fed to the carrier bus bars in multiple with a resulting adverse reaction to service. In order to avoid this, it is necessary to lock in the emergency supply when testing the tubes or doing other work on the transfer panel and, in addition, to block the output of the regular supply by opening the carrier supply circuit at the TST ODD, TST EVEN, and other test jacks of the regular carrier supply.

4. OPERATIONS

A. Responsibility

4.01 The system control office should arrange for making available at the system terminal the 2-kHz or 4-kHz reference frequency for use in checking the frequency of the 4-kHz or 5-kHz supply of the carrier generator.

B. Major and Minor Alarms (Type J2 or K Carrier Supply)

4.02 The failure of the 340-kHz supply in the type J2 carrier supply or the 120-kHz supply in the type K carrier supply will bring in a major alarm, indicated by an audible signal and the lighting of the red MJ or CARR ALM lamp on the alarm panel of the carrier supply, when a trouble condition such as covered in 4.03 occurs. The aisle pilot lamp also lights when there is a failure in the type J2 carrier supply. The failure of any of the other carrier supplies will bring in a minor alarm, indicated by an audible signal and the lighting of the red MN lamp on the alarm panel of the carrier supply, when a trouble condition such as covered in 4.03

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occurs. The aisle pilot lamp also lights. Upon receipt of either of these alarms, the following action should be taken.

- (1) Attempt to transfer manually to either the regular or emergency supply. If the trouble is not cleared, lock in the regular supply.
- (2) If a major alarm occurs, measure (at the test jacks) the 340-kHz carrier supply output in the type J2 supply or the 120-kHz carrier supply output in the type K supply and investigate the circuit for trouble.
- (3) If a minor alarm occurs, measure (at the test jacks) the output of each carrier supply other than the 340-kHz supply and investigate the circuit for trouble.
- (4) After the trouble is cleared, be sure that the carrier systems are operating from the regular carrier supply and that the regular supply is not locked in.

4.03 The operation of the carrier supply major or minor alarms may be due to one of the following causes.

- (a) Failure of both generator circuits.
- (b) Failure of both the 340-kHz amplifiers for the type J2 supply or a failure of both the 120-kHz amplifiers for the type K supply will produce a major alarm. For the other carrier frequencies of the type J2 supply, a failure of both the amplifiers of the same frequency will produce a minor alarm.
- (c) Failure of the regular supply when the regular supply is locked in.
- (d) Failure of the emergency supply when operating on the emergency supply.
- (e) Failure of the automatic transfer circuit to operate when the carrier systems are operating from the regular supply and a failure of the regular supply occurs.

C. Major and Minor Alarms (Combined Type J2 and K Carrier Supply)

4.04 The failure of either the 120-kHz or the 340-kHz supply will bring in a major alarm,

indicated by an audible signal and the lighting of the red MJ lamp on the alarm panel of the carrier supply, when a trouble condition such as covered in 4.05 occurs. The aisle pilot lamp also lights. The failure of any of the other carrier supplies will bring in a minor alarm, indicated by an audible signal and the lighting of the red MN lamp on the alarm panel of the carrier supply, when a trouble condition such as covered in 4.05 occurs. The aisle pilot lamp also lights. Upon receipt of either of these alarms, the following action should be taken.

- (1) Attempt to transfer manually to either the regular or emergency supply. If the trouble is not cleared, lock in the regular supply.
- (2) If a major alarm occurs, measure (at the test jacks) the output of the 340-kHz and 120-kHz carrier supplies to determine whether both or only one of the supplies has failed. Investigate the affected circuit for trouble.
- (3) If a minor alarm occurs, measure (at the test jacks) the output of each carrier supply other than the 340-kHz and 120-kHz supplies and investigate the circuit for trouble.
- (4) After the trouble is cleared, be sure that the carrier systems are operating from the regular carrier supply and that the regular supply is not locked in.

4.05 The operation of the carrier supply major or minor alarms may be due to one of the following causes.

- (a) Failure of both generator circuits.
- (b) Failure of both the 340-kHz or both the 120-kHz or all the 340-kHz and 120-kHz amplifiers will produce a major alarm. For the other carrier supplies, a failure of both of the amplifiers of the same frequency will produce a minor alarm.
- (c) Failure of the regular supply when the regular supply is locked in.
- (d) Failure of the emergency supply when operating on the emergency supply.
- (e) Failure of the automatic transfer circuit to operate when the carrier systems are

operating from the regular supply and a failure of the regular supply occurs.

D. Transfer Alarm (Type J2 or K or Combined Type J2 and K Carrier Supply)

4.06 When the regular carrier supply fails, the carrier systems are automatically transferred to the emergency supply. This transfer is indicated by a minor alarm and the lighting of the green lamp (idle indicator) on the transfer panel. The following action should be taken.

- (1) Silence the audible alarm by operating the red EMER key on the transfer panel.
- (2) For the regular carrier supply, make the measurement and adjustment of the carrier supply outputs. This will include the testing of the electron tubes and the replacement of any tubes not meeting the requirements.
- (3) After the condition causing the alarm has been corrected, transfer to the regular supply by operating the black RLS key.

E. Transfer Circuit Fuse Alarm (Type J2 or K or Combined Type J2 and K Carrier Supply)

4.07 When either the A or B fuse in the heater circuits of the tubes in the transfer circuit blows, the regular and emergency carrier supplies may be connected in parallel. When the blowing of the A or B fuse causes a fuse alarm, the following action should be taken immediately.

- (1) Operate the carrier system using the emergency carrier supply.
- (2) Open the regular carrier supply at the test jacks.
- (3) Locate and clear the circuit trouble and replace the fuses.
- (4) Remove the open circuit from the regular supply.
- (5) Transfer to the regular supply by operating the black RLS key.

4.08 When, in connection with maintenance procedures, it is necessary to remove the fuses from the transfer circuit, the carrier supply

output not supplying the carrier systems should be opened at the test jacks in order to prevent the two supplies from operating in parallel.

F. Pilot Channel Supply Alarm (Type J2 or K or Combined Type J2 and K Carrier Supply)

4.09 A deviation in level greater than 0.5 dB from normal for either of the type J2 pilot frequencies supplied from one panel will be indicated on a Sensitrol® relay and will cause audible and visual office alarms and the lighting of the ALM lamp on the supply panel. In the type K carrier supply, the three pilots are combined in one Sensitrol relay. The sum of the three pilots must deviate more than 0.5 dB from normal before there is an alarm. Upon receipt of this alarm, the following action should be taken.

- (1) Silence the audible alarm by operating the CO key.
- (2) Check the alarm by restoring the Sensitrol relay pointer to normal by operating the RST key. If the pilot supply level has returned to normal, the ALM lamp is extinguished upon release of the RST key and the Sensitrol relay will indicate a normal level.
- (3) If the pilot supply level remains in excess of 0.5 dB from normal, as indicated by the ALM lamp and the Sensitrol relay, investigate the supply circuit for trouble. This will include testing the electron tubes and replacing any tubes not meeting requirements.
- (4) After the condition causing the alarm has been corrected, operate the RST key to restore the Sensitrol relay to normal and to extinguish the ALM lamp.

5. REPLACEMENT OF ELECTRON TUBES AND BALLAST LAMPS

5.01 The electron tubes of the carrier system are tested without being removed from their sockets and without removing the equipment from service. When tube replacements are required, the action to be taken depends upon the type of circuit, as outlined below.

5.02 Electron-tube tests should not be made when the battery voltage is changing rapidly since

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under this condition the heater current will be constantly changing.

5.03 Before removing any tube from its socket, turn off the heater current and allow time for the tube to cool. After cold tubes are in place, allow sufficient time for the tube to become stabilized before testing the tube. All replacement tubes should be tested before the circuit is returned to service. The details and cautions to be observed when turning the heater circuits on or off are given in Section 356-030-505 or 356-030-510, covering the testing methods for the carrier supply equipment.

A. Carrier Supply

5.04 When tubes or ballast lamps (J2 carrier supply only) are to be replaced in any of the circuits listed below, the switching of the carrier supply circuits should be in accordance with the instructions in Part 3,A of this section. If the carrier systems are operating on the emergency supply as a result of an automatic transfer, it indicates a possible trouble in the regular carrier supply and this should be cleared before proceeding with tube or ballast lamp changes in the emergency supply or in the transfer circuit.

5.05 Regular Carrier Generator and Carrier Supply Amplifiers:

- (1) Switch to the emergency carrier supply.
- (2) Replace the tube or ballast lamp and test the tubes in the heater circuit affected.
- (3) Check the carrier supply output at the test jacks.
- (4) Transfer the systems to the regular supply.

5.06 Emergency Carrier Generator and Carrier Supply Amplifiers:

- (1) Lock in the regular carrier supply to prevent an automatic transfer to the emergency supply.
- (2) Replace the tube or ballast lamp and test the tubes in the heater circuit affected.
- (3) Check the carrier supply output at the test jacks.

- (4) Restore the regular supply to normal so that an automatic transfer can take place.

5.07 Carrier Generator Transfer Circuit:

- (1) Lock in the emergency carrier supply to prevent an automatic transfer.
- (2) Replace the ballast lamp *or* replace the tube and make electron-tube test.
- (3) Perform the tests "Ionization of Gas Tubes in Transfer Circuit" and "Operation of Carrier Generator Transfer Circuit" in Sections 356-030-505 (J2) and 356-030-510 (K).
- (4) Restore the regular supply to normal so that an automatic transfer can take place.

B. Type K Stabilized Pilot Supply

5.08 The tubes in this supply may be replaced at any time since they are in the alarm circuit and do not affect the pilot level output.

- (1) Replace the tube and perform vacuum-tube tests.
- (2) Perform the test "Gain Adjustment of Pilot Supply Alarm" in Section 356-030-510.

C. Pilot Channel Supply—J2 Terminals

5.09 Tubes or ballast lamps may be replaced on an in-service basis. The regulating equipment at all stations will lock up during the few minutes required for the change, but this will not affect the operation of the systems. Unless the audible alarm feature of the high-low pilot channel circuit alarm has been made inoperative, audible alarms will be received at the main repeater stations. Terminal stations and those offices having the audible alarm feature in operation should be notified by the control terminal.

- (1) Replace the tube or ballast lamp and perform electron-tube tests if the tube is replaced.
- (2) Read the pilot level on the IND 1 or IND 2 Sensitrol relay of the pilot channel supply and adjust the output, if required.