

TonePulse[®] Converter Model 204

DESCRIPTION, IDENTIFICATION, TECHNICAL SUMMARY AND INSTALLATION INSTRUCTIONS

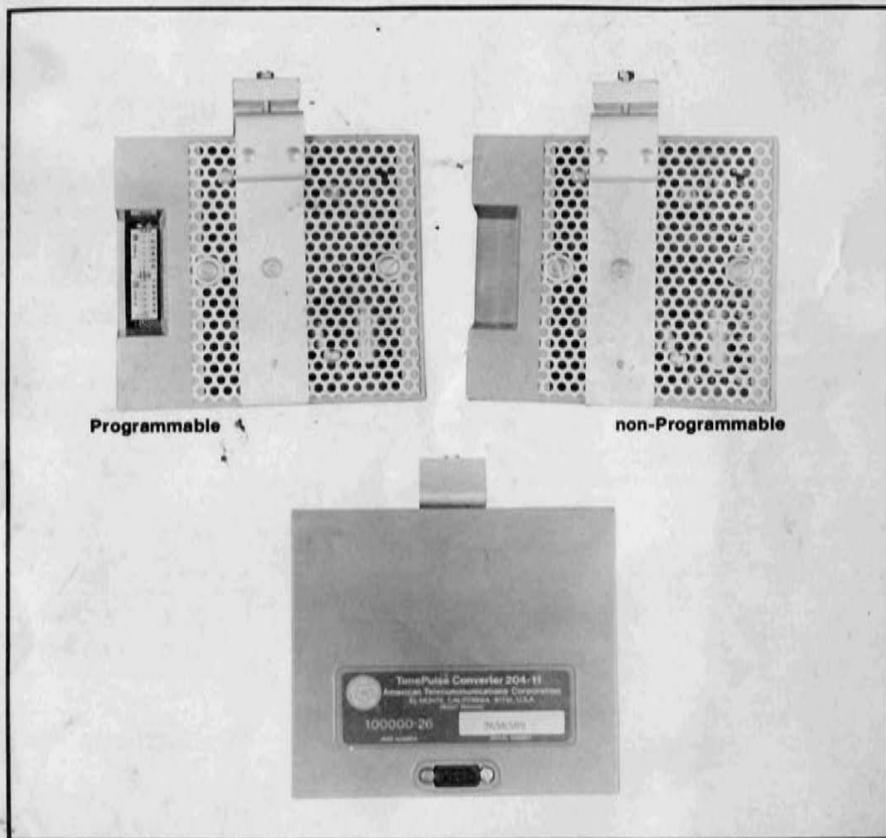


FIGURE 1. TonePulse Converter

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Rick Vals (Bought from North Supply)

TonePulse™ Converter Model 204

1.0 GENERAL

1.01 This Standard Practice provides a General Description, Theory of Operations, Ordering Information, Installation Instructions, and Trouble Shooting Procedures for the Model 204 TonePulse® Converters.

1.02 CONCEPT

The 204 family of dedicated TonePulse Converters translate Touch Tones® to rotary pulses. Two models are designed for conversion of #1 Crossbar, ten others for conversion of step-by-step Central Offices and PBX's.

1.03 OPTIONAL FEATURES

- Tip party identification (ANI)
- First digit drop-off program
- Early line split
- 24 Volt operation
- PBX Sleeve control
- Dry Loop talking path
- Touch Tone® Class of Service Mark
- Asterisk conversion
- 20 PPS outpulsing

Refer to Table 1 for specific models with above features.

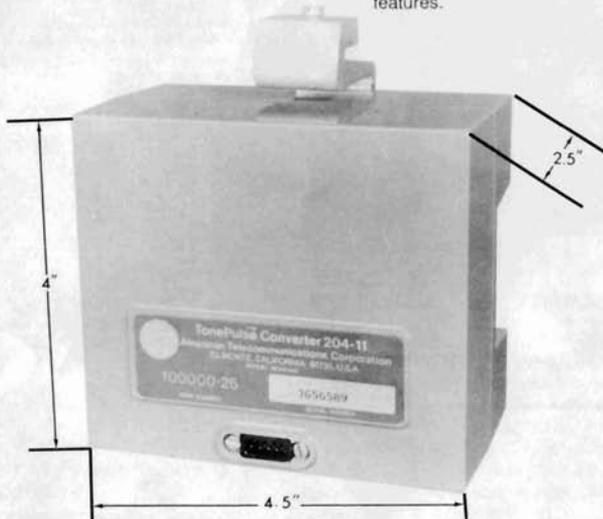


FIGURE 2. TonePulse Converter Model 204

2.0 DESCRIPTION

2.01 PHYSICAL DIMENSIONS

The Model 204 TonePulse Converter (Figure 2) is a compact, solid state unit measuring 4" high x 4.5" wide x 2.5" deep. In most applications it can be mounted directly behind the linefinder.

2.02 CONVERTED DIGITS

For step equipment the Converter is dedicated one per linefinder. For #1 Crossbar Offices one is associated with each subscriber sender. In both cases Touch Tone digits 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 are converted to a sequence of break pulses.

2.03 ANSWER SUPERVISION

All Converters except 204-12 treat a polarity reversal of the outgoing Tip and Ring the same as an on-hook. This feature prevents dial pulse conversion after the called party has answered.

2.04 TIP PARTY IDENTIFICATION

Converters with this option detect impedance imbalances from the incoming Tip and Ring and present either 1K Ω or 2.7K Ω from the outgoing Tip to Ground when the line is split. Models without this feature do not provide Tip Party Identification to toll ticketing systems while the line is split.

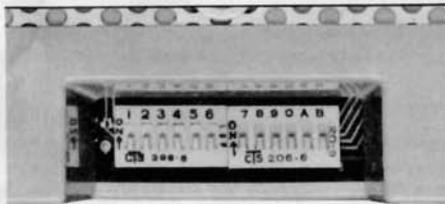


FIGURE 3 - PROGRAMMING SWITCHES

2.05 FIRST DIGIT, A, AND B PROGRAMMING

This option should be used when only the first digit is to be converted. When converting dial PBX's which are trunked to a central office or another PBX, order this feature. Even if the central office or second PBX is not equipped for Touch Tone, plan for it. Other applications include operator assisted access to Touch Tone WATS lines.

Option A should be programmed when conversion is required beyond the 10 or 20 second time-out interval. When using this feature the first digit option is disabled.

Option B should be programmed when accessing computer equipment utilizing unconverted Touch Tone digits for data or control. In this mode when # is depressed in a sequence of digits, the digits prior to # will be converted while those following # will not. Either the first digit or A options may be used in conjunction with this feature.

2.06 EARLY SPLIT

This option is primarily used in PBX's accessing other Converters or Tone Receivers after several digits have been converted. Early Split allows no more than 16 ms of valid tone to be transmitted through the converter. Secondary conversion of Touch Tones by tandem receivers is blocked.

2.07 24 VOLT VERSION

This Converter is designed for use with PBX's or Key Systems whose battery voltage is nominally -24 V dc.

2.08 SLEEVE CONTROL

The optional sleeve lead monitors the transfer trunk to prevent on-hook detection during call transfer. In dial PBX's with station initiated transfer this unit prevents the possibility of two converters being connected in tandem.

2.09 DRY LOOP TALKING PATH

The option provides a talking path through the converter even if no current flows in the line. Models without this feature drastically attenuate voice as line current drops below 10 mA. This unit is used in Leich 40, 80, and 100T PBX's for three-way consultation.

2.10 CLASS OF SERVICE MARK

With this option the blue lead is ground marked whenever the line is split.

2.11 ASTERISK CONVERSION

For convenience the * digit is converted to rotary 1. This option can provide an easily remembered abbreviated access to paging in some PBX's.

2.12 20 PPS

Converters used with #1 Crossbar are specially equipped with 20 PPS outpulsing. This is to minimize the holding time of the subscriber senders.

2.13 TIME OUT

Unless programmed by Option A all Converters (except Models 204-07 & 14 which never time out) time out after 10 or 20 seconds. After the unit has timed out no further conversion occurs until an on-hook followed by an off-hook is recognized. Timing commences after off-hook and is reset by each converted dial pulse.

2.14 CALL IN PROGRESS FEEDBACK

All Converters except 204-07 & -14 capacitively couple muted dial pulses to the calling party during conversion.

2.15 HERMETIC AND NON-HERMETIC VERSIONS

Model 204 Converters are assembled with hermetic semiconductors. Model 204A Converters are assembled with non-hermetic (plastic) semiconductors.

3.0 FUNCTIONAL DESCRIPTION

(See Figure 4)

3.01 POWER CONSUMPTION

Converters powered by -48 V batteries draw no more than 100 mA idle and 160 mA when the line is split. The -24 V Converter draws twice as much current.

3.02 OFF-HOOK, ON-HOOK, AND SLEEVE DETECTION

An on-hook or off-hook is recognized only by current flow from the Tip to the Ring. That is, Tip is positive with respect to Ring. Off-hook is determined by a 20 mA or greater current drain within 400 ms. On-hook is determined by a 2 mA or less current drain within 300 ms. A ground on the Sleeve lead is detected within 50 ms.

3.03 TOUCH TONE RECEIVER

Touch Tone digits sent by the subscriber are capacitively coupled into the input amplifier which is protected from lightning surges. High and low band split apart filters attenuate all undesired frequencies by 35 dB. Limited high and low outputs are analyzed by a crystal controlled digital receiver.

3.04 ANSWER SUPERVISION DETECTION

A Reversal of current flow for 150 ms or longer at

20 mA or more halts conversion until the subscriber goes on and off hook.

3.05 NORMAL LINE SPLITTING

The Converter must split the line to allow the subscriber to send Touch Tone digits while previous digits are converted to dial pulses. Splitting occurs at "buttons up". The line remains split if a digit is sent within 1.5 seconds of the last converted dial pulse. During conversion, the subscriber's Tip and Ring are fed with battery and ground through 437 Ω resistors. Programmed options, on-hook, or answer supervision will terminate conversion and restore the line.

3.06 EARLY LINE SPLITTING

The line is split within 16 ms after receipt of valid tone. If the tone duration is less than 40 ms the line restores within 50 ms. Once a 40 ms tone is detected the line remains split as in 3.05. False tone detection results in a momentary interruption of speech.

3.07 TONE GUARD PROTECTION

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

3.08 REGISTER

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

3.09 SENDER

The sender accesses the digits from the register in order and generates breaks pulses. Reliable outpulsing is acquired through the use of a non-position sensitive mercury relay which applies 300 Ω across the outgoing Tip and Ring.

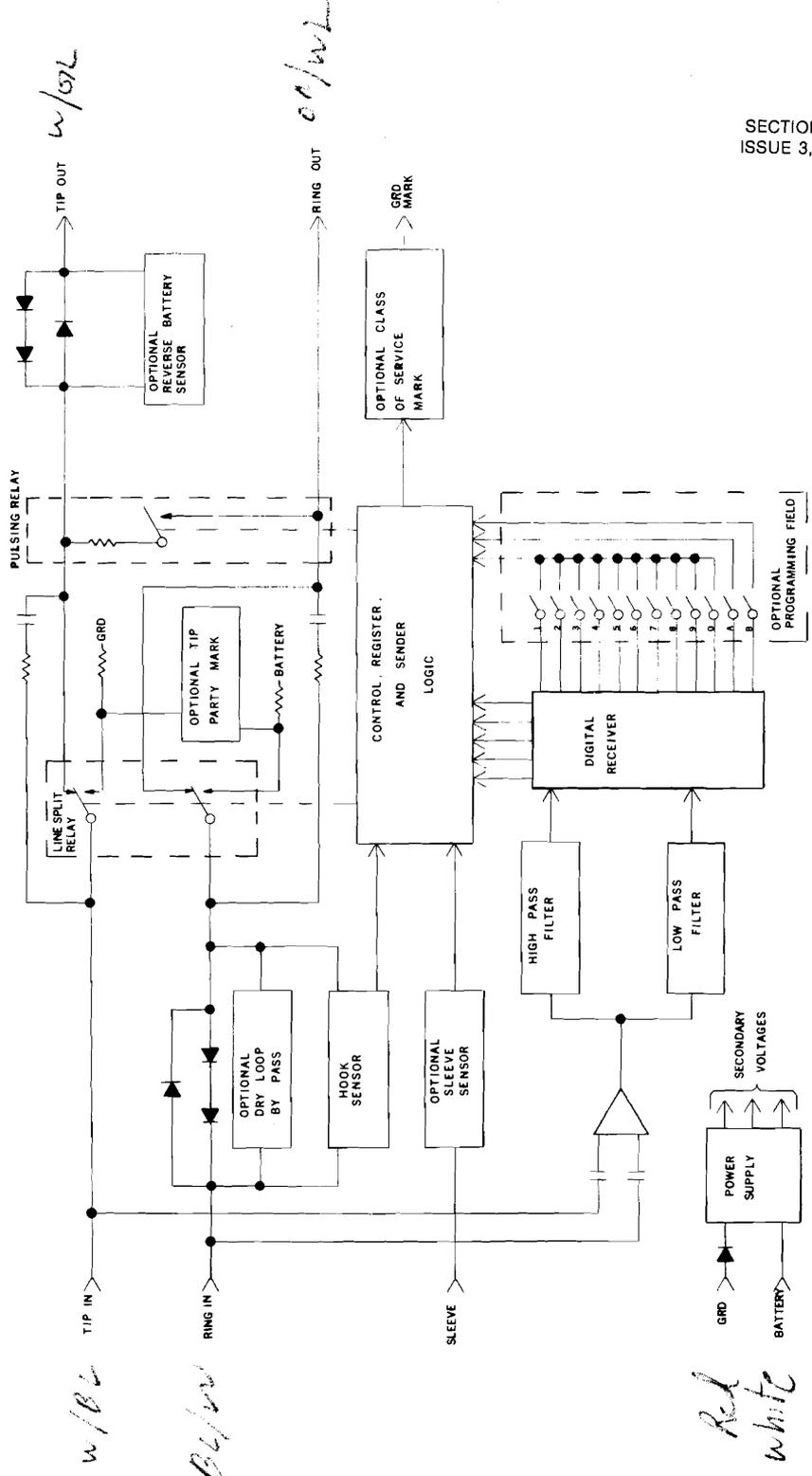


FIGURE 4 - FUNCTIONAL SCHEMATIC

4.0 SPECIFICATIONS

PARAMETER	MINIMUM	MAXIMUM	QUALIFICATION
Input Impedance	40K Ω		Tone Receiver, AC Bridging
Tone Amplitude	-20 dBm	+6 dBm	Per Frequency
Frequency Deviation		+ 1.5%	
Twist		6dB	Absolute Value of Tone Amplitude Difference
Skew		3.0%	Absolute Value of Difference In Frequency Deviation
Tone Duration	40ms		
Intertone Duration	40ms		
Tone to White Noise Ratio		20dB	
Digit Storage Capacity		16	
Outpulsing Rate	9.9 pps	10.1 pps	
	20.0 pps	21.0 pps	Models 204-07, -14
% Break	58%	62%	
	60%	64%	Models 204-07, -14
Interdigital Time	677 ms	683 ms	
	322 ms	328 ms	Models 204-07, -14
Conductor Loop Resistance		1200 Ω	Not including the Telephone
Insertion Loss		0.5 dB	
Early Line Split		16 ms	Models 204-06, -15
Early Line Restoral		50 ms	Duration of line interruption caused by false duration Models 204-06, -15
Late Line Split			Buttons Up
Time to Unsplit		1.5 sec	After last Converted Pulse
		150 ms	After Battery Reversal
		300 ms	After On Hook

PARAMETER		MINIMUM	MAXIMUM	QUALIFICATION
Time Out		9 sec	11 sec	Models 204-05, -06, -07, -14, -15
		19 sec	20 sec	Models 204-07, -14 never time out
Identifiable Tip Mark		1K Ω	3.0K Ω	
Repeated Tip Mark		900 Ω	1.1 K Ω	Model 204-14
		2.6 K Ω	2.7 K Ω	Models 204-04, -13
Ground Mark Relay Rating			500 mA	Model 204-08
Battery		-44 Vdc	-56 Vdc	
		-20 Vdc	-28 Vdc	Model 204-03 ✓
Current	Idle		100 MA	
			200 MA	Model 204-03 ✓
	Pulsing		160 MA	
			320 MA	Model 204-03 ✓
Off Hook Recognition		200 ms	400 ms	
			50 ms	Models 204-07, -14
On Hook Recognition		150 ms	300 ms	
Sleeve Lead Recognition			50 ms	Models 204-05, 204-15
Answer Supervision		50 ms	150 ms	Tip and Ring Polarity Reversal
Fusing		½ Ampere		Linefinder fusing is adequate
Storage Temperature		-55° C	85° C	
Operating Temperature		0° C	55° C	

5.0 ORDERING INFORMATION

Ordering Model 204 TonePulse Converter Equipment requires selecting the desired option configuration, and its associated cables and mounting hardware. Tables 1, 2 and 3.

TABLE 1 TONE PULSE™ CONVERTER MODEL DESIGNATIONS

APPLI- CATION	MODEL NO.	VOLTAGE		SPEED (PPS)			ANI	SLEEVE CONTROL	ASTERISK CONVERTED TO DIGIT-1	EARLY SPLIT	CLASS OF SERVICE MARK	DRY LOOP	FIRST DIGIT & OPTION PROGRAMS	CABLES		AVAILABILITY		TIME OUT SECONDS		OPTION FEATURES SEE PARA.
		48V	24V	10	20	2.7K								1K	204	7-Cand.	204A	10s	20s	
PBX/CO	204-02	X		X								X	X	X		NOW	6-76	X		2.05
PBX	204-03		X	X								X	X	X		8-76	6-76	X		2.05 2.07
CO	204-04	X		X		X						X	X	X		NOW	6-76	X		2.04 2.05
PBX	204-05	X		X								X	X	X		8-76	6-76	X		2.05 2.08
PBX	204-06	X		X					X			X	X	X		8-76	6-76	X		2.05 2.06
#1 Cross- bar CO	204-07	X			X									X		NOW				2.12
CO	204-08	X		X							X		X	X		NOW	6-76	X		2.13 2.10 2.05
PBX	204-09	X		X				X				X	X	X		8-76	6-76	X		2.05 2.11
CO	204-11	X		X									X	X		NOW	6-76	X		
LEIGH PBX	204-12	X		X								X	X	X		NOW				2.05 2.09
CO	204-13	X		X			X							X		NOW	6-76	X		2.04
#1 Cross- bar CO	204-14	X		X		X							X	X		NOW				2.04 2.13
PBX	204-15	X		X					X			X	X	X		8-76		X		2.05 2.06

TABLE 2 BRACKETS & MOUNTING HARDWARE

TYPE	PART NO.
*Long Throat	100114-1
Short Throat	100114-2
Vertical	100114-3
Extender	100114-4
Side Mount Long Throat	100111
Side Mount Short Throat	100111-1
Boxed Angle	201036
Auxiliary Mounting Bracket	200977
Mounting Frame Assembly	100339
Crossbar Adapter	201067

* Furnished with all Converters unless otherwise specified.

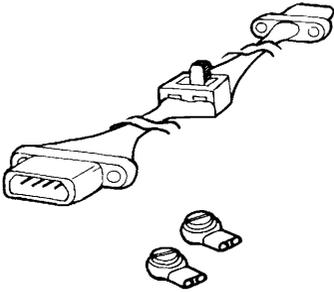
TABLE 3 CABLES & ACCESSORIES

TYPE	LENGTH	PART NUMBERS
6-Pin Cable	*18"	100342-4
	**24"	100342-8
	48"	100342-5
	72"	100342-9
7-Pin Cable	*18"	100342-6
	48"	100342-7
Sleeve Control Test Cable		200970
Splice Connectors	***	721006-1
Converter Connector Plug		100319-9
Polarity Guard		201171-1

*Furnished with all Converters unless otherwise specified.

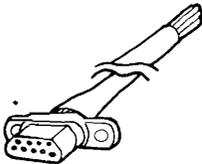
**Furnished with 204-07, -14

***Two each furnished with every cable.



721006-1
SPLICE CONNECTORS

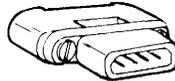
*100342-4, -5, -6, -7, -8, -9
CABLE



(*) Each Cable includes two splice connectors.

200970 SLEEVE CONTROL TEST CABLE

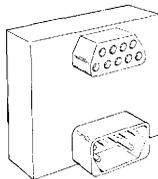
This Test Cable allows a functional test of the Model 204-05 and 204-15 Converters to be made without un-wiring the Converters from the existing hookup cable.



100319-9
CONVERTER CONNECTOR
PLUG

Used to provide circuit continuity when converter cables are to be installed prior to the converters.

**FIGURE 5
CABLE AND PLUG ACCESSORIES**

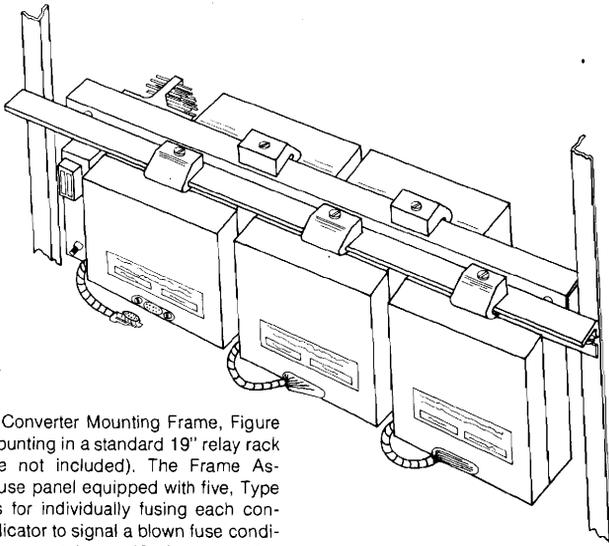


**FIGURE 6
POLARITY GUARD**

201171-1 POLARITY GUARD

This accessory is recommended for use with converters serving TouchTone subscribers without polarity guarded telephones. Polarity guards are required for subscribers who signal computers. The polarity guard is compatible with all converter cables and is installed between the converter and its cable.

MOUNTING BRACKETS & TYPICAL APPLICATIONS

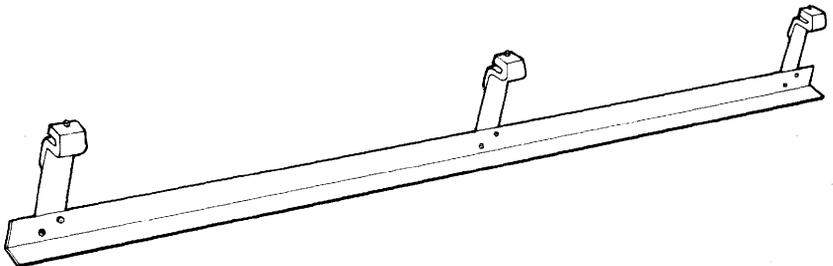


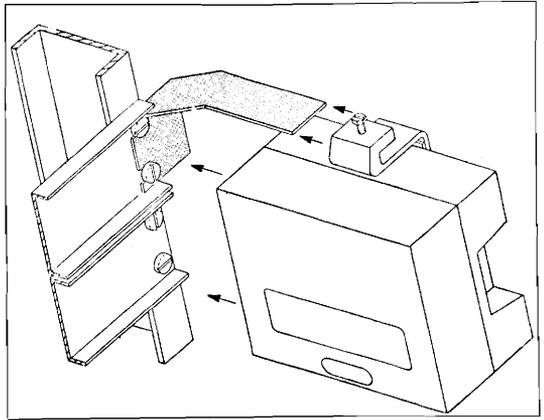
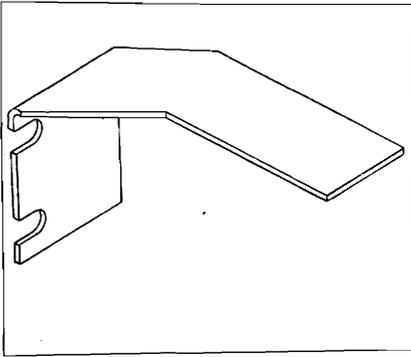
The A.T.C. 100339 Converter Mounting Frame, Figure 7, is designed for mounting in a standard 19" relay rack (mounting hardware not included). The Frame Assembly contains a fuse panel equipped with five, Type GMT, ½ amp fuses for individually fusing each converter and a LED indicator to signal a blown fuse condition. The Frame also contains a 40-pin connecting block allowing up to 5 converters to be connected between a linefinder and first selector.

FIGURE 7
100339 MOUNTING FRAME ASSEMBLY

FIGURE 8
200977 CONVERTER MOUNTING BRACKET

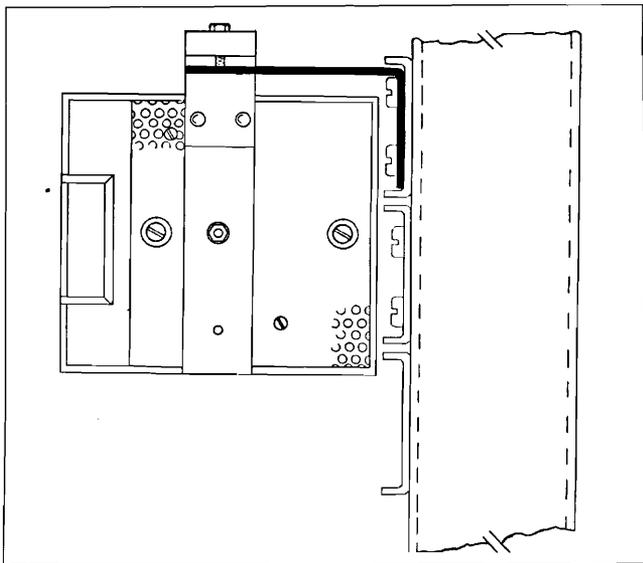
A forty-one inch bracket designed to mount up to ten converters.

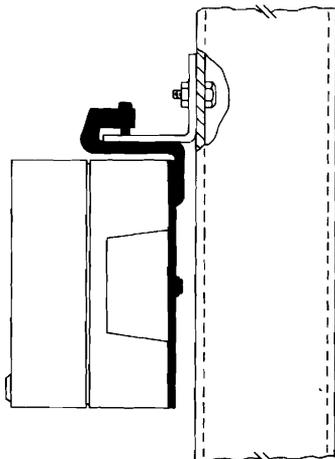
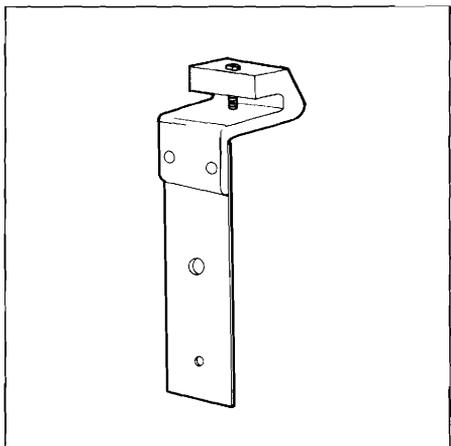




201067 CROSSBAR ADAPTER

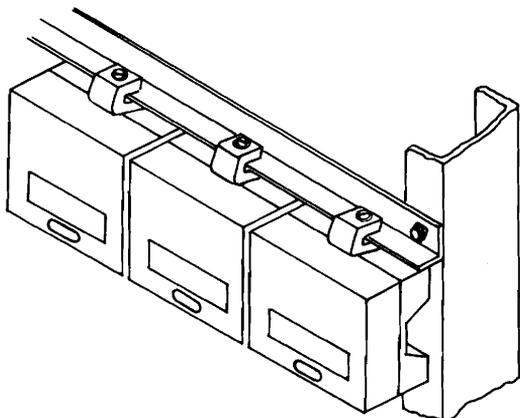
This bracket is required for Converter mounting in #1 Crossbar Offices. This bracket must be used in conjunction with one of the other brackets.



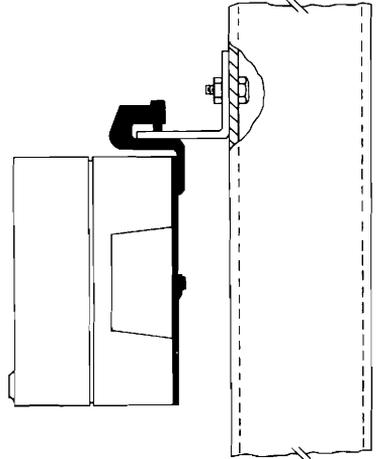
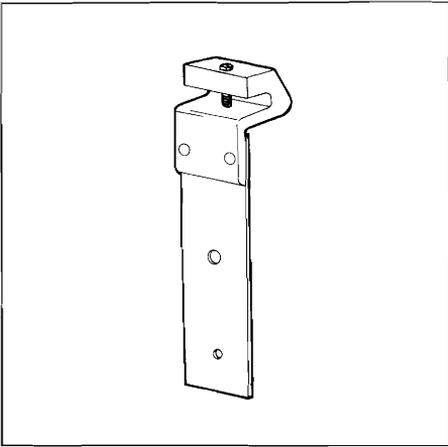


100114-1 LONG THROAT

A typical mounting behind a line finder is shown here. This bracket is used where there are no wires, components or other protrusions extending beyond the channel. Converters are not position sensitive, and may be mounted upside down or sideways (see for example, the 100111 bracket).

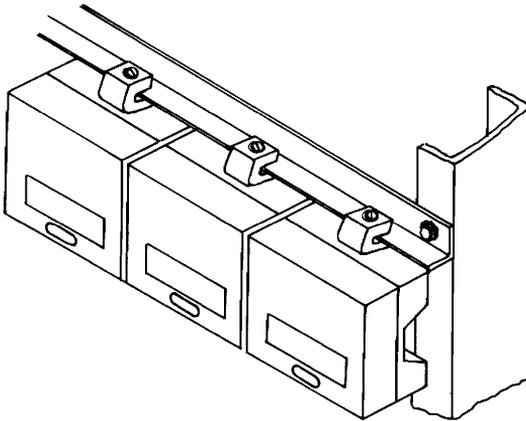


Typical installation with number 100114-1 bracket.



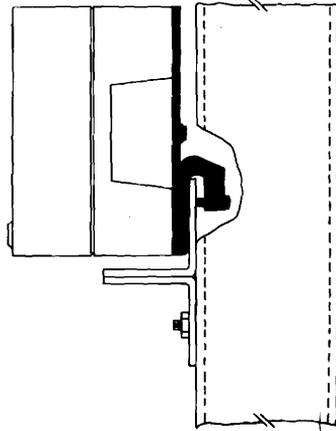
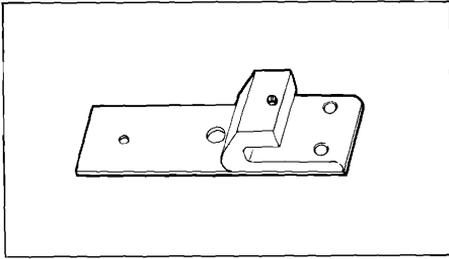
100114-2 SHORT THROAT

This bracket is used in place of the 100114-1 version when components or other protrusions occur up to 0.75 inches beyond the channel.



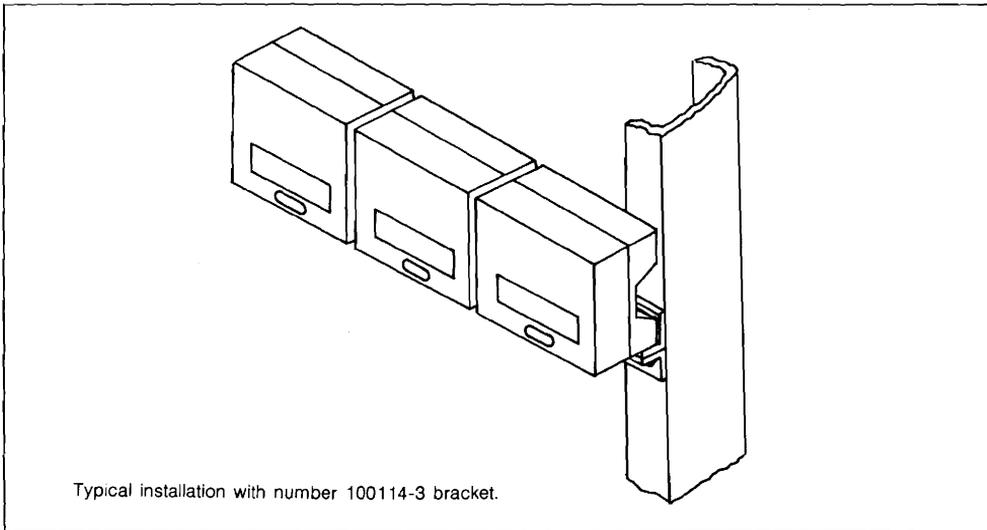
Typical installation with number 100114-2 bracket.

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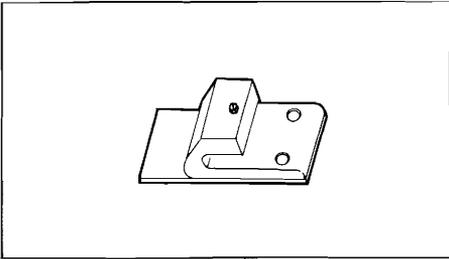


100114-3 VERTICAL

This bracket is used on ED-30427 type line finder frames (or equivalent) when double angle iron sections preclude standard mounting.

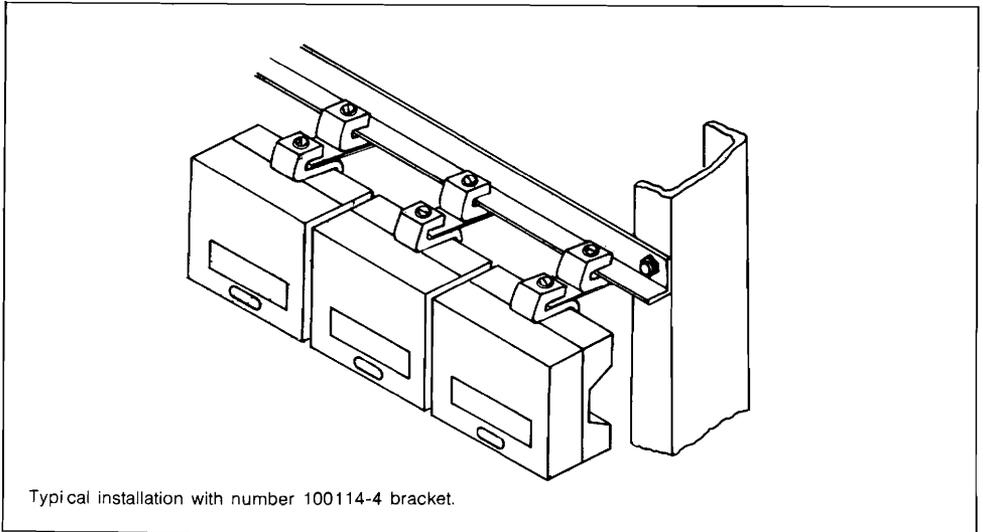
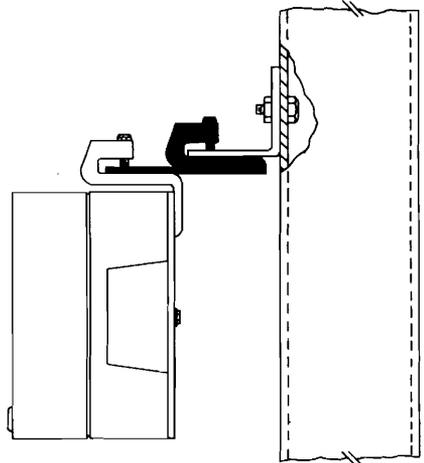


Typical installation with number 100114-3 bracket.

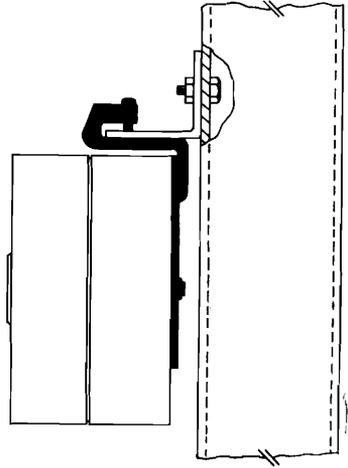
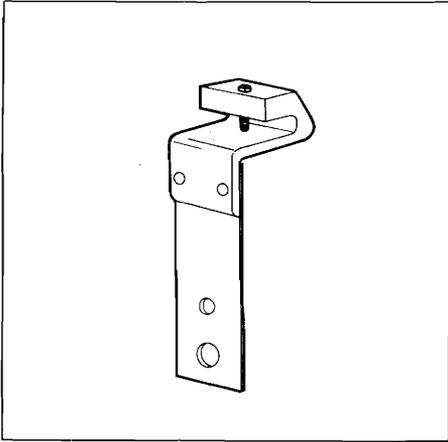


100114-4 EXTENDER

This bracket is intended as an extender for other brackets (shown here with the 100114-1 bracket) when protrusions occur up to 1.5 inches beyond the channel, providing that the converter does not extend beyond the guard rail. This bracket must be used in conjunction with one of the other brackets.

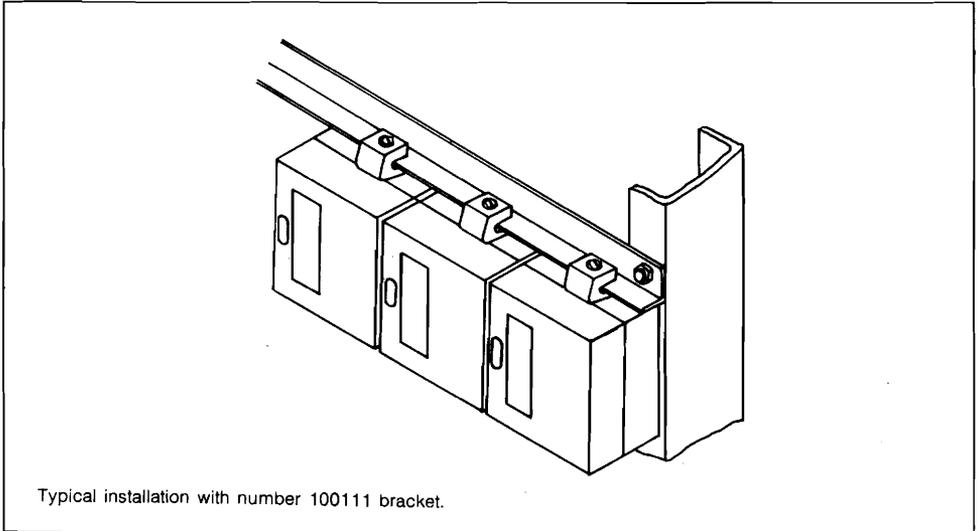


Typical installation with number 100114-4 bracket.

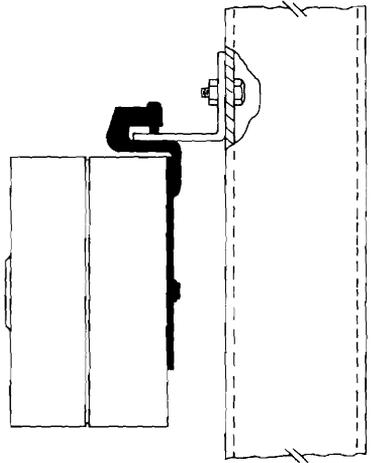
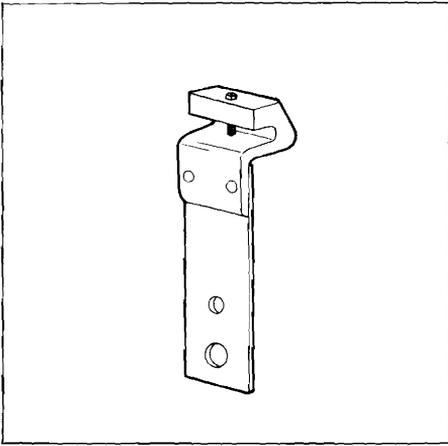


100111 SIDE MOUNT LONG THROAT

This bracket is attached to a converter that has been turned on its side. Thus the converter in this position, has a width of 4 inches, as opposed to 4.5 inches when mounted in the upright position. Side mounting allows 10 converters to fit in the same space as would 9 converters mounted in upright position.

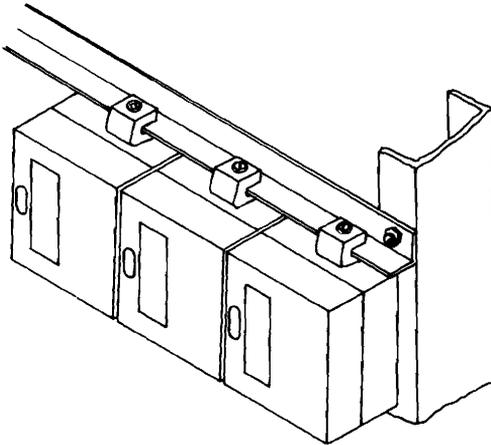


Typical installation with number 100111 bracket.

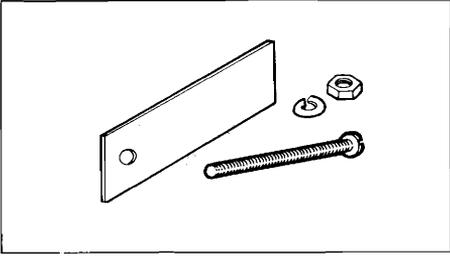


100111-1 SIDE MOUNT SHORT THROAT

This bracket is used in place of the 100111 version when components or other protrusions occur up to 0.75 inches beyond the channel.

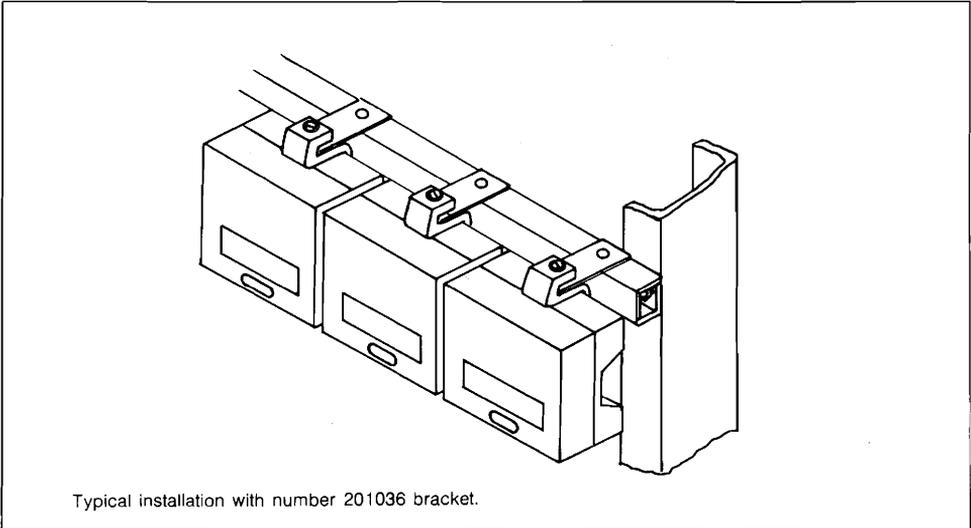
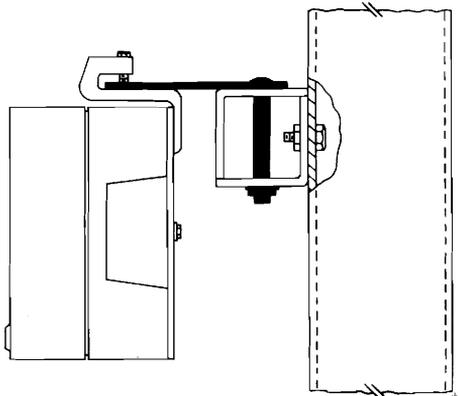


Typical installation with number 100111-1 bracket.



201036 BOXED ANGLE

This bracket (consisting of a metal strap and hardware) is used to mount converters to boxed angle sections which are drilled for 2 1/4-inch 1/4-20 bolts.



Typical installation with number 201036 bracket.

6.0 INSTALLATION AND MOUNTING
 (See Table 4)

6.01 DIAL TONE

Lines to be converted should be equipped with precise dial tone. (350 H_z plus 440 H_z at -13dBm per frequency). Standard Dial Tones such as 600 H_z modulated by 120 H_z or 133 H_z 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 from 680 H_z to 1680 H_z. Failure to observe harmonic content may result in multiple conversion of Touch Tone digits sent in the presence of Dial Tone.

6.02 FUSING

In step offices, the battery source for the linefinder is usually fused with approximately 1 1/3 amp fuse per finder or a 5 amp fuse for each 5 linefinders. This fusing will serve to protect the Converter since a Converter will always operate after the linefinder has found the line requesting service and, therefore, this fusing will suffice for both the linefinder and the Converter.

In #1 Crossbar Offices sender fusing should be adequate to protect the Converter.

6.03 PRE-WIRING

Cables and connecting plugs can be delivered early for prewiring of the office. Converter connecting plugs restore Tip and Ring continuity prior to Converter installation.

TABLE 4

	Color	Function	Notes
INPUT	Blue/White White/Blue	Ring Tip	Normally from the linefinder Normally from the linefinder
OUTPUT	Orange/White White/Orange	Ring Tip	Normally to the first selector Normally to the first selector
POWER	White Red	Battery Ground	
CONTROL	Blue	Sleeve Ground Mark	Model 204-05, -15 Model 204-08

6.04 INSTALLATION PROCEDURE

- (A) Carefully remove the Converter, its associated cable and splices from the packing containers.
- (B) Refer to 2.05 for Converters with programming.
- (C) Check the linefinder, transfer selector, or sender and when it is idle, make it busy.
- (D) Remove the linefinder or sender fuse.

- (E) Unsolder or unwrap the Tip and Ring leads from the jacks of the linefinder or the sender terminal block.
- (F) Splice the white-orange lead of the cable to the Tip lead that was disconnected in step (E). Similarly, splice the orange-white lead of the harness to the Ring lead.
- (G) Connect the white-blue and blue-white leads of the cable to the Tip and Ring of the linefinder or sender terminal block.
- (H) Connect the red lead of the cable to the linefinder ground jack or to ground on the sender terminal block.
- (I) Connect the white lead of the cable to the linefinder battery jack or to battery on the sender terminal block.
- (J) (On the Model 204-05, -15) Connect the blue cable lead to the sleeve jack terminal. (On the Model 204-08) Connect the blue cable lead to the appropriate apparatus.
- (K) Dress the cable along the existing wiring allowing enough slack for removal of the Converter.
- (L) Replace the linefinder or sender fuse.

6.05 MOUNTING THE CONVERTER IN STEP OFFICES (See pages 12 through 18)

- (A) Place the mounting bracket over the shelf angle iron approximately at the center of the linefinder switch.
- (B) In most Strowger installations, the shelf angle iron on which the Converter is to be located is positioned such that the Converter can be mounted directly in the configuration as illustrated on page 12. However, in some vintages of equipment the angle iron is located toward the lower portion of the 'switch, and therefore, requires repositioning of the 100114-1 Standard Converter mounting bracket. This is easily accomplished by removing the 1/4" nut at the rear of the Converter, rotating the bracket 180° and retightening the nut.
- (C) Tighten the locking screw with a screwdriver or a switch adjusting wrench

until the Converter is secure. Do not over-tighten the locking screw.

- (D) Insert the plug of the Converter cable into the receptacle of the TonePulse Converter until it locks in place.
- (E) To remove plug, insert screwdriver under one ear of the plug and pry outward.

6.06 MOUNTING THE CONVERTER IN #1 CROSS-BAR OFFICES

- (A) Mount the adapter bracket 201067 on the right side of the relay mounting plate immediately below the sender terminal blocks. First loosen both relay mounting plate screws. Slide the 201067 bracket under the screws as shown in Figure 9. Retighten the screws.
- (B) Place the Converter mounting bracket on the adapter bracket tightening the locking screw.
- (C) Insert the plug of the Converter cable into the receptacle of the TonePulse Converter until it locks in place.
- (D) To remove plug, insert screwdriver under one ear of the plug and pry outward.

7.0 TESTING THE CONVERTER

7.01 STEP INSTALLATIONS

- (A) Connect a Touch-Tone® telephone equipped with a proper plug to the linefinder test jacks.
- (B) TonePulse a test number. Verify that the correct number has been reached and that a transmission path exists. Depress a button on the test telephone. Verify that no further outpulsing occurs.
- (C) TonePulse a digit and hold the button down for an extended period of time (1-2 seconds) - no pulsing should occur. Release the button and the correct digit should be pulsed.
- (D) TonePulse any digit. Wait approximately 20 seconds (10 seconds for Models 204-05, -06 and -15) and attempt to TonePulse additional digits. Verify that no outpulsing

occurs. If option A is programmed "ON", the Converter will continue to outpulse each time a button is depressed and released.

- (E) If the TonePulse Converter has been programmed for first digit recognition, TonePulse the digit programmed. Verify that second dial tone is heard. TonePulse additional digits. No outpulsing should take place.
- (F) Connect a rotary dial telephone (or hand test telephone) to the linefinder test jacks. Dial a test number. Verify that the desired number is reached.
- (G) (On the Model 204-05 only) Program all 12 option switches to the "OFF" position. Insert the Sleeve Control Test Cable (ATC P/N 200970) between the Converter and its cable, setting the slide switch to the "OFF" position. TonePulse any digit. Wait at least 10 seconds and attempt to TonePulse additional digits. Verify that no outpulsing occurs. Next set the slide switch on the Test Cable to the "ON" position. Hang up for at least 1 second. TonePulse any digit. Verify that no outpulsing occurs. Return the slide switch to the "OFF" position. Hang up for at least 1 second. TonePulse any digit. Verify that the correct number is outpulsed.

7.02 #1 CROSSBAR INSTALLATIONS

Model 204-07 and -14 Converters can be tested from the sender test frame.

8.0 REPAIR AND WARRANTY

8.01 American Telecommunications (A.T.C.) offers a complete repair and return service and suggests the use of this facility for servicing the 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 A.T.C.

8.03 WARRANTY POLICY

The standard A.T.C. warranty policy applies. The unit is warranted against defective material and workmanship for a period of one year from the date of purchase. Units in warranty requiring servicing must be returned to A.T.C., transportation prepaid. A return authorization must be secured by calling A.T.C. Customer Service at 213/579-1710.