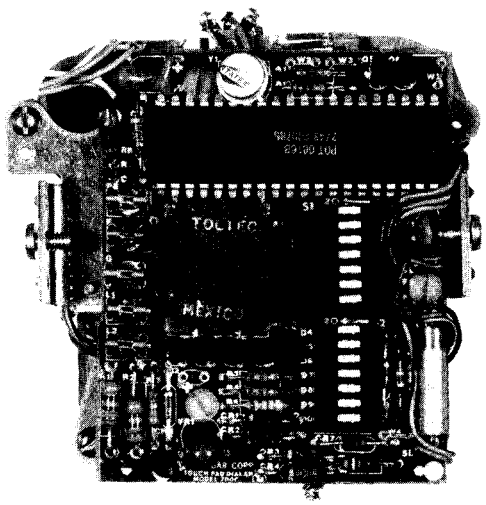
CD-0701-000A
February 1978
Printed in U.S.A.

SB701C TOUCH PAD DIALER™



CONTENTS

		Page
1.0	GENERAL	1
2.0	SPECIFICATIONS	1
3.0	INSPECTION	2
4.0	MOUNTING	2
5.0	INSTALLER CONNECTIONS AND COMPATIBLE INSTRUMENTS	3
6.0	CIRCUIT DESCRIPTION	4
7.0	TESTING	5
8.0	TOLL RESTRICTION PROGRAMMING	5

1.0 GENERAL

1.1 This section provides circuit description, installation instructions, and basic testing information for the SAN/BAR SB701C TOUCH PAD DIALER

1.2 The SB701C, when installed in a telephone instrument, gives the subscriber the convenience of push-button dialing in areas where tone service is not available. The SB701C accepts touch pad inputs in the form of contact closures, stores them in a first-in-first-out memory, and begins generating dial pulses when the first digit has been entered. As an option, the SB701C provides for various switch programmable combinations of toll restriction, to limit selected types of calls from being dialed at that station. The SB701C circuitry mounts in the same space that the tone electronics normally occupies on the back of the touch pad. As the SB701C is powered from the telephone line, no external power supply or connection to the AC line is required. Complete kits for conversion of a wide variety of telephone models are available.

1.3 WARRANTY: The SB701C is covered by a one year warranty from date of purchase, against defective workmanship or materials.

2.0 SPECIFICATIONS

2.1 List of Applicable Drawings

(a)	Equipment Drawing	ED-0700-000
(b)	Schematic Drawing	SD-0700-100

2.2 Electrical Characteristics

(a) Power Requirements: Powered from C.O. battery, via telephone line. Battery voltage may be any DC value up to 100V. Minimum tip-ring voltage required at the instrument is 8 VDC.

(b) Power Consumption: Negligible power is consumed by the functional circuits of the SB701C. Some loop current will be diverted away from the telephone network; approximately 7% of a low loop current, approximately 35% of a high loop current. This current is shunted through a nominal 6.2 volt Zener diode.

(c) Loop Current Limits: 23ma minimum, 120ma maximum.

(d) Keypad Input Requirements: Asynchronous input. There is no limit on the speed at which a user may key digits. The touch pad is of the standard 3 x 4 matrix type, using 2-out-of-7 contact closures to represent 12 digits.

(e) Digit Storage Capability: 24 digits max.

(f) Audio Tone: A 1 KHz tone is generated during the time a key is depressed, to provide audio feedback to the user.

(g) Output Dial Pulsing: 10pps ± 0.5 pps, 61 ± 2% break. (20pps - optional.)

(h Interdigit Timing: 764 msec ± 5%.

(i) Muting of Receiver: The SB701C provides muting of the receiver during dial pulsing, There is no impairment of receiver operation during normal conversation. Dial pulsing is heard at a low level, so that the user is aware that functions are taking place, after he has finished dialing.

(j) Toll Restriction (Optional): by means of miniature switches, the user can program the following restrictions:
Keying any digit as the first digit. (one or more digits can be restricted.) Keying "0" as the second digit. And/Or number lengths exceeding 4, 7, 8, 9, 10, or 24 digits.
Dialing a restricted number causes dial pulsing to stop immediately, and a steady 1 KHz tone to be heard until the hookswitch is operated.

(k) Prevention of Hookswitch Dialing: The SB701C detects the operation of the hookswitch, and opens the loop for 400 msec. effectively preventing any attempt to use the Hookswitch for dialing. Hookswitch flashing to the operator (PABX) is not impaired.

(l) Transmission Impairment: Less than 1 db over full loop current range.

(m) ANI Compatibility: Compatible with two-party ANI installations.

(n) Polarity Reversal and Transient Protection: A diode bridge provides protection against polarity reversal and overvoltage transients exceeding 100V.

(o) Ringing Current Protection: The SB701C will not be damaged by ringing current as high as one ampere for two seconds, provided that there is a minimum of 100 ohms in series with the ringing generator, in the event that a C.O. malfunction causes ringing voltage to be present when the telephone is off-hook.

(p) Leakage: The unit will function through the "Leak A" test, which effectively tests for proper operation with three bridged high-impedance ringers.

2.3 Environmental Characteristics

(a) Operating Temperature: 0°C to + 70°C

(b) Storage Temperature: – 30°C to + 100°C

(c) Humidity: 0% to 95% RH

(d) Altitude: Sea level to 10,000 ft.

2.4 Physical Characteristics

(a) Printed Circuit Card Dimensions:
Length 2.9"
Width 2.4"
Height 0.5"

(b) Maximum Height Above Touch Pad Base: 0.65.

(c) The profile of the circuit card fits within the profile of conventional Touch Tone* or Touch Call** electronics.
* W.E. Trademark
** A.E. Trademark

3.0 INSPECTION

3.1 Inspect the unit thoroughly, as soon as possible after delivery. If any part of the unit has been damaged in transit, report the extent of damage to the transportation company immediately. If the unit is to be stored for some time before installation, make an operational check at once. If the unit is to be installed at once, make an operational check after the installation is completed.

3.2 Caution should be exercised to insure that touch pad contact closures remain properly adjusted. These contacts can be damaged or shorted by improper handling.

4.0 MOUNTING

4.1 Card Wires and Terminals

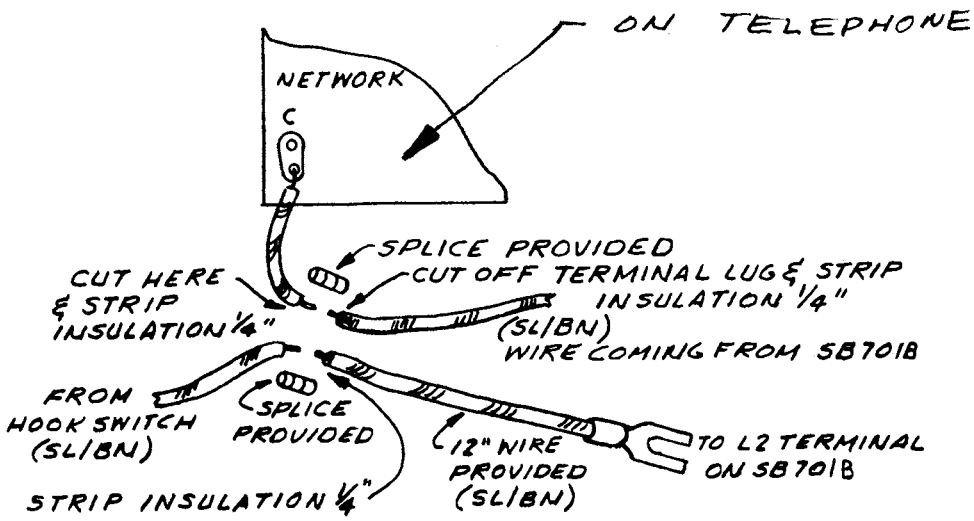
(a) Three 12" wires (GN, WH, SL-BN) come from the SB701C circuit card. Each of these are lugged, and connect to appropriate terminals on the telephone network.

(b) Five push-on terminals are provided on the circuit card to allow connection of lugged wires coming from the hookswitch and handset. Care should be taken during connection to the SB701C not to disturb the contacts located on the sides of the touch pad.

(c) Normally the SL-BN wire from the hookswitch of a W.E. type phone is lugged and connected to network terminal C. If this wire is soldered to terminal C, refer to Figure 1 for solderless splicing information.

4.2 Hardware Supplied

2 - splices
1 - 12" lugged SL-BN wire
2 - 'Z' Brackets
2 - Screws 5-40
2 - Screws 6-32



SPLICING DETAILS WHEN WIRE FROM HOOKSWITCH IS SOLDERED TO TERMINAL

Figure 1

5.0 INSTALLER CONNECTIONS AND COMPATIBLE INSTRUMENTS

5.1 Compatible Models

(a) Installation instructions and/or modification kits are available for the following telephone instruments:

W.E./I.T.T./S.C.			A.E.
500	1704	80E	192A
554	1714	80TC	192A TC
564	1800	95	880TC
565	2500	95TC	
576	2554	182A	
630DA	2564	182A TC	
830	2565	186	
831	2830	186TC	
K832	2831	187	
835	2835	187TC	

(b) "Princess" and "Trimline" style instruments are not adaptable.

(c) Speaker phone applications require special consideration. A SAN/BAR device, the SB706A Speakerphone Adapter is available for these installations. Please consult SAN/BAR concerning the specific application.

(d) The above listed instruments represent those that are proved compatible as of this printing. Please consult SAN/BAR concerning models not listed.

5.2 Ordering Information

(a) To order the touch pad dialer mounted on and wired to an I.T.T. or S.C. touch pad with both numbers and letters (Metro type) specify the following:
SB701C-11 without Toll Restrict Option
SB701C-12 with Toll Restrict Option

(b) To order the touch pad dialer mounted on and wired to an I.T.T. or S.C. touch pad with numbers only specify the following:
SB701C-13 without Toll Restrict Option
SB701C-14 with Toll Restrict Option

NOTE:
The number only touch pad is normally used outside the United States.

(c) To order the touch pad dialer mounted on and wired to an A.E. touch pad specify the following:
SB701C-21 without Toll Restrict Option
SB701C-22 with Toll Restrict Option

(d) To order the touch pad dialer mounted on and wired to a SAN/BAR Standard touch pad specify the following:
SB701B-31 without Toll Restrict Option
SB701B-32 with Toll Restrict Option

NOTE: The SB701C allows the conversion of any Touch Tone* or Touch Call** telephone which provides for a conventional sized touch pad (i.e., I.T.T. #86134-3 or A.E. #D-840000-C).

* W.E. Trademark

**A.E. Trademark

(e) When converting a rotary dial instrument additional parts are required. Normally the rotary dial housing is replaced by a housing of its touch tone

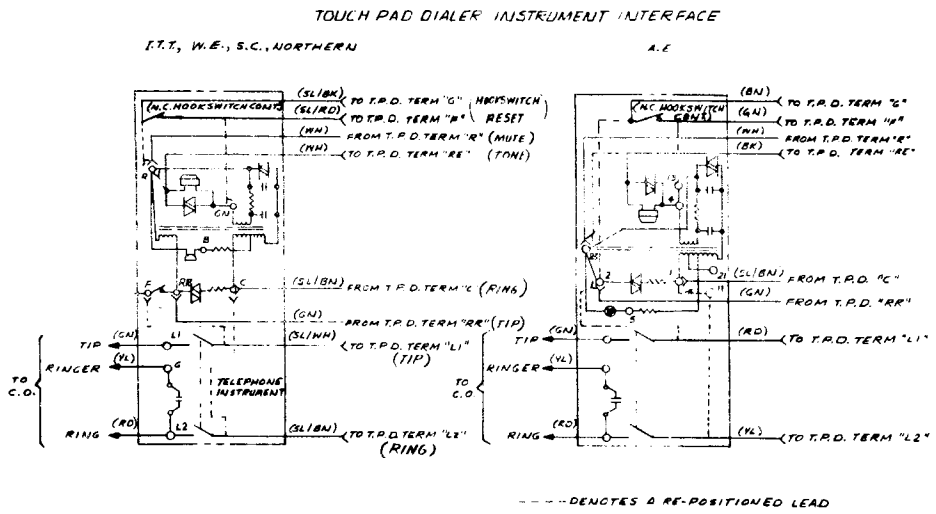


Figure 2

counterpart (i.e. for a model 500, use a model 2500 housing). However, if desired, on certain W.E. type instruments a rotary to touch tone housing adapter may be used to fill the hole vacated by the rotary dial:

Specify Part #KIT 701B-1 COLOR*

*COLORS AVAILABLE

Black	White
Moss Green	Burnt Orange
Ivory	Light Ash
Rose Pink	Cocoa Brown
Aqua Blue	Harvest Gold
Beige	Cherry Red

5.3 Installer connections
For conversion and hook-up instructions, information is included with the unit, or refer to appendix "A" of this document. Figure 2 shows typical connections for a type 500 or type 80 telephone instrument.

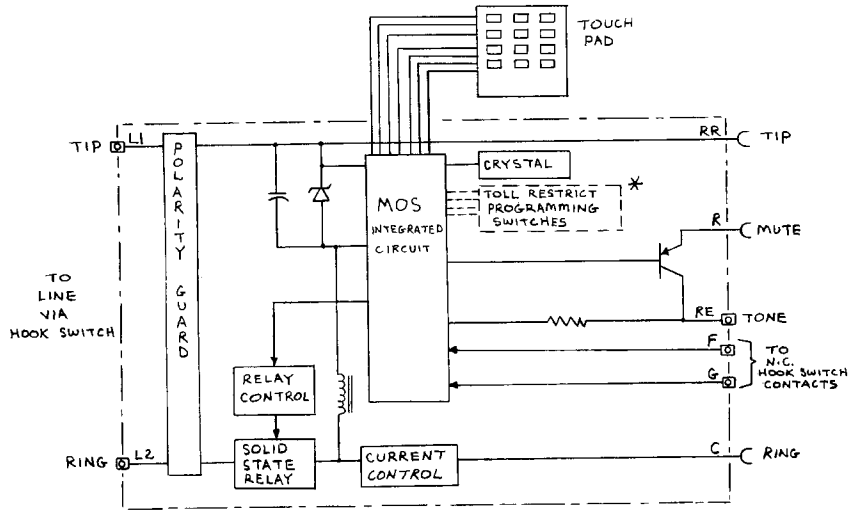
5.4 Operation with speaker phones
The SAN/BAR SB706 is a supplementary product that provides interface problem relief when adapting the SB701 to speaker phones. Request the SB706 circuit description from your distributor.

5.5 Operation with extensions
If transmission complaints occur on SB701C equipped stations with an extension, it is advisable to place a 180 ohm, 2 W resistor in series with tip or ring of extension.

6.0 CIRCUIT DESCRIPTION

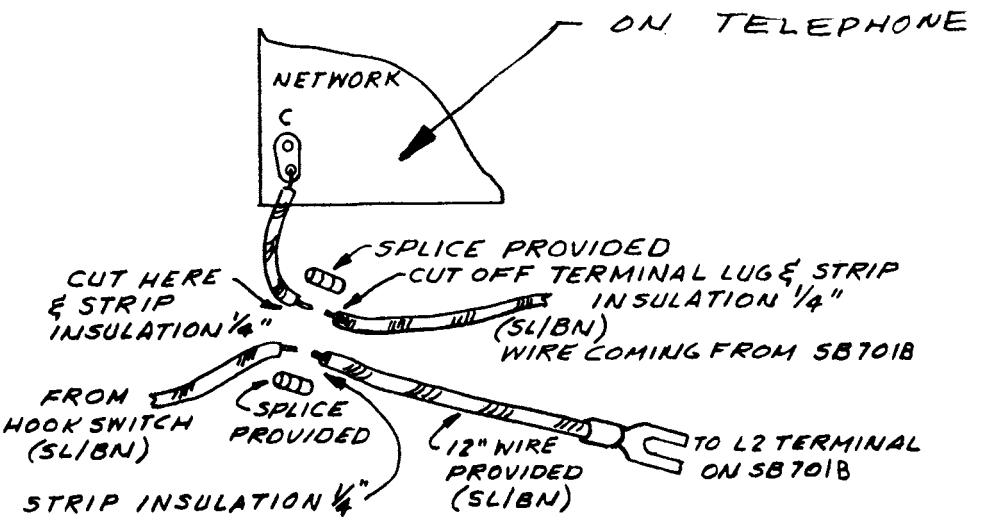
Please refer to the Block Diagram, Figure 3.

6.1 Polarity Guard & Transient Protection
With the tip and ring connected through the hookswitch to L1 and L2, proper polarity is guaranteed to the MOS device and associated circuitry by means of a bridge rectifier. Any voltage across the tip and ring exceeding 100 volts is clamped by a surge arrestor.



BLOCK DIAGRAM
SB701C
TOUCH PAD DIALER

Figure 3



SPLICING DETAILS WHEN WIRE FROM HOOKSWITCH IS SOLDERED TO TERMINAL

Figure 1

5.0 INSTALLER CONNECTIONS AND COMPATIBLE INSTRUMENTS

5.1 Compatible Models

(a) Installation instructions and/or modification kits are available for the following telephone instruments:

W.E./I.T.T./S.C.			A.E.
500	1704	80E	192A
554	1714	80TC	192A TC
564	1800	95	880TC
565	2500	95TC	
576	2554	182A	
630DA	2564	182A TC	
830	2565	186	
831	2830	186TC	
K832	2831	187	
835	2835	187TC	

(b) "Princess" and "Trimline" style instruments are not adaptable.

(c) Speaker phone applications require special consideration. A SAN/BAR device, the SB706A Speakerphone Adapter is available for these installations. Please consult SAN/BAR concerning the specific application.

(d) The above listed instruments represent those that are proved compatible as of this printing. Please consult SAN/BAR concerning models not listed.

5.2 Ordering Information

(a) To order the touch pad dialer mounted on and wired to an I.T.T. or S.C. touch pad with both numbers and letters (Metro type) specify the following:
SB701C-11 without Toll Restrict Option
SB701C-12 with Toll Restrict Option

(b) To order the touch pad dialer mounted on and wired to an I.T.T. or S.C. touch pad with numbers only specify the following:
SB701C-13 without Toll Restrict Option
SB701C-14 with Toll Restrict Option

NOTE:
The number only touch pad is normally used outside the United States.

(c) To order the touch pad dialer mounted on and wired to an A.E. touch pad specify the following:
SB701C-21 without Toll Restrict Option
SB701C-22 with Toll Restrict Option

(d) To order the touch pad dialer mounted on and wired to a SAN/BAR Standard touch pad specify the following:
SB701B-31 without Toll Restrict Option
SB701B-32 with Toll Restrict Option

NOTE: The SB701C allows the conversion of any Touch Tone* or Touch Call** telephone which provides for a conventional sized touch pad (i.e., I.T.T. #86134-3 or A.E. #D-840000-C).

* W.E. Trademark

**A.E. Trademark

(e) When converting a rotary dial instrument additional parts are required. Normally the rotary dial housing is replaced by a housing of its touch tone

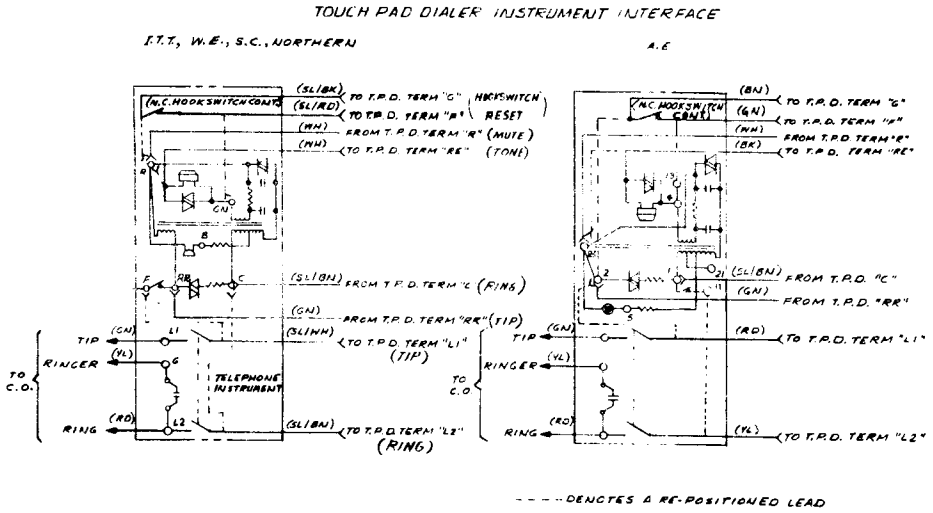


Figure 2

counterpart (i.e. for a model 500, use a model 2500 housing). However, if desired, on certain W.E. type instruments a rotary to touch tone housing adapter may be used to fill the hole vacated by the rotary dial:

Specify Part #KIT 701B-1 COLOR*

*COLORS AVAILABLE

Black	White
Moss Green	Burnt Orange
Ivory	Light Ash
Rose Pink	Cocoa Brown
Aqua Blue	Harvest Gold
Beige	Cherry Red

5.3 Installer connections
For conversion and hook-up instructions, information is included with the unit, or refer to appendix "A" of this document. Figure 2 shows typical connections for a type 500 or type 80 telephone instrument.

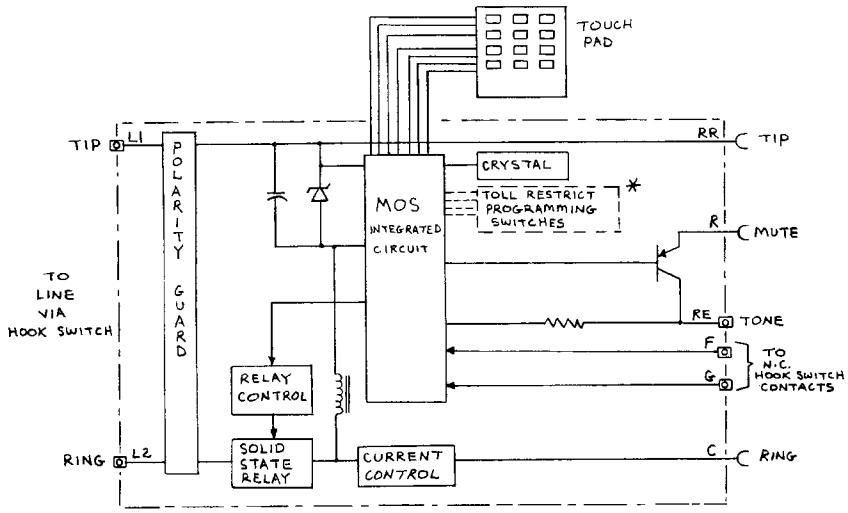
5.4 Operation with speaker phones
The SAN/BAR SB706 is a supplementary product that provides interface problem relief when adapting the SB701 to speaker phones. Request the SB706 circuit description from your distributor.

5.5 Operation with extensions
If transmission complaints occur on SB701C equipped stations with an extension, it is advisable to place a 180 ohm, 2 W resistor in series with tip or ring of extension.

6.0 CIRCUIT DESCRIPTION

Please refer to the Block Diagram, Figure 3.

6.1 Polarity Guard & Transient Protection
With the tip and ring connected through the hookswitch to L1 and L2, proper polarity is guaranteed to the MOS device and associated circuitry by means of a bridge rectifier. Any voltage across the tip and ring exceeding 100 volts is clamped by a surge arrestor.



BLOCK DIAGRAM
SB701C
TOUCH PAD DIALER

Figure 3

6.2 Derivation of Power

A small amount of loop current bypasses the telephone network and flows through the Zener diode and inductor to provide power for the MOS device and other semiconductor circuitry. The capacitor provides storage so that voltage is available when the loop is open during dial pulsing. The inductor presents a high AC impedance to prevent attenuation of speech by the touch pad dialer. The current control provides for proper distribution of current at various loop lengths.

6.3 Keypad Interface & MOS Integrated Circuit

The contacts of the touch pad are parallel inputs to the MOS integrated circuit. The MOS circuit accepts the keyed digits at an asynchronous rate, stores them, and logically translates them into a series pulse train at 10pps rate, appearing at the relay control. The crystal is the frequency-determining element of an internal oscillator, which generates all timing necessary for the operation of the device.

6.4 Solid State Relay

The solid state relay, driven by the MOS circuit, via the relay control, breaks the loop current in order to generate dial pulses. The switch consists of discrete transistors, arranged as a high-gain current switch.

6.5 Muting and Audio Tone

A solid state switch, controlled by the MOS circuit, is provided in series with the receiver element. This switch is normally in the low-impedance ON state. Whenever the MOS circuit is active (dial pulsing), the switch will go into a high-impedance state. The switch does not completely open the receiver, but allows out-pulsing to be heard at a low level. Whenever a key is depressed, the MOS circuit will inject a 1 KHz signal into the switch, causing an audible tone to be generated in the receiver.

6.6 MOS Circuit Reset

Depressing the hookswitch resets the MOS circuit, clearing its memory, via F and G. Attempts at hookswitch dialing are defeated, as the MOS circuit opens the loop for 400 msec, when it is reset. Note that hookswitch operation must occur at the end of each call (hang-up) to avoid false operation due to the MOS memory reaching its capacity of 24 digits.

6.7 Toll Restriction (Option)

Miniature switches are equipped to provide this option. The switch contacts interface with the MOS circuit, which reads them to determine the Toll Restriction mode that has been programmed. (See Section 8 for detailed instructions to set up the switches.) If a restricted number is keyed, the MOS circuit will stop outpulsing and keep the solid state relay on the ON state. A continuous 1 KHz tone will be sent to the receiver. The MOS circuit must be reset by actuating the hookswitch in order to regain the ability to key digits.

7.0 TESTING

7.1 Operational Test After Installation

(a) Dial a test number to verify proper dialing.
(b) While dialing, listen for 1KHz tone with each button depressed.
(c) During dial pulsing check for proper muting of pulses (at low level but audible).
(d) Verify each enabled restrict function (if option is equipped).
(e) Verify that no other restrictions have been accidentally enabled (if option is equipped).

7.2 Trouble - Shooting Procedure

(a) Check for wiring errors.
(b) Check for proper operation of touch pad contacts.
(c) Check for shorts due to bent components.
(d) If Toll Restriction is not working properly (if equipped) recheck switch settings.
(e) If trouble persists, return unit to SAN/BAR Corporation. For technical assistance call SAN/BAR at (714)546-6500.

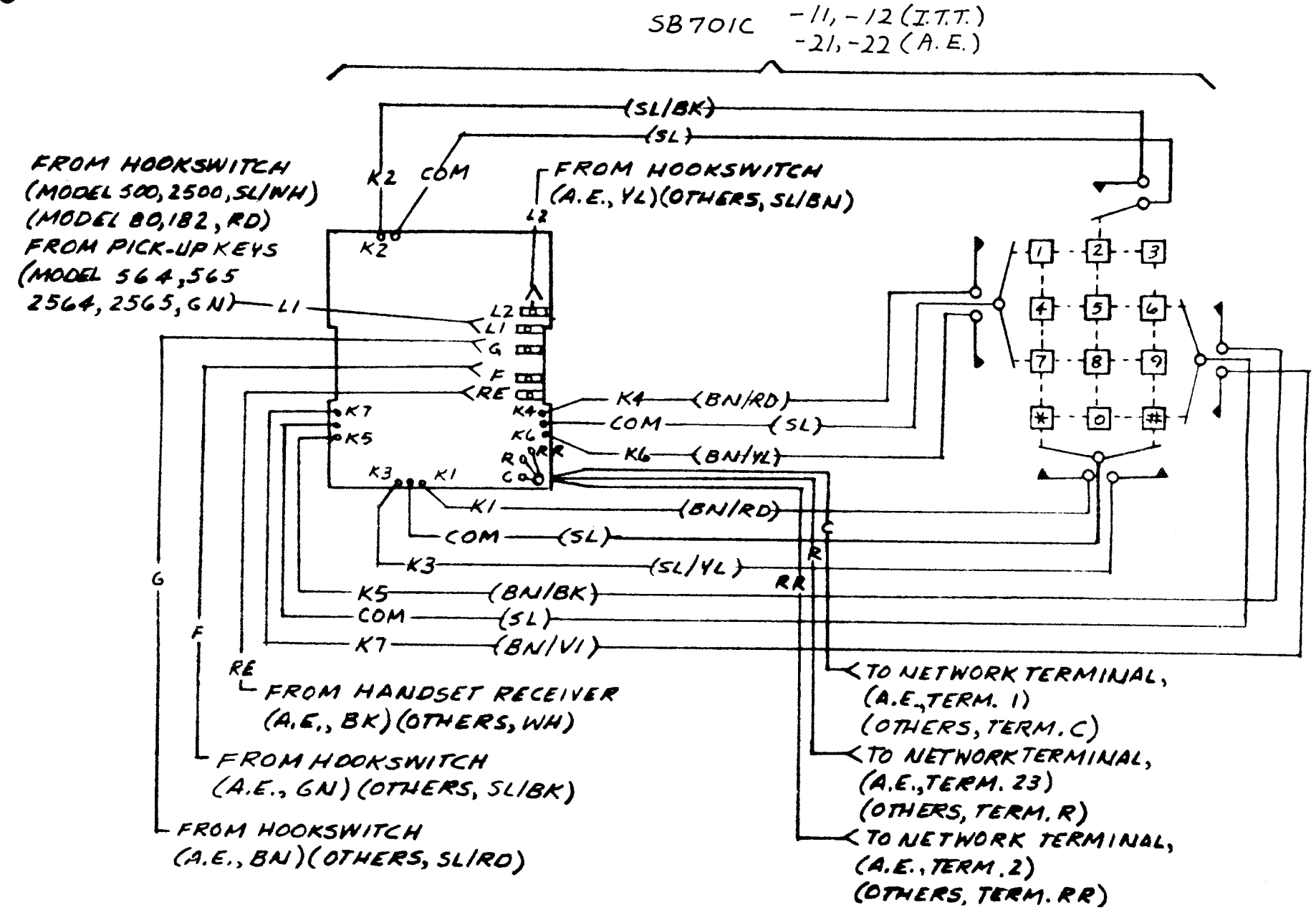
8.0 TOLL RESTRICTION PROGRAMMING

8.1 See Table I for switch programming information.

8.2 Only one number length option (combination of NL 0, NL 1, & NL 2) can be implemented at one time.

8.3 Any combination of digit restrictions can be used at one time, and can be implemented simultaneously with any one of the number length restrictions.

8.4 If Toll Restriction is not equipped, restriction to a maximum number length of 24 digits automatically takes place.



SCHEMATIC MODEL SB701C TOUCH PAD DIAL CIRCUIT CARD TO TOUCH PAD DIAL

FIGURE 4

APPENDIX "A"

TOUCH-PAD DIALER™ INSTALLATION INSTRUCTIONS FOR WESTERN ELECTRIC, I.T.T. and STROMBERG-CARLSON INSTRUMENTS

Rotary Dial Type
500, 502, 510, 554, 564, 565, 575, 576, 577

Step

1. Remove the rotary dial from its mounting and disconnect the four wires (BL, GN, WH & WH) from the network terminals without disturbing any other connections.
2. Remove the wire (SLATE-WHITE or GREEN) from terminal "F" on the network, and connect it to terminal "L1" on the SB701C.
3. Remove the SLATE-BROWN wire from terminal "C" on the network, and connect it to terminal "L2" on the SB701C. If the SL-BN wire is soldered to network terminal "C", refer to Figure 1 for splicing details.
4. Remove the SLATE-RED wire from terminal "GN" on the network, and connect it ot terminal "F" on the SB701C.
5. Remove the SLATE-BLACK wire from terminal "R" on the network, and connect it to terminal "G" on the SB701C.
6. Remove the WHITE wire from terminal "R" on the network, and connect it to terminal "RE" on the SB701C.
7. Connect the GREEN wire coming from the SB701C to terminal "RR" on the network.
8. Connect the SLATE-BROWN wire coming from the SB701C to terminal "C" on the network. If splicing was required in Step #3 above, see Figure 1 for this connection.
9. Connect the WHITE wire coming from the SB701C to terminal "R" on the network.
10. The pad may now be mounted in the same brackets as the rotary dial assembly using the 6-40 x 1/4" screws and adapter brackets provided.

NOTES:

(1) A rotary to touch-tone housing adapter SAN/BAR part No. KIT 701B-1 (specify color) is required to fill the space vacated by the rotary dial. Or, the rotary housing must be replaced by a touch-tone housing of the same instrument family. (i.e., replace a model 500 housing with one for a model 2500.)

(2) The wire colors associated with the telephone instrument may vary with the manufacturer.

(3) Instructions are available on request, for installation in specific model instruments.

Touch-Tone Type
1500, 2500, 2502, 2564, 2565, 2576, 2577

Step

1. Remove the touch-tone dial from its mounting and disconnect all wires associated with it. Do not disturb any other connections. Save the mounting screws.
2. Remove the wire (SLATE-WHITE or GREEN) from network terminal "F", and connect it to terminal "L1" on the SB701C.
3. Remove the SLATE-BROWN wire from network terminal "C", and connect it to terminal "L2" on the SB701C. If the SLATE-BROWN wire is soldered to network terminal "C", refer to Figure 1 for splicing details.
4. Remove the SLATE-RED wire from network terminal "GN", and connect it to terminal "F" on the SB701C.
5. Remove the SLATE-BLACK wire from network terminal "R", and connect it to terminal "G" on the SB701C.
6. Remove the RED wire (coming from the handset) from key assembly terminal 2, 4, 5, 11, or X, and connect it to network terminal "R".
7. Remove the WHITE wire (coming from the handset) from key assembly terminal 1, 3, 6, 10, or Y, and connect it to terminal "RE" on the SB701C.
8. Connect the GREEN wire coming from the SB701C to network terminal "RR".
9. Connect the SLATE-BROWN wire coming from the SB701C to network terminal "C". If splicing was required in Step #3 above, see Figure 1 for this connection.
10. Connect the WHITE wire coming from the SB701C to network terminal "R".
11. The SB701C may now be mounted in the same brackets as the touch-tone dial using the same mounting screws.

NOTES:

(1) The wire color associated with the telephone instrument may vary with the manufacturer.

(2) Instructions are available on request for installation in specific model instrument.