

“PULSE* 120” – SG-1A

ELECTRONIC PRIVATE AUTOMATIC BRANCH EXCHANGE

TESTS AND INSPECTIONS AT TIME OF INSTALLATION

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2. TOOLS AND TEST AIDS	1	2. TOOLS AND TEST AIDS
3. GROUND TEST	2	2.01 The tools required for the tests and adjustments described in this section are the KS14510, List 1 volt-ohm-milliammeter (or equivalent), a suitable transmission measuring set, and basic installation tools.
4. POWER SUPPLY VOLTAGE TESTS	4	
5. TRANSMISSION LIMITS AND SUPPLIES	11	2.02 The test aids are equipped with Light Emitting Diodes (LED) which detect the absence or presence of critical voltages at designated points on the shelf. The function of the LED on the fuse panel and circuit packs is described in Section 553-5011-502. The alarm associated with the LED indication is also described in that section.
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6. INSPECTION OF CABINET	11	2.03 The LED, mounted on the QPJ47-type circuit pack (Fig. 1), light during the failure of the monitored voltage.
7. INSPECTION OF CABLES	11	2.04 The LED, mounted on the QPJ40-type circuit pack (Fig. 2), extinguish during the failure of the monitored voltage on the line and trunk shelves. Control shelf -12 V and +24 V voltage failure is indicated by the extinguished LED on the QPJ97-type circuit pack (Fig. 3).
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9. OPERATIONAL TESTING	12	
1. GENERAL		
1.01 This section covers the tests and inspections to be completed when the PULSE 120 Electronic Private Automatic Branch Exchange (EPABX) is being installed.		
1.02 The tests must be performed in the sequence given in this section.		
		2.05 The LED, next to or above the Bussman fuses on the power shelves, extinguish if the fuse is blown or becomes defective. The fuse F2 on power shelf no. 2, is monitored by the 20-Hz LED on the QPJ47-type circuit pack.
		2.06 The fuse or major alarm and the LED indications appear simultaneously on the power shelves when a power failure occurs in the EPABX.

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3. GROUND TEST

3.01 This test is designed to ensure that the PULSE 120 EPABX is adequately grounded. The test is divided into two parts:

- (1) A check within the EPABX cabinet to ensure that wiring has not been damaged or loosened during the shipment. Refer to Section 553-5011-202 for ground connection locations. Perform the test described in Chart 1.
- (2) A check that the EPABX has been correctly connected to the approved ground (cold metallic water pipe or ground rod), and that the path has an adequately low resistance. Perform the test described in Chart 2.

WARNING: Failure to carry out these tests could result in an installation that is both unsafe for personnel using the equipment and unprotected against lightning or power transient.

Warning Tags

3.02 Attach warning tags to:

- (a) the approved ground connection to prevent the ground wire from being disconnected.
- (b) the plug-end of the power cord to prevent accidental removal of the cord.
- (c) the commercial-power circuit-breaker type fuses to prevent unauthorized manual operation.

CHART 1 – EPABX GROUND CONNECTIONS	
STEP	PROCEDURE
1	Unplug the power cord from the commercial ac supply.
2	Extend slide 2.
3	Examine connections of the black pvc-covered ground lead which is routed from the connector panel to the rear of trunk shelf no. 1 (just below P360), and the short link between its terminal and the shelf ground bus bar. All screws must be tight and the wire must be secure in its terminal lugs.
4	Push back slide 2, and withdraw slide 1.
5	Examine the connections to the master grounding lug situated on the connector panel; they must be securely made and all screws must be tight.
6	Switch the KS14510 List 1 meter to the OHMS x1 range, and carefully adjust the OHMS ADJUST control to obtain a zero reading. Ensure that the test leads are firmly shorted together.

CHART 1 (Cont) – EPABX GROUND CONNECTIONS

STEP	PROCEDURE
7	Connect one test lead to the ground lug on the connector panel; connect the other to a convenient point on each aluminum slide frame.
8	The meter must indicate an equal resistance of zero ohms from the ground lug to each frame. Any discrepancies from this requirement must be investigated, and the installer must be satisfied that they are due to the meter and not to faulty connections within the system.

CHART 2 – GROUND CONNECTION TEST

For this ground test the commercial power outlet ground is used as an alternative source of ground.

STEP	PROCEDURE
1	Check the physical installation of the ground wire connecting the approved ground (cold metallic water pipe – street side of water meter, building riser ground bus, or ground rod) to the EPABX ground lug on the connector panel. All screws should be tight, and the wires must be firmly positioned under the fasteners.
2	Unplug the power cord from the commercial power outlet.
3	Switch the KS14510 List 1 meter to the x1 range.
4	Connect one test lead to the U-ground pin of the power cord plug.
5	Connect the other lead to the U-ground socket in the commercial power outlet. The meter deflection should be approximately 0 ohms. A resistance of 3 ohms or greater should be investigated, and the installer must be satisfied that it is due to the meter and not to faulty ground connections.

**4. POWER SUPPLY
VOLTAGE TESTS**

4.01 The preliminary voltage tests ensure that the internal power supplies are functioning correctly. If faults are encountered during voltage test procedures, refer to Section 553-5011-516 to correct the faults.

Note: The KS14510 List 1 meter is not sufficiently accurate or reliable for carrying out some of the measurements in the voltage tests. For this reason both the absolute EPABX operating limits and the readings allowable on a KS14510 List 1 meter are given.

4.02 In general, meter readings are well within the allowable limits, if there are no faults on the power shelves; or well outside limits should a component fail. Intelligent use of the meter however, enables marginal faults to be detected. If for example, the -48 volt supply gives a meter reading of -55 volts, examine the readings on all other dc supplies (+24 V, -24 V, +12 V, -12 V) with the same 0 - 60 V meter range. If all these voltages are above or tend towards the high limits given, the meter may be damaged although the power supply is operating correctly.

4.03 The voltage tests are performed as detailed in Chart 3.

CHART 3 - POWER SUPPLY VOLTAGE AND LOGIC TESTS

Refer to Section 553-5011-516, if any of the verification tests fail to meet the voltage limits. The asterisks (*) after the circuit tack code replaces the suffix letter.

STEP	PROCEDURE	VERIFICATION				
1	Measure the voltage at the commercial power outlet with the KS14510 meter set on the 300 ac range.	The voltage limits for satisfactory operation of the EPABX are: <table border="1"> <thead> <tr> <th>EPABX LIMITS</th> <th>METER LIMITS</th> </tr> </thead> <tbody> <tr> <td>115±12 V ac</td> <td>115±21 V ac (on 300 V range)</td> </tr> </tbody> </table>	EPABX LIMITS	METER LIMITS	115±12 V ac	115±21 V ac (on 300 V range)
EPABX LIMITS	METER LIMITS					
115±12 V ac	115±21 V ac (on 300 V range)					
2	Connect the power cord from the EPABX cabinet to commercial power outlet. Operate switch on power shelf no. 2 to ON position.	The MAJOR ALARM lamp lights.				

CHART 3 (Cont) – POWER SUPPLY VOLTAGE AND LOGIC TESTS

STEP	PROCEDURE	VERIFICATION
3	Depress the RESET button on the fuse panel of power shelf no. 2.	Both MAJOR and FUSE ALARM lamps should be extinguished. If the FUSE ALARM lamp remains lit substitute any blown fuse on the fuse panel on power shelf no. 2 with one having the same rating as indicated by the color code of the fuse holder.
4	Insert the QPJ40* in a spare station line and trunk connector in all trunk and line shelves.	When inserted in a station line connector, all LED lamps light except for the lamp in position 6. When in a trunk connector, LED lamps in positions 2 through 8 light.
5	Check that all LED on QPJ47* are extinguished.	Improper strapping of TB3 on power shelf no. 2 causes LED to illuminate.
6	Check that all LED are lit on fuse panel on power shelves no. 1 and no. 2.	Fuse F6 LED and Fuse F9 LED light, if good fuses are present in holders F6 and F9 respectively. The voltage through fuse F2 is <i>NOT</i> monitored by an LED.
7	Check that -12 V and +24 V LED on the QPJ97* in connector 2 control shelf are lit.	
8	Using the appropriate voltmeter ranges, measure negative dc voltages at test points on power shelf no. 1. Insert the positive lead in the ground (GRD) test point on the fuse panel on power shelf no. 1.	

CHART 3 (Cont) – POWER SUPPLY VOLTAGE AND LOGIC TESTS

STEP	PROCEDURE	VERIFICATION								
9	<p>Insert the negative meter lead in the appropriate test points on the fuse panel on power shelf no. 1 for:</p> <p>(a) -48 V</p> <p>(b) -24 V</p> <p>(c) -12 V</p>	<p>The voltage limits allowable for satisfactory operation of the EPABX are:</p> <table border="1"> <thead> <tr> <th>EPABX LIMITS</th> <th>METER READING</th> </tr> </thead> <tbody> <tr> <td>(a) -48 ±4 V</td> <td>-48±6 V (on 60 V range)</td> </tr> <tr> <td>(b) -24±2 V</td> <td>-24±4 V (on 60 V range)</td> </tr> <tr> <td>(c) -12±1 V</td> <td>-12±3 V (on 60 V range)</td> </tr> </tbody> </table> <p><i>Note:</i> The meter readings include the EPABX limits plus allowance for normal meter inaccuracy.</p>	EPABX LIMITS	METER READING	(a) -48 ±4 V	-48±6 V (on 60 V range)	(b) -24±2 V	-24±4 V (on 60 V range)	(c) -12±1 V	-12±3 V (on 60 V range)
EPABX LIMITS	METER READING									
(a) -48 ±4 V	-48±6 V (on 60 V range)									
(b) -24±2 V	-24±4 V (on 60 V range)									
(c) -12±1 V	-12±3 V (on 60 V range)									
10	<p>Measure positive dc voltages (set the voltmeter on the appropriate ranges). Insert the negative lead in the GRD test point on the fuse panel on power shelf no. 1 for positive voltage reading.</p>									
11	<p>Insert the positive meter lead in the different test points on the fuse panel on power shelf no. 1 for:</p> <p>(a) +24 V</p> <p>(b) +12 V</p>	<p>The voltage limits and the meter readings are:</p> <table border="1"> <thead> <tr> <th>EPABX LIMIT</th> <th>METER READING</th> </tr> </thead> <tbody> <tr> <td>(a) +24±2 V</td> <td>+24±4 V</td> </tr> <tr> <td>(b) +12 V limits: X option +10 V and +13 V W option +11 V and +14 V</td> <td>+12 V limits +8 V and +15 V +9 V and +16 V</td> </tr> </tbody> </table>	EPABX LIMIT	METER READING	(a) +24±2 V	+24±4 V	(b) +12 V limits: X option +10 V and +13 V W option +11 V and +14 V	+12 V limits +8 V and +15 V +9 V and +16 V		
EPABX LIMIT	METER READING									
(a) +24±2 V	+24±4 V									
(b) +12 V limits: X option +10 V and +13 V W option +11 V and +14 V	+12 V limits +8 V and +15 V +9 V and +16 V									

CHART 3 (Cont) – POWER SUPPLY VOLTAGE AND LOGIC TESTS

STEP	PROCEDURE	VERIFICATION				
12	<p>Insert the positive meter lead for +5 V measurement in test point on the QPJ43-type circuit pack in connector locations 1, 2, 7, and 3 (if present) on power shelf no. 2. Repeat test on QPJ43-type circuit pack in connector 26 on option shelf QSP6M or QSP6R if present (connector 29 on option shelf QSP6U).</p>	<p>If the voltage readings obtained are beyond the specified limits or not present at test points, refer to Section 553-5011-516.</p> <table border="1"> <thead> <tr> <th>EPABX LIMIT</th> <th>METER READING</th> </tr> </thead> <tbody> <tr> <td>+5±0.25 V</td> <td>+5±0.60 V Individual measurements should not differ by more than 0.5 V.</td> </tr> </tbody> </table>	EPABX LIMIT	METER READING	+5±0.25 V	+5±0.60 V Individual measurements should not differ by more than 0.5 V.
EPABX LIMIT	METER READING					
+5±0.25 V	+5±0.60 V Individual measurements should not differ by more than 0.5 V.					
13	<p>With the appropriate ac voltmeter range and with one lead connected to the GRD test point on the fuse panel on power shelf no. 1, use the other lead to check for 12 V, 20 Hz at the test point on the QPJ44-type circuit pack in connector location 4, power shelf no. 2.</p>	<table border="1"> <thead> <tr> <th>EPABX LIMIT for 20 Hz</th> <th>METER Reading for 20 Hz</th> </tr> </thead> <tbody> <tr> <td>12.4±1.2 V</td> <td>12.4±3 V</td> </tr> </tbody> </table>	EPABX LIMIT for 20 Hz	METER Reading for 20 Hz	12.4±1.2 V	12.4±3 V
EPABX LIMIT for 20 Hz	METER Reading for 20 Hz					
12.4±1.2 V	12.4±3 V					
14	<p>Check the 86 V ac at the test points on the QPJ37-type circuit packs on the line shelves. For this test, ensure that the QPJ40-type circuit pack is <i>NOT</i> plugged into any of the line shelves.</p>	<p>The EPABX limits for the 86 V ac are between 76.5 V and 93.5 V.</p> <p><i>Note:</i> The reading on the KS14510 meter varies around 190 V because 86 V ac is superimposed on dc.</p>				
15	<p>Perform control logic test described in Chart 4.</p>					

CHART 4 – TEST A – CONTROL LOGIC TEST (STATION TO STATION)

This test is performed between station lines (2)39 and (3)46 only. Using station lines (2)39 and (3)46 as test lines exercises all the control logic combinations used in processing all types of calls in the EPABX. Test A must be completed successfully. If faults are encountered during this test refer to Section 553-5011-504. The QPJ97-type circuit pack is described in Section 553-5011-502.

Apparatus required to perform test:

- QPJ97* circuit pack inserted in connector 2 in the control shelf
- QSE4-type handset or equivalent to dial in the EPABX

Note: In systems configured for Hotel/Motel service, system numbers 239 and 346 correspond to dialed numbers 761 and 763 respectively.

STEP	PROCEDURE	INDICATIONS ON QPJ97*										REMARKS	
		HEART	ACTIVATE	DT/BSY/OVFL	ORIG	RING	TALK	DISC	TERM	TKNT	EMERG		
1	Inform station users at stations (2)39 and (3)46 that their station lines will be used for testing. The station users are to ignore incoming calls during tests.	⓪											
2	Flick handset switch to monitor mode, and connect handset leads to TIP and RING test points on maintenance test aid circuit packs (QPJ97*).	⓪											
3	Set maintenance test aid switches to idle position as shown in Fig. 3.	⓪											
4	Operate LINE/TRK switch to the lower position.	⓪											
5	Operate LAMP TEST/ACTIVATE switch momentarily to lower position.	⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪	Diode Pin Tester LED does not light.
6	Operate LAMP TEST/ACTIVATE switch to upper ACTIVATE position. One of the two following indications appear: (a) Test station lines (2)39 and/or (3)46 are in use. (b) Test station lines (2)39 and (3)46 are idle and can be used for testing.	⓪			⓪				⓪				The condition of the ORIG and TERM lamps depends on the status of the test station lines.
7	When both station lines (2)39 and (3)46 are idle, operate the BUS DIS switch to the upper "ON" position.	⓪	⓪										Station lines (2)39 and (3)46 are not available for service at station users.

CHART 4 (Cont) – TEST A – CONTROL LOGIC TEST (STATION TO STATION)

STEP	PROCEDURE	INDICATIONS ON QPJ97*										REMARKS		
		HEART	ACTIVATE	DT/BSYOVFL	ORIG	RING	TALK	DISC	TERM	TKNT	EMERG			
8	Select station line (2)39 by operating LINE SEL switch to upper position.	10	<input type="radio"/>											
9	Flick handset switch to talk mode.	10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>									
10	Do not perform any operation for 19 seconds.	10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>									Call appears as a Permanent Signal (PS) indication on the console, if QPJ61* is inserted in connector 9 of the control shelf.
11	After 19 s, the abandoned call times out.	10	<input type="radio"/>	120	<input type="radio"/>									
12	After a further delay of 19 s, the call times out.	10	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>							
13	Flick handset switch to monitor mode.	10	<input type="radio"/>											
14	Operate ACTIVATE/LAMP TEST switch to upper position.	10	<input type="radio"/>											
15	Flick handset switch to talk mode.	10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>									
16	For non-Hotel/Motel systems, dial digit "3" only, and wait for 19 s. For Hotel/Motel systems with non-7+ dialing, dial "33" only, and wait for 19 s. For Hotel/Motel systems with 7+ dialing, dial "733" only, wait for 19 s.	10	<input type="radio"/>		<input type="radio"/>									
17	After 19 s, the abandoned call times out.	10	<input type="radio"/>	120	<input type="radio"/>									
18	After a further delay of 19 s, the call times out.	10	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>							
19	Flick handset switch to monitor mode.	10	<input type="radio"/>											
20	Operate ACTIVATE/LAMP TEST switch to upper position.	10	<input type="radio"/>											
21	Flick handset switch to talk mode.	10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>									
22	Dial station line (3)46 (763 for Hotel/Motel systems).	10	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>				Ring ing (RNG) lamp follows ringing cycle.

5. TRANSMISSION LIMITS AND SUPPLIES

TRANSMISSION MEASUREMENTS

5.01 When testing through the EPABX from a station line loop, a 600-ohm termination is used on the transmission test set. The station apparatus must be removed from the circuit under test.

5.02 To perform transmission measurements on the cable pair from the CO, the transmission measuring equipment is set for 600-ohm or 900-ohm termination impedance to match the CO trunking arrangement. The EPABX is disconnected from the pair under test prior to taking readings.

5.03 The transmission measurements must not exceed the loss recommended by the transmission engineer.

OPERATING RANGES FOR STATION LINES

5.04 The nominal maximum circuit loop resistance for the station lines, excluding station apparatus, is 1000 ohms. The maximum number of ringers per station line loop in relation to the loop resistance is:

Maximum loop resistance in ohms:	350	600	850	1000
Maximum ringers per loop:	5	4	3	2

ELECTRICAL SUPPLIES

5.05 The +48 V talking battery across the station line circuit is achieved by the combination of the -24 V on the ring and the +24 V on the tip of the station line.

5.06 The 86-V, 20-Hz ringing is applied on the ring conductor of the station line and completes the circuit through the tip of the line for loop ringing or to ground for metallic ringing.

5.07 The system control and timing circuitry is powered by the +5 V supply. The switching principles are described in Section 553-5011-501.

5.08 The +12 V supply from power shelf no. 1 energizes the 51A lamps used in the console, the busy lamp field, and the fuse alarm indicators. The +12 V is present on the lamp continuously, and the circuit is closed by applying ground to the lamp lead.

6. INSPECTION OF CABINET

6.01 The cables should be clamped and coiled in the base of the cabinet to prevent interference with the opening and closing of the slides.

6.02 The adjustable plate should cover the free cable entry opening at the rear base of the cabinet.

6.03 Check that all apparatus has been installed and connected according to the applicable instructions.

6.04 The circuit pack locking bar on the face of the shelves should be in the upper position.

6.05 The record sheets for the Class-Of-Service (COS) blocks should be updated.

7. INSPECTION OF CABLES

7.01 The cables should be securely fastened to the wall or ceiling. They should be protected from physical or electrical hazards by tape or by conduit, when the minimum separation requirements are not met.

7.02 At the attendant position, the connector cable and the console mounting cord connectors are neither waterproof nor moistureproof. The connections should therefore be contained in a service fitting when underfloor conduit is provided. For surface wiring runs, the

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connectors should be clamped to a desk or wall to prevent damage.

8. INSPECTION OF CROSS-CONNECTING TERMINAL

- 8.01 The connecting blocks and backboards should be firmly mounted, with the proper color of spools inserted in the rails.
- 8.02 The face of each connecting block fanning strip should be properly stenciled.
- 8.03 The cross-connecting wires should be run in the jumper channel and terminated according to standard practice.
- 8.04 The terminal room should be left tidy and free of loose wires and wire clippings. The debris accumulated during installation should be disposed of according to local ruling.

9. OPERATIONAL TESTING

- 9.01 Operation tests are performed according to the procedures described in Section 553-5011-300 for console operation and tests, and Section 553-5011-301 for station operation and tests.
- 9.02 The tests described in Section 553-5011-300 may be performed in the proximity of the cabinet using the jumper cable arrangement described in the section. This permits the console operation and the system operation to be fully tested before the completion of station installations.
- 9.03 On completion of the tests described in Section 553-5011-300, only the range of features and services provided by the COS diode pin arrangement require testing at each station, according to the procedures described in Section 553-5011-301.

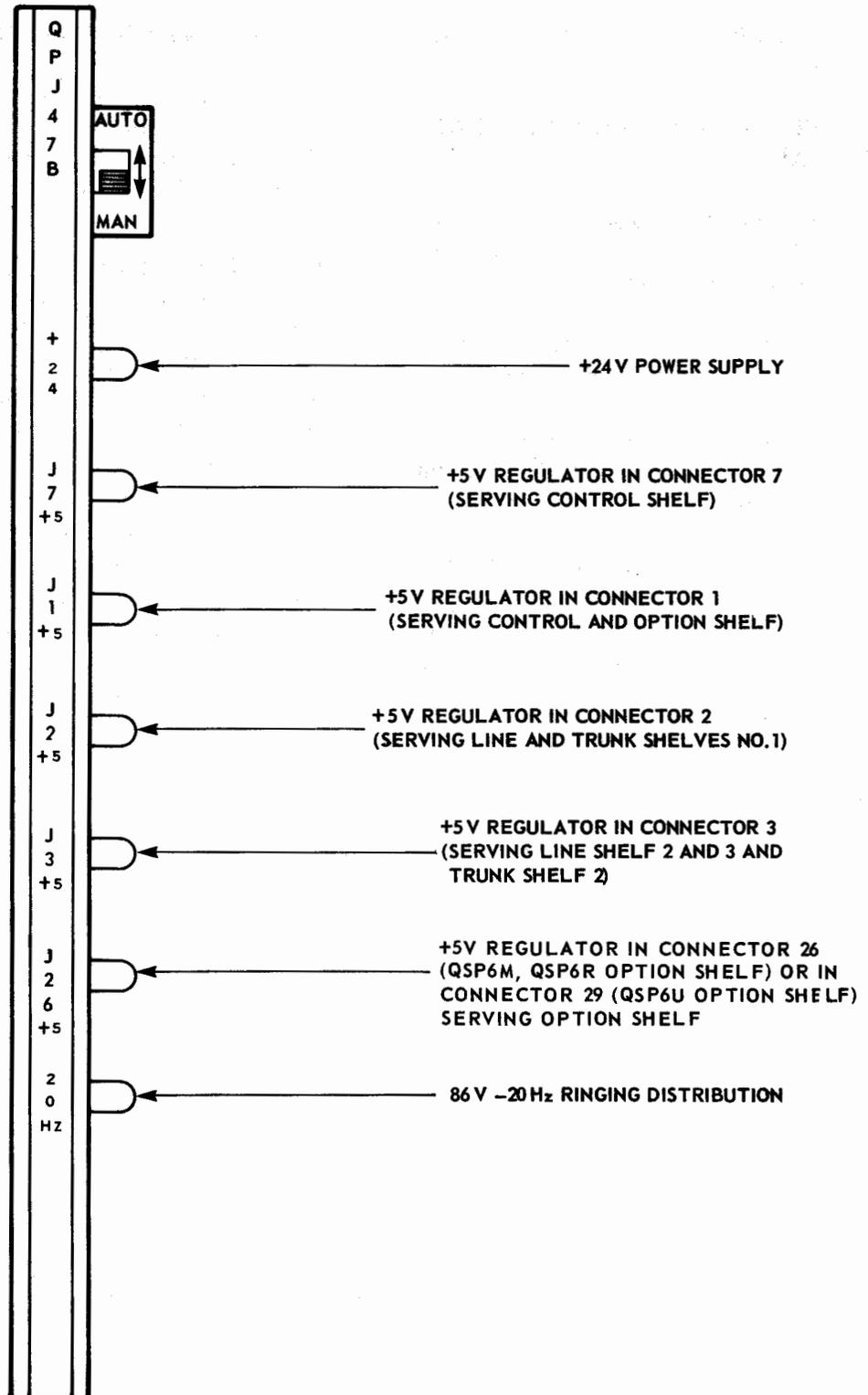


Fig. 1 – QPJ47-Type Circuit Pack LED Arrangement

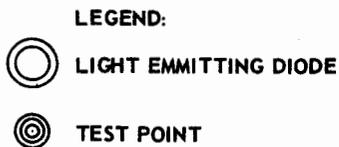
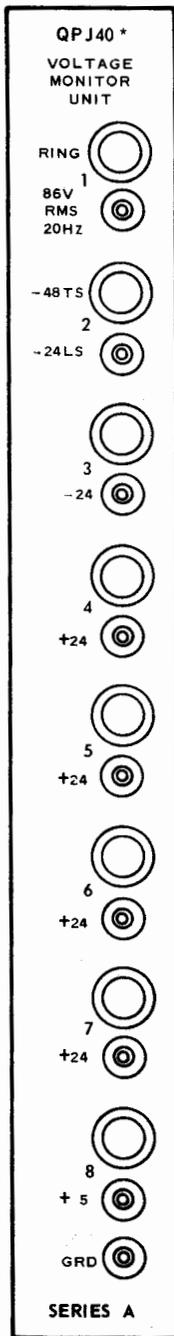
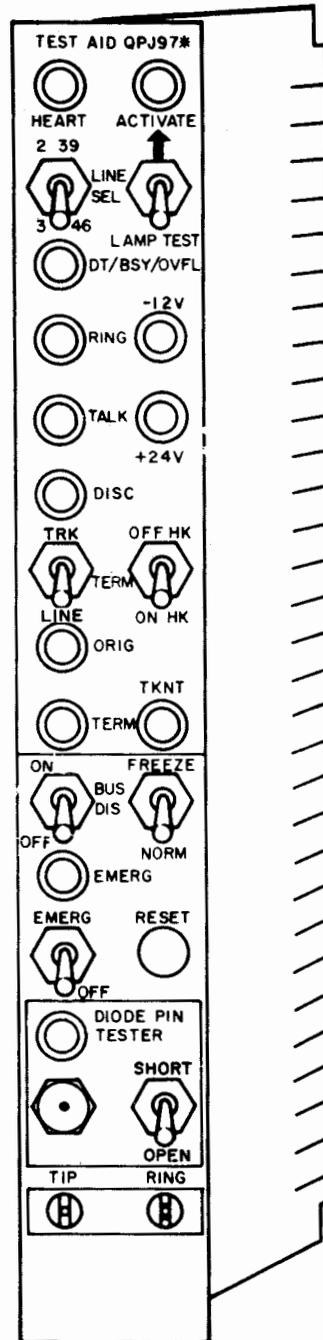


Fig. 2 — QPJ40-Type Circuit Pack LED Arrangement



CAUTION:

1. IF THE EMERG SWITCH IS NOT RESTORED TO IDLE CONDITION AFTER TESTS, THE EPABX WILL BE OUT OF SERVICE.
2. IF BUS DIS AND TRK SEL SWITCHES ARE NOT RESTORED TO IDLE CONDITION AFTER TESTS, STATION LINES (2)39 AND (3)46 WILL BE OUT OF SERVICE.

Fig. 3 — QPJ97-Type Circuit Pack Maintenance Test Unit