

# KS-15947 TOTALIZER CIRCUIT SD-95965-01

## TESTS USING KS-15946 TEST SET SD-96568-01

### 1. GENERAL

1.01 This section describes the method of testing the KS-15947 totalizer circuit, using the KS-15946 test set SD-96568-01. It also describes the method of adjusting the sensitivity of the unit. The sensitivity adjustments must be made before a unit is put into service. All other tests described in this section need be made only if a trouble is suspected.

1.02 This section is reissued to improve the method of testing totalizers equipped with more than one regenerator. This reissue does not affect the Equipment Test List.

1.03 The following tests are covered:

PAGE

**A. Sensitivity Adjustment:** The adjustment of the sensitivity controls depends upon the circuits connected to the input of the totalizer. These circuits and the associated sensitivities are listed in Table A. . . . . 3

**B. Counter Test:** This test verifies the accuracy of the decade scaler package. . . . . 5

**C. Corrective Maintenance Test:** This test outlines a procedure for locating a defective package or circuit component. . . . . 6

1.04 The KS-15947 totalizer circuit is referred to in this section as totalizer.

1.05 The KS-15946 test set is referred to in this section as test set.

1.06 The test set PULSE key should always be depressed slowly and evenly to minimize generation of contact chatter.

1.07 Operation of the test set PULSE key will cause the test set meter to read near zero. On release of the pulse key, the meter will return to the value for which it was originally set.

1.08 The interval between test set PULSE key operations shall be no shorter than the time required for the test set meter to return to the original value.

1.09 It may be noted in some of the following tests that when the test set BLUE—OUT lead is connected to the totalizer, the test set lamp remains lighted or flashes intermittently. If this occurs, it indicates the totalizer ground is not at the same level as the test set ground or that the DA package is shorted. To insure that both grounds are the same level under these conditions, the test set BLACK—GRD lead should be connected directly to the totalizer chassis.

1.10 **Lettered Steps:** A letter a, b, c, etc, added to a step number in Part 3 or 4 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

### 2. APPARATUS

#### All Tests

2.01 KS-15946 test set SD-96568-01.

2.02 3-inch C screwdriver.

2.03 D screwdriver.

2.04 R-8210 screwdriver.

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**Test B**

**2.05** Blocking tools as required. Use tools and apply as covered in Section 069-020-801.

**Test C**

**2.06** KS-14510, L1 volt-ohm-milliammeter (VOM) or equivalent.

**3. PREPARATION**

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
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**All Tests**

◆**Note:** Refer to Fig. 1 for KS-15947 totalizer cord connections.◆

- |   |   |  |
|---|---|--|
| 1 | Connect test set RED 48V lead to -48V and BLACK-GRD lead to totalizer chassis.          |  |
| 2 | Set test set switches as follows:<br>POLARITY switch to -<br>OUT COUPLING switch to AC. |  |

**Tests A and B**

- |     |  |  |
|-----|--|--|
| 3   | Set test set OUT IMPEDANCE potentiometer to 0.   |  |
| 4   | Set test set SENS selector switch and adjust PULSE AM potentiometer so that product of meter indication and SENS selector switch position (X1, X2, X3, or X4) equals sensitivity value shown in Table A. |  |
| 5   | ◆Remove totalizer patch cords between jacks P5 and P6 of each regenerator provided and between jacks◆ P7 and P8, P11 and P12.  |  |
| 6   | Connect test set GREEN-IN lead to P11 jack.  |  |
| 7a  | If only one regenerator is provided—<br>Connect WHITE-PATCH 1 and PATCH 2 leads to P5 and P8 jacks respectively.   |  |
| 8a  | Connect test set BLUE-OUT lead to T1 jack.   |  |
| 9b  | ◆If more than one regenerator is provided—<br>Connect WHITE-PATCH 1 cord to P5 jack for selected regenerator.  |  |
| 10b | Connect WHITE-PATCH 2 cord to P8 jack.   |  |
| 11b | Connect test set BLUE-OUT lead to T1 jack of selected regenerator.◆  |  |

STEP	ACTION	VERIFICATION
<b>Test C</b>		
12	Set test set controls as follows: OUT IMPEDANCE potentiometer to 2, SENS selector switch to 0, PULSE AM potentiometer so that test set meter indicates 18 volts.	
13	Remove totalizer patch cords between P11 and P12, P9 and P10 jacks.	
14	Connect test set GREEN-IN lead to P11 and BLUE-OUT lead to P10 jacks.	

**4. METHOD**

STEP	ACTION	VERIFICATION
<b>A. Sensitivity Adjustment</b>		
12	Operate all switches of active (inputs connected) A packages to N and all switches of inactive (no inputs) A packages to G.	
13c	If SENS potentiometer has dual concentric shafts and sensitivity setting is to be less than -60 volts (that is, larger number -130 volts)— Adjust totalizer COARSE SENS potentiometer (outside shaft) fully clockwise and set the FINE SENS potentiometer fully counterclockwise.	
14c	Operate test set PULSE key.	Test set lamp L1 should flash once.
15c	Adjust COARSE SENS potentiometer counterclockwise in gradual steps (2 to 5 degrees), operating PULSE key at each step.  <i>Note:</i> Timing interval between PULSE key operations shall be no shorter than the time required for meter to return to its original value.	Test set lamp L1 momentarily lighted for each operation of key. At some point, lamp will fail to flash.
16c	Adjust FINE SENS potentiometer slightly clockwise and operate PULSE key.	
17c	Repeat Step 16c until test set lamp L1 just starts to flash. (Totalizer is now set at desired sensitivity.)	Test set lamp L1 momentarily lighted for each operation of PULSE key.
18d	If SENS potentiometer has dual concentric shafts and sensitivity setting is to be greater	

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STEP	ACTION	VERIFICATION
	than -60 volts (that is, smaller number -25 Vdc, -40 Vdc, etc)— Adjust both COARSE and FINE SENS potentiometer shafts fully clockwise.	
19d	Operate test set PULSE key.	Test set lamp L1 should flash once.
20d	Adjust FINE SENS potentiometer counterclockwise in gradual steps (approximately 5 degrees), operating PULSE key at each step.  <i>Note:</i> Timing interval between PULSE key operations shall be no shorter than the time required for meter to return to its original value.	Test set lamp L1 momentarily lighted for each operation of key. At some point, lamp will fail to flash.
21d	Adjust FINE SENS potentiometer slightly clockwise and operate PULSE key.	
22d	Repeat Step 21d until test set lamp L1 just starts to flash. (Totalizer is now set at desired sensitivity.)	Test set lamp L1 momentarily lighted for each operation of PULSE key.
23e	If SENS potentiometer has a single shaft— Adjust totalizer SENS potentiometer fully clockwise.	
24e	Operate test set PULSE key.	Test set lamp L1 momentarily lighted.
25e	Adjust SENS potentiometer counterclockwise in gradual steps, operating PULSE key at each step.  <i>Note:</i> Timing interval between PULSE key operations shall be no shorter than the time required for meter to return to its original value.	Test set lamp L1 momentarily lighted for each operation of key. At some point, lamp will fail to flash.
26e	Adjust SENS potentiometer slightly clockwise and operate PULSE key.	
27e	Repeat Step 25e until test set lamp L1 just starts to flash. (Totalizer is now set at desired sensitivity.)	Test set lamp L1 momentarily lighted for each operation of PULSE key.
28b	◆If more than one regenerator is provided—◆ Repeat Steps 9b through 11b and 12 through 21d or 22e through 26e for each.	
29	Remove all test set leads.	
30	Restore all totalizer patch cords to normal.	

STEP	ACTION	VERIFICATION
<b>B. Counter Test</b>		
	<p><b>Note:</b> ♦If more than one regenerator is provided,♦ only one regenerator need be selected for this test. Patch cords between P5 and P6 of all other regenerator totalizers removed in Step 5 shall not be restored until Step 23.</p>	
12	Remove BLUE—OUT lead from T1 jack.	
13	Operate SW1 switch to N and all other SW_ switches to G.	
14	Block all input sources to A1 package.	
	<p><b>Note:</b> Input sources may be removed by either blocking nonoperated the relay associated with totalizer input leads or by taking the connecting circuit out of service.</p>	
15	Remove WHITE—PATCH 1 and PATCH 2 leads from P5 and P8 jacks.	
16	Replace totalizer patch cords between P5 and P6, P7 and P8 jacks. Do not replace patch cords between P5 and P6 of additional regenerator totalizers.	
17	Reset the SENS selector switch and PULSE AM potentiometer so that the product of meter reading and SENS selector switch position equals a value that is 20 percent greater than value of input sensitivity shown in Table A.	
18	♦Replace BLUE—OUT lead in T1 jack.♦	
19	Operate PULSE key as many times as required to flash test set lamp and no more.	Test set lamp L1 momentarily lighted.
	<p><b>Note 1:</b> Timing interval between PULSE key operations shall be no shorter than the time required for meter to return to its original value.</p>	
	<p><b>Note 2:</b> The totalizer is now cleared of all stored counts.</p>	
20	Operate PULSE key nine times.	

STEP	ACTION	VERIFICATION
	<i>Note:</i> Timing interval between PULSE key operations shall be no shorter than the time required for meter to return to its original value.	
21	Operate PULSE key once more.	On tenth pulse, test set lamp L1 momentarily lighted.
	<i>Note:</i> If PULSE key requires more than ten operations to light the lamp, repeat Steps 19 through 21 to confirm this. If the test fails again, the DS or DS1 package is defective and should be replaced.	
22	Remove all test set leads and blocking tools.	
23	Restore all totalizer patch cords and switches to normal before returning totalizer to service.	
24	Operate all switches of active (inputs connected) A packages to N and all switches inactive (inputs not connected) A packages to G.	

### C. Corrective Maintenance Test

*Note 1:* The individual package tests outlined are predicted on the assumption that all succeeding packages are working properly. Therefore, the tests are to be performed in the prescribed order. When a source of failure has been located and corrected, the tests may be terminated at that point.

*Note 2:* All tests are to be performed with totalizer SENS potentiometer (both dual concentric and single shaft) fully clockwise. The totalizer should be restored to its normal sensitivity setting before it is returned to service.

15	Measure voltage between ground and terminals 22 and 13 of totalizer A terminal strip, using VOM.	VOM should indicate between: -45 and -50 volts on terminal 13, -45 and -50 volts on terminal 22 with W, X, Y, and Z option provided, -21 and -26 volts on terminal 22 with V option 0 volts with Q option provided on each terminal.
16	Measure voltage at -20V test jack of totalizer, using VOM.	VOM indicates between -18 and -22 volts.
17	Operate test set PULSE key.	Test set lamp L1 lighted momentarily. LED CR5 lighted momentarily (ZZ option).

STEP	ACTION	VERIFICATION
		Failure of lamp(s) to light indicates faulty DA package.
		If test set lamp L1 and LED CR5 (ZZ option) remain(s) lighted, the DA package is shorted, or there is a ground on terminal 28 (register connection).
18	Remove BLUE—OUT lead from P10 jack.	
19	Set test set OUT IMPEDANCE potentiometer to 0.	
20	Adjust PULSE AM potentiometer so that test set meter indicates 9 volts.	
21	Remove totalizer patch cord between P7 and P8 jacks; replace patch cord between P9 and P10 jacks.	
22	Connect test set BLUE—OUT lead to P8 jack.	
23	Operate test set PULSE key.	Test set lamp L1 lighted momentarily. LED CR5 lighted momentarily (ZZ option). Failure of lamp and LED CR5 (ZZ option) to light indicates defective PS package.
24	Remove BLUE—OUT lead from P8 jack.	
25	Set OUT IMPEDANCE potentiometer to 2.	
26	Set SENS selector switch to 9.	
27	Adjust PULSE AM potentiometer so that test set meter indicates 18 volts.	
	<p><b>Note:</b> ♦If more than one regenerator is provided,♦ the SA, RPA and A packages along with jacks P1 through P6 are repeated for each. For Steps 28 through 58 one regenerator should be selected for test. The patch cord between P5 and P6 of the regenerators not selected for test should also be removed in Step 28 and restored in Step 60. ♦All references to T1 and P1 through P6 in Steps 29 through 58 apply only to the regenerator selected for test.♦</p>	
28	Remove totalizer patch cord between P5 and P6 jacks ♦of all regenerators provided;♦ replace patch cord between P7 and P8 jacks.	

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STEP	ACTION	VERIFICATION
29	Connect test set BLUE—OUT lead to P6 jack.	
30	Operate test set PULSE key ten times.	Test set lamp L1 momentarily lighted at least once. Failure of lamp to light indicates defective DS or DS1 package.  <i>Note:</i> This test is not intended to be a check of counter accuracy.
31	Remove BLUE—OUT lead from P6 jack.	
32	Set OUT IMPEDANCE potentiometer to 10.	
33	Set SENS selector switch to 0.	
34	Remove totalizer patch cords between P3 and P4 jacks; replace patch cord between P5 and P6 jacks.	
35	Connect BLUE—OUT lead to P4 jack.	
36	Operate repeatedly test set PULSE key.	Test set lamp L1 momentarily lighted. This should occur in less than 15 operations of key. Failure of lamp to flash indicates defective RPA package.
37	Remove test set BLUE—OUT lead from P4 jack.	
38	Set OUT IMPEDANCE potentiometer to 0.	
39	Set SENS selector switch to X2.	
40	Adjust PULSE AM potentiometer so that test set meter indicates 26 volts.	
41	Remove totalizer patch cords between P5 and P6, P7 and P8 jacks; replace patch cord between P3 and P4 jacks.	
42	Operate SW1 switch to N and all other SW switches to G.	
43	Connect WHITE—PATCH 1 and PATCH 2 leads to P5 and P8 jacks.	
44	Connect BLUE—OUT lead to T1 jack.	
45	Operate test set PULSE key.	Test set lamp L1 momentarily lighted for each operation of key.

STEP	ACTION	VERIFICATION
	<p><b>Note:</b> Failure of the test set lamp at this point indicates a trouble in either the SA package, the coupling between the SA and A packages, or in the first A package. The following procedure is to be followed to isolate the cause of failure.</p>	
46	Remove patch cord between P1 and P2 jacks.	
47	Remove BLUE—OUT lead from T1 jack.	
48	Disconnect two fuses associated with totalizer under test.	
49	Operate all SW switches to N.	
50	Measure resistance between P1 jack and ground, using VOM.	<p>VOM should indicate:            If V, W, or X option is provided—            8500 ohms minimum, 11,500 ohms maximum.            If Y option is provided—            1700 ohms minimum, 2300 ohms maximum.            If A, Z, or Q option is provided—            Infinite.</p>
		<p><b>Note:</b> If VOM indication is not within preceding limits, trouble in the coupling network is indicated.</p>
51	Connect POS lead of VOM to P1 jack.	
52	Measure resistance between P1 jack and 7B terminal of each A pack.	VOM should indicate 500,000 ohms minimum.
53	Replace totalizer patch cords between P1 and P2 jacks.	
54	Restore totalizer fuses.	
55	Place clip adapter on BLUE—OUT lead.	
56	Connect BLUE—OUT lead to 1T terminal of A2 package.	
57	Operate all SW switches except SW2 switch to G.	
58	Operate test set PULSE key.	Test set lamp L1 should momentarily light for each operation of key.
	<p><b>Note:</b> If the lamp should fail to light, repeat Steps 56 through 58 for all other A packages. Failure of the lamp to light in all cases indicates a defective SA package. If the</p>	

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
	lamp should light for some of the A packages but not all, the SA package is operating but the individual A packages that failed to light the lamp could be defective. Remove the two capacitors on the terminals of the packages that failed to light the lamp, and test them using a VOM or substitute capacitors from another package. If a capacitor proves defective, replace it and repeat Step 58. If the capacitors prove good, replace the A package and repeat Step 58.	
59a	If regenerator totalizers are provided — Repeat Steps 28 through 58 for each.	
60	Restore all totalizer cords to normal.	

TABLE A

MAXIMUM PERMISSIBLE COUNT PER HOUR				
INPUT LEADS OF TOTALIZER CONNECTED TO	FOR RPA PKG. (THOU.)	FOR ANY (A) PKG. (THOU.)	INPUT SENSITIVITY (VOLTS)	MAXIMUM LEAD LENGTH
48-VOLT REGISTER CIRCUITS WITHOUT CONTACT PROTECTION	30	10	-130	1000 feet
48-VOLT REGISTER CIRCUITS WITH CONTACT PROTECTION	30	10	-60	460 feet
48-VOLT REGISTER CIRCUITS WITH 1000-OHM SHUNT	30	10	-30	230 feet
48-VOLT REGISTER CKTS WITH RELAY HELPER	30	10	-15	_____
SLEEVES OF TRUNK CIRCUITS CONNECTED TO STEP-BY-STEP SELECTOR BANK MULTIPLE	3	1	-40	1000 feet
ANNOUNCEMENT TRUNKS	6	3	-32	250 feet
DRY CONTACTS CIRCUITS	30	3	-25	190 feet
24-VOLT REGISTER CIRCUITS WITH RELAY HELPER	30	10	-40	310 feet
48-VOLT SWITCHBOARD LAMPS	3	1	-25	190 feet
24-VOLT SWITCHBOARD LAMPS	3	1	-15	_____
23 DESK POSITION PEG COUNT	See SD-95965-01 Note 107			_____
SWITCHBOARD TOTALIZER INTERFACE CKT.	3	1	-25	190 feet
	See SD-95965-01 Note 111			
PEG COUNT CONVERTER WITHOUT REGISTERS	30	10	-40	310 feet

TABLE A (Contd)

MAXIMUM PERMISSIBLE COUNT PER HOUR				
INPUT LEADS OF TOTALIZER CONNECTED TO	FOR RPA PKG. (THOU.)	FOR ANY (A) PKG. (THOU.)	INPUT SENSITIVITY (VOLTS)	MAXIMUM LEAD LENGTH
PEG COUNT CONVERTER WITH REGISTERS	30	10	-60	460 feet
KEY TELEPHONE SYSTEM CIRCUIT IN BUSINESS OFFICE (BOFADS)	3	1	-20	1000 feet

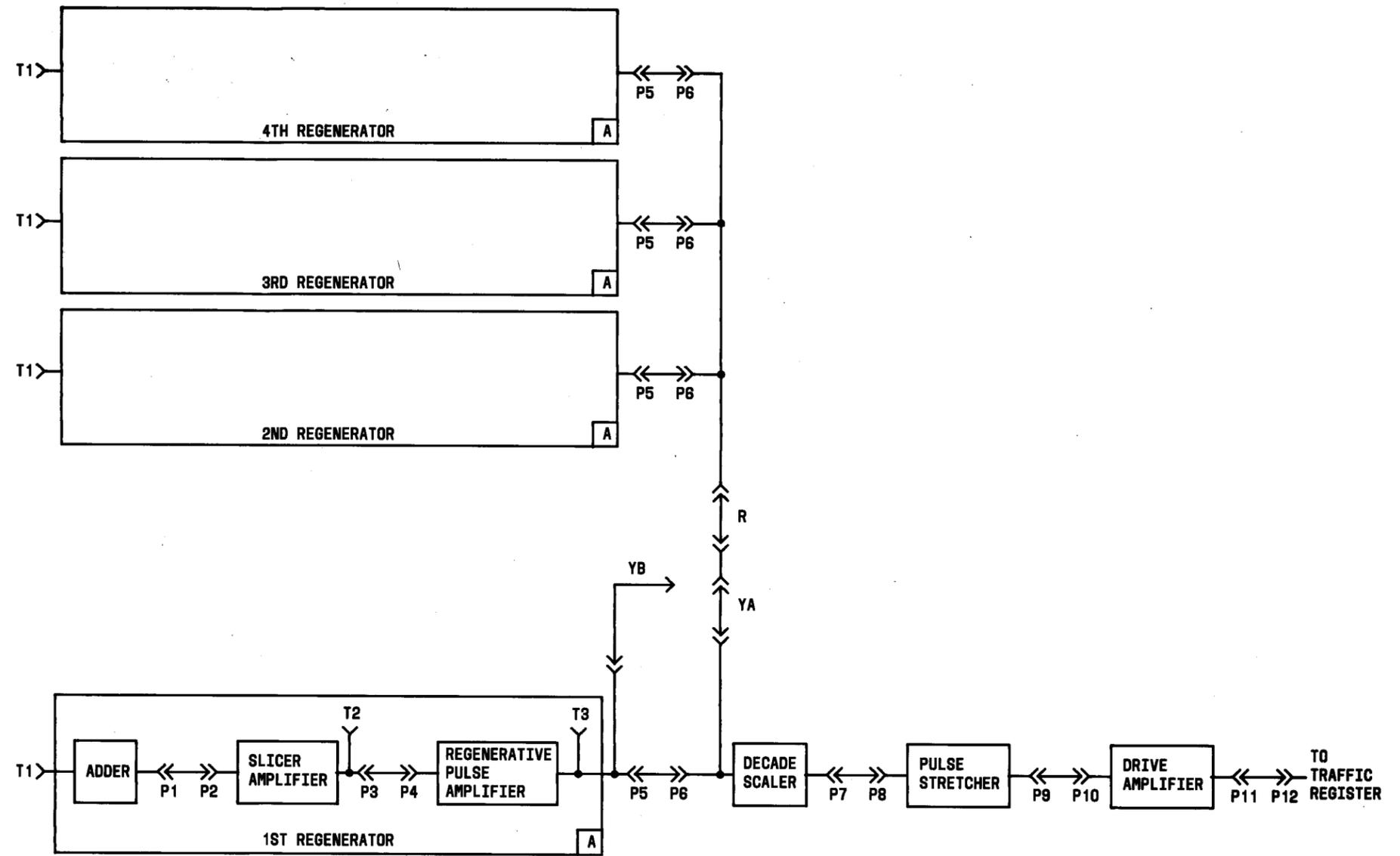


Fig. 1—Totalizer Test Options