

AMERICAN TELECOMMUNICATION CORPORATION  
MODEL 210 *TONEPULSE\** RECEIVER  
MODEL 206-17 *TONEPULSE* CONVERTER  
NO.5 CROSSBAR SYSTEM

1. GENERAL

1.01 This section is a cover sheet for the American Telecommunication Corporation (ATC) *TonePulse* Receiver Model 210-01 instruction, Section 201436, and *TonePulse* Converter Model 206-17 instruction, Section 202441 for No.5 Crossbar. PTEL (formerly GAEL) 1803 authorizes the use of this equipment in Pacific Company (PAC).

1.02 (Reserved for future use.)

1.03 The Model 210-01 *TonePulse* Receiver and Model 206-17 *TonePulse* Converter are solid state devices for translating *Touch-Tone*<sup>®</sup> signals to the necessary digit input required by the No.5 Crossbar originating register (OR).

1.04 These units are designed to mount on the right side of the OR bay on a one-for-one basis. No additional rack space or cabling is required.

1.05 The Model 210-01 *TonePulse* Receiver is used with wirespring ORs (SD-26040-01) provided with XB option.

1.06 The Model 207-17 *TonePulse* Converter is used with flatspring ORs (SD-25551-01) equipped with TL option or wirespring ORs (SD-26040-01) equipped with XH option. (See Addendum, Section 202441 attached.)

1.07 The receiver or converter is connected into the dial pulse path of the OR. On a rotary dial call, the receiver or converter will remain in the passive state and the call will be completed in the dial pulse mode.

1.08 On a *Touch-Tone* call, the receiver will translate the *Touch-Tone* code into a 2-out-of-5 (0, 1, 2, 4, 7) code which is required by the OR for digit registration.

1.09 The converter, upon detecting the *Touch-Tone* signals, connects a pulsing circuit into the operating path to convert the *Touch-Tone* code into dial pulses. The OR responds to these pulses and completes the call in the normal manner.

1.10 Due to the effects that nonprecise dial tone may have on these units, it is necessary to limit their installation to offices equipped with precise dial tone.

1.11 If corrections are required in the manufacturer's instructions, use Form E 3973-1PT as described in Section 000-010-901PT to process the correct information.

1.12 If equipment design and/or manufacturing problems should occur, refer to Section 010-700-011PT for procedures on how to file an Engineering Complaint.

2. TRAINING

2.01 Minimal training is required as no repair work will be performed on these units by PAC maintenance forces.

3. MAINTENANCE

3.01 Field repairs that involve replacement or modification of components within these units are not recommended.

\* Trademark of American Telecommunications Corporation.

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NOTICE

Not for use or disclosure outside the  
Bell System except under written agreement

## SECTION 218-135-900PT

3.02 For those units out of warranty, ATC could (at their discretion) refuse to perform any requested work.

### 4. TEST PROCEDURE

4.01 Model 210-01 Receiver and Model 206-17 Converter shall be tested in accordance with Section 218-135-501, Tests A, B, C, I, AO, AP, AQ, AR, AS, AT, AV, and AV-1. Key SDC (Station Delay Cancel) shall be operated when making *Touch-Tone* tests on the Model 206-17 Converter.

*Note:* Test AU (Section 218-135-501) or test AM (Section 218-135-503), Special 3-Frequency Test, is not applicable to either unit and shall *not* be performed.

### 5. ORDERING PROCEDURE

5.01 The American Telecommunication Corporation no longer manufactures these units. Should a need for this equipment develop, a request

should be directed to the Administration Manager, Central Office Equipment.

### 6. REPAIR AND RETURN

6.01 A factory repair service is provided by ATC. A return authorization shall be obtained from ATC by calling 213-579-1710. ATC will send a packaging label to be placed on the package, listing where the item is to be shipped for repair.

6.02 A GTP 2161, Return Material Tag, must be attached to the unit(s) prior to shipping.

6.03 The unit(s) are to be shipped transportation *prepaid*.

### 7. EXCLUSIONS/REVISIONS

7.01 The following change applies to the manufacturer's instructions (Section 202441):

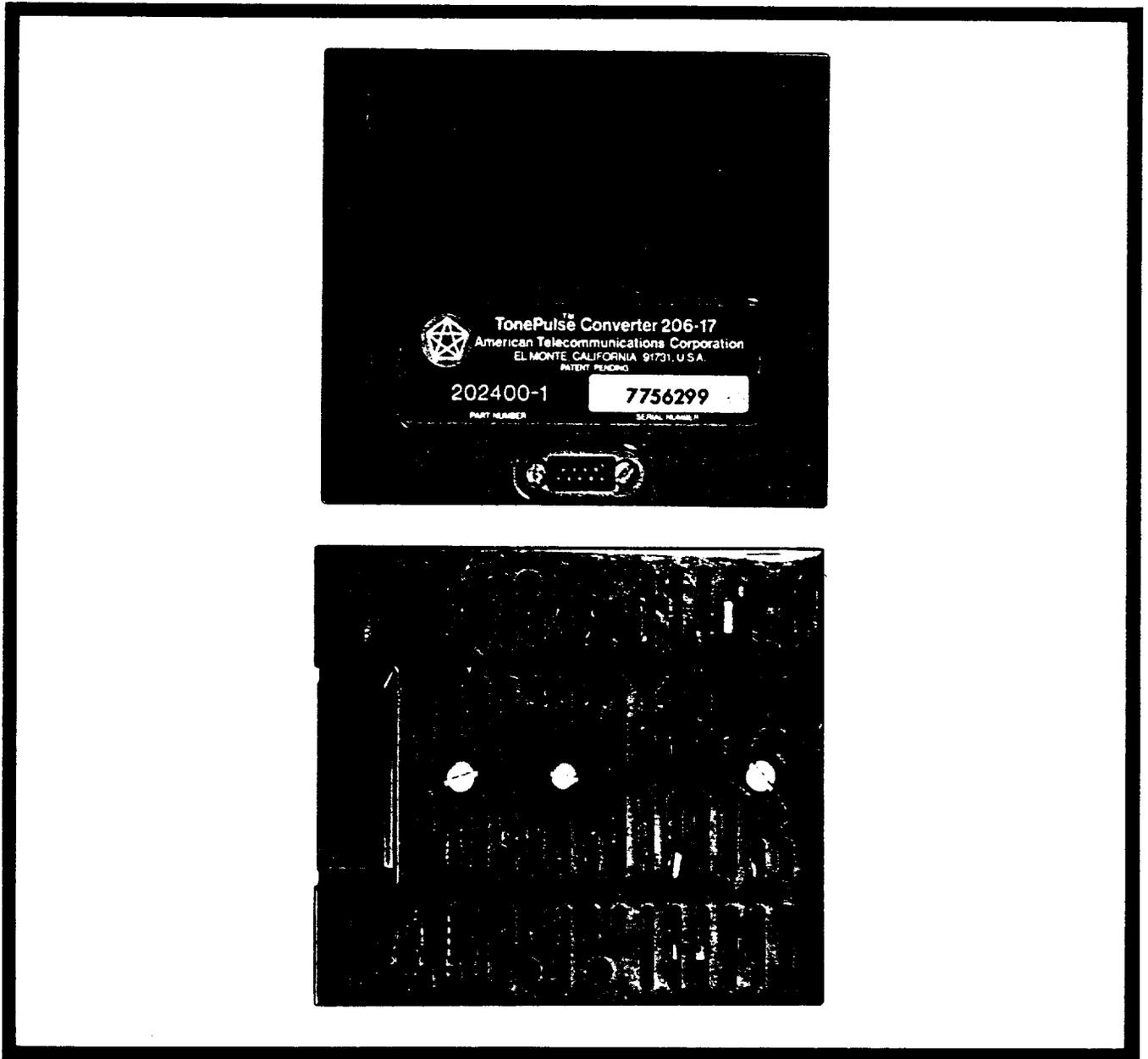
- Part 5, Ordering Information — delete

#### *Attachments:*

American Telecommunication Corporation, #5 Crossbar Flatspring TonePulse Converter Model 206-17, Section 202441, June 1977. Addendum June 1977. Model 210 No.5 Crossbar Receiver, Section 201436, Issue 3, December 1978. Application Notes-1, Issue 2, December 1978.

# #5 Crossbar Flatspring TonePulse™ Converter Model 206-17

DESCRIPTION, FUNCTIONAL DESCRIPTION, SPECIFICATIONS, ORDERING  
INFORMATION, INSTALLATION, TESTING



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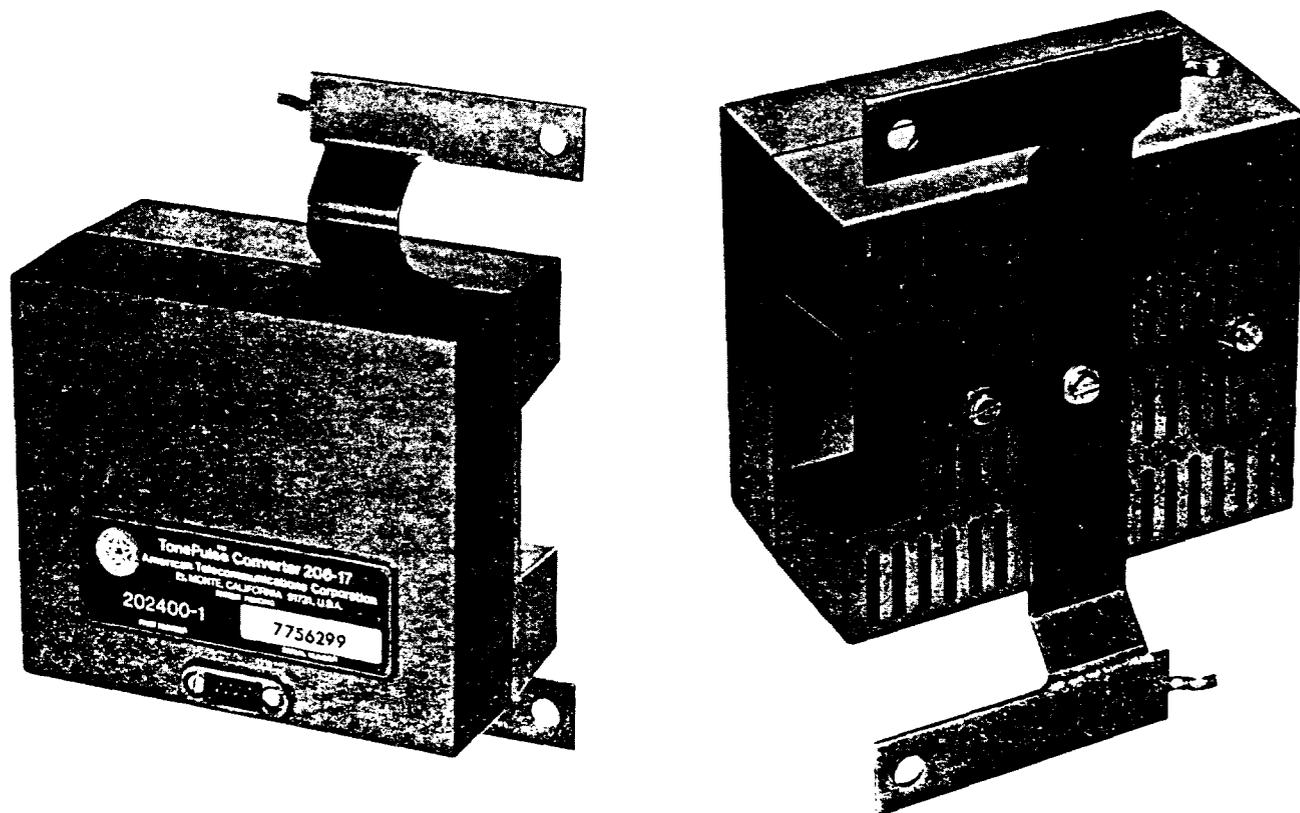


FIGURE 1. TONEPULSE CONVERTER 206-17 WITH MOUNTING BRACKET

### 1.0 GENERAL

This Standard Practice provides a Description, Functional Description, Specifications, Ordering Information, Installation and Mounting Instructions, and Testing Procedures for American Telecommunications Corporation #5 Crossbar Flatspring TonePulse Converter Model 206-17.

#5 Crossbar Flatspring Converters translate Touch-Tone\* signals to rotary pulses at a 20 PPS outpulsing rate. The units are designed for use in #5 Crossbar Central Offices with Flatspring Originating Registers.

Wiring of the Originating Register must be modified when installing the Converter.

\*Touch-Tone is a registered trademark of AT&T.

### 2.0 DESCRIPTION

The #5 Crossbar Flatspring TonePulse Converter is a compact, solid-state unit measuring 4.1 inches high by 4.7 inches wide by 2.7 inches deep. It is mounted on the right side of the Originating Register bay with two press-in fasteners.

### 3.0 FUNCTIONAL DESCRIPTION [See Figure 2]

#### 3.01 POWER CONSUMPTION

#5 Crossbar Flatspring Converters, powered by -48 V, draw no more than 100 mA idle and 160 mA when Touch-Tones have been detected.

#### 3.02 LOOP CURRENT DETECTOR

Less than 2 mA of current flow through the R1 lead for a period of 150 to 300 milliseconds resets the Converter. Previously detected Touch-Tone digits are erased from memory, outpulsing is terminated, and the SP relay is restored. After a reset condition is detected, current flow in the Converter R1 lead of 20 mA or more for a period of 30 to 50 milliseconds permits the detection of Touch-Tone digits.

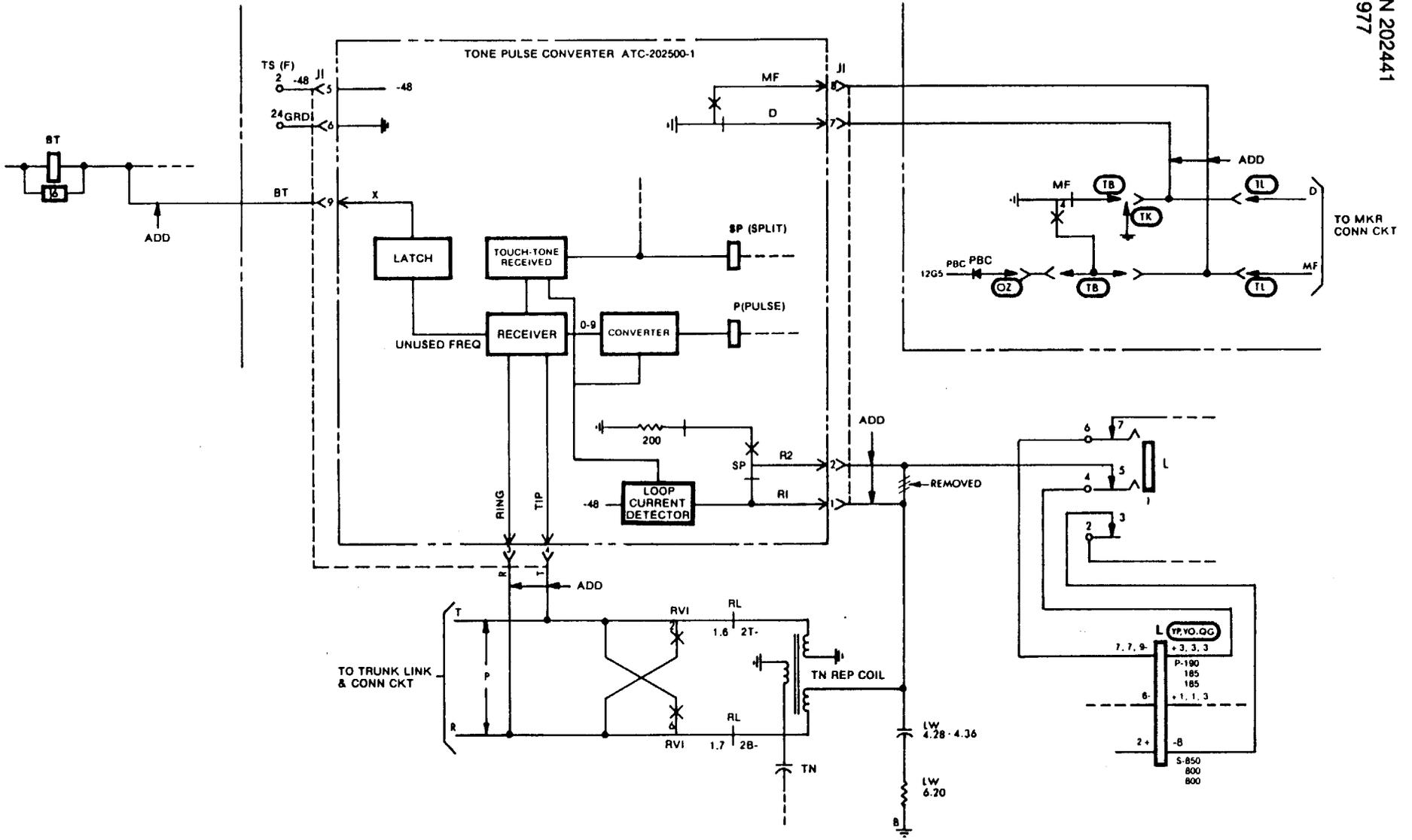


FIGURE 2. FUNCTIONAL SCHEMATIC

### 3.03 TOUCH-TONE RECEIVER

Touch-Tone digits sent by the subscriber are capacitively coupled into the input amplifier. Filters separate the high and low band and attenuate all undesired frequencies. Limited high and low outputs are analyzed by a crystal-controlled digital receiver.

### 3.04 TONE GUARD PROTECTION

After a tone has been validated, a 10-millisecond interruption is allowed to guard against line transients. This minimizes the chance of splitting tones of long duration into more than one digit.

### 3.05 BUFFER MEMORY

Since Touch-Tone digits can be generated by subscribers faster than switching equipment will accept dial pulses, a 16-digit buffer memory stores the digits. The first digit input is the first converted.

### 3.06 SENDER

The sender accesses the digits from the register in order and generates "break" pulses. Reliable outpulsing is achieved at the R2 output of the Converter through a transistor and a 1 K-ohm current-limiting resistor.

### 3.07 INPUT-OUTPUT FUNCTIONS

- (A) **Tip and Ring** These inputs capacitively-couple Touch-Tone signals from the telephone line.
- (B) **R1 and R2** When a numbered Touch-Tone digit is recognized by the receiver, Relay SP splits the TN Repeat Coil (R1) from the Operate circuit of the "L" Relay (R2). Relay SP switches in a local circuit (R2) for pulsing Relay "L" and terminates the TN Repeat Coil (R1) to -48 V via a 195-ohm resistor.
- (C) **D and MF** Prior to outpulsing and after the unit is reset by the Loop Current Detector, the "D" lead is grounded through the normally-closed contacts of the SP Relay. After reception of a numbered Touch-Tone digit, the SP Relay operates, transferring the ground from the "D" to the "MF" lead. Ground is not transferred back to the "D" lead until the next reset condition is removed.

- (D) **Output X** This output is grounded upon detection of the special Touch-Tone digits \*, #, A, B, C, or D. This ground operates Relay BT of the OR, causing the calling customer to hear 120 IPM low-tone. Ground is removed from Output X when a reset condition is recognized.

### 3.08 DIAL PULSE CALLS

On calls from dial pulse stations, the OR functions in the normal manner. The SP Relay does not operate, and the Converter has no effect.

4.0 SPECIFICATIONS

PARAMETER		MINIMUM	MAXIMUM	QUALIFICATION
Input Impedance		40K $\Omega$		Tone Receiver, AC Bridging
Tone Amplitude		-20 dBm	+ 6 dBm	Per Frequency
Frequency Deviation			+ 1.5%	
Twist			6 dB	Absolute Value of Tone Amplitude Difference
Skew			3.0%	Absolute Value of Difference in Freq. Deviation
Tone Duration		40 ms		
Intertone Duration		40 ms		
Tone to White Noise Ratio			20 dB	
Digit Storage Capacity			16	
Outpulsing Rate		20.0 pps	21.0 pps	
% Break		60%	64%	
Interdigital Time		340 ms	346 ms	
Conductor Loop Resistance			1600 $\Omega$	Not Including the Telephone
Insertion Loss			0.5 dB	
Time to Restore SP Relay			70 ms	After Reset Recognition
Battery		-44 Vdc	-56 Vdc	
Current	Idle		100 MA	
	Pulsing		160 MA	
Seizure Recognition Time		30 ms	50 ms	
Reset Recognition Time		150 ms	300 ms	
Fusing		1/2 Ampere		Originating Register Fusing is Adequate
Storage Temperature		-55° C	85° C	
Operating Temperature		0° C	55° C	
X Output Load			125 ma	

5.0 ORDERING INFORMATION

(See Table 1)

The #5 Crossbar Flatspring Converter, bracket, and cable may be ordered together or separately. To order, call ATC Order Department at (213) 579-1710.

TABLE 1 - ORDER PART NUMBERS	
ITEM	PART NUMBER
Model 206-17 Converter with Mounting Bracket, hardware, and Cable	202400-1
Model 206-17 Converter	202500-1
#5 Crossbar Mounting Bracket and hardware	201669-1
30-inch Cable	100342-11
#5 Crossbar Converter Connector Plug	100319-22

TABLE 2 WIRING INFORMATION				
LOCATION	FUNCTION	WIRE COLOR CODE	TERMINATION	
			TERMINAL BLOCK	PIN NUMBER
REGISTER CONTROL UNIT	R1	Orange-White	TN Repeat Coil	3
	R2	White-Orange	L Jack	5
	RING	Blue-White	D	30
	TIP	White-Blue	D	29
	-48 V	White	F	2
	GND	Red	F	24
	X	Blue	E	32
DIAL PULSE COUNTING UNIT	D	Blue-Black	C	19
	MF	Black-Blue	C	20

## 6.0 INSTALLATION AND MOUNTING

(The following information applies to Flatspring Originating Registers only. See Table 2 for wiring information. OR's should be equipped and wired per SD-25551-01, Option TL.)

### 6.01 DIAL TONE

Lines to be converted should be equipped with precise dial tone (350 Hz plus 440 Hz at -13 dBm per frequency). Standard dial tones such as 600 Hz modulated by 120 Hz or 133 Hz have been successfully used. Harmonics generated by such dial tones must be at least 30 dB down from either Touch-Tone frequency in the range of 680 Hz to 1680 Hz. Failure to observe harmonic content may result in multiple conversion to Touch-Tone digits sent in the presence of dial tone.

### 6.02 FUSING

The Converter receives -48 V from the "C" fuse of the associated OR. Operation of this fuse will cause a major alarm. Since the Converter will always operate after the OR has found the line requesting service, this fusing will suffice for both the OR and the Converter.

### 6.03 PRE-WIRING

Cables and connecting plugs can be delivered early for prewiring of an office. #5 Crossbar Flatspring Converter connecting plugs restore Ring continuity prior to Converter installation.

### 6.04 INSTALLATION PROCEDURE

- (A) Remove the Converter, bracket hardware, fasteners, and the associated cable from the packing containers.
- (B) Check the Register, and when it is idle, make it busy.
- (C) Remove the rear Originating Register bay panel.
- (D) Remove the wire between Pin 5 of the "L" jack to Pin 3 of the TN Repeat Coil. Remove the wire between the LW Capacitor and Pin 5 of the "L" Jack. Add a new wire from the LW Capacitor to Pin 3 of the TN Repeat Coil.
- (E) Solder the nine color-coded leads to the terminal blocks and pin numbers specified in Table 2.
- (F) Remove the solid ground (TK Option) from C19 of the terminal block if provided.

- (G) If not provided, add a wire from C20 to Connector Relay ORA 1, 2, 3, or 4, Pin 13.
- (H) Feed the cable through the vacant space to the left of the "M" Relay.
- (I) Replace the rear bay panel.

### 6.05 MOUNTING PROCEDURE

- (A) Remove the plastic dust cover panel.
- (B) Position the Converter on the right side of Register frame upright, inserting the two bracket fingers into holes nearest the relay mounting angles. Secure the Converter by pressing the fasteners through the bracket and into the bay.
- (C) Insert the plug of the Converter cable into the receptacle of the TonePulse Converter until it locks into place.
- (D) To remove the plug, insert a screwdriver under one ear of the plug and pry outward.
- (E) Replace the dust cover panel.

### 7.0 TESTING THE #5 CROSSBAR FLATSPRING TonePulse CONVERTER

The Converter shall be tested with Key SDC operated per BSP-218-135-501, tests A, B, C, I, AO, AP, AQ, AR, AS, AT, AV, and AV.1.

The Model 206-17 Converter is not designed to reject Touch-Tone in the presence of a third frequency above 1900 Hz; therefore, test AU should not be performed.

## 8.0 REPAIR AND WARRANTY

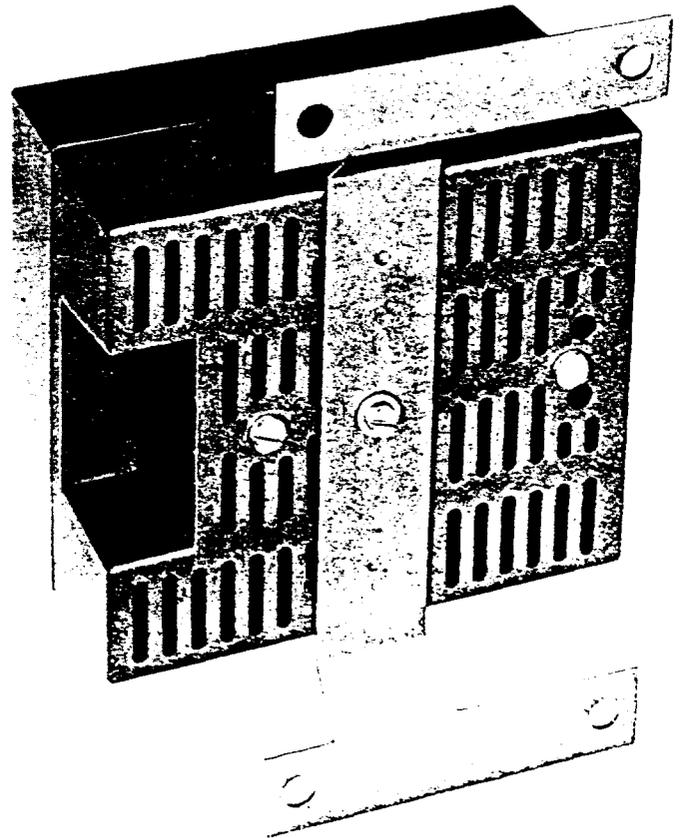
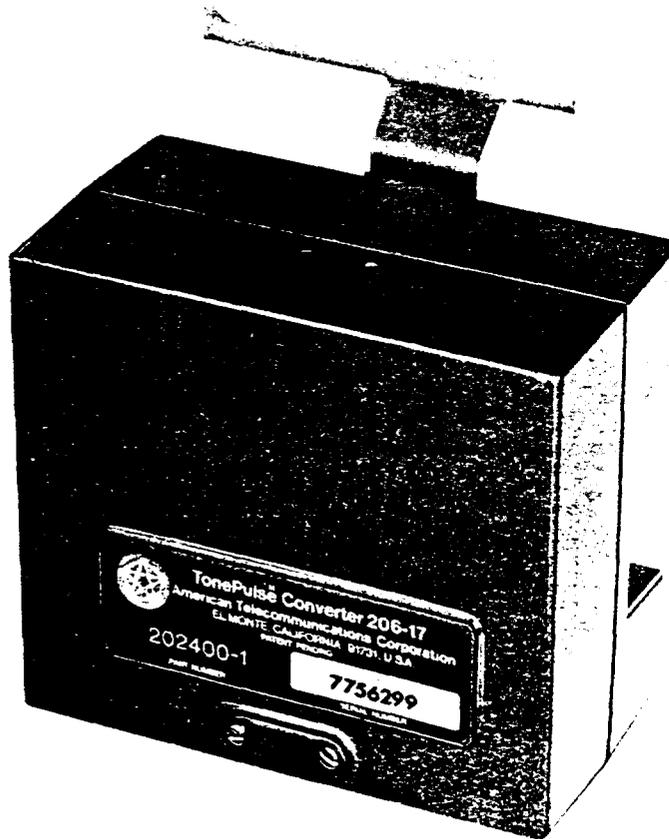
8.01 American Telecommunications Corporation (ATC) offers a complete repair and return service and suggests the use of this facility for servicing the #5 Crossbar Flatspring TonePulse Converter.

8.02 A flat rate, as specified on the current pricing schedule, will apply to all units out of warranty and considered repairable—as determined by ATC.

### 8.03 WARRANTY POLICY

The standard ATC warranty policy applies to Crossbar Flatspring TonePulse Converter warranted against defective material and work for a period of three years from the date of Units in warranty requiring service must be ATC transportation prepaid. A Return must be secured by calling ATC Customer (213) 579-1710.

# #5 Crossbar Flatspring TonePulse™ Converter Model 206-17



## 1.0 GENERAL

This addendum provides installation and connecting information for the Model 206-17 TonePulse Converter when used in #5 Crossbar Central Offices with Wirespring Originating Registers. It applies to Wirespring Registers without the XB option but with the XH option. The #5 Crossbar Receiver Model 210-01 should be used to convert Wirespring Registers with the XB option.

## 2.0 INSTALLATION

### 2.01 INSTALLATION PROCEDURE [See Figure 1]

- (A) Remove the Converter, bracket hardware, fasteners, and the associated cable from the packing containers.
- (B) Check the Register and make it busy.
- (C) Remove the ground lead from TS (B) 41—see CAD GIA/F6.
- (D) Solder the 1N4007 Diode's anode to TS (B) 12 and cathode to TS (B) 14.
- (E) Remove the lead from Pin 11 of the Line

Relay socket and connect it to the Orange-White lead from the converter cable.

- (F) Connect the White-Orange lead from the converter cable to Pin 11 of the Line Relay socket.
- (G) Solder the remaining seven color-coded leads to the terminal blocks and pin numbers specified in Table 2.

(CAUTION: Because Class of Service is changed from rotary to Touch-Tone,\* check Trunk Link Frame for proper cross connections.)

### 2.02 MOUNTING PROCEDURE

- (A) Position the Converter on the left side of the Register frame upright. Secure the Converter by pressing the four fasteners through the bracket and into the bay.
- (B) Insert the plug of the Converter cable into the receptacle of the Converter until it locks into place.
- (C) To remove the plug, insert a screwdriver under one ear of the plug and pry outward.

\*Touch-Tone is a registered trademark of AT&T.

**FIGURE 1. CONNECTION FOR WIRESRING  
ORIGINATING REGISTERS  
[MODIFICATION OF SD 26040-01]**

ADDENDUM—SECTION 202441  
JUNE, 1977

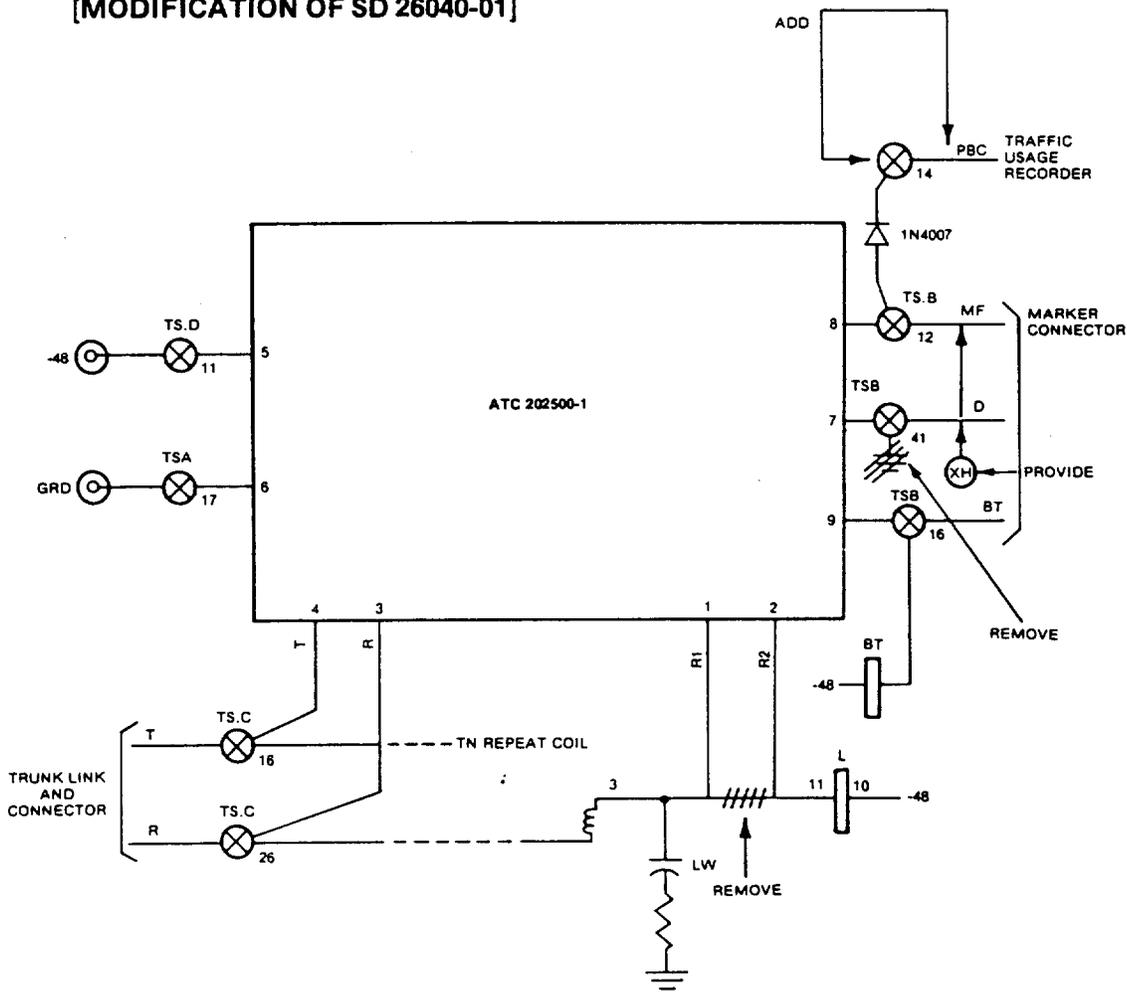
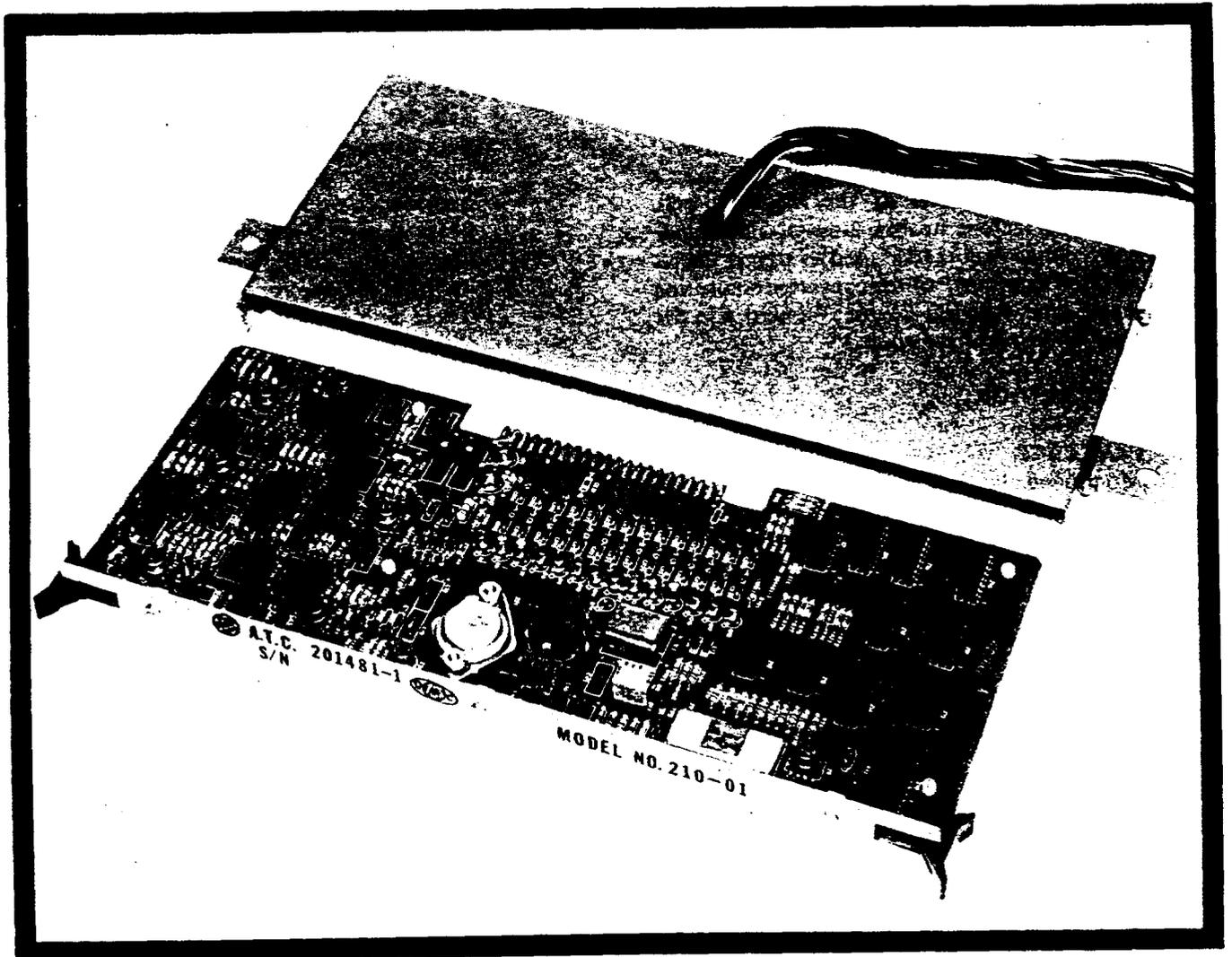


TABLE 1 — ORDER PART NUMBERS	
ITEM	PART NUMBER
Model 206-17 Converter with Mounting Bracket, hardware, and Cable	202400-1
Model 206-17 Converter	202500-1
#5 Crossbar Flatspring Mounting Bracket and hardware	201669-1
#5 Crossbar Wirespring Mounting Bracket and hardware	202596-1
72-inch Cable—Wirespring & two 1N4007 Diodes	100342-11
#5 Crossbar Converter Connecting Plug	100319-22

TABLE 2 — WIRING INFORMATION FOR WIRESRING ORIGINATING REGISTERS			
FUNCTION	WIRE COLOR CODE	TERMINATION	
		TERMINAL BLOCK	PIN NUMBER
R1	Orange-White	TN Repeat Coil	3
R2	White-Orange	L Relay	11
RING	Blue-White	C	26
TIP	White-Blue	C	16
-48 V	White	D	11
GND	Red	A	17
X	Blue	B	16
D	Blue-Black	B	41
MF	Black-Blue	B	12

# MODEL 210 NO. 5 CROSSBAR RECEIVER



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## 1.0 GENERAL

This Standard Practice provides a description, theory of operation, specifications, and information related to installation and mounting, testing, ordering, and repair and warranty for American Telecommunications' Model 210-01 No. 5 Crossbar Receiver.

The Model 210-01 gives No. 5 crossbar telephone central offices the capability of completing originating calls from Touch-Tone\* telephones. It translates incoming Touch-Tone signals into code outputs that interface with the central office originating register (OR) equipment.

Upon detecting dual tone multi-frequency (DTMF) signals from the telephone, the Model 210-01 produces a unique code for each tone of the incoming call. Resulting outputs include strobes, 2-out-of-5 code outputs, and ground control marks, used to trigger circuit operations. This "marking" of the converted wirespring OR duplicates the function of the Western Electric SD98148-01 A3 Receiver (or equiv.)

## 2.0 DESCRIPTION

### 2.01 FEATURES

Mounts on the right side of the OR bay with two press-in rivets. No additional rack space or cabling is required.

Equipped with program switches for options labeled "XM", "XC", and "VB".

Printed circuit card removal requires no unwiring.

Performance is equivalent to that of the Western Electric SD98148-01 A3 Receiver (or equiv.)

### 2.02 PHYSICAL DIMENSIONS

The Model 210-01 No. 5 Crossbar Receiver is a low-profile, solid-state unit that measures 12.46 inches by .88 inches by 5.24 inches. In most applications, it can be mounted on the right side of wirespring OR's.

### 2.03 OUTPUT CODES (See Figure 2, Functional Block Diagram)

The fourteen outputs of the unit include a 2-out-of-5 code (or 2-out-of-7 when XM, XC, or VB are programmed), and two strobes. Three leads are provided to enable (via a ground return) the 2-out-of-5 code, the two strobes, or the 1- (or 2-) out-of-7-code.

#### (A) 2-Out-of-5 Code

These five outputs are labeled "0", "1", "2", "4", and "7". (See Figure 3.) They are enabled by the line labeled "G", which supplies ground. Table 2 specifies the relationship of the output codes to the Touch-Tone digits. For example, to represent the digit "6", the outputs labeled "2" and "4" are in the ON state; saturated transistors provide a return path to ground. These outputs remain on for 45 milliseconds after digit recognition (see Figure 1).

#### (B) Strobe Outputs

The two strobe outputs are labeled "MF" and "S". These outputs provide a current path to ground when any digit is recognized; they turn on starting with digit recognition and remain on for 20 milliseconds after the tone disappears, or 45 milliseconds, whichever is longer (see Figure 1).

#### (C) 1-Out-of-7 Code (or 2-Out-of-7)

These outputs are labeled "11A", "P2A", "PLN", "D", "M", "X1", and "X2". They are enabled by the "1" lead (not to be confused with the "1" of the 2-out-of-5 code). Table 2 shows the relationship of the output codes activated by receipt of the tone frequencies from a Touch-Tone dial. The 11A signal is activated only when the initial dialed digit is one (1). The P2A signal is activated when the initial digit is other than one (1), plus when optional features are provided for special services. (See "D", below.)

#### (D) UM, XC, and VB Option Switches

In the No. 5 crossbar OR (SD-24060), several features provide for "absorbing" the first digit (if it is an 8, 9, or zero) when certain special service features are specified. To enable these options, a ground signal must be provided on leads PLN, D, or M, in addition to a signal on Lead P2A.

The P2A output is enabled for digits 2, 3, 4, 5, 6, and 7 regardless of the position of the option switches. If the register is not arranged for Centrex or person-to-person collect (0+) features, option switches UM, SC, and VB should be programmed "ON". This will enable the P2A output for digits 8, 9 and 0, respectively (see Table 1).

When the register is arranged for Cer and private line network features requiring dial 8 access, operate the UM switch "OFF". This provides both PLN and signals for an initial digit 8.

\*Touch-Tone is a registered trademark of AT&T

When the register is arranged for Centrex and digit 9 access, operate the XC switch to "OFF". This provides both D and P2A signals for an initial digit 9.

When the register is arranged for person-to-person collect special (0+) service, operate the VB switch to "OFF". This provides both M and P2A signals for an initial digit zero (0).

Option switches UM, XC, and VB function independently and can be arranged "ON" or "OFF", in any combination, as required.

### 3.0 THEORY OF OPERATION (See Figure 2)

#### 3.01 DTMF LOW GROUP AND HIGH GROUP FILTERS

The low group frequency component and high group frequency component of the Touch-Tone signal are separated by two filters. Both signals are then digitally analyzed by a crystal-controlled, custom large scale integration (LSI) unit to determine the presence of valid tone pairs. When the digit is recognized, a strobe and an output corresponding to the appropriate digit identify the tone pair.

#### 3.02 LOGIC

When a valid tone pair is recognized, the strobe stores the digit identification into a latch. This information is then transmitted to the output transistors of the 2-out-of-5 and 1 or 2-out-of-7 codes, turning them on for a time period of 45 milliseconds. (See Figure 1 for Timing Diagram.)

#### 3.03 TRANSISTOR SWITCHES

Output 11A is designed to drive a 270 ohm, 48 volt relay coil. All other outputs are intended to operate a 700 ohm, 48 volt relay. The outputs are diode-clamped to a -48 volt supply to prevent damage from inductive kick. Because of these diode clamps, the -48 volt supply operating the relays must either be common or within 2 volts of each other. Ground must be common between receiver and central office relay circuits.

#### 4.0 INSTALLATION AND MOUNTING

The following information applies to wirespring OR's only: (See Table 3 for wiring information.)

#### 4.01 DIAL TONE

Lines to be converted should be equipped with precise dial tone. (350 Hz plus 440 Hz at -13 dBm.) Standard, mechanically-generated dial tones such as 600 Hz modulated by 120 Hz or 133 Hz have been successfully used. Harmonics generated by such dial tones must be at

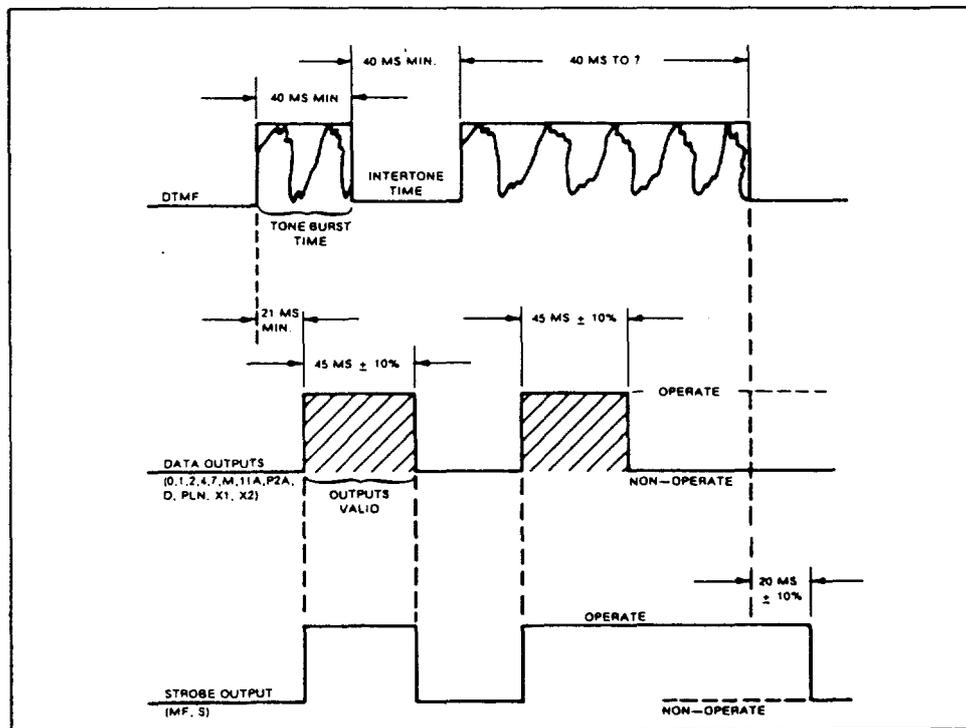


FIGURE 1 - TIMING DIAGRAM

**TABLE 1 - SPECIFICATIONS**

PARAMETER		MINIMUM	MAXIMUM	QUALIFICATION
Input Impedance		40 k		Tone receiver, a-c bridging.
Tone Amplitude		-20 dBm	+6 dBm	
Frequency Deviation			+1.5%	
Twist			+6 dB -8 dB	Relative amplitude of high band frequency referenced to low band frequency.
Skew			3.0%	Absolute value of difference in frequency deviation.
Tone Duration		40 ms		
Intertone Duration		40 ms		
Tone to White Noise Ratio			20 dB	
Insertion Loss			0.5 dB	
Battery		-44 V d-c	-56 V d-c	
Output Current	P2A		210 ma	Not including output current.
	all others		100 ma	
Current	idle		80 ma	
	peak		100 ma	
Fusing		½ ampere		Sender fusing is adequate.
Storage Temperature		-55° C	85° C	
Operating Temperature		0° C	55° C	
Dimensions: 12.46" (31.65 cm) x .88" (2.24 cm) x 5.24" (13.31 cm)				

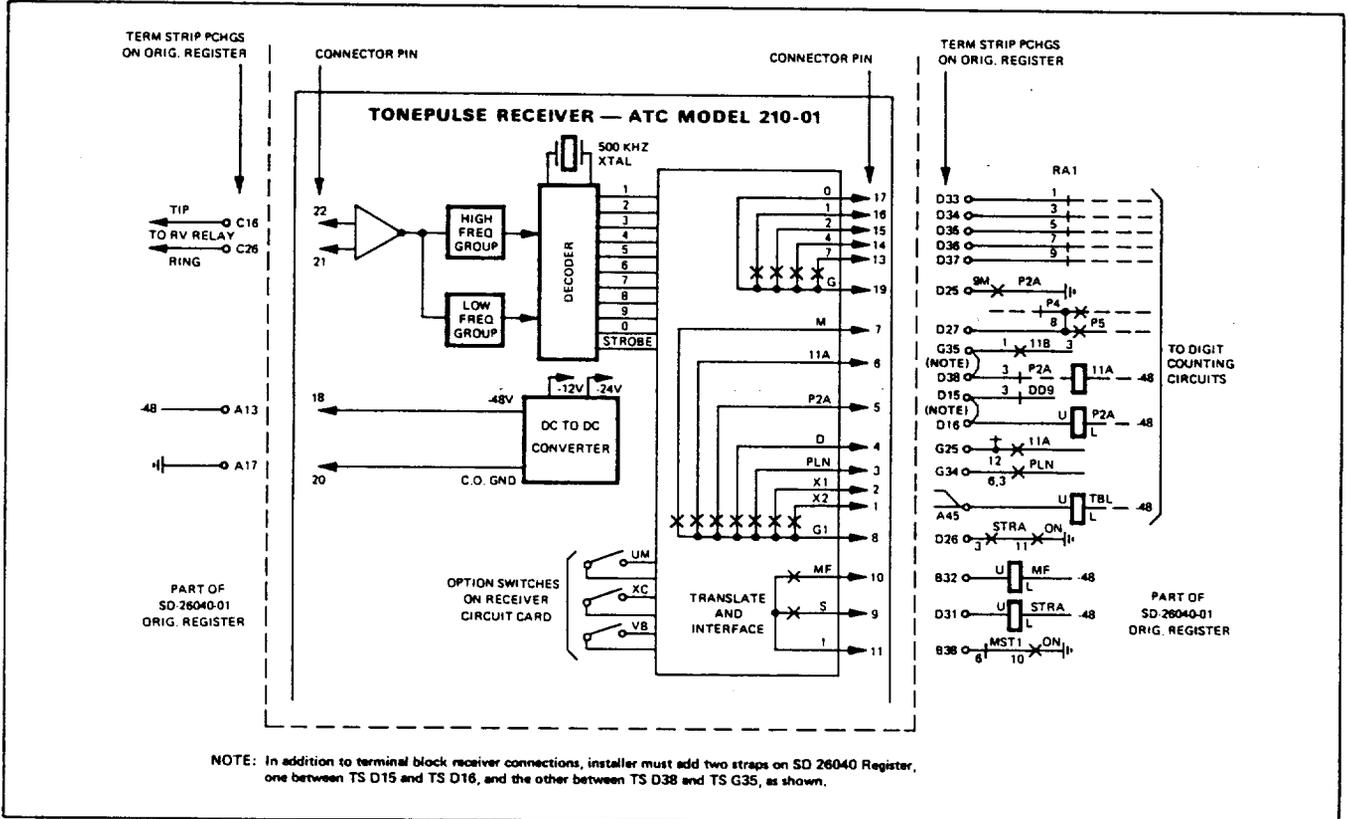
**TABLE 2**  
**TEST CONNECTIONS FOR TROUBLE ISOLATION**  
**MODEL 210-01 RECEIVER**

Digit Keyed	TOUCH-TONE INPUT (HZ)	TEST POINT NAME OPTION	Ground Mark (Note 2)															
			Test Point T.S. Pchs on Register															
			D33	D24	D35	D36	D37	D38	D16	G34	G25	D27	A45	A45	B32	D31	D25	D26
1	697,1209		X	X				X										
2	697,1336		X		X				X									
3	697,1477			X	X					X								
4	770,1209		X			X				X								
5	770,1336			X		X				X								
6	770,1477				X	X				X								
7	852,1209		X				X		X									
8	852,1336	UM ON		X				X		X								
		UM OFF		X				X		X	X							
9	852,1477	XC ON			X			X		X								
		XC OFF			X			X		X		X						
0	941,1336	VB ON				X	X		X									
		VB OFF				X	X		X			X						
*	941,1209											X						
#	941,1477												X					

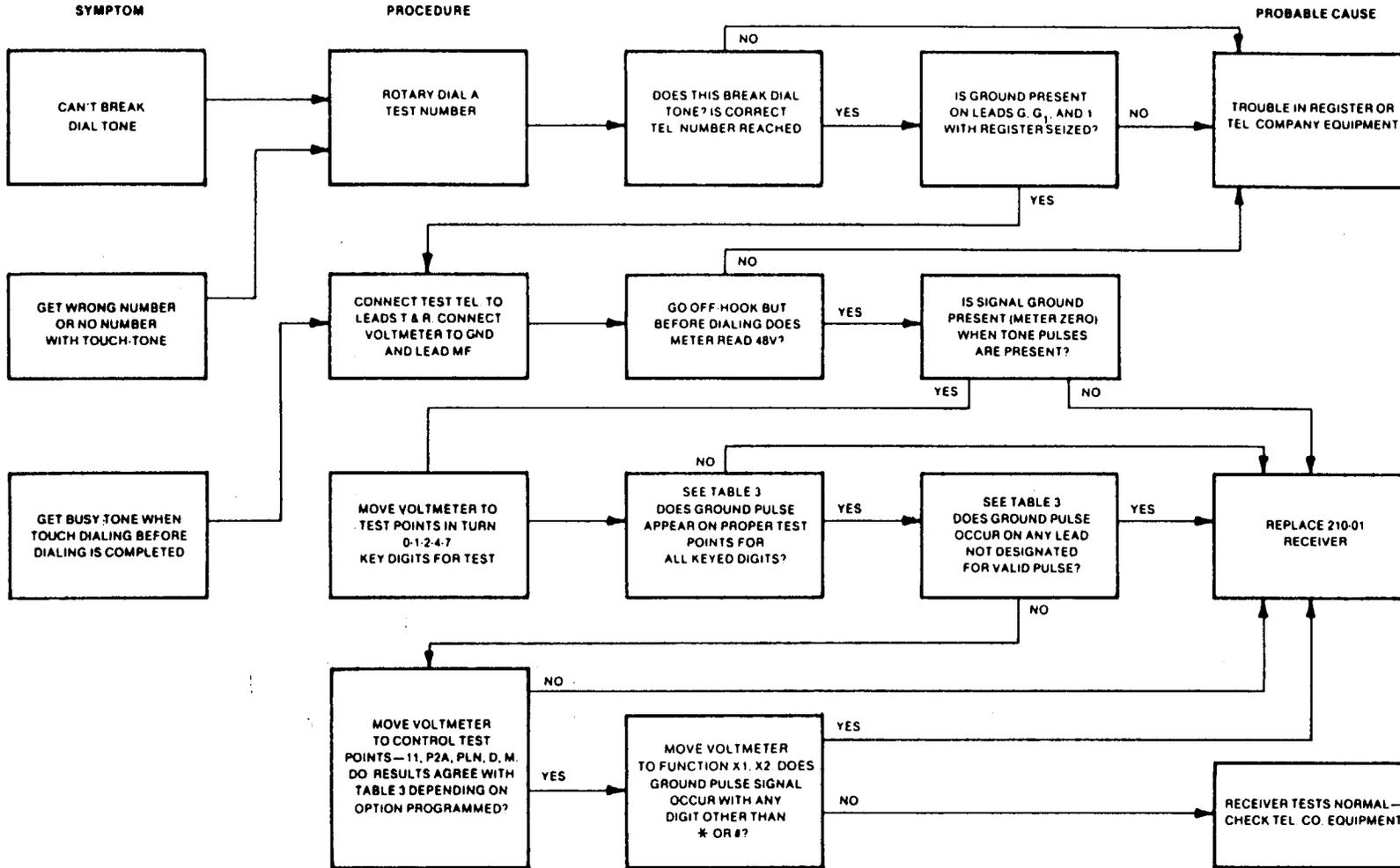
**NOTES:**

- All tests are made with voltmeter looking for ground. Connect meter to -48 V and test point indicated, battery or open circuit will read zero, ground will read 48 V.
- The TonePulse Receiver provides a 45 ms ground pulse for each keyed function. The pulse is easily seen if observer is watching meter. After this one pulse there is no further action unless another digit is keyed.

- Ground signals on leads MF and S will remain on for the duration of the "Key Down" condition.
- Ground signal on G, G1, and "1" will be present whenever originating register is seized, and will remain until register is released or times out.
- For current applications both symbols \* and # (Leads X1 and X2) are tied to the same register terminal (A45). These signals operate the (TBL) relay in the register and return busy tone to the calling line.



**FIGURE 2 - FUNCTIONAL SCHEMATIC MODEL 210-01 RECEIVER**



**CHART NOTES**

1. All voltages are referenced to ground unless otherwise stated.
2. Zero voltage may range from zero to + 3 volts under some conditions.

3. Voltage -48 V is normal central office battery voltage and may range between -46 V and -52 V.

4. Test points referenced are ATC connector lead designations where they connect to originating register. See Table 3.

**ATC TONEPULSE RECEIVER MODEL 210-01  
FOR WESTERN ELECTRIC NO. 5 CROSSBAR APPLICATION  
Trouble Isolation Chart**

**TABLE 3 - WIRING INFORMATION**

FUNCTION	CONNECTOR		WIRE COLOR CODE	TERMINATION	
	PIN NUMBER			TERMINAL BLOCK	PIN NUMBER
—48V		18	White - Blue	A	13
1		11	Blue - White	B	38
GND		20	White - Orange	A	17
MF		10	Orange - White	B	32
TIP		22	White - Green	C	16
RING		21	Green - White	C	26
P2A		5	White - Brown	D	16
G		19	Brown - White	D	25
G1		8	White - Slate	D	26
M		7	Slate - White	D	27
S		9	Red - Blue	D	31
0		17	Blue - Red	D	33
1		16	Red - Orange	D	34
2		15	Orange - Red	D	35
4		14	Red - Green	D	36
7		13	Green - Red	D	37
11A		6	Red - Brown	D	38
D		4	Brown - Red	G	25
PLN		3	Red - Slate	G	34
X1		2	Slate - Red	A	45
X2		1	Black - Blue	A	45
SPARE		12	Blue - Black		

least 30 dB down from either Touch-Tone frequency in range from 680 Hz to 1680 Hz. Failure to observe harmonic content can result in multiple conversion of Touch-Tone digits sent in the presence of dial tone.

**4.02 FUSING**

Originating register fusing is adequate to protect both originating register and the Model 210-01 Receiver.

**4.03 XB MODIFICATION**

Each OR to be converted with 210-01 Receivers must be equipped with the Western Electric XB option.

**4.04 MOUNTING**

- (A) Remove housing, receiver, and fasteners from the packing containers.
- (B) Check to determine that there is adequate clearance for mounting the receiver housing (see photo page 8). It may be necessary to loosen the OR relay mounting plate screws and slide the plates to the left. (While facing the equipment from the front.)

- (C) Position the receiver housing in the bay with the cable opposite D terminal strip wiring. (See Table 3.)
- (D) Press fasteners supplied with the receiver into holes opposite G and B terminal strips.
- (E) Dress the cable through the D terminal strip wiring guide and fan-out individual wires to the A, B, C, D, and G terminal strips.
- (F) Wire-wrap the twenty-one color coded leads to the terminal blocks and pin numbers specified in Table 3.
- (G) Program receiver according to office options (paragraph 2.03, D).
- (H) Slide receiver card into mounting, making certain that it has seated completely into the card edge connector.

**5.0 TESTING THE NO. 5 CROSSBAR RECEIVER**

Refer to BSP 218-135-501 for tests to be performed on the receiver from the test frame. The Model 210-01 Receiver is not designed to reject Touch-Tone in the presence of a third frequency above 1900 Hz; therefore, test AU should not be used. A trouble isolation chart is provided on page 6 that may be useful when diagnosing several types of trouble involving signals on control leads.

**6.0 ORDERING INFORMATION (See Table 4)**

The No. 5 Crossbar Receiver card must be ordered separately from its enclosure. Two fasteners are included with each enclosure. To order, call ATC Order Department at (213) 579-1710.

**TABLE 4 - ORDERING PART NUMBERS**

ITEM	PART NUMBERS
Model 210-01 Receiver without enclosure	201481
Model 210-01 Receiver enclosure	201514

**7.0 REPAIR AND WARRANTY**

American Telecommunications Corporation (ATC) offers a complete repair and return service and suggests the use of this facility for servicing the No. 5 Crossbar Receiver.

A flat rate, as specified on the current pricing schedule, will apply to all units out of warranty and considered repairable by ATC.

**7.01 WARRANTY POLICY**

The No. 5 Crossbar Receiver is warranted against defective material and workmanship for a period of three years from the date of purchase. Units in warranty requiring servicing should be returned to ATC transportation prepaid.

A return authorization should be secured prior to return shipment by calling ATC Customer Service at (213) 579-1710.



**#5 Crossbar Receiver mounted on the right side of a wire-spring originating register in typical insta'**

# APPLICATION NOTES



APPLICATION NOTES - 1  
ISSUE 2, DECEMBER, 1978

## ATC TonePulse™ Equipment for Western Electric #5 Crossbar Systems

### 1.0 GENERAL

American Telecommunications Corporation has developed two new TonePulse units for application in Western Electric #5 Crossbar Systems: One is the Model 206-17 TonePulse Converter for Flatspring Originating Registers (SD-25551-01) and for Wirespring Originating Registers (SD-26040-01) which are not equipped with the XB option. The other is the ATC Crossbar Receiver Model 210-01 for use when the XB option is provided. Both units are described in ATC Standard Practices, as shown in Table 1. Table 2 provides interconnect and test-point information for Model 206-17. Table 3 provides this information for Model 210-01. Also included as part of these Application Notes are simplified functional schematics (Figures 1-3) and a series of Trouble Isolation Charts.

It is the intention of the Notes to provide practical information and testing procedures for analyzing troubles which may be encountered under varying conditions.

### 2.0 PROCEDURES

In all cases, the expedient procedure to minimize outages is to replace the suspect converter or receiver with a maintenance spare unit or to swap it with another unit known to be operating properly. Units found to be faulty should be returned to the ATC factory for repair as covered by appropriate paragraphs in the ATC Standard Practice series.

When no spare unit is available or when local tests appear advisable, trouble isolation tests should be made using the Trouble Isolation Charts as a guide.

Tests and charts included in these Notes assume that the converter or receiver has been previously-installed and working satisfactorily with the associated Originating Register. The tests, however, may also be useful during initial installation if troubles are encountered.

Trouble isolation is accomplished by making successive point-to-point tests between various connections where the TonePulse unit interfaces the Originating Register and by observing the test results. Clip-cord connections can be made to designated circuit terminals on the wiring side of the Register. Terminal data is shown in Tables 2 and 3.

### 3.0 REQUIRED/RECOMMENDED

#### TEST APPARATUS

- (A) Medium impedance volt-ohmmeter (20,000 ohms-per-volt or greater).
- (B) High impedance monitor headset (capcitor isolated).
- (C) Combination Rotary/Touch-Tone\* test telephone to initiate calls.
- (D) Clips or clip-cords, as required.

### 4.0 TEST REQUIREMENTS

Originating Register must be removed from service (made busy) before trouble tests are made.

Dialing tests should be made from the automatic test position whenever possible.

When dialing tests cannot be made from the automatic test frame, dialing may be made at the Register by connecting the test telephone to points T and R. Register seizure may be required from test frame. One or two digits can be dialed per test without dropping a trouble card. The test telephone must be put "On-Hook" before initiating each succeeding test. Three or more dialed digits may drop a trouble card, since line location and class of service information cannot be simulated to satisfy the marker circuit.

It is necessary to keep each test brief, since a prolonged "Off-Hook" condition (typically 20 seconds) will result in a "permanent signal" office alarm.

\*Touch-Tone is a registered trademark of AT&T.

Standard BSP tests (or equivalent) should be made as listed in the appropriate ATC Standard Practice before returning the Originating Register to service.

#### **5.0 LOCAL TESTS— MODEL 206-17 CONVERTER**

Tests that can be made in the field on the Model 206-17 Converter are outlined in Trouble Isolation Charts 1 through 5, listed by the type of reported trouble.

The Trouble Isolation Charts assume that replacing the suspect unit has failed to solve the problem or that no replacement is available.

Procedures outlined will assist in determining if the trouble is in the converter or in the telephone company plant.

One feature of the 206-17 Converter application provides an external diode (Type IN4007 recommended), which is wired between Punchings C20 and C22 (Flatspring) and between Punchings B12 and B14 (Wirespring) on the associated Originating Register. Failure of this diode will result in faulty operation of the (PBC) Relay in the Register which supplies traffic data. Test for this diode is shown in Trouble Isolation Chart 4.

#### **6.0 LOCAL TESTS— MODEL 210-01 RECEIVER**

Tests that can be made in the field on the Model 210-01 Receiver are outlined in Trouble Isolation Chart 6.

The Trouble Isolation Charts assume that replacing the suspect unit has failed to solve the problem or that no replacement unit is available.

Procedures outlined will assist in determining if the trouble is in the Receiver or in the telephone company plant.

#### **6.01 MODEL 210-01 TEST PROCEDURES**

Verify that the Receiver card is completely seated into its connector. Check the circuit card fingers for abrasion markings on the fingers, indicating that the connector contact has been providing a firm grip on the finger surface.

The Receiver card should require a firm pressure for both insertion and removal. Verify that the finger section of the card is flat—not bowed or otherwise distorted or damaged. Remove any dirt or foreign matter from the contact fingers with an approved contact cleaning solution. Do not use an abrasive; this will destroy the gold plating on the contact finger surface.

**TABLE 1**  
**ATC TONEPULSE EQUIPMENT FOR WESTERN ELECTRIC #5 CROSSBAR APPLICATION**

ATC MODEL NUMBER	ATC STANDARD PRACTICE	UNIT FUNCTION	SPECIAL DIGIT CONVERSION	CENTRAL OFFICE PREPARATION
206-17 Converter	202441 and addendum (addendum describes wirespring register installation.)	Bridges incoming line for tonepulsing. converts tones to 20 pps dial pulses for register.	Special codes* and # return busy signal when X output is wired to BT Relay.	Office may require "precise" dial tone. Requires addition of one 9- conductor cable harness per origi- nating register equipped. Units snap into existing punched holes in origi- nating register frame. Flatspring registers SD-25551-01 should be equipped with option TL. Wirespring registers SD-26040-01 should be wired without XB option but with XH option. Application requires minor strapping modifications on rear of register.
210-01 Receiver and receiver enclosure	201436	Bridges incoming line. Converts tones to 2-out-7 code for "handshake" func- tions.	Converts all special digits to codes acceptable to reg- ister.	Originating Register must be provided with "XB" option. Office may require "precise" dial tone. Unit consists of receiver printed circuit card which slides into enclosure. Enclosure fasteners snap into existing punched holes in originating register frame. Requires adding one 22 conductor connecting harness (tail of mounting enclosure) to existing terminal strip punchings on rear of register.

**TABLE 2**  
**TEST CONNECTIONS FOR TROUBLE ISOLATION MODEL 206-17 CONVERTER**

CONVERTER LEAD DESIGNATION	WIRE COLOR	LEAD FUNCTION	MODEL 206-17 #5 FLATSPRING (SD-25551-01)		MODEL 206-17 #5 WIRE SPRING (SD-26040-01)	
			TERM BLOCK	PCHG. NO.	TERM BLOCK	PCHG. NO.
R1	ORANGE/ WHITE	OUTGOING RING	TN REPEAT COIL	3	TN REPEAT COIL	3
R2	WHITE/ ORANGE	PULSING LEAD	L JACK	5	L RELAY	11
R	BLUE/WHITE	INCOMING RING	D	30	C	26
T	WHITE/BLUE	INCOMING TIP	D	29	C	16
48	WHITE	BATTERY	F	2	D	11
GND	RED	GROUND	F	24	A	17
X	BLUE	BUSY TONE LATCH	E	32	B	16
D	BLUE/BLACK	ROTARY DIAL CALL IDENTIFICATION	C	19	B	41
MF	BLACK/BLUE	TOUCH TONE™ CALL IDENTIFICATION	C	20	B	12
EXTERNAL DIODE	ANODE	USAGE LEAD	C	20	B	12
	CATHODE		C	22	B	14

**TABLE 3**  
**Test Connections for Trouble Isolation Model 210-01 Receiver**

Test Point T.S. Pchg on Register		D33	D34	D35	D36	D37	D38	D16	G34	G25	D27	A45	A45	B32	D31	D25	D26	B38
Digit Keyed	TEST POINT NAME OPTION	Ground Mark (Note 2)										(Note 5)		(Note 3)		(Note 4)		
		0	1	2	4	7	11A	P2A	PLN	D	M	X1	X2	MF	S	G	G1	1
1		X	X				X							X	X	X	X	X
2		X		X				X						X	X	X	X	X
3			X	X				X						X	X	X	X	X
4		X			X			X						X	X	X	X	X
5			X		X			X						X	X	X	X	X
6				X	X			X						X	X	X	X	X
7		X				X		X						X	X	X	X	X
8	UM ON		X			X		X						X	X	X	X	X
	UM OFF		X			X		X	X					X	X	X	X	X
9	XC ON			X		X		X						X	X	X	X	X
	XC OFF			X		X		X		X				X	X	X	X	X
0	VB ON				X	X		X						X	X	X	X	X
	VB OFF				X	X		X			X			X	X	X	X	X
*												X		X	X	X	X	X
#													X	X	X	X	X	X

**NOTES:**

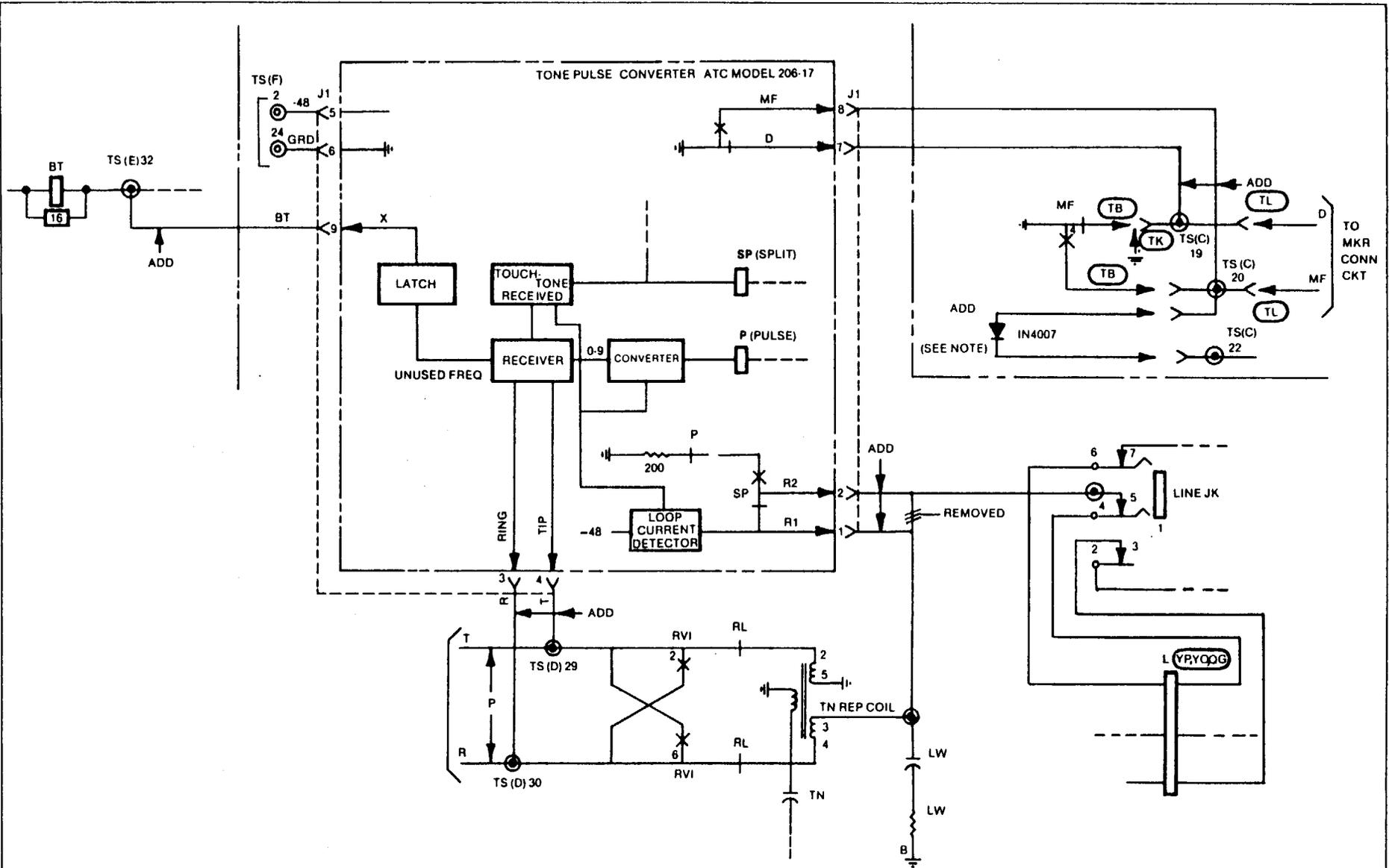
1. All tests are made with voltmeter looking for ground. Connect meter to -48V and test point indicated, battery or open circuit will read zero, ground will read 48V.

2. The TonePulse™ Receiver provides a 45 ms ground pulse for each keyed function. The pulse is easily seen if observer is watching meter. After this one pulse there is no further action unless another digit is keyed.

3. Ground signals on leads MF and S will remain on for the duration of the "Key Down" condition.

4. Ground signal on G, G1, and "1" will be present whenever originating register is seized, and will remain until register is released or times out.

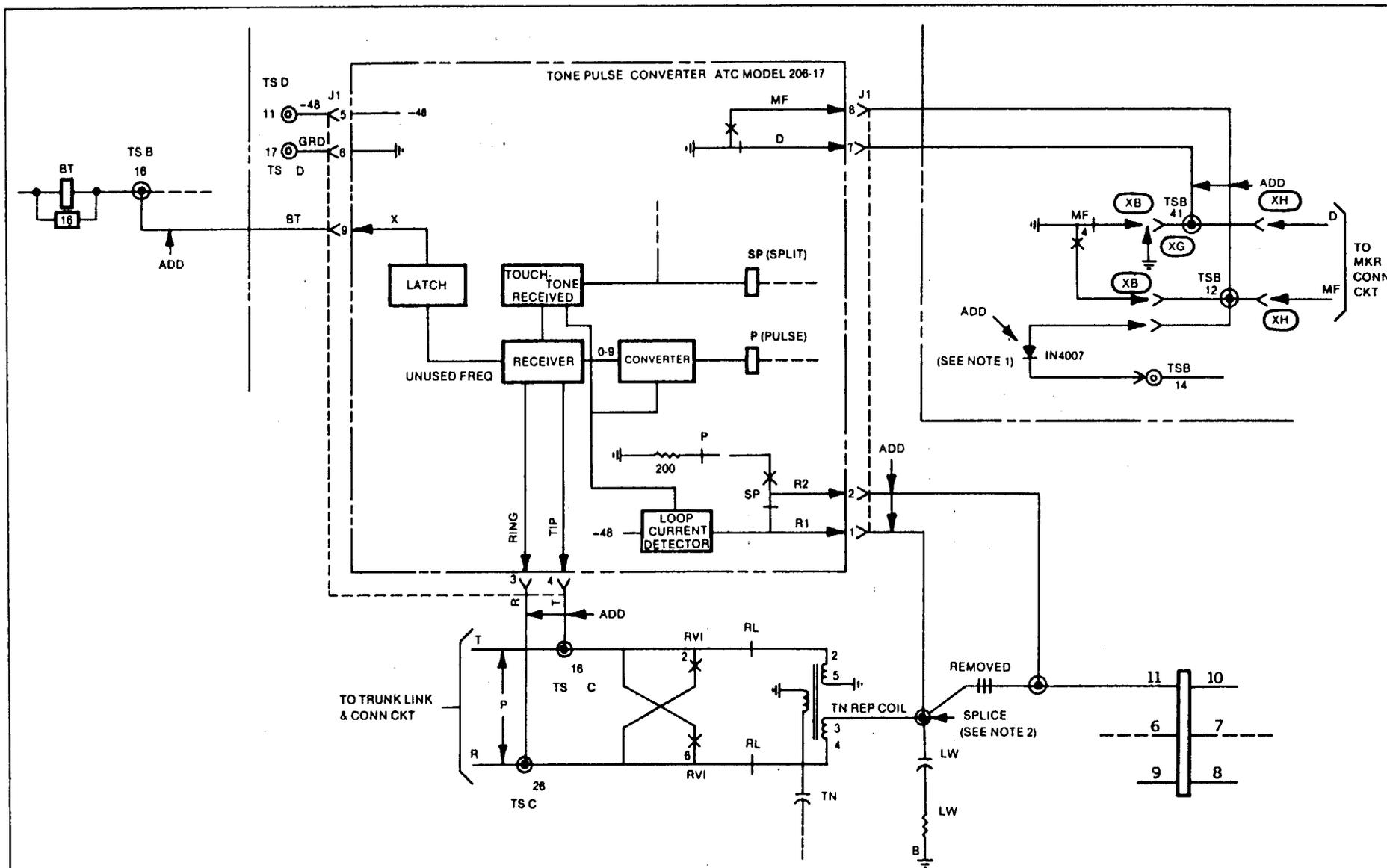
5. For current applications both symbols \* and # (Leads X1 and X2) are tied to the same register terminal (A45). These signals operate the (TBL) relay in the register and return busy tone to the calling line.



**NOTE 1:** The IN4007 diode is wired between PCHGS 20 and 22 of TS(C) when specified or required for traffic usage recorder operation.

**NOTE 2:** Converter unit is wired to SD-25551-01 Register per ATC Practice Section 202441 Paragraph 6.04.

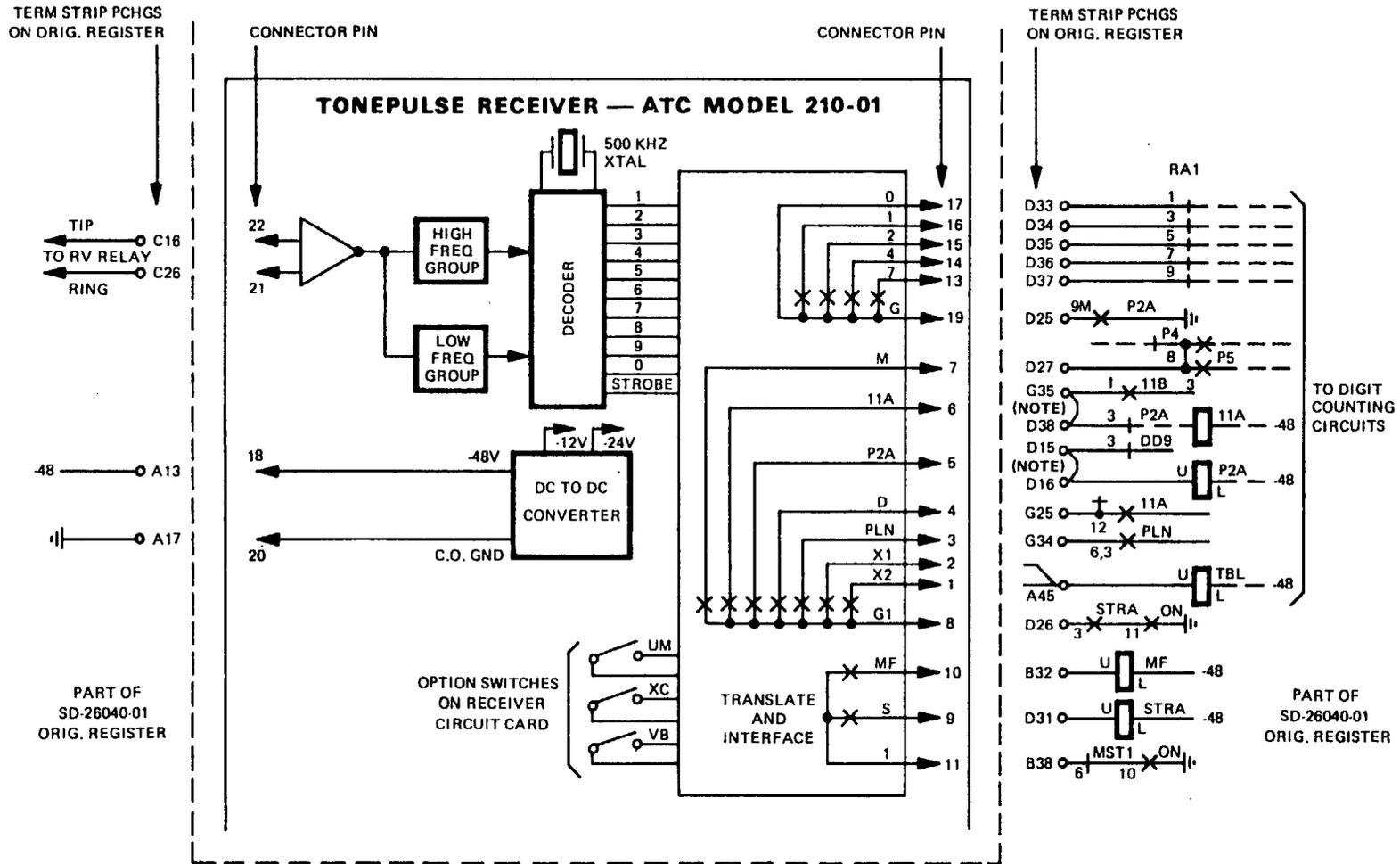
**FIGURE 1. FUNCTIONAL SCHEMATIC—FLATSPRING APPLICATION  
206-17 Converter**



**NOTE 1:** Provide added IN4007 diode for operation of PBC relay for traffic usage count.

**NOTE 2:** White/Orange and Orange/White leads are spliced to existing wire per ATC Practice Section 202441 Addendum Paragraphs 2.01 E, and F.

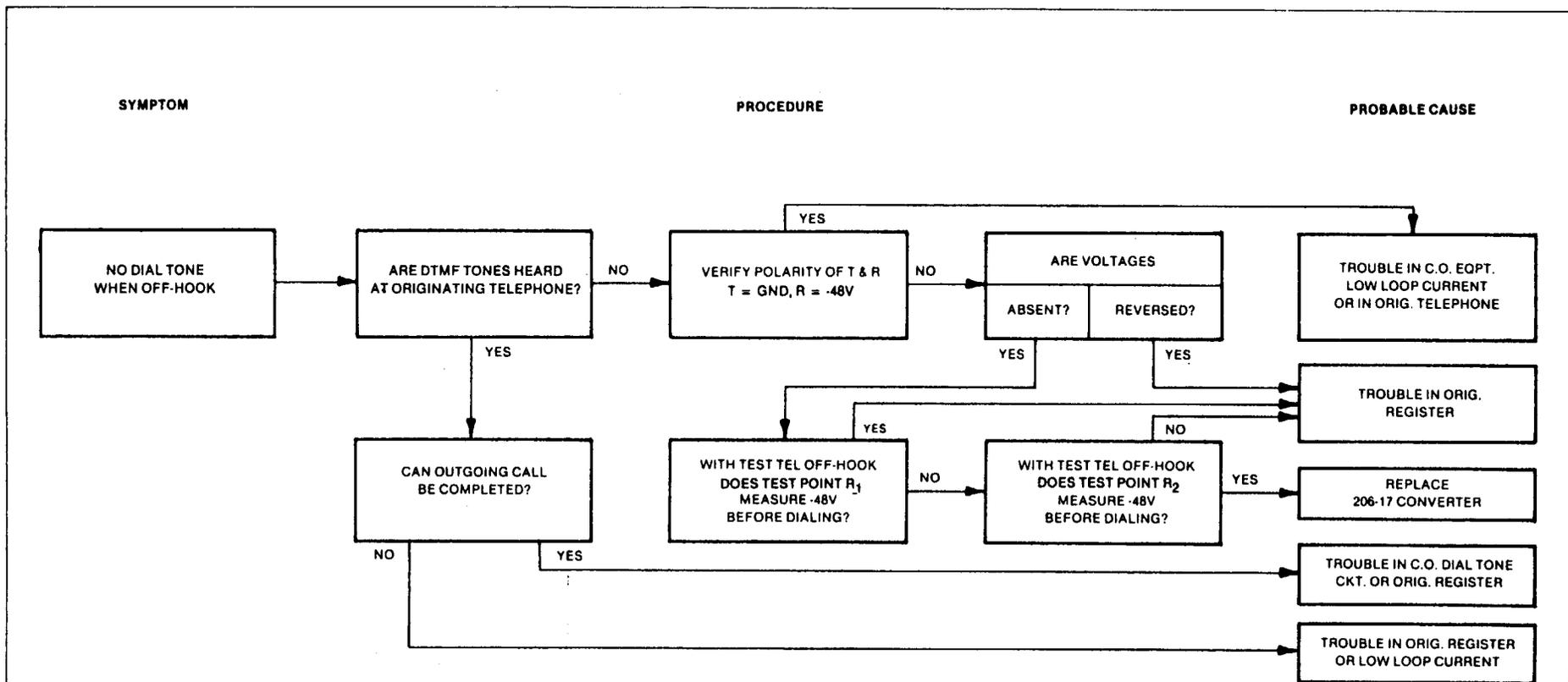
**FIGURE 2. FUNCTIONAL SCHEMATIC—WIRESRING APPLICATION**  
206-17 Converter



**NOTE:** In addition to terminal block receiver connections, installer must add two straps on SD-26040 Register, one between TS D15 and TS D16, and the other between TS D38 and TS G35, as shown.

FIGURE 3. FUNCTIONAL SCHEMATIC

MODEL 210-01 RECEIVER

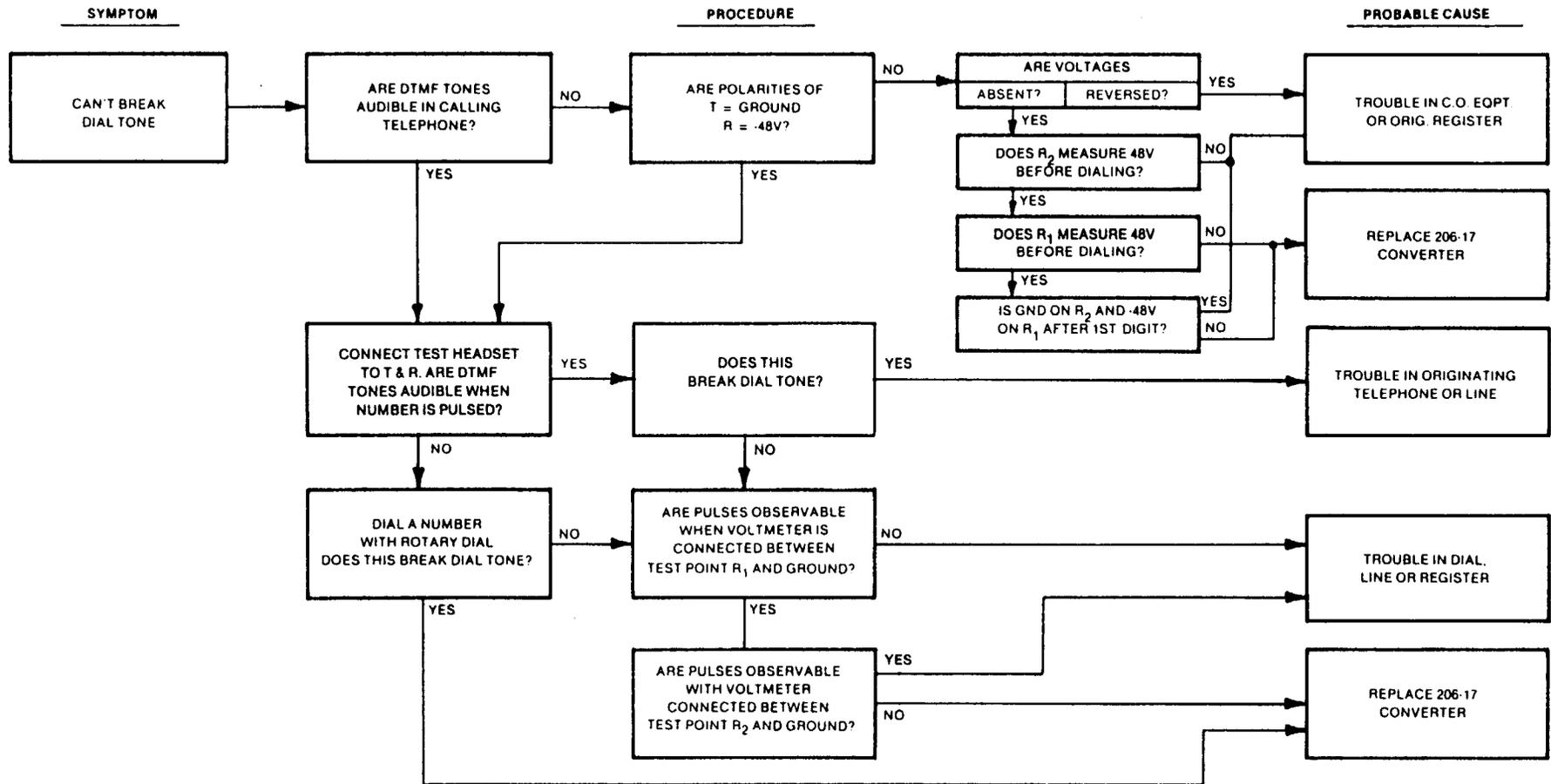


**CHART NOTES**

1. All voltages are referenced to ground unless otherwise stated.
2. Zero voltage may range from zero to ± 3 volts under some conditions.

3. Voltage -48V is normal central office battery voltage and may range between -46V and -52V.
4. Test points referenced are ATC connector lead designations where they connect to originating register. See Table 2.

**ATC TONEPULSE CONVERTER FOR WESTERN ELECTRIC #5 CROSSBAR APPLICATION**  
**Trouble Isolation Chart 1**  
**Model 206-17**



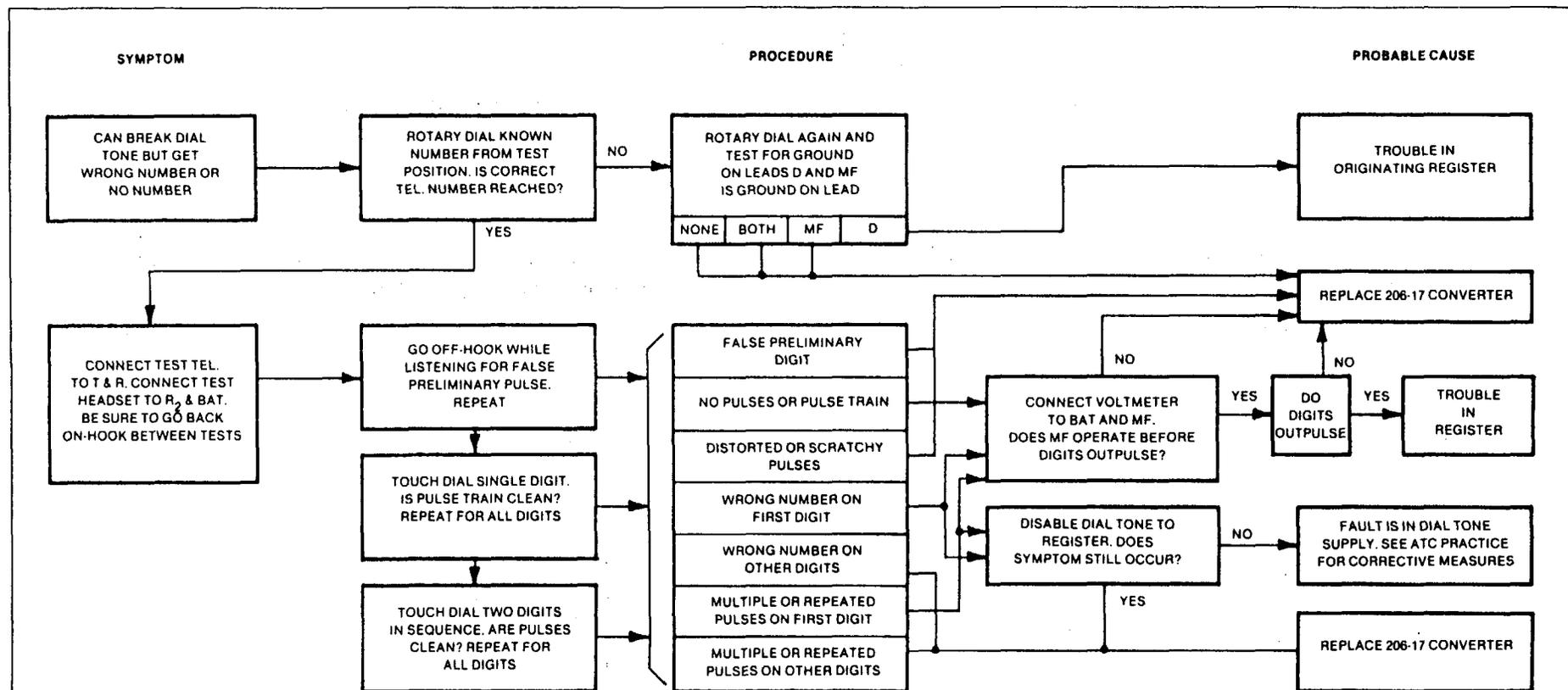
**CHART NOTES**

1. All voltages are referenced to ground unless otherwise stated.
2. Zero voltage may range from Zero to  $\pm 3$  volts under some conditions.

3. Voltage -48V is normal central office battery voltage and may range between -46V and -52V.
4. Test points referenced are ATC connector lead designations where they connect to originating register. See Table 2.

**ATC TONEPULSE CONVERTER FOR WESTERN ELECTRIC #5 CROSSBAR APPLICATION**

Trouble Isolation Chart 2  
Model 206-17



### CHART NOTES

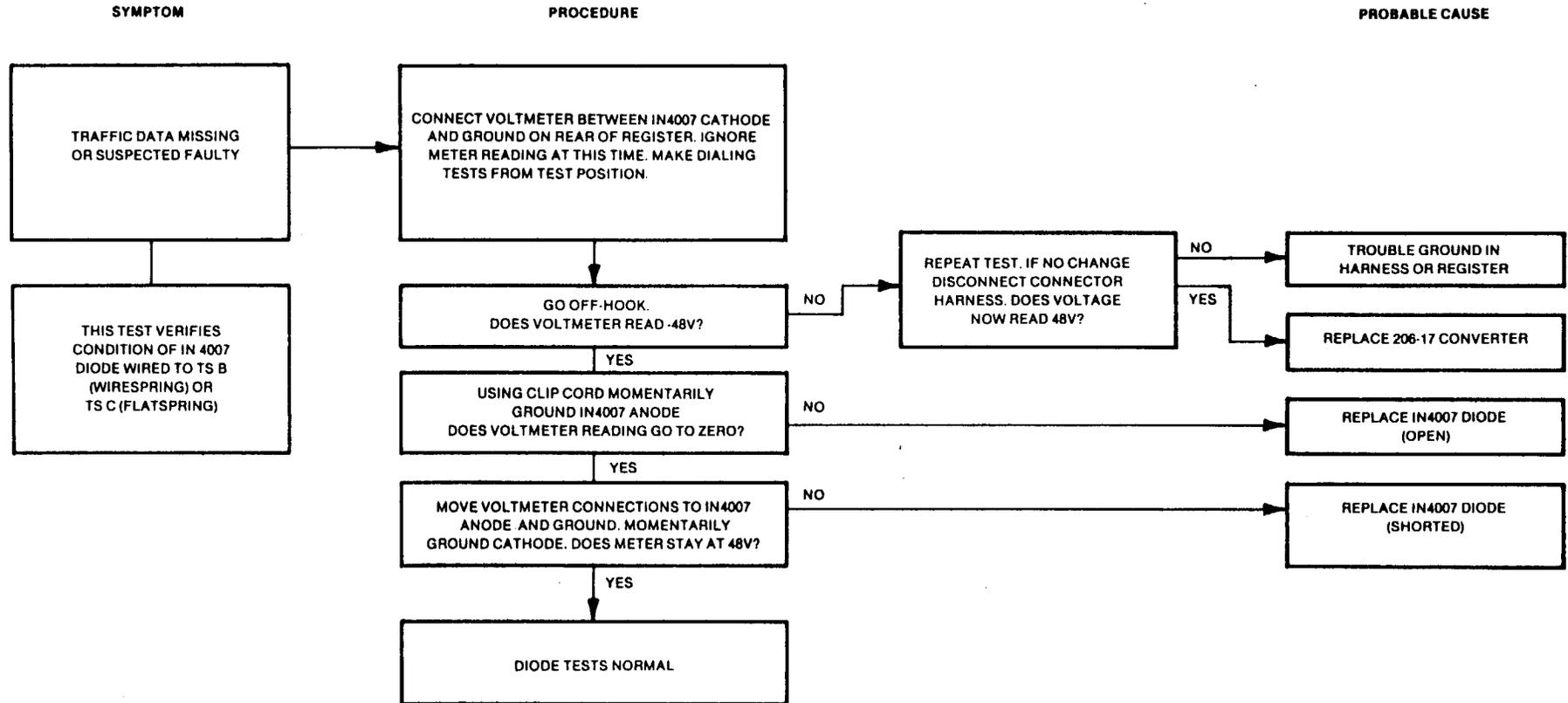
1. All voltages are referenced to ground unless otherwise stated.
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3. Voltage -48V is normal central office battery voltage and may range between -46V and -52V.

4. Test points referenced are ATC connector lead designations where they connect to originating register. See Table 2.

ATC TONEPULSE CONVERTER FOR WESTERN ELECTRIC #5 CROSSBAR APPLICATION

Trouble Isolation Chart 3  
Model 206-17

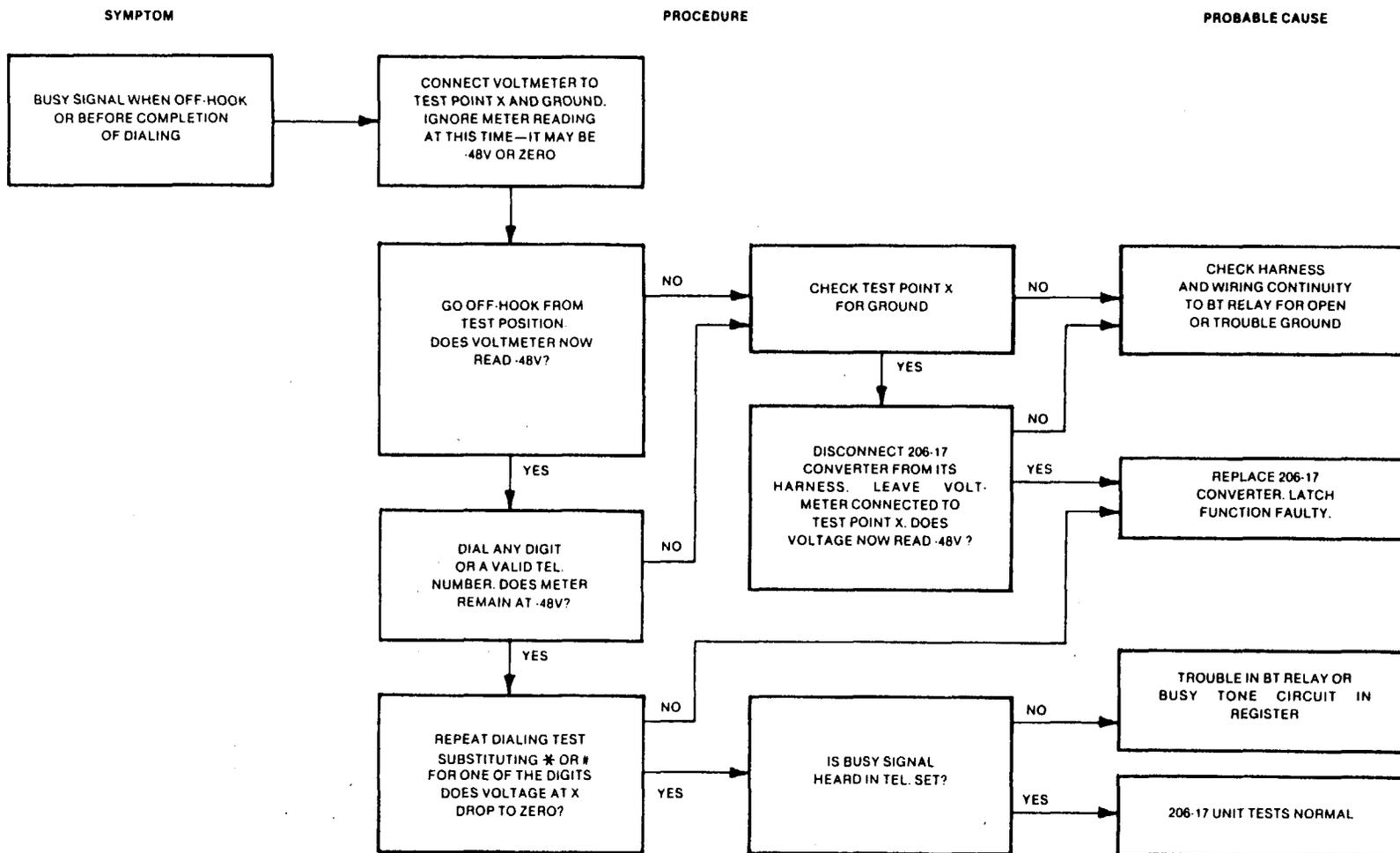
**CHART NOTES**

1. All voltages are referenced to ground unless otherwise stated.
2. Zero voltage may range from zero to  $\pm 3$  volts under some conditions.

3. Voltage -48V is normal central office battery voltage and may range between -46V and -52V.
4. Test points referenced are ATC connector lead designations where they connect to originating register. See Table 2.

**ATC TONEPULSE CONVERTER FOR WESTERN ELECTRIC #5 CROSSBAR APPLICATION**

Trouble Isolation Chart 4  
Model 206-17



### CHART NOTES

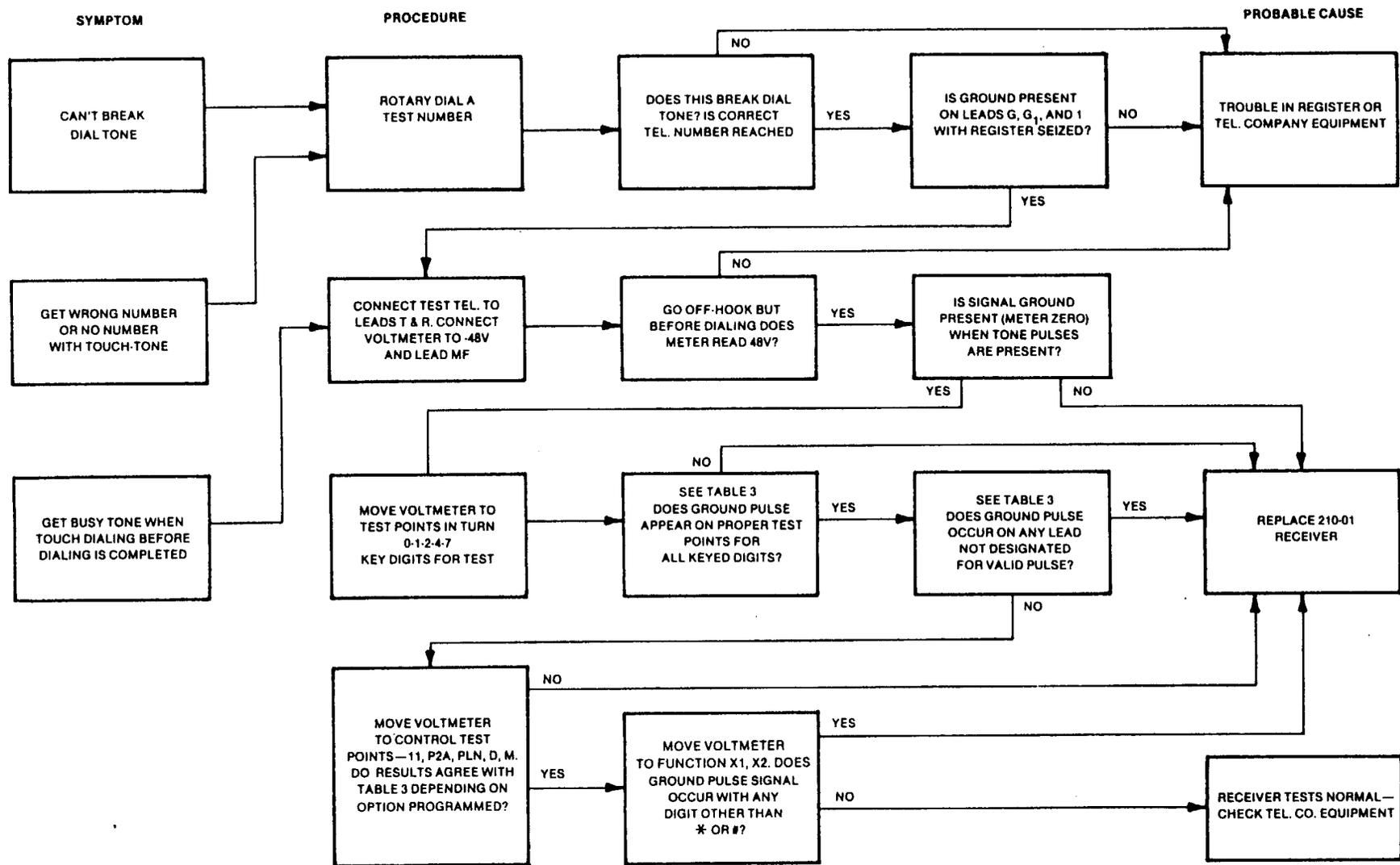
1. All voltages are referenced to ground unless otherwise stated.
2. Zero voltage may range from zero to  $\pm 3$  volts under some conditions.

3. Voltage -48V is normal central office battery voltage and may range between -46V and -52V.

4. Test points referenced are ATC connector lead designations where they connect to originating register. See Table 2.

## ATC TONEPULSE CONVERTER FOR WESTERN ELECTRIC #5 CROSSBAR APPLICATION

Trouble Isolation Chart 5  
Model 206-17

**CHART NOTES**

1. All voltages are referenced to ground unless otherwise stated.
2. Zero voltage may range from zero to  $\pm 3$  volts under some conditions.

3. Voltage -48V is normal central office battery voltage and may range between -46V and -52V.

4. Test points referenced are ATC connector lead designations where they connect to originating register. See Table 3.

ATC TONEPULSE RECEIVER MODEL 210-01 FOR WESTERN ELECTRIC #5 CROSSBAR APPLICATION  
 Trouble Isolation Chart 6