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SIMPLEX 10
Technical Instructions
Doc. #13-101476 Rev. J
September 1984

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Federal Communications Commission
(FCC) Regulations

1.04 To comply with FCC regulations, the following requirements must be met:

- The FCC registration number of this unit AHI-9V9-11936-KN-E must be reported to the telephone company.
- This equipment complies with the requirements in Part 15 of FCC Rules for a "Class A" computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.
- This unit must be installed by telephone company personnel or agents authorized under Part 68 of FCC Rules and Regulations.
- This unit must not be installed on coin-operated or multi-party telephone lines.
- If this unit malfunctions, the telephone company may disconnect service temporarily. If disconnection is necessary, the telephone company must attempt to notify the user in advance, if possible. If not, they must notify the user as soon as they are able.
- Repair work on this unit must be done by TCS.

1. GENERAL INFORMATION

Description of Product

1.01 Simplex 10 is a self-contained, 10 station micro-processor controlled electronic key system. Simplex 10 contains:

- 4 line circuits with music on hold
- power supply
- common-talkpath intercom with call progress signaling
- 2 zone paging amplifier
- interrupter
- cross-connect field
- low voltage signaling

Related Documentation

1.02 #14-101476 Simplex 10 Users Guide

Manual Changes

1.03 To add fuse ratings to specifications, add information on proper grounding and voltage protection, and correct Application Note 5 relay voltage ratings from 10VAC to 12VAC.

1. GENERAL INFORMATION (cont'd.)

Service Information

- 1.05 If service is ever needed on this product contact:

CUSTOMER SERVICE ENGR. DEPT.
TONE COMMANDER SYSTEMS, INC.
P. O. Box 97039
4320 150th Avenue N.E.
Redmond, Washington 98073-9739
Telephone: (206) 883-3600
Telex: 15-2246

Warranty Information

See Addendum for warranty statement.

Consumer Comment

- 1.08 TCS is interested in comments and criticism regarding our equipment and literature. Please address remarks to the Customer Service Engineering Department.

2. SPECIFICATIONS

- 2.01 Ringer Equivalence: 1.1B
- 2.02 Station Loop Length:
50 ohms max.
- 2.03 Maximum Number of Stations:
10; six button key telephone sets
- 2.04 Station Lamps:
10VAC, 60Hz, short circuit protected
- 2.05 Station Buzzers:
10VAC, 60Hz, short circuit protected
- 2.06 C.O. Range:
20 - 100 ma loop
- 2.07 Maximum C. O. Lines:
4; loop start
- 2.08 C.O. Ringing (station signaling):
Single burst, 4 second ring cycle
- 2.09 Intercom:
Dial tone: 437Hz, continuous
Busytone: 437Hz,
0.5 sec ON, 0.5 sec. OFF
Ringback: 437Hz,
1 sec ON, 3 sec OFF
- 2.10 Intercom Ringing:
Double burst, 4 second ring cycle
- 2.11 Music Input: High Impedance,
30-1000mV rms (1000Hz sine wave)
- 2.12 Paging Outputs:
1.5W rms into 8 ohms (nom.)
2.5W rms into 4 ohms (nom.)
4 ohm load minimum
- 2.13 Power Supply Input:
115VAC -10%, 60Hz 80VA (max.)
- 2.14 Fuse Ratings:
F1 - AGC 5A
F2 - AGC 2A
- 2.15 Physical Size:
15"H x 10"W x 4"D

2. SPECIFICATIONS (cont'd.)

- 2.16 Weight:
less than 15 lbs.
- 2.17 Environment:
0 to 50°C operating
-20 to +80°C storage
5 - 95% relative humidity (non-condensive)

3. TELEPHONE MODIFICATIONS

3.01 The system will not ring bridged ringers, it requires the use of low voltage (10VAC) buzzers. These buzzers are easily mounted in standard key telephones and connect to a spare pair, typically the YEL-ORN pair.

NOTE: Some users prefer Floyd Bell Assoc. PBX 1H or 1L tone ringers over 10VAC buzzers.

3.02 The BL connections at the system provide an indication to stop ringing on the intercom line (ring trip). There are two ways to properly terminate the BL leads. The first method returns busy to calling stations when the called station is off-hook on any line. It requires modifying every station that is to have off-hook busy indication. The second method will allow called stations to ring if off-hook on any line except intercom. NOTE: Intercom ringing will not trip without an appropriate BL termination.

Method 1. Consult the key telephone's schematic (available from its manufacturer). It shows various modifications that can be made. Make a diode busy lamp conversion. Connect the BL leads as shown in Figure 3.

Method 2. At the system block, connect station cable BLK-BRN (A-lead) to appropriate intercom BL terminal only. Do not daisy chain between the intercom A-lead terminal and BL terminal. Do not terminate station cable YEL-BRN to system.

Long Loops

3.03 On loops greater than 30 ohms, many key phones will have dim lamps. To correct this problem, connect the Lamp Grounds from lines 2, 3, 4 and intercom (RED-BLU, RED-BRN, BLK-ORN, BLK-SLT) to the GRD connection of the Simplex 10. This will greatly increase the brightness of the line lamps on long loops.

4. MOUNTING

4.01 Refer to Fig. 1. Loosen the two locking screws and swing the front panel open carefully.

4.02 Secure unit on wall, using hardware suitable for the wall material.

4.03 Central Office Timing -- The Simplex 10 is designed to respond to loop current interruptions during the hold state. This feature allows the unit to release the C.O. line when the held party hangs up.

Two timing options are provided. Long (nominal release time of 450msec) for ESS exchanges and short (nominal release time 25 msec) for all other exchanges. To select the long option, open option switches S1-S4. Refer to Fig. 2.

4.04 Close unit, and tighten locking screws.

4. MOUNTING

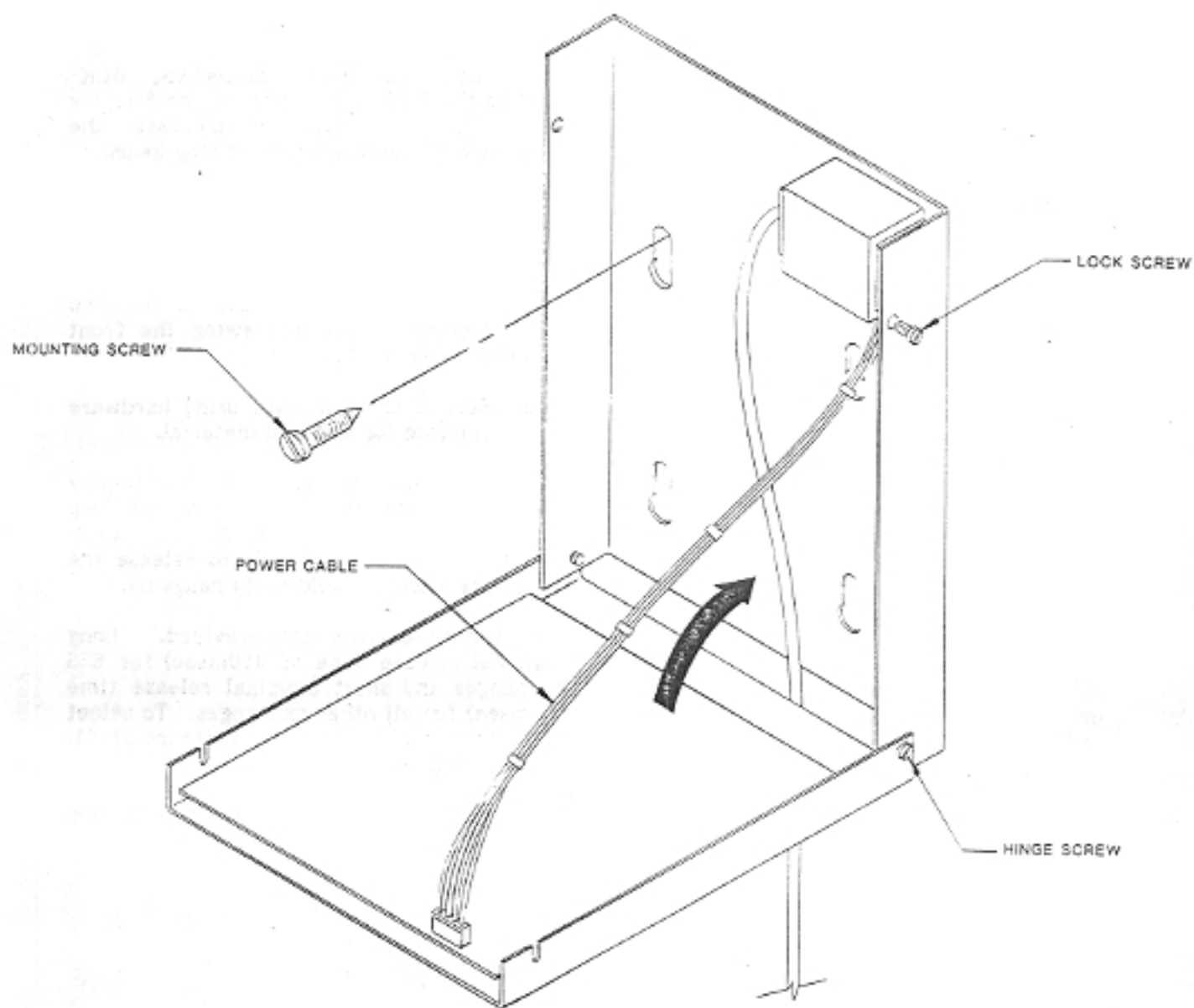


Fig. 1 -- Mounting Diagram

4. MOUNTING

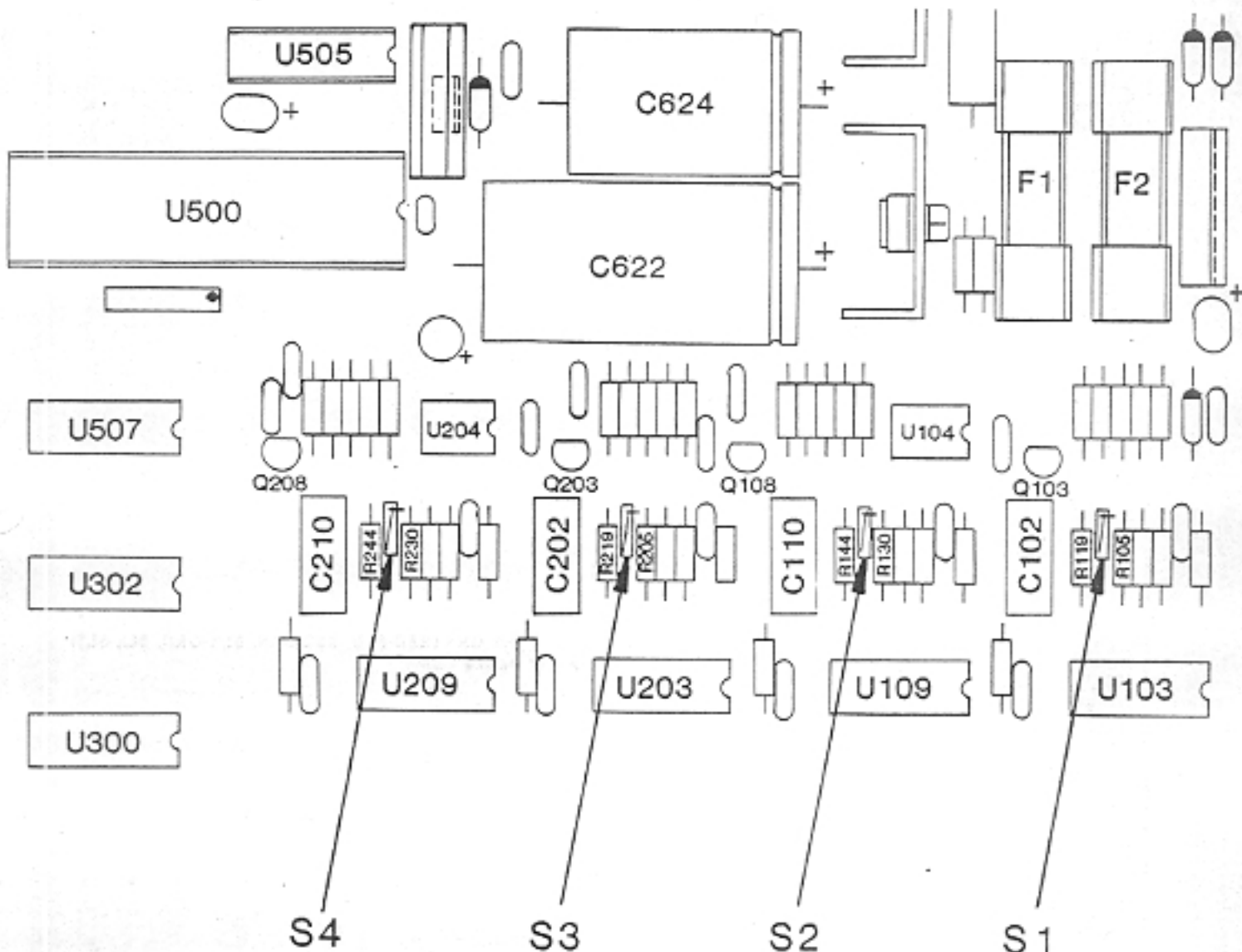


Fig. 2 -- Switch Locations

5. BLOCK DESCRIPTION

NOTE: Some key phones do not observe this wiring color code. Check telephone schematic before connecting.

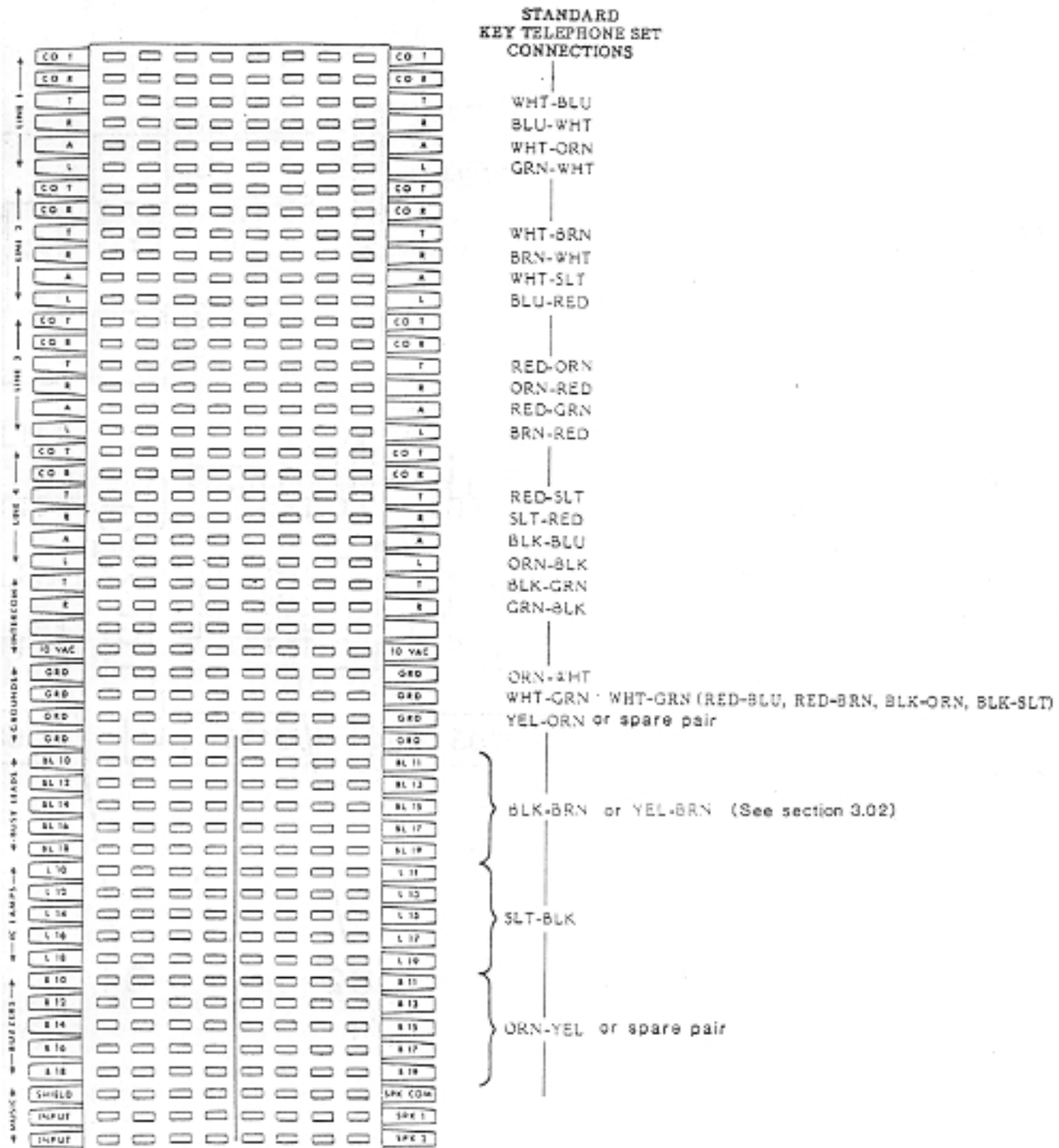


Fig. 3 -- Simplex 10 Typical Installation

5. BLOCK DESCRIPTION

	DESCRIPTION
Tco	Connect to Tip of CO line.
Rco	Connect to Ring of CO line.
T	Tip side of each line. Connect to all telephones.
R	Ring side of each line. Connect to all telephones.
A	A lead of each line. Connect to all telephones.
L	Lamp lead of each line. Connect to all telephones.
GRD	Lamp, A1, and buzzer ground. Connect to all telephones.
BL10-19	Busy line lead. Provides the hook status of the numbered station and ring-trip on the intercom.
L10-19	Intercom lamps. Connect to individual intercom lamp leads for each station.
B10-19	Buzzer leads. They provide individual signaling to each station. connect to (10 VAC) buzzer.
SHIELD	System ground. Connects to shield wire (if used) from music system.
INPUT	High impedance inputs to the system amplifier. Used to provide music-on-hold and background music. Connect to music source.
SPK	These three outputs are 8 ohm speaker outputs. SPK 1 & 2 are separate Paging Zones. SPK COM connects to all speakers and provides the return path for them.

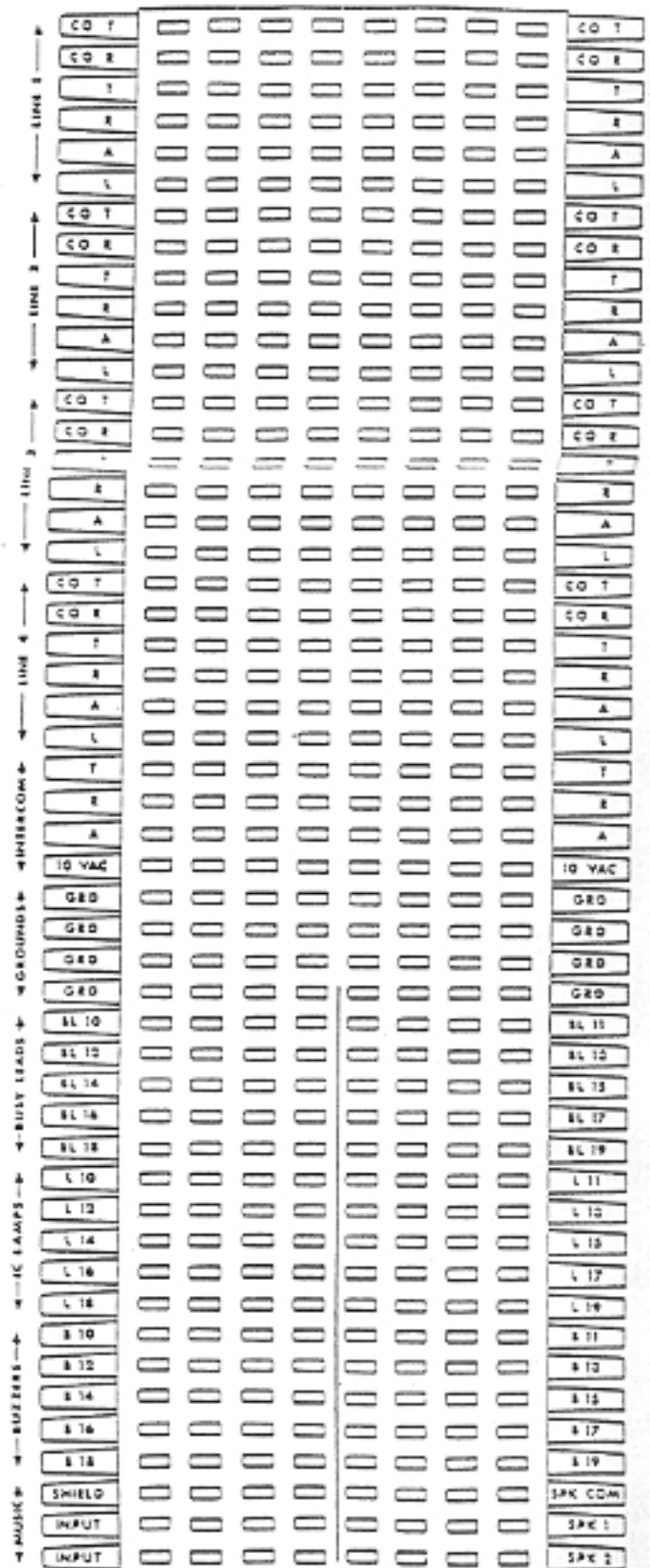


Fig. 4 -- Simplex 10 Block

6. CABLING

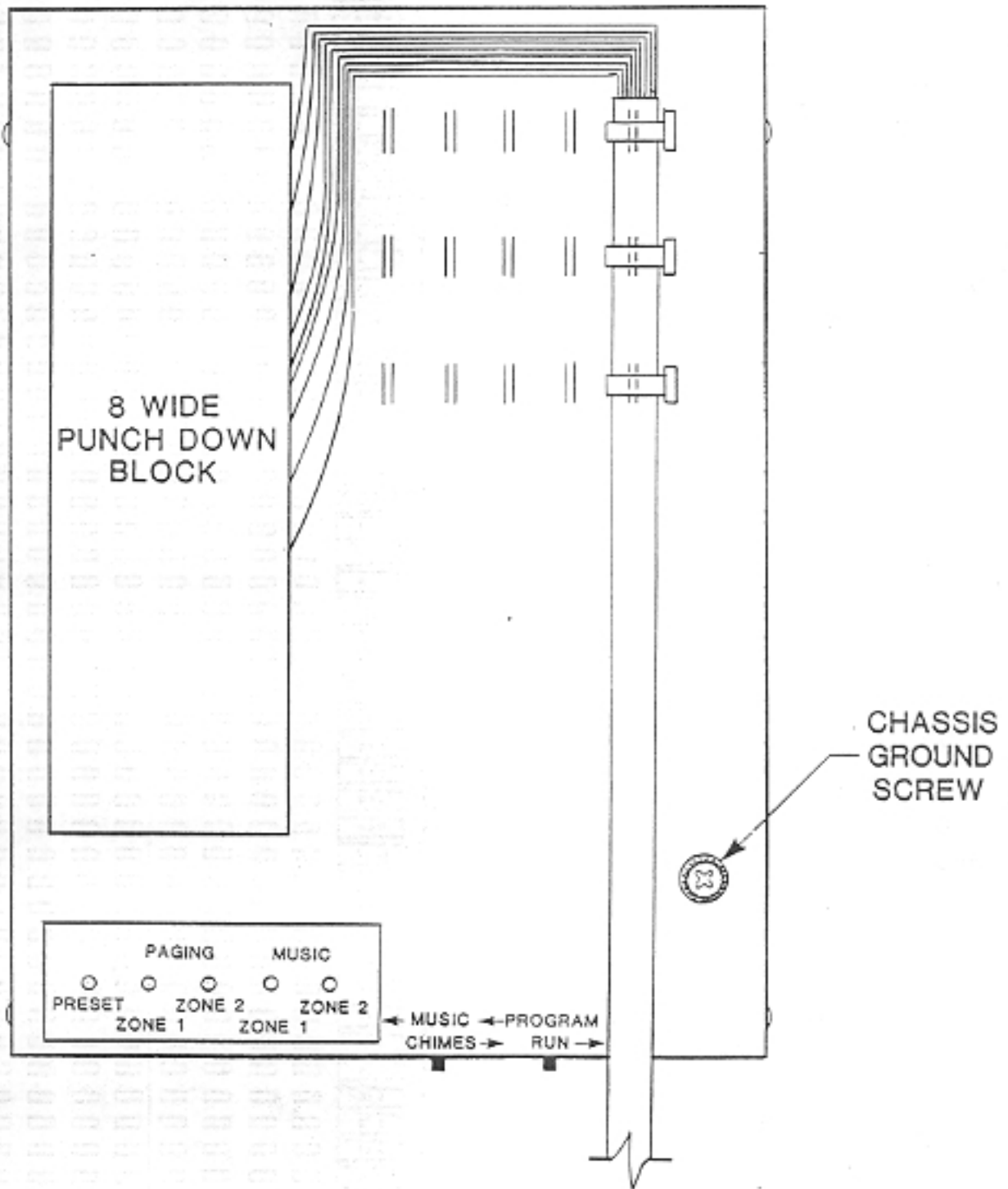


Fig. 5 -- Simplex 10 Front Panel

6. CABLING

6.01 The Simplex 10 comes with an eight wide block pre-wired to the system. Fig. 3 shows the labeled block and the color-coded 25-pair wiring connections to a standard 6-button key telephone set. The unit also provides tie-strap slots for strain relief and posts to loop the cabling to the block (see Fig. 5).

6.02 Use home run wiring directly to the unit for most applications.

6.03 Connect each key telephone set cable as illustrated in Fig. 3. (Refer to Key Telephone Schematic to check connection compatibility.) If Off-hook Busy indication is desired on the intercom, connect the (YEL-BRN) or designated "BL-LEAD" to the appropriate "BL" terminal on the connecting block. If Off-hook Busy indication is not desired, connect the intercom A-led (BLK-BRN) to the appropriate "BL" terminal on the connecting block. (Refer to 3.02.)

6.04 If more than 8 stations are used, a satellite terminal must be established or some stations must be daisy-chained. Refer to Fig. 6.

6.05 If using less than 4 CO lines, the phone used for programming must have lamps wired for all 4 lines.

6.06 For CO interface, use RJ21X, 2-RJ14C, or 4-RJ11C.

NOTE: Three element gas tube protectors are recommended on all CO lines in addition to the carbon block type usually provided.

WARNING: Disconnect power before servicing unit or adding cables.

6.07 See Fig. 7. For a ground connection we recommend connecting a 12 AWG (min.) wire between the ground screw, located on the front panel, to the CO line protector GRD LUG. The lightning protector and power system ground connections should be bonded (connected together) with 6 AWG (min.) wire at the power service ground.

Grounding

6.08 Most 6-button key telephones common the lamp grounds to two wires. On long or daisy-chained cabling this can lead to dim lamps because the grounds are carrying much more current than the rest of the wires.

6.09 It is recommended that the installer maintain a minimum of two lamp grounds and a buzzer ground per station (commoned to lamp ground) when daisy-chaining. For loops greater than 30 ohms use a minimum of three lamp grounds and a buzzer ground per station. Refer to Section 3.03 -- telephone modifications on long loops.

Music and Paging

6.10 Connect a music source to the music inputs. The output level of the source should be between 30-1000mV rms. The shield input is only for use with 2-wire, shielded cable. Some music sources require a low impedance load across the outputs. If this is the case, bridge a resistor across the music inputs of the Simplex 10.

6.11 Connect speakers to SPK COM and SPK 1 or 2. Speakers connected to SPK 1 respond to Zone 1 paging and those connected to SPK 2 respond to Zone 2 paging. More than one speaker can be connected to each output provided that the total load impedance is 4 ohms or greater per zone.

7. POWER UP

7.01 Plug the unit into a standard 117 VAC grounded outlet.

NOTE: A power line surge protector is recommended at the outlet. Refer to Fig. 7

7.02 Turn the PRESET and MUSIC knobs counter-clockwise if background music was installed and turn the music source on. Make sure that the output is within the specified range (refer to Section 2.11). Turn the PRESET knob clockwise until the LED lights intermittently. Turn the MUSIC volume knobs clockwise until the paging background music volume is satisfactory.

6. CABLING

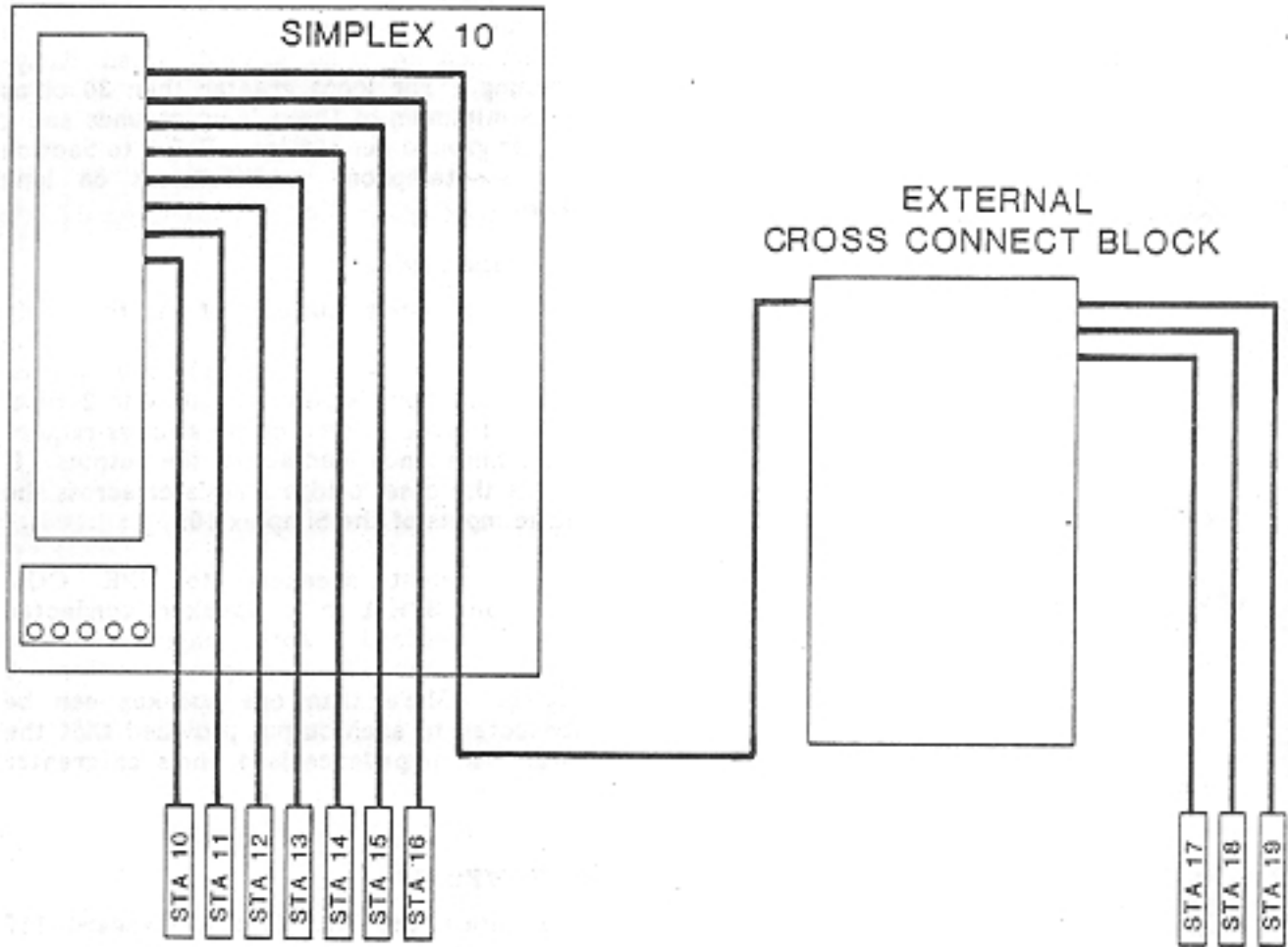


Fig. 6 -- Typical 10 Station Installation

6. CABLING

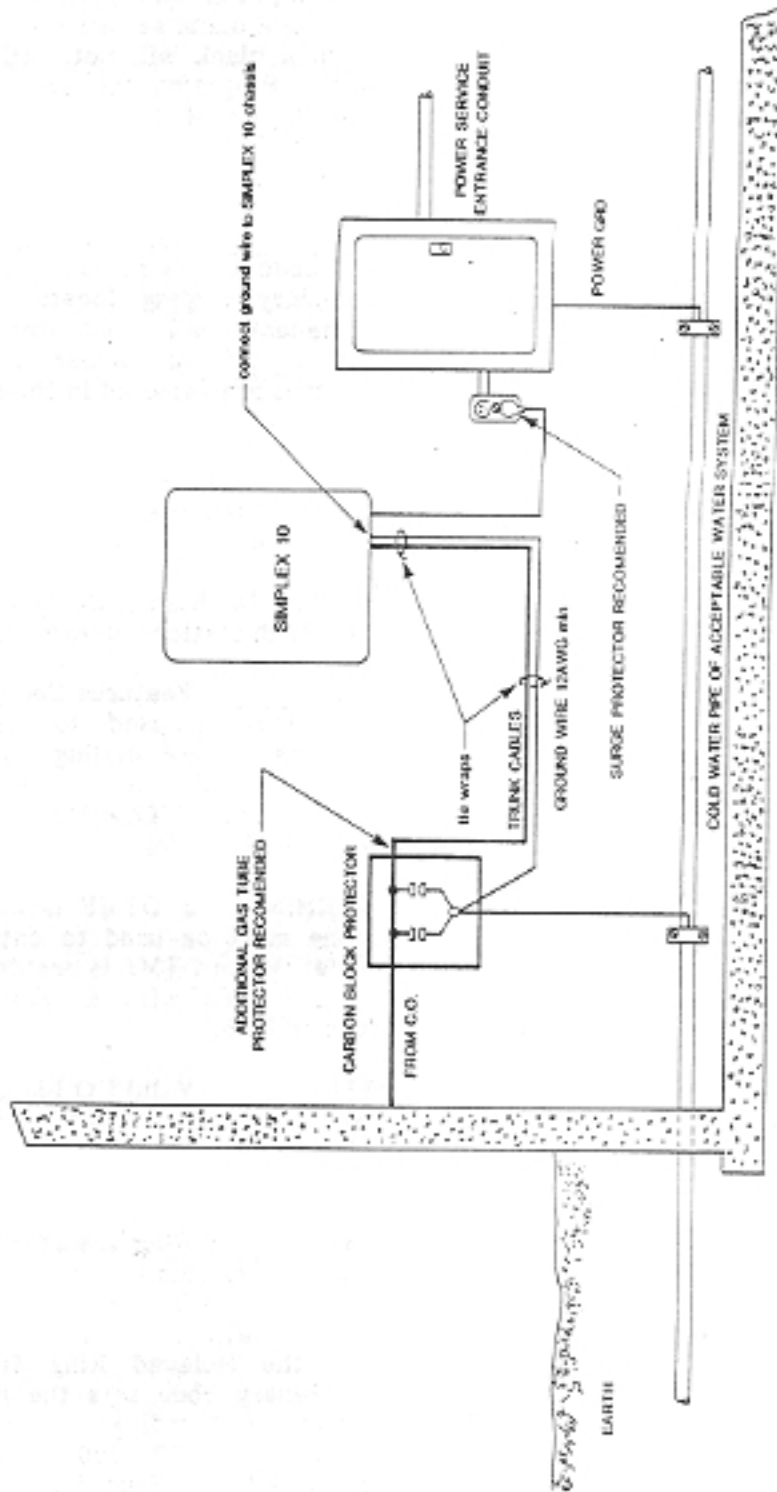


Fig. 7 - - Recommended Protection and Grounding

8. SYSTEM SETUP

Switches

8.01 At the bottom center of the common control unit there are two switches. The left one is an option to provide either chimes or music to lines on hold. Push the switch left for music or right for chimes. The right switch is for setup programming. Move it to the left to place the system in the program mode. **NOTE:** Before placing the system in the program mode, ALL phones must be on-hook.

Programming

8.02 To program the system make sure all phones are on-hook, then set the program/run switch to the program mode. Press the intercom line, take just one phone off-hook, and dial 0. An interrupted dial tone will be heard in the receiver and the intercom lamp will wink and flash. This indicates that the system is ready to accept programming digits.

8.03 Complete Tables 1 through 5. Use them for reference during programming.

8.04 Each program code is a seven-digit number. The first three digits determine the function to be coded. The last four digits are a binary code that define it. After the three-digit code is entered, the line lamps will light reflecting the currently programmed binary code. When the last four digits are entered the line lamps will display the new binary code.

(61X ___) Main Ringing.

This code is used to establish whether a line will ring at a selected station. To select a station, put its last digit in place of the "X". A "1" in a blank selects a line for ringing. A "0" in a blank will not. (EXAMPLE: 617 1001 - Programs the system so that only lines 1 and 4 will ring at station 17.) **WARNING:** Every installed station must be programmed.

(62X ___) Delayed Ring Transfer.

This code allows for a C.O. line to have a secondary ringing location, i.e., a semi-permanent call forwarding arrangement after a variable number of rings. Stations and lines are selected in the same manner as the Main Ringing code. The number of rings before forwarding are selected by Ring Transfer delay code. (EXAMPLE: 622 0000 - Programs the system so that no trunks are forwarded to station 12.) **WARNING:** Every installed station must be programmed. **NOTE:** To disable Delayed Ring Transfer, code each station the same as Main Ringing.

(630 ___) Features Code.

This code is used to determine which features; DTMF dialing, Message Waiting, Hold Recall, are allowed for the installation. (EXAMPLE: 630 0100 enables only DTMF dialing.)

WARNING: If DTMF is disabled a rotary phone must be used to enter the program mode. When DTMF is enabled, programming can be done with a DTMF phone. See Section 8.06.

(631 ___) Valid CO Lines.

Use this code to disable unused line keys. (EXAMPLE: 631 0111 - turns off the first line.)

(632 ___) Ring Transfer Delay

This code selects the number of rings before a ringing line is forwarded to the secondary ringing station. It is used in combination with the Delayed Ring Transfer feature. The binary code sets the number of rings before forwarding. See Table 5. (EXAMPLE: 632 0100 - Sets ringing to be forwarded after four rings.)

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8. SYSTEM SETUP (cont'd.)

Programming (cont'd.)

(633) Hold Recall

This code sets the time delay before a line on hold will ring back to all stations programmed by the Main Ringing code to ring that line. Refer to Table 4 for the delay time determined by each code. (EXAMPLE: 633 1100 -- ALL calls on hold more than 6 minutes will recall to the Main Ringing stations for that line.) NOTE: To disable this feature, refer to the Features Code.

(634) Abandoned Call

Simplex 10 compares this time to the time between rings of an incoming line. If this time elapses before the next ring cycle, the processor will disconnect ringing to the stations. Set the Abandoned Call time just slightly longer than the time between CO ringing cycles. Refer to Table 4 for the Abandoned Ringing time determined by each code. (EXAMPLE: Central Office ringing is one second on and three off. Code 634 0011 -- sets the time at 4.8 seconds, slightly longer than the four seconds of the ring cycle.)

8.05 IMPORTANT: After the programming is completed, dial 2. Dial tone will be heard in the receiver and the intercom lamp will light steady. Hang up the phone and set the PROGRAM/RUN switch to RUN. When in the run mode, dialing zero will not put the system in the program mode.

NOTE: The Simplex 10 will retain the program if power failure occurs.

DTMF Feature

8.06 When the DTMF feature is disabled while in the program mode, programming can continue using a pushbutton telephone. Once out of the program mode, DTMF dialing is disabled when a call is completed on the intercom line. When DTMF dialing is disabled, a pushbutton telephone can be used to enter the programming mode only if the system is unplugged for five to ten seconds. A pushbutton phone can then be used if the program mode is accessed immediately after power up. Rotary telephones can always be used for programming.

TABLE 1 -- MAIN RINGING TABLE

ENTER: "1" - RING, "0" - NO RING

STATION	LOCATION	ACCESS CODE	Line 1	Line 2	Line 3	Line 4
10		610				
11		611				
12		612				
13		613				
14		614				
15		615				
16		616				
17		617				
18		618				
19		619				

TABLE 2 -- DELAYED RING TRANSFER

ENTER: "1" - RING, "0" - NO RING

STATION	LOCATION	ACCESS CODE	Line 1	Line 2	Line 3	Line 4
10		620				
11		621				
12		622				
13		623				
14		624				
15		625				
16		626				
17		627				
18		628				
19		629				

TABLE 3 -- SYSTEM PARAMETERS

ENTER: "1" - ENABLE, "0" - DISABLE

	ACCESS CODE	NOT USED	DTMF	MESSAGE	HOLD RECALL
FEATURES	630	0			
		LINE 1	LINE 2	LINE 3	LINE 4
VALID CO LINES	631				

TABLE 4 -- TIMING TABLE
STANDARD TIME VALUE TABLE

RING TRANSFER DELAY (632)	HOLD RECALL (633)	ABANDONED CALL (634)	CONTROL CODE			
0 rings	0 min.	0 sec	0	0	0	0
1	.5	1.6	0	0	0	1
2	1	3.2	0	0	1	0
X 3	1.5	4.8	X 0	0	1	1
4	2	6.4	0	1	0	0
5	2.5	8.0	0	1	0	1
6	3	9.6	0	1	1	0
7	3.5	11.2	0	1	1	1
8	4	12.8	1	0	0	0
9	4.5	14.4	1	0	0	1
10	5	16.0	1	0	1	0
11	5.5	17.6	1	0	1	1
12	6	19.2	1	1	0	0
13	6.5	20.8	1	1	0	1
14	7	22.4	1	1	1	0
15	7.5	24.0	1	1	1	1

TABLE 5 -- TIMING PARAMETERS

ACCESS CODE		TIMING CODE				TIME
Ring Transfer Delay	632					
Hold Recall	633					
Abandon Call	634					

35:56
39:29
40:18
41:18
42:18
43:18
44:18
45:18
46:18
47:18
48:18
49:18
50:18
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97:18
98:18
99:18
100:18

9. TESTING

9.01 This section outlines the test procedure for the unit. Refer to the Troubleshooting section when failures occur. Listed below is the recommended list of equipment to properly test and troubleshoot the Simplex 10:

- A. VOM multimeter
- B. Rotary test phone
- C. Punchdown tool
- D. Spare fuses (AGC 2 and AGC 5)
- E. General tool kit

	ACTION	RESULT
<u>Lamp Tests</u>		
9.02	A. All phones on-hook.	Every lamp at every phone should be off.
	B. At each station, take the handset off-hook. Press each line button.	Each equipped line button should light when pressed.
<u>C.O. Line Tests</u>		
9.03	A. Take the phone off-hook. Press a line button.	Lamp should light; C.O. dial tone is heard in receiver.
	B. Press HOLD button.	Line button should release; line lamp winks, receiver is quiet.
	C. Press the winking line button.	Lamp lights steady; receiver is reconnected to C.O.
	D. Call another C.O. line, count the ring delay and listen for delayed ring transfer.	Line rings at the main ringing location for that line. The lamp of the ringing line should flash at all stations. The number of rings before the secondary stations start ringing should be as programmed. The secondary ringing stations start ringing.
	E. Press the HOLD button, press the ringing line button.	Line goes on hold, chimes or music-on-hold is heard in receiver.
	F. Press winking line button. Hang up.	Phone is idled.
	G. Repeat for each line equipped.	

9. TESTING

ACTION

RESULT

Intercom Tests

- | | | |
|------|--|--|
| 9.04 | A. Take phone off-hook, press intercom line. | Intercom lamp lights steady, intercom dial tone is heard in receiver. |
| | B. Call each intercom station, observe intercom lamp, listen for intercom ringing. | Lamp flashes and double burst buzzing at called station only. |
| | C. Answer called station. | Lamp at called station changes to steady and buzzer is silenced. |
| | D. Set the paging volume controls at a medium level. From a station, press the intercom line, go off-hook, and dial:
7 to test Zone 1
8 to test Zone 2
9 to test ALL CALL | When a paging zone is accessed, words spoken into the handset sound over the paging speakers of that zone. |

Message Waiting

- | | | |
|------|--|---|
| 9.05 | A. Access the intercom line; dial 4 + station number. Repeat for all stations. | The intercom lamp of every station dialed should blink about every two seconds. |
| | B. Access the intercom line; dial 5 + station number. Repeat for all stations. | The blinking has discontinued. |

Busy Test (For phone equipped with off-hook busy, refer to 3.02.)

- | | | |
|------|---|--|
| 9.06 | A. Take a phone off-hook; press any line button except the intercom line. From a different phone, access the intercom line and call the off-hook station. | When the off-hook station is called, busy tone is heard in the receiver. |
| | B. Hang up called station. | Called station rings. |

10. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	TEST PROCEDURE	CORRECTIVE ACTION
SYSTEM POWER			
No power observed, system appears dead.	Faulty power connections. Bad transformer.	Trace power from outlet to system. Take corrective action to restore power to the system.	Repair, reconnect, or replace wiring. Replace bad transformer.
LAMPS			
Line lamp does not light at one station.	Blown fuses.	Check fuses on the PC board.	Replace open fuses.
	Open.	Trace lamp and lamp ground wires.	Repair wiring.
	Blown lamp.		Replace the lamp.
All lamps of one line do not light.	Disabled by software.	Test if disabled by software.	Enter program mode. Dial 631 1111 to turn on all lamps.
	Short.	Trace lamp and lamp ground wires of affected line.	Repair wiring.
Intercom lamp does not light.	Open.	Trace lamp and lamp ground wires of station(s) with unlighted intercom lamps.	Repair wiring.
No intercom lamps light.	Short.	Test B in Section 9.03 will locate shorted lamp and buzzer leads. If an intercom lamp lead is shorted, the intercom lamp will flash when that station is called. If a buzzer is shorted, the intercom lamp will blink when the shorted station is called.	Repair wiring.
Line lamps will not light.	No "A" lead control.	Try to put line on hold.	Check wiring, possible reversed diode going to HOLD button.

10. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	TEST PROCEDURE	CORRECTIVE ACTION
LAMPS (cont'd.)			
Line lamps are faint.	Insufficient grounding.	If the line lamps are too faint, refer to sections 6.04 and 6.05.	Add more grounding to the lamps.
Lamps go out during ringing.	Buzzer lead shorted to ground.		Repair wiring.
Lamps dim during ringing.	Buzzer ground connected to lamp ground at phone.		Isolate the grounds at the phone.
Line lamp stays on.	A lead grounded.	Trace A lead of lighted line lamp.	Repair wiring.
MUSIC AND PAGING			
No music, no paging.	Speaker wiring.	Make sure that the paging volume knobs are turned up. Check wiring, music volume levels.	Repair wiring.
Paging OK, no music.	Music source.	Check music source wiring, music volume levels.	Repair wiring.
Preset LED does not light.	Preset knob out of adjustment. Source volume too low. Source load mismatch.		Turn knob clockwise. Increase source volume. Connect resistor in parallel with music input to match music source output drive impedance.

10. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	TEST PROCEDURE	CORRECTIVE ACTION
RINGING			
Station does not ring.	Wiring Faulty buzzer.	Trace B lead of faulty station, also Trace buzzer ground.	Repair wiring. Replace buzzer.
BUSY			
Station fails busy test.	Faulty wiring or telephone modification.		Repair wiring or telephone modification (refer to 3.02).
Ringling will not trip on intercom station.	Faulty wiring or telephone modification.		Reverse diode going to YEL- BRN wire (refer to 3.02).
No ring transfer.	System not counting rings.		Increase abandoned call time (634 _____).

NOTICE

The Simplex 10 system requires that an incoming Telco line provides a minimum of 10 volts (open circuit) across tip and ring. Some lines, such as an Auxiliary Main Line Carrier, do not provide enough open circuit voltage to talk through the system. A loop extender that passes ringing may be placed in front of the system if such a Telco line must be used.

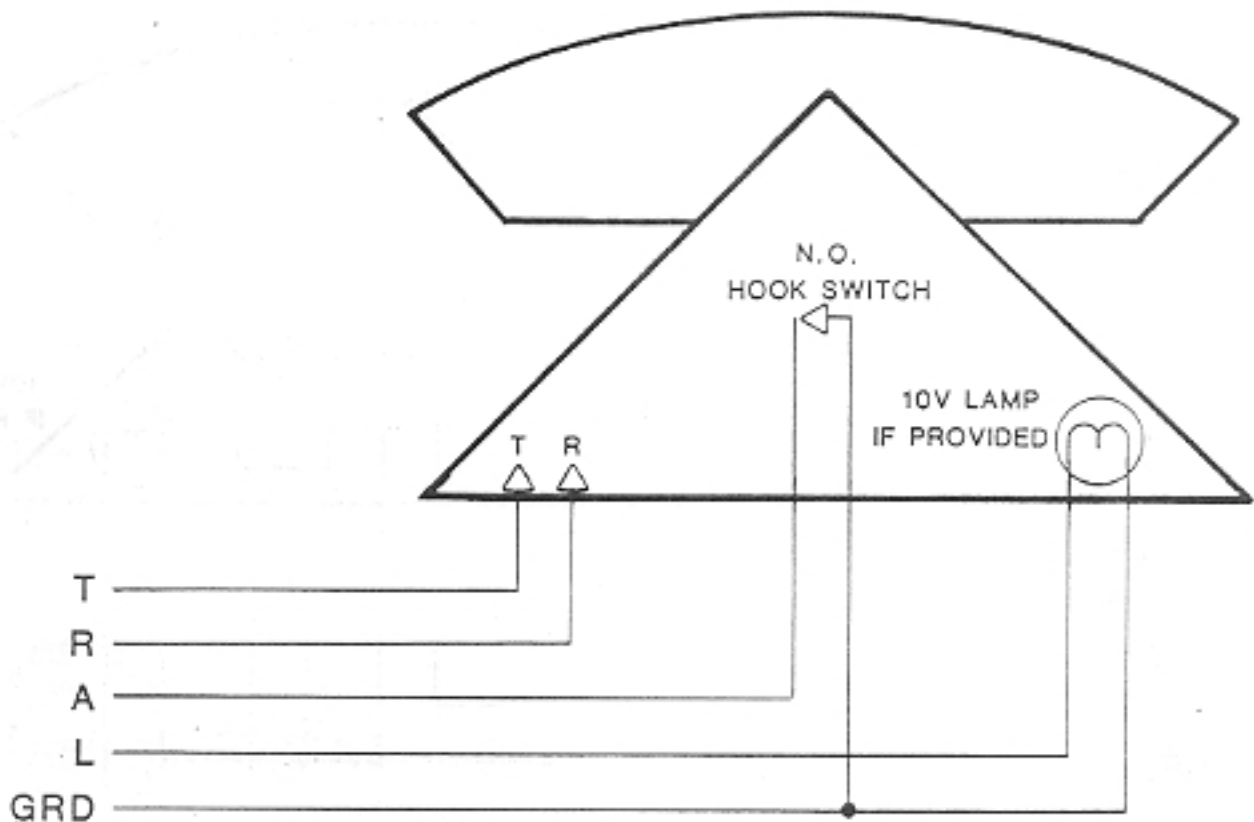
11. APPLICATION NOTES

A single line telephone can be connected to a C.O. line circuit of a Simplex 10 system. The telephone will not have audible ringing. If a lamp is added and wired as shown in APPLICATION 1, the lamp will provide a visual indication of the status of the line to which it is connected. By connecting the hookswitch as shown in APPLICATION 1 other stations will have a visual indication when the single line phone is off-hook.

NOTE: Tel set ringer must be disconnected or equipment failure may occur.

APPLICATION 1

CONNECTING A SINGLE LINE PHONE TO A C.O. LINE OF SIMPLEX 10

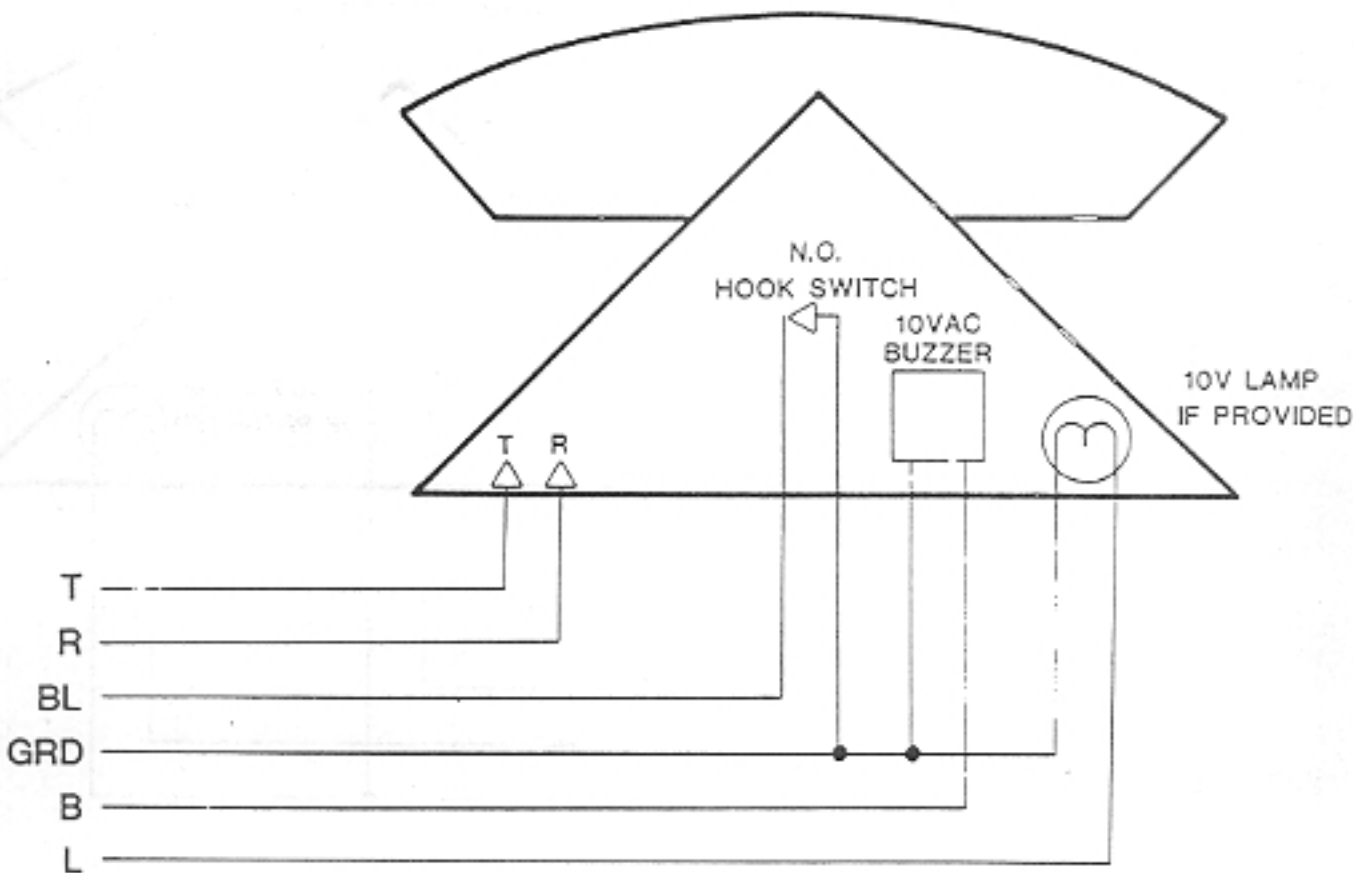


11. APPLICATION NOTES

A single line telephone can be connected to the intercom line of a Simplex 10 system as one of the ten intercom stations. If a lamp is added and wired as shown in APPLICATION 2, the lamp will provide a visual indication of the status of the intercom line. By connecting the hookswitch as shown in APPLICATION 2, other stations will have a visual indication when the single line phone is off-hook. The station can be made to ring if a 10VAC buzzer is added and wired as shown in APPLICATION 2. Be sure to program Main Ringing and Delayed Ringing so the single line intercom station does not ring for incoming lines.

APPLICATION 2

INSTALLING A SINGLE LINE PHONE TO THE INTERCOM LINE OF SIMPLEX 10

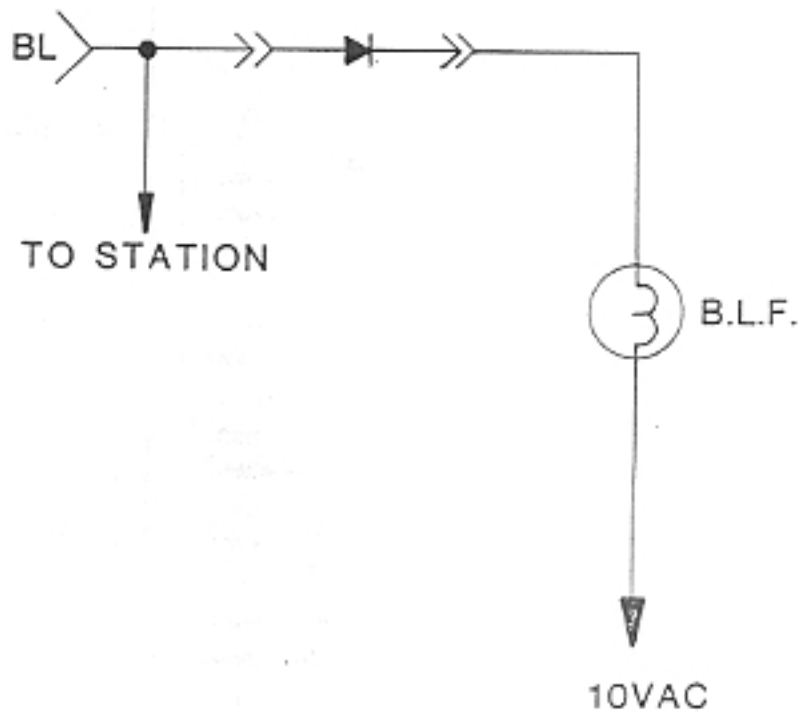


11. APPLICATION NOTES

A Busy Lamp Field can be used with the Simplex 10 system by connecting the BLF to the BL lead of each station as shown in APPLICATION 3.

WARNING: Equipment damage may result if the BL lead is not protected with a properly installed diode.

APPLICATION 3



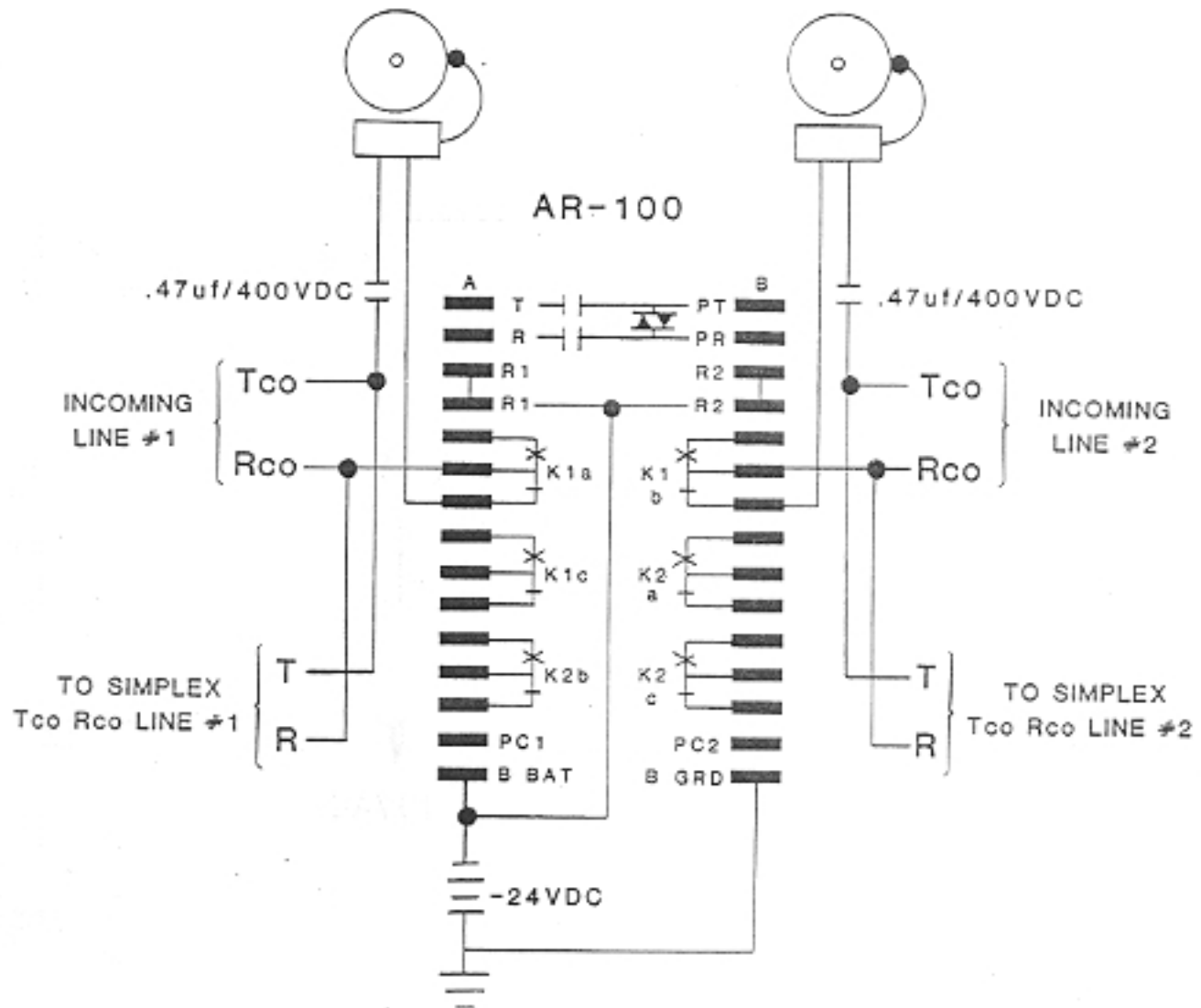
To use the "BL" lead for a BLF, a diode must be added to the circuit.

11. APPLICATION NOTES

An AR-100, available from TONE COMMANDER SYSTEMS, INC., provides ringing capability for two Simplex 10 C.O. lines during power failure. It must be connected as shown in APPLICATION 4. The ringers, capacitors, and 24 volt supply are not included with the AR-100.

APPLICATION 4

POWER FAILURE RINGERS FOR SIMPLEX 10



NOTE: Two lines shown. Repeat on unused relay contacts for lines 3 and 4.

11. APPLICATION NOTES

This Application Note includes equipment requirements and installation instructions for the connection and signaling of high voltage ringing devices. These devices are for use in place of low voltage buzzers and other low voltage signaling devices.

APPLICATION 5

ALTERNATIVE SIGNALING FOR STATION SETS

EQUIPMENT REQUIRED

12VAC, 1FA (N.O.) Relay(s) - - Coil resistance must be greater than 100 ohms. One relay is required for each alternate ringing device used.

Ringling supply or ringling generator - - One supply is required for each installation. The supply must be rated to provide simultaneous signaling to all ringling devices used.

Alternative ringling device(s) - - One device is required for each alternative ringer location.

INSTALLATION

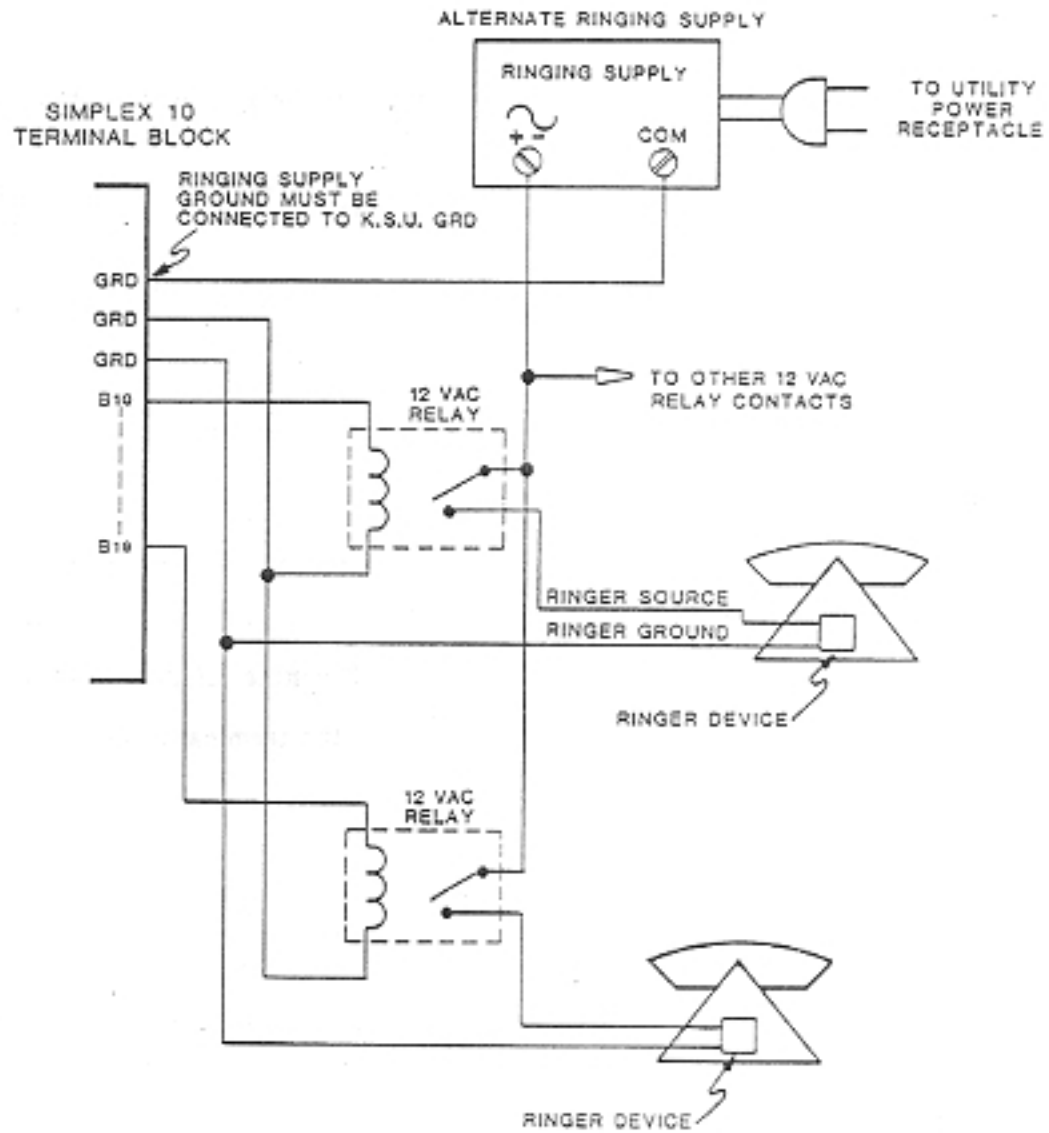
The figure on the following page illustrates the connections required for supplying 2 station sets with alternative ringling.

1. Install ringling device in station set. Use spare cable conductors to connect the ringling device to the relay contact and ground on the terminal block.
2. Connect the relay coil to ground and the station's B-lead on the terminal block.
3. Connect the ringling supply output to the "COM" contact of the 12VAC relays.
4. Connect the ringling supply ground to ground on the terminal block.

11. APPLICATION NOTES

APPLICATION 5

ALTERNATIVE SIGNALING FOR STATION SETS



TONE COMMANDER PRODUCT WARRANTY

For a period of one year from date of manufacture, Tone Commander Systems, Inc. (Tone Commander) warrants its products to be free from defects in material and workmanship under conditions of normal use and service. Tone Commander shall, at its option, repair or replace any defective product which in its opinion has not been misused, damaged, or improperly installed.

Repair or replacement under this warranty will be performed at Tone Commander's factory. Authorization for return (with freight prepaid) must be obtained from Tone Commander prior to returning a product.

Products beyond the warranty period may be repaired at the factory for a reasonable charge. Repaired out-of-warranty units are warranted as above for 90 days from the date of repair.

A handling charge will be assessed on all units, in or out of warranty, that are returned and found to be free of defects.

The repair or replacement of a product under this warranty represents the entire obligation of Tone Commander; and Tone Commander shall not be liable for any special or consequential damages resulting from or caused by any defect, failure, incapacity or malfunction of any of its products.

The foregoing express warranty is in lieu of all other warranties, express or implied, including but not limited to, any implied warranty of merchantability, fitness or adequacy for any purpose or use, quality, productiveness or capacity; and Tone Commander, to the extent permitted by law, hereby disclaims all such other warranties.

April 1985