

L MULTIPLEX TERMINALS
LMX-1
CARRIER AND PILOT SUPPLY
TRANSFER OF CARRIER AND PILOT SUPPLIES AND
LINE PILOT SWITCHING

CONTENTS	PAGE
1. GENERAL	1
2. DETERMINATION OF WORKING GENERATOR	1
3. MANUALLY SWITCHING CIRCUITS OUT OF SERVICE	2
4. CIRCUIT FAILURES AND ALARMS	3
5. MANUAL CONTROL AFTER A FAILURE OCCURS	3
6. LINE PILOT SWITCHING	6

1. GENERAL

1.01 This section covers the automatic and manual switching of the LMX-1 carrier and pilot supply equipment. It also provides patching procedures for regular and spare pilots on L1 and L3 carrier systems.

1.02 This section is issued as part of the general reorganization of the 356 Division and to clarify the L1 pilot supply patching procedures. It supercedes Section 356-052-501.

Caution: The transfer of a carrier, pilot, or line switching pilot supply may cause hits on associated telegraph and data services. All supply transfers should be kept to a minimum.

1.03 The type of transfer circuit used in the carrier supply for all installations does not recognize one 4-kHz harmonic generator as the regular and the other 4-kHz harmonic generator as the emergency. The transfer circuit is so

designed that it will transfer from either 4-kHz harmonic generator to the other in case of a failure of one or more of the group or supergroup carrier supplies. Furthermore, in case the spare generator is inoperative, the transfer circuit transfers the carrier load back to the first generator. At this point, the transfers cease.

1.04 At L3 installations, the monitoring of each individual 308-, 556-, 2064-, 3096-, 7266-, and 8320-kHz pilot frequency or 13.00-, 14.04-, 15.60-, 18.20-MHz carrier frequency generator is accomplished by means of two Sensitrol* relays, WKG GEN and STBY GEN, mounted on each transfer and control panel. The Sensitrol relays do not recognize any one generator as the regular or emergency but only as the working or standby generator. Thus, the WKG GEN Sensitrol relays always monitor the in-service working generator and the STBY GEN Sensitrols monitor only the standby generator, regardless of the operation of the transfer switch.

1.05 In order to interchange regular and spare line pilot equipment at the line pilot supply bay, it is necessary to make a manual patch. Insert a 305A open-circuit plug into the 128-kHz PAD OUT jack of the J68858B unit.

2. DETERMINATION OF WORKING GENERATOR

2.01 In order to determine which 4-kHz harmonic generator is working, press the TEST key on the 4-kHz harmonic generator transfer panel. This causes a white lamp (1, 3, A or 2, 4, B) to light on the generator transfer panel indicating that either generator No. 1, 3, A or No. 2, 4, B is the working generator.

2.02 At L3 installations (using J68828G pilot transfer and control panel) to determine whether the regular or emergency generator is

* Trademark of Weston Instruments, Inc.

the working generator, it is necessary to observe the REG and EM white-capped lamps associated with the manual control (MAN CON) switch on each transfer and control panel, as listed below.

MAN CON POS	IND LAMP LIGHTED	WORKING GEN
NORM	—	REG
NORM	REG	REG (EM failed)
NORM	EM	EM (REG failed)
REG	REG	REG (locked in)
EM	EM	EM (locked in)

Note: MAN CON has to be in NORM position for automatic transfer to take place. *Automatic transfer takes place from regular to emergency generator only.*

2.03 A physical check at the line pilot supply bay will indicate whether the regular or the spare pilot supply is supplying pilots to the line.

3. MANUALLY SWITCHING CIRCUITS OUT OF SERVICE

3.01 When it is necessary to remove the metal cover from one of the generator panels, the green idle-indicator lamp on that panel must be lighted. This lamp indicates that the duplicate generator, which is not to be disturbed, has been locked in service by manual operation of the proper MAN CON switches. To remove a generator from active service and to light the green idle-indicator lamp, turn the MAN CON switches to the position indicated in Table A or B.

Caution: The transfer of a carrier, pilot, or line switching pilot supply may cause hits on associated telegraph and data services. All supply transfers should be kept to a minimum.

3.02 *Manual Transfer of 4-kHz Harmonic Generator:*

- (1) In the case of a 4-kHz harmonic generator, the operation of a switch causes the white lamp associated with the working generator to light on the carrier generator transfer panel and also causes the green lamp A to light on the 4-kHz harmonic generator panel.
- (2) After determining which 4-kHz harmonic generator is the working generator, the

TABLE A
LOCKING REGULAR SUPPLY PANELS
OUT OF SERVICE

PANEL DESIG	MAN CON SWITCHES WHICH MUST BE TURNED TO EM POSITION
REG 4 KC FREQ SUP	All 4-kHz harmonic generators to 2, 4, or B supply; all six pilots; all four carrier frequencies
REG 4 KC HRM GEN	4-kHz harmonic generator transfer circuit to 2, 4, or B supply
REG 124 KC HRM GEN	4-kHz harmonic generator transfer circuit to 2, 4, or B supply
REG PRI FREQ CONV	All six pilots and all four carrier frequencies
REG INT FREQ CONV	All pilot frequencies except 8320 kHz
REG 520 KC HRM GEN	The 8320-kHz pilot and all four carrier frequencies
REG PIL GEN PANEL	The two pilot frequencies specified in panel designations
REG CARR AMPL	The carrier frequency specified in panel designation

Caution: The transfer of a carrier, pilot, or line switching pilot supply may cause hits on associated telegraph and data services. All supply transfers should be kept to a minimum.

working generator may be transferred by turning the transfer switch to the position in which the lamp did not light when TEST key was depressed.

- (3) Should one or more (but not all) of the group or supergroup carrier supply busses be de-energized after transfer, there will be (a) a minor audible alarm, (b) the lighting of a white lamp or lamps GR SIG or SG SIG corresponding to the number of group or supergroup carrier supplies that failed, (c) the lighting of the green lamp CARR ALM. Under this condition, the load should be transferred immediately to the original generator by turning

TABLE B

**LOCKING EMERGENCY SUPPLY PANELS
OUT OF SERVICE**

PANEL DESIG	MAN CON SWITCHES WHICH MUST BE TURNED TO REG POSITION
EM 4 KC FREQ SUP	All 4-kHz harmonic generators to 1, 3, or A supply; all four frequencies; all six pilots
EM 4 KC HRM GEN	4-kHz harmonic generator transfer circuit to 1, 3, or A supply
EM 124 KC HRM GEN	4-kHz harmonic generator transfer circuit to 1, 3, or A supply
EM PRI FREQ CONV	All six pilots and all four carrier frequencies
EM INT FREQ CONV	All pilot frequencies except 8320 kHz
EM 520 KC HRM GEN	The 8320-kHz pilot and all four carrier frequencies
EM PIL GEN PANEL	The two pilot frequencies specified in panel designation
EM CARR AMPL	The carrier frequency specified in panel designation

Caution: The transfer of a carrier, pilot, or line switching pilot supply may cause hits on associated telegraph and data services. All supply transfers should be kept to a minimum.

the transfer switch. The trouble should then be cleared in the carrier supply circuit in which trouble was noted.

- (4) Should all group or supergroup carrier supply busses be de-energized after transfer, there will be (a) a minor and a major audible alarm, (b) the lighting of all the white lamps GR SIG and SG SIG, (c) the lighting of the green lamp CARR ALM and the red lamp GEN ALM. Under this condition the load should be transferred immediately to the original generator by turning the transfer switch. The trouble should then

be cleared in the carrier supply circuits in which trouble was noted.

4. CIRCUIT FAILURES AND ALARMS

4.01 When both regular and emergency generators are functioning properly, all lamps are extinguished and the MAN CON switch is in the NORM position. When an alarm occurs, the MAN CON switch must be operated to the proper position as described below to silence the minor alarm. A minor alarm occurs when any carrier-frequency or pilot-frequency generator fails. In addition, there is a major alarm if both regular and emergency generators of the same frequency fail. Furthermore, if a generator has been locked in service by the MAN CON switch and the generator then fails, a major alarm results. In such a case, no automatic transfer is possible because this function is disabled when the MAN CON switch is moved away from the NORM position.

4.02 Alarms may indicate a trouble condition involving only one frequency or possibly several frequencies. For example, complete failure of the regular intermediate converter circuit at an L3 installation will cause a transfer to the emergency generator in five pilot transfer and control panels (all pilot frequencies except 8320 kHz). However, a partial failure of the same circuit might cause a transfer of only the 7266-kHz pilot. Nevertheless, MAN CON switches for all pilots except 8320 kHz have to be turned to the EM position before work can be done on the regular intermediate converter circuit. A minor alarm can be silenced by proper positioning of the MAN CON switches (5.01). A major alarm can not be silenced until all carrier-frequency and pilot-frequency distributing circuits are supplied with power at the proper level.

5. MANUAL CONTROL AFTER A FAILURE OCCURS

5.01 *Automatic Single Transfer of 4-kHz Harmonic Generators—All Busses Made Good After Transfer:*

- (1) The failure of one or more group or supergroup carrier supplies results in the automatic transfer of generators. This results in (a) a minor audible alarm, (b) the lighting of a green lamp TRNS on the carrier generator transfer panel, (c) the lighting of a white lamp or lamps GR SIG or SG SIG corresponding to the number

SECTION 356-150-300

of the group or supergroup carrier supplies that failed.

- (2) Determine which generator is working according to 2.01.
- (3) Lock the working generator in service according to 3.02. This will silence the alarm, extinguish the green lamp TRNS on the carrier generator transfer panel, light the white lamp on the same panel showing which generator is locked in service, and light the green lamp A on the 4-kHz harmonic generator panel which is not in-service.
- (4) Determine cause of trouble and clear. One or more, but not all, GR SIG lamps lighted may indicate that the trouble is in either group carrier supply filters or associated equipment. One or more, but not all, SG SIG lamps lighted may indicate trouble in the supergroup carrier supply filters or associated equipment.
- (5) Operate the RST key associated with the GR SIG and SG SIG lamps. This will extinguish the signal lamps.
- (6) After the trouble has been cleared, the transfer circuit should be reset to normal.

5.02 Automatic Single Transfer of 4-kHz Harmonic Generators—One or More Busses De-energized After Transfer:

- (1) The failure of one or more group or supergroup carrier supplies results in the automatic transfer of generators. If one to four group busses are de-energized after transfer, this still results in only a single transfer. Under this condition, there is (a) a minor audible alarm, (b) the lighting of a green lamp TRNS on the carrier generator transfer panel, (c) the lighting of a white lamp or lamps GR SIG corresponding to the number of group carrier supplies that failed, (d) the lighting of the green lamp CARR ALM. In case of a supergroup carrier failure causing the alarm, there is (a) a minor audible alarm, (b) the lighting of a green lamp TRNS on the carrier generator transfer panel, (c) the lighting of a white lamp or lamps SG SIG corresponding to the number of group carrier supplies that failed, (d) the lighting of the green lamp CARR ALM.

- (2) Determine which generator is working according to 2.01.
- (3) Lock the working generator in service according to 3.02. This will extinguish the green lamp on the carrier generator transfer panel, light the white lamp on the same panel showing which generator is locked into service, and light the green lamp A on the 4-kHz harmonic generator panel which is not in-service.
- (4) The minor alarm continues to ring until all busses are made good.
- (5) Note which white GR SIG or SG SIG lamps are lighted. Operate the RST key associated with the above signal lamps. This operation will extinguish the lamps of the busses which have been restored to service.
- (6) Determine cause of trouble and clear. The trouble should be cleared in the circuits associated with the working generator first.
- (7) Operate the RST key associated with the GR SIG and SG SIG lamps. This will extinguish the signal lamps.
- (8) After the trouble has been cleared, the transfer circuit should be reset to normal.

5.03 Automatic Double Transfer of 4-kHz Harmonic Generators:

- (1) The failure of one or more group or supergroup carrier supplies results in the automatic transfer of generators. If all the group busses or all of the supergroup busses are de-energized after transfer, a further automatic transfer back to the original working generator occurs. This results in (a) a major audible alarm, (b) minor audible alarm, (c) the lighting of a red lamp DBL TRNS on the carrier generator transfer panel, (d) the lighting of all the white GR SIG or SG SIG lamps, (e) the lighting of the green lamp CARR ALM, and (f) the lighting of the red lamp GEN ALM.
- (2) Determine which generator is working according to 2.01.
- (3) Lock the working generator in service according to 3.02.

(4) Operate the RST key associated with the GR SIG and SG SIG lamps. This operation will extinguish the lamps of the groups and supergroups which are supplied with carrier from the generator locked in service under Item (3).

(5) Determine cause of trouble and clear. The trouble should be cleared in the circuits associated with the working generator first. The minor audible alarm will continue to ring until all of the group or supergroup busses are made good.

5.04 Automatic Transfer of 13.00-, 14.04-, 15.60-, or 18.20-MHz Carrier or 308-, 556-, 2064-, 3096-, 7266-, or 8320-kHz Pilot Generator:

(1) The MAN CON switch can be used to connect either the regular or emergency generators to the distributing circuit. It is necessary only to turn the switch to the position designated REG or EM as desired; however, under normal conditions the MAN CON switch should remain in the NORM position.

(2) When a failure occurs, it is necessary to operate the MAN CON switches on each transfer and control panel where lamps are lighted before work is begun on any generator circuits. The procedure for each transfer and control panel follows:

(a) Turn the MAN CON switch from NORM to the lighted position, REG or EM.

Caution: The MAN CON switch must be turned to the position, REG or EM, indicated by the lamp which is lighted while the MAN CON switch is in the NORM position. Turning to the unlighted position may cause an otherwise avoidable service interruption.

(b) Depress the RESET key momentarily.

(c) Observe the Sensitrol relays to determine the condition of the working generator (WKG GEN) and the standby generator (STBY GEN).

(d) If the WKG GEN Sensitrol pointer remains centered (within approximately ± 0.5 dB for pilot or ± 3 dB for carrier supply), normal power is being supplied to the working circuits.

If the WKG GEN Sensitrol pointer is pulled onto the high or low contact when the RESET key is released, the distributing bus is not receiving the correct amount of power. In this case, there is a major alarm, and the red-capped ALM lamp on the transfer and control panel is lighted.

(e) If the STBY GEN Sensitrol pointer remains centered, the nonworking generator is providing normal output (within approximately ± 0.5 dB for pilot or ± 3 dB for carrier supply) to the monitoring circuit. However, if the pointer is pulled onto either contact, the standby generator is still in a trouble condition.

(f) If, after depressing the RESET key, the WKG GEN Sensitrol indicates failure and the STBY GEN Sensitrol indicates normal output, the position of the MAN CON switch should be reversed immediately. That is, switch from REG to EM or from EM to REG to restore power to the working circuits.

5.05 Restoring Automatic Control After a Double Failure of Either a 13.00-, 14.04-, 15.60-, or 18.20-MHz Carrier or 308-, 556-, 2064-, 3096-, 7266- or 8320-kHz Pilot Generator:

(1) After a double failure, both the WKG GEN and the STBY GEN Sensitrol pointers will be off scale (contact closed). This condition may exist for only one frequency or perhaps for several frequencies, depending on the nature of the trouble conditions. When either the regular or the emergency panel involved is restored to working order, depress the RESET keys on all affected control panels. Observe the appropriate Sensitrol, WKG GEN or STBY GEN, to see that the pointer remains centered. If the generator which was repaired is being monitored by the WKG GEN Sensitrol, the major alarm ceases as soon as the resetting is done. The MAN CON switch should remain in the same position while the second trouble is being eliminated. If, on the other hand, the first generator restored to normal output is being monitored by the STBY GEN Sensitrol, the MAN CON switch must be turned to the opposite position (turn from REG to EM, or from EM to REG, as the case may be) to re-energize the distributing bus. The RESET key must then be depressed to center the WKG GEN Sensitrol pointer. However, the major alarm continues until at least one generator

for each carrier and pilot frequency is supplying correct power to the distributing busses, and until the WKG GEN Sensitrols for all frequencies involved have been reset.

(2) When there has been only a minor alarm, the faulty generator circuit (or circuits) will be in the standby condition, under control of the MAN CON switches. When a generator circuit has been restored to working order, the STBY GEN Sensitrol must be reset. If the pointer remains centered when the RESET key is released, the MAN CON switch may be turned to the NORM position, thus restoring the automatic control of alarms and transfers.

Caution: Restore MAN CON switches to the NORM position as soon as both generators are working properly. If this is not done, failure of the working generator will cause a major alarm and service interruption.

6. LINE PILOT SWITCHING

6.01 Patching from Regular to Spare L1 Line Pilot Equipment (Fig. 1A):

Caution: The transfer of a carrier, pilot, or line switching pilot supply may cause hits on associated telegraph and data services. All supply transfers should be kept to a minimum.

- (1) Remove the 341A plug between SP PIL and SP TRK jacks [patch (1), Fig. 1A].
- (2) Remove one of the 341A plugs between REG PIL and REG TRK jacks [patch (2), Fig. 1A].
- (3) Remove the remaining 341A plug between REG PIL and REG TRK jacks. At the same time, patch a 341A plug from SP PIL to REG TRK jack [patch (3), Fig. 1A]. (The removal of the plug and insertion of the other plug mentioned in this item should be as simultaneous as possible.)

6.02 Patching from Spare to Regular Line Pilot Equipment (Fig. 1B):

- (1) Remove the 341A plug between SP PIL and REG TRK jacks [patch (1), Fig. 1B]. At the same time, patch a 341A plug from REG PIL to REG TRK jack.

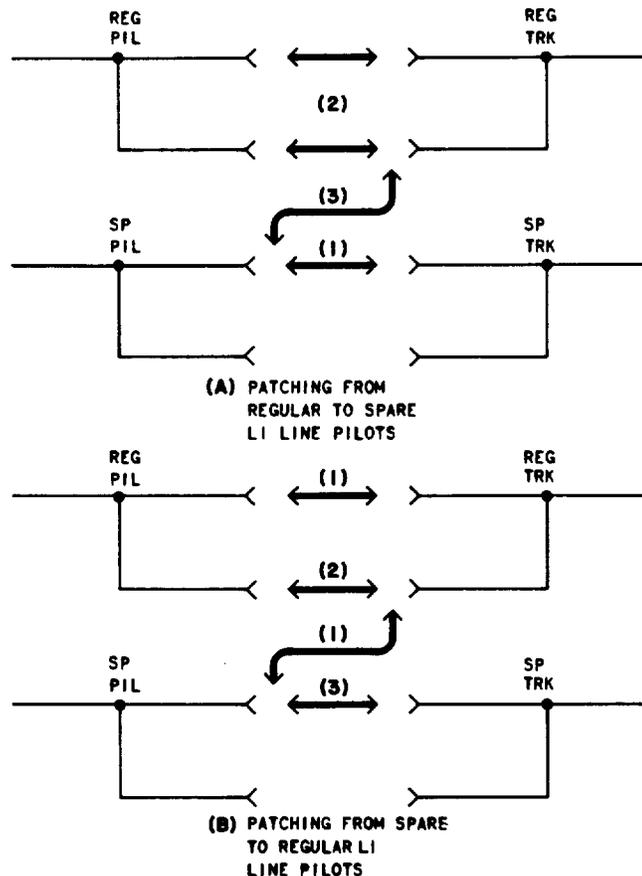


Fig. 1—L1 Line Pilot Switching—Patching Procedures

- (2) Put a second 341A plug from the multiple REG PIL to REG TRK jack [patch (2), Fig. 1B].
- (3) Replace the 341A plug between SP PIL and SP TRK jacks [patch (3), Fig. 1B].

6.03 Patching from Regular to Spare L3 Line Pilot Equipment (Fig. 2):

- (1) Patch a P2BJ cord from SP PIL jack to the TRSG HY NET.
- (2) Remove the 372A plug from between REG PIL and TRSG HY NET.

Note: The supplying of spare pilots to the TRSG HY NET and the removal of the 372A plug should be done as simultaneously as possible.

6.04 Patching from Spare to Regular L3 Line Pilot Equipment (Fig. 2):

- (1) Patch a 372A plug from REG PIL and TRSG HY NET.

- (2) Remove the patch cord from SP PIL jack to the TRSG HY NET.

Note: The inserting of the 372A plug and the removal of the patch cord should be done as simultaneously as possible.

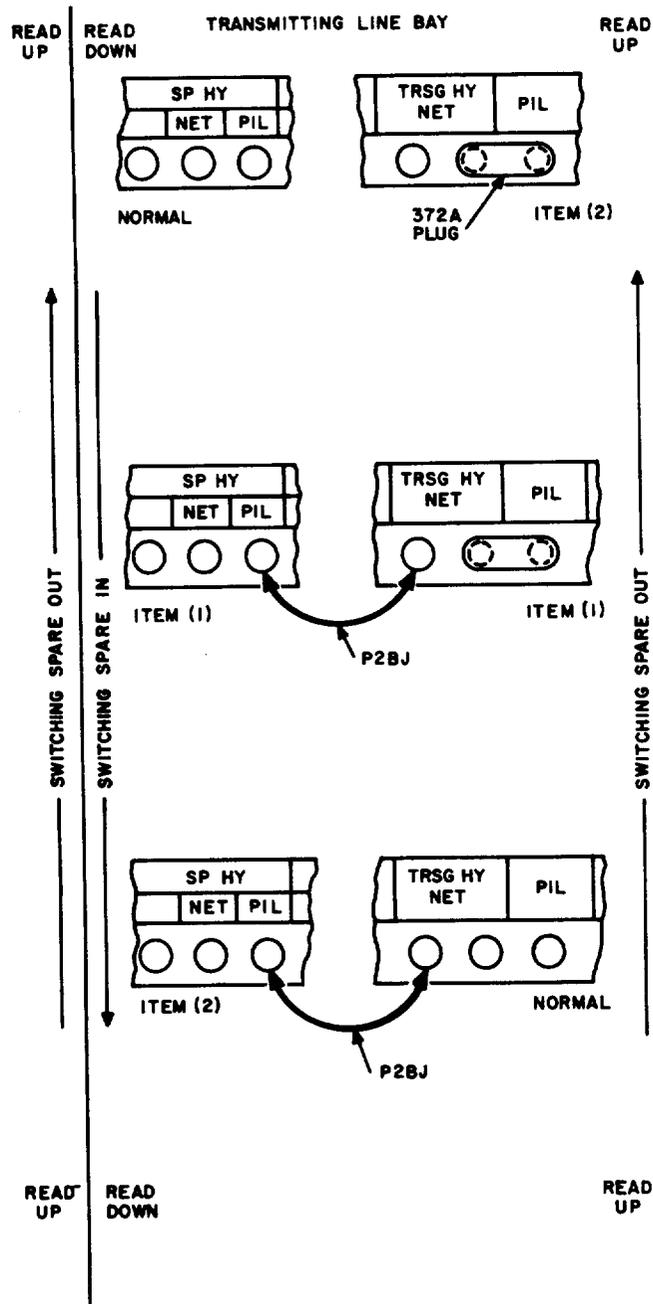


Fig. 2—L3 Line Pilot Switching—Patching Procedures