L3 AND L4 CARRIER
COMMON EQUIPMENT
J68820 AUTOMATIC LINE SWITCHING
TESTS
GENERAL TEST INFORMATION

CONTENTS PAGE

1. GENERAL

1.01 This section and associated sections (2.01) describe methods for making tests and adjustments on the J68820 automatic line switching equipment as applied to L3 and L4 carrier systems. These applications include the 2-line (nonstandard for L4 systems), multiline, expanded multiline, and supermultiline arrangements.

1.02 This section is reissued to include information on equipment units which provide for improved operation of the automatic line switching system. Equipment units are added to correct for misalignment of the switching signals which occurs when the signals are transmitted over L3 or L4 carrier system facilities and to prevent false operation of transmitting switches due to high line noise. In addition, overloading of the switching signal amplifier is corrected by attenuating switching signal levels near the input of the amplifier.

1.03 The switching equipment can be mounted in two different bay configurations. One of the configurations uses an 11-foot 6-inch bay; the other, a 9-foot bay. Opposite ends of a switching section must use the same bay configuration.

1.04 The regular lines are classified in three groups (A, AA, and AB). Each group can provide switching equipment for up to four regular lines. Table A lists the different arrangements for the two bay configurations.

1.05 The switching circuits automatically substitute a standby line for a defective regular line in a switching section. (Manual operation is also provided by the automatic switching equipment.) A switching section is a length of high-frequency ***multiple conductor coaxial cable*** extending between main repeaters at which switching equipment is installed.

1.06 ***In 2-line switching,*** the transmitting end feeds a regular line and a standby line from one hybrid. These lines are connected to a receive switch at the distant end. Control equipment monitors the incoming signals and detects a failure of the regular line. The receive switch then transfers service from the regular line to the standby line.

1.07 ***In the multiline, expanded multiline, and supermultiline arrangements,*** switches are used at the receiving end and at the transmitting end. Frequencies in the 280- to 296-kHz band, which is below the normal transmission band of the L3 and L4 systems, are used to control operation of the transmitting and receiving switches. All switching is controlled from the receive end and commands are sent over the coaxial lines to the transmit end. Basically, the transmit switch and the receive switch are used to transfer service from a failed regular line to the standby line.

1.08 Early installations of switching equipment in the L3 carrier system may be adversely affected by an unfavorable signal-to-noise ratio in the switching signal band. Noise in this band could cause a switch to take place and result in a loss of service. This noise problem can be corrected by transmitting the switching signals at a higher power level and restoring them to the proper level at the distant end.

TABLE A
L3 AND L4 SWITCHING ARRANGEMENTS

TYPE OF SYSTEM*	BAY HEIGHT	
	9 FEET	11 FEET 6 INCHES
2-Line (L3 only)	1A	1A
Multiline	1A, 2A, and 3A	1A, 2A, 3A, and 4A
Expanded Multiline	1A, 2A, 3A, 1AA, 2AA, and 3AA	1A, 2A, 3A, 4A, 1AA, 2AA, 3AA, and 4AA
Supermultiline	1A, 2A, 3A, 1AA, 2AA, 3AA, 1AB, 2AB, 3AB	1A, 2A, 3A, 4A, 1AA, 2AA, 3AA, 4AA, 1AB, 2AB, 3AB, and 4AB†

* One standby line is provided for each type of system.

† A maximum of twelve lines cannot be furnished due to the size of the existing 20-tube coaxial cable.

1.09 Switching equipment manufactured after August 8, 1966, includes the changes needed to prevent noise operation of the line switches. In early installations, power levels may be changed where signal-to-noise ratio improvement is needed, as shown optionally in SD-59634-01, SD-59484-01, and either SD-59608-01 or SD-59638-01.

1.10 In Bell System Practices and on the SDs, unmodified early installations of switching equipment are referred to as ***Condition A.*** Early installations of switching equipment modified for improved signal-to-noise ratio or newly manufactured switching equipment (including equipment used in L4 systems) are referred to as ***Condition B.*** The L3 switching equipment must be physically inspected to determine if the equipment under test is unmodified ***(Condition A)*** or modified ***(Condition B).***

1.11 The higher power level of the transmitted switching signal band can cause the J68820E switching signal amplifier to become overloaded. The overload occurs when switching tones are applied from both directions of transmission and results in the line failing to switch in at least one direction. The overload condition is corrected by placing an 8-dB pad close to the input of the amplifier, thus decreasing the input signal level. The allowable switch tone levels at the SW FIL OUT jack will then be −63 to −76 dBm.

1.12 Unequalized gain or loss of the switching signal band occurs when the signals are transmitted over L3 or L4 carrier system cable facilities. Either of these conditions can prevent proper operation of the line protection switching system. To compensate for these level variations, a new circuit design provides adjustable gain and loss on an individual line basis at the transmitting and receiving ends of a switching section.

1.13 The new design is standard in new production L3 and L4 systems. It provides the following equipment at the transmitting end of a switching section.

(a) A switch tone amplifier (ED-52102-G1) in the common switch control circuit which provides ±15 dB of adjustment for the release check signal.

(b) A switch tone amplifier (ED-52102-G2) in the transmitting switch control circuit which provides ±15 dB of adjustment for the line identification and release signals.

(c) A switch tone amplifier (ED-52102-G3) in the director circuit which provides ±10 dB of adjustment for the verifier signal.

1.14 The receiving end of an L4 switching section is provided with a level compensating circuit (J68820AD panel). It provides an adjustment range

of +24 to −21 dB. The level compensator is inserted between the output of the L4 pilot indicator circuit and the input to the switch signal filter circuit. Adjustment procedures for the amplifiers and the level compensator are covered in Section 359-100-509.

1.15 The switching signals of existing L4 systems may be measured using the procedures in Section 359-100-509. Any regular or standby line with switching signal levels of −71 dBm ±10 dB at the SW FLT OUT jack may be modified with the following equipment and then adjusted to the proper levels given in Section 359-100-509.

(a) Regular line transmitting switch control circuit. Add switch tone amplifier ED-52102-G2.

(b) Standby line common switch control circuit. Add switch tone amplifier ED-52102-G3.

(c) Standby line director circuit. Add switch tone amplifier ED-52102-G3.

(d) Add a J68820AD level compensating unit to any line not meeting the above requirements.

1.16 Excessively high line noise can falsely initiate the operation of transmitting line switches. If a switch is already operated, the operation of a second switch can cause service interruption on the switched line and/or wrong message service to be inserted on the standby line. In addition, noise can cause the release of an operated switch.

1.17 Noise guard circuits are now provided in the switching system circuitry which will eliminate the false operation of transmitting switches due to noise and which will also provide for remotely inhibiting the operation of all transmitting switches at one end of a switching section. The remote control of the switches will prevent false switch operations from occurring during message service restoration over the standby line which would result in wrong message service being inserted on the restored line. Transmitting switches are remotely operated by a key on a service restoration bay in the same office and by the E-type status reporting and control system or B1 alarm and control system.

1.18 The line switching equipment requires the addition of three printed wiring boards to incorporate the noise guard feature.

(a) An ED-52313( ) ID detector is added to the transmitting switch control circuit to prevent the false operation of transmitting switches due to noise.

(b) An ED-52314( ) release tone blocking circuit is added to the director circuit to prevent the release of an operated switch due to noise.

(c) An ED-52315( ) steering circuit is mounted on the switching signal filter panel. This circuit, in conjunction with the ID detector and the release tone blocking circuit, prevents false operation of switches, due to noise. Remote control of this circuit is also provided as described in 1.17.

1.19 The tests in some of the switching sections require the use of transmission test equipment. Suitable equipment is listed in Section 356-010-500.

1.20 Some of the switching equipment test circuits contain multiplier resistors which are used in conjunction with an external dc voltmeter. In these test circuits, measurements are taken from an internal metering circuit, such as in the initiator test circuit (Fig. 1) at the METER jacks [J1(−) and J2(+)]. ***A KS-14510 volt-ohm-milliammeter is always specified with no substitution.*** The 0.3-Vdc scale, used in most cases, has a sensitivity of 16,667 ohms-per-volt rather than 20,000 ohms-per-volt. When connected to the METER jacks, the voltmeter can monitor various points in the circuit by operation of the MTR switch. As the meter circuit is switched, the appropriate multiplier resistor is connected in series with the meter. The meter ranges for each position of the MTR switch are listed in Table B.

1.21 Certain tubes in the switching circuit operate under fixed conditions and are tested on an in-service basis. Such tubes are tested by measuring the cathode voltage drop (an indication of space current) using an external voltmeter as described in 1.12. The detector and oscillator tubes are tested by a different method. The bias of the detector tubes may be adjusted by their associated potentiometers. The oscillator tubes will remain in the circuit until the output power no longer can be adjusted to hold associated alarm relays at specified readings.

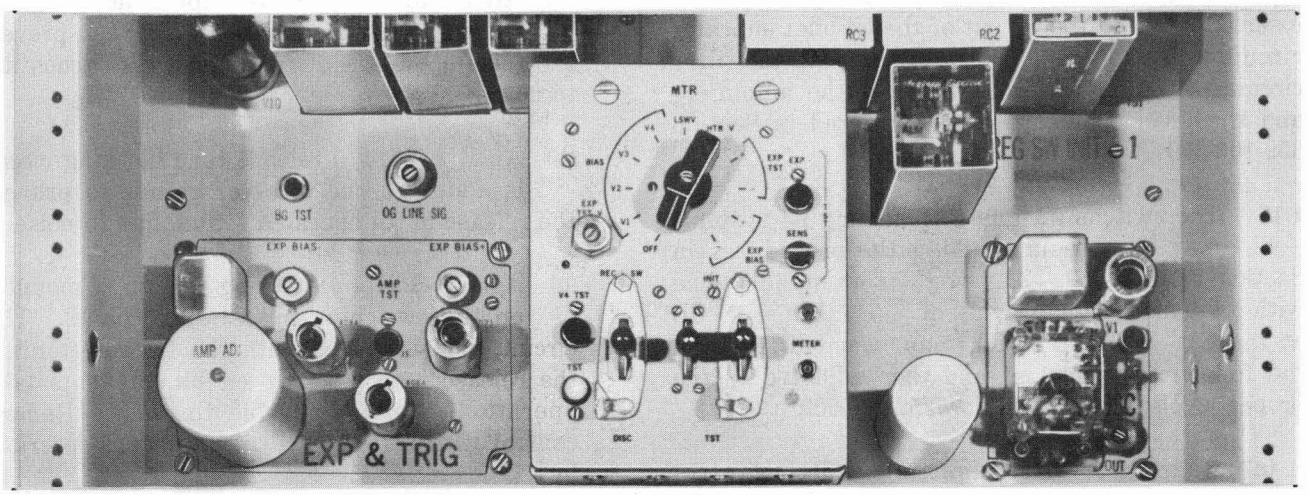

Fig. 1—Regular Switch Initiator with Test Circuit Shown in Center of Unit

TABLE B

METERING CIRCUIT

SWITCH POSITION	DESIGNATION	METER SCALE (VOLTS)
1	OFF	
2	V1	3
3	V2	3*
4	V3	3
5	V4	3
6	LSWV	3
7	HTR V	30
8	EXP TST +	30
9	EXP TST —	30
10	EXP BIAS +	30
11	EXP BIAS —	30

* The 3-volt scale incorporated for switch position 3 is adequate for measurement of the cathode potential of tube V2 in its quiescent or normal state. When drive, the cathode potential of tube V2 will rise to a somewhat higher value. Measurements in this condition should be made with the external voltmeter set to the 12-volt scale.

2. REFERENCES

2.01 Tests and adjustments for the J68820 Automatic Line Switching System may be found in the following sections:

359-100-501	Automatic Line Switching—Tests—Removal and Replacement of Coaxial Switches
359-100-502	Automatic Line Switching—Tests—Switching Signal Oscillator
359-100-503	Automatic Line Switching—Tests—Expandor and Trigger Circuit
359-100-504	Automatic Line Switching—Tests—Switching Signal Amplifier
359-100-505	Automatic Line Switching—Tests—Detector Circuits
359-100-506	Automatic Line Switching—Tests—Receiving Switch Operation
359-100-507	Automatic Line Switching—Tests—Transmitting Switch Operation
359-100-508	Automatic Line Switching—Tests—Manual Operations