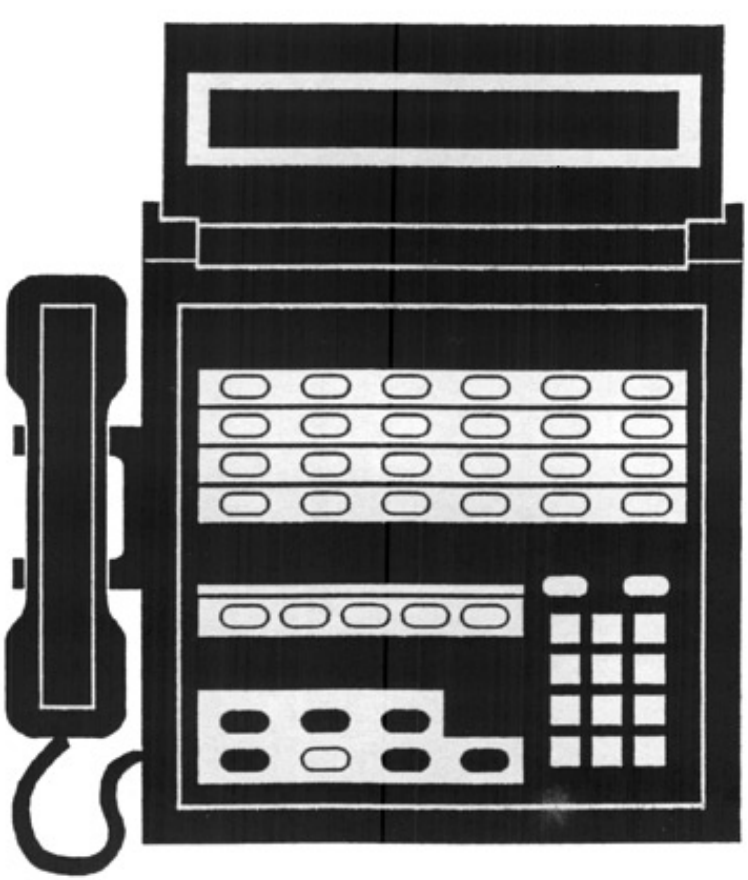
TONE COMMANDER®

11609 49th Place West
Mukilteo, WA 98275-4255
Phone: (800) 524-0024 (425) 349-1000
Fax: (425) 349-1010
www.tonecommander.com

524
Installation Instructions



13-102408 Rev. H
June 2001

Changes in this revision –

- removed references to Message Waiting Interfaces and Voice Announce

Printed in USA

Contents

Introduction

The Tone Commander 524 is a call processing console for use in receptionist or departmental attendant positions, with Centrex or PABX systems. Five line keys are provided for LDN (listed directory number) terminations or call processing loops. Up to 24 stations may be monitored for status. Autodialing is available for each station. Autodialing is normally used to dial the station number associated with the DSS (Direct Station Select) key, but spare DSS keys may optionally dial outside lines or special access codes.

Features include hold and transfer, single button call answer, line privacy, delayed ringing, station status display, station name display, music on hold, and a digital clock. Console parameters may be programmed by the installer for different system configurations.

A configuration programming mode is used by the installer to set console parameters as required by the telephone system. The attendant may program name displays, autodial numbers, ring delays, and the time-of-day clock. Switches can be set to prevent accidental programming changes.

The system includes a CPU (Central Processing Unit) in the equipment room. Two consoles may be connected to a single CPU.

Please refer to the System Description section for detailed descriptions of all 524 features.

Call Tone Commander Customer Service at **(800) 524-0024** if you have any questions about features, installation, or operation of the 524.

Tone Commander consoles are easy to install and configure. The step-by-step instructions in this manual guide the installer through the installation, preliminary testing, programming, and operational testing of the 524.

Installation consists of the following steps:

1. Ordering equipment *(page 5)*
2. Ordering lines *(page 6)*
3. Site preparation *(page 7)*
4. Configuration Sheet preparation *(page 8)*
5. Mounting equipment and blocks
6. Connecting lines to CPUs
7. Installing consoles and console cables
8. Preliminary testing
9. Installing optional equipment (paging, etc.)
10. Configuration programming – includes central office/PABX compatibility parameters, and several customer-preference items. The system's default values will be adequate for many installations.
11. DSS/Autodial number programming
12. Name display programming
13. Ring delay programming

1. Ordering Equipment

Order the optional PA-24 Paging/Chime Module and related equipment as required. Allow adequate time to ensure equipment availability at cutover.

Required for each 524 system

- ❑ (1) 524 Central Processing Unit (equipped for 5 attendant lines, 24 stations, 2 consoles)
- ❑ (1) 524 console for each attendant position (2 max.)

Required to provide Paging service

- ❑ (1) PA-24 Paging/Chime module
- ❑ (1) Paging Amplifier and speakers

Additional required equipment

- ❑ (1) 66M1-50 split block + (1) male-terminated 25 pair cable
- ❑ (1) 66M1-50 split block + (2) female-terminated 25 pair cables
- ❑ (2) 3 pair cables from the CPU to each console (500 ft. maximum length)
- ❑ (2) 6 position, 6 contact modular jacks per console
- ❑ (1) 117 VAC, 60 Hz grounded power outlet per CPU in the equipment room
- ❑ Sufficient space on a plywood sheet in the equipment room for mounting CPU, blocks, and ancillary equipment
- ❑ Cross connect wire and mounting hardware

2. Ordering Lines

IMPORTANT – The line features listed below are ***required*** for proper operation of the 524 console. Allow adequate time prior to cutover for the receipt and testing of all lines and programmed features.

Please refer to the System Description section for further information regarding line requirements.

Common requirements for all attendant and station lines

- ❑ Standard Centrex loop start lines
- ❑ Disconnect Supervision
- ❑ Call Pickup Terminate
- ❑ Must originate from the same Centrex Common Block

Requirements for all attendant lines

- ❑ Tone dialing
- ❑ Station Call Transfer
- ❑ Directed Call Pickup *without* Barge-In (non-Barge-In)
- ❑ *Do not* configure with Call Transfer-Attendant

Optional attendant line features

- ❑ Order (1) nonhunting Centrex line per 10 attendant lines per console (recommended for retrieving unanswered station calls). Refer to the Answer Use line feature described on page 36.

Requirements for all station lines

- ❑ Must be assigned to a Call Pickup Group
- ❑ *Do not* configure with Call Forward-No Answer to the attendant

Optional station/line features

Additional features may be optioned as required.

3. Site Preparation

Central Processing Unit (CPU)

The CPU should be installed in a clean, *dry* area which is secure but also accessible by maintenance personnel. This unit is designed for wall mounting only. Allow adequate wall space for ventilation, the necessary mounting blocks, and related equipment.

Ambient Environmental Requirements

1. Between 60° and 80° F (recommended).
2. Free of toxic fumes or static electricity (copiers).
3. At least 50 feet away from electromagnetic sources (arc welders).
4. Free from transient electrical load switching equipment (elevator rooms).
5. Between 5% and 95% noncondensing relative humidity.

Power Requirements

A dedicated, 15 amp, 117 VAC, 60 Hz circuit must be provided for the exclusive use of the CPU.

IMPORTANT – Ancillary or unrelated equipment should never draw power from the same circuit that powers the CPU.

The ground (3rd prong) on the power plug provides a safety ground to the chassis of the CPU, and is required for EMI shielding. It must be plugged into a grounded outlet.

Transient Surge and Spike Protection

While Tone Commander products comply to FCC rules part 68.306, Hazard Voltage Limitations, in those areas of high lightning activity, the use of external protection devices on all telephone lines and the power source is recommended.

Reference Grounding

Reference grounding of the 524 system is necessary for proper operation. This ground should be referenced to within 3 volts of telco ground.

Attendant Consoles

The consoles should be installed in a clear work space and away from plants that require frequent watering or counters that tempt the placement of beverages.

Ambient Environmental Requirements

It is recommended that the same environmental conditions be maintained for the consoles as one would maintain for a personal computer (PC) or data terminal.

Power Requirements

Console operating power is provided by the CPU.

4. Configuration Sheet Preparation

Prior to installation of this system, the Configuration Sheets attached to the back of this manual should be completed with the information listed below. **Please leave the Configuration Sheets on site.**

System Programmable Features

Factory programmed values have been chosen to accommodate standard central office or PABX operating parameters and generally accepted customer requirements. These values may be adjusted to specific needs.

A space is provided on the Configuration Sheet for the Directed Call Pickup code required by the telephone system.

Station and Line Programmable Features

1. Phone number and name identification for each line. Refer to the DSS/Autodial Number Programming section.
2. Programmable features for each line (Privacy, Answer Use).
3. Station number and user name identification for each station. Include any additional functions to be dialed with the DSS number, such as an *FD* prefix.
4. Autodial numbers for spare DSS keys.

Sample Configuration Sheets are provided on the following three pages.

524 Configuration Sheet
System Programmable Features

STATION KEY	FEATURE	DIAL PAD KEYS	AVAILABLE VALUES	DEFAULT VALUE	ACTUAL VALUE
A	'ABANDON' Ring Time	2 - 9, 0	2 - 9 sec, 10 sec	5	5
B	'RECALL' Rings	1 - 9, 0	1 - 9 rings, no recall	3	3
C	'DCP DIAL' Sequence	0, 1	first, last	first (0)	first
D	'DIAL SPEED'	6, 0	slow (6 digits/sec), fast (10 digits/sec)	fast (0)	fast
E	'PAUSE' Time	2 - 9	200 - 900 msec	700	700
F	'FLASH' Time	5 - 9, 0	500 - 900 msec, 1 sec	600	500
G	Dial Tone 'DETECT' Time	1 - 9, 0	500, 600, 700 msec, 1, 1.2, 1.5, 1.8, 2 sec	700	600
H	'HOLD' Recall Time	3 - 6, 9, 1, 2, 0	30 - 60, 90 sec, 2, 3 min, no recall	90	60
I	Hold 'RELEASE' Time	1 - 8	45, 80, 200, 400, 600, 800 msec 1, 2 sec	600	600
K	Queue 'PRIORITY'	1 - 4	stations only, stations > lines, lines > stations, lines + stations (FIFO)	FIFO (4)	FIFO
L	'ALERT TYPE'	1, 2, 0	normal ringing, distinctive ringing, both	both (0)	both
M	'RNG TYPE'	1, 0	long, short	short (0)	short

DIRECTED CALL PICKUP CODE	D*7

524 Configuration Sheet
Line Programmable Features

(Default settings for all lines are shown in ***BOLD ITALICS***.)

LINE KEY NO.	LINE NAME I.D. or PAGE KEY	PRIV. WHEN BUSY		MUSIC ON HOLD		ANS. USE		RING DELAY (***NO RINGING***, NO DELAY, 1-9 RINGS)	TELEPHONE NUMBERS
		OFF	ON	OFF	***ON***	OFF	***ON***		
1	local 1	X			X	X		no delay	555-1990
2	local 2	X			X		X	no delay	555-1991
3	local 3	X			X		X	no delay	555-1992
4	WATS	X			X	X		no delay	280-2339
5	Page key		X	X		X		no ring	N/A

524 Configuration Sheet
DSS Keys

DSS keys are numbered vertically on the console.

DSS KEY	STATION NUMBER	USER NAME	DSS KEY	STATION NUMBER	USER NAME
1	FD4710	John F	13	FD4737	Phillip R
2	FD4719	Bill Jones	14	FD4736	Mary S
3	FD4729	Jill K	15	FD4723	Steven E
4	FD4711	Jane W	16	FD4713	Karen G
5	FD4712	Ronnie Y	17	FD4714	Robert T
6	FD4715	Kim L	18	FD4724	Jim W
7	FD4720	Jack S	19	FD4725	Pat K
8	FD4716	William F	20	FD4726	Randy A
9	FD4717	Sarah S	21	FD4727	Kirk B
10	FD4718	Robin R	22	FD4728	Cliff M
11	FD4721	John L	23	FD4730	Paul C
12	FD4722	Bill T	24	FD4731	Norm D

Installation

Important Safety Instructions

1. Never install telephone wiring during a lightning storm.
2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
4. Use caution when installing or modifying telephone lines.

Contents of Shipping Boxes

The Tone Commander 524 system is shipped in two boxes: one for the console, and one for the central processing unit (CPU). Please compare the contents of these boxes with the lists below. Contact your distributor if any items are missing or damaged.

Console Box:

(1) console
(2) 7′ line cords
(1) handset with cord
(1) handset cradle
(2) cradle mounting screws
(1) Attendant's Guide
(1) Quick Reference Card
(1) bag of clear keycaps
(1) sheet of keycap labels

CPU Box:

(1) 524 CPU
(1) Installation Instructions
(1) mounting template
(3) cable retainers
(1) bag for storing instructions and miscellaneous items

CPU Installation

Mounting CPU and Blocks

Refer to Figure 5.

1. Fasten a plywood sheet to the wall with hardware suitable for the wall material.
2. Using the supplied mounting template, mark and pre-drill the mounting holes for the CPU.

   Make sure that the CPU mounting location is within 5 feet of a standard 117 VAC, 60 Hz grounded power outlet.

   Allow at least one foot of free space above and below the CPU for ventilation.
3. Drive in four suitable fasteners (such as #10×¾" pan head tapping screws), leaving the heads out ¼".
4. Remove the two cover screws, turn each CPU cover fastener so that the slots are horizontal, then remove the cover.

   When installation and testing are completed, replace the cover, turn each cover fastener so that the slots are vertical, then lock it in place with the cover screws to assure compliance with UL requirements. *If the cover screws need to be replaced, use 6-32×¼" pan head machine screws.*
5. Hang the CPU on the four mounting screws and tighten the screws.
6. Label each side of the split terminal blocks as shown in the Designation columns of Tables 1 and 2.
7. Mount the blocks to the plywood sheet below the CPU, using suitable fasteners.

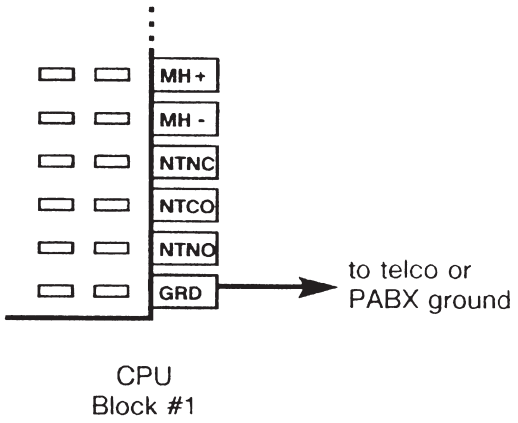
Cabling to Blocks

Refer to Figure 5.

1. Punch down the cables to the blocks as shown in the Wire Color columns of Tables 1 and 2. The cable with the male connector should be punched down to the right side of block #1.
2. Plug the 25 pair cable from block #1 into the connector on the left side of the CPU circuit board.
3. Plug the cable from the left side of block #2 into the connector on the lower right side of the CPU circuit board.
4. Plug the cable from the right side of block #2 into the connector on the upper right side of the CPU circuit board.
5. Secure the cables with the supplied cable retainers.

Reference Grounding

Reference grounding of the 524 is necessary for proper operation.



Connect telco or PABX ground to the GRD pin on the bottom right of CPU block #1.

DO NOT connect this reference ground to the CPU's metal housing!

Figure 1

CPU Chassis Grounding

This ground connection is required for safety and EMI shielding. It is usually provided by the 3rd wire on the CPU power cord. If the integrity of the power outlet ground is questionable, use the ground connection shown below for the 524 CPU.

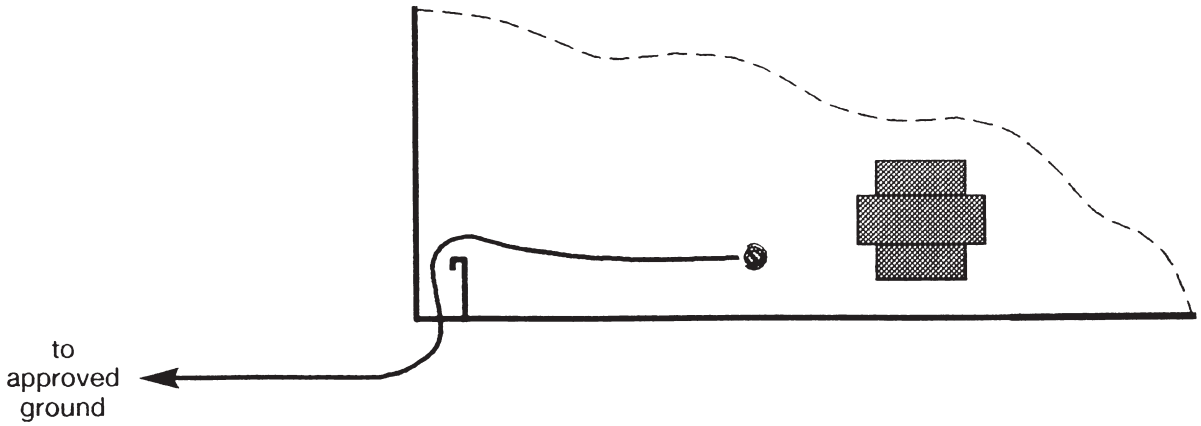


Figure 2

1. Connect a solid copper #10 or #12 AWG wire to the ground terminal on the CPU. The wire should be tightly clamped between the ground screw and the cup washer.
2. Connect the wire to an approved ground, such as MGN (multi-grounded neutral) from the power lines, building ground, a metallic cold water pipe, or a grounding rod.

Connections to Telco/PABX Lines

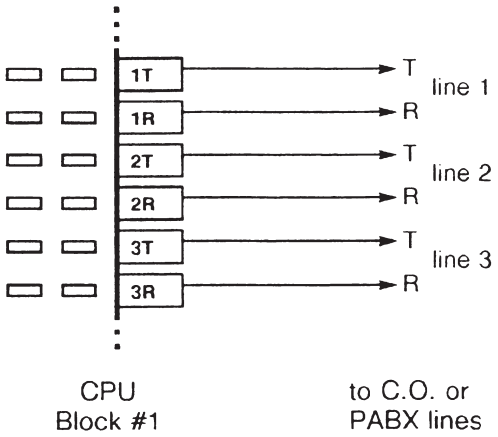


Figure 3

1. Connect Tip and Ring of each line to the associated *T* and *R* pair on the right side of CPU block #1.

   If the 524 is used with a key system, connect to the C.O. side of the line cards.

2. If this installation has stations paralleled with console lines, the stations should be connected to Tip and Ring at the telco/PABX block.

Line Testing

Connect a test telephone to each line; verify the presence of dial tone, and break dial tone by dialing a number.

The 524 allows DTMF tone dialing only – refer to the Telco/PABX Requirements section.

Test any additional features ordered with the lines. Open circuit voltage must be approximately 48 volts.

Station Connections

Station Monitoring

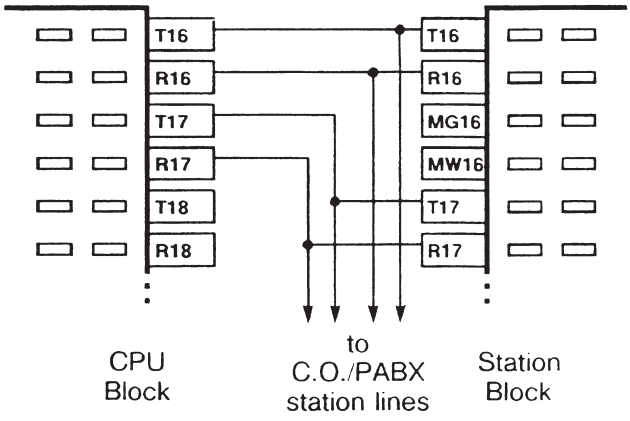


Figure 4

Connect *T* (Tip) and *R* (Ring) from each monitored station to the associated *T* and *R* pins on CPU block #2. The 524 is connected in parallel with the station lines.

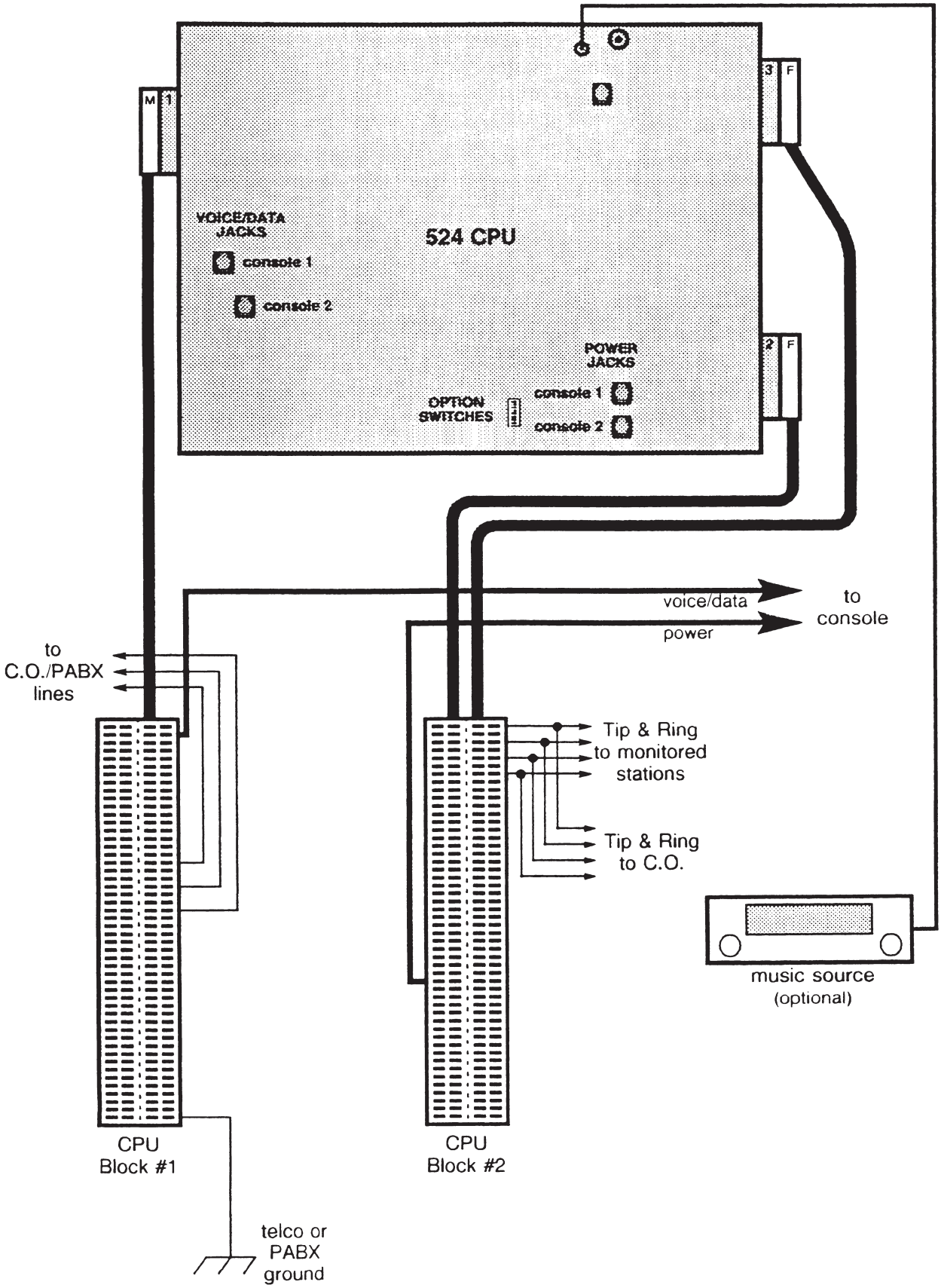

M
1
3
F
2
F
VOICE/DATA
JACKS
console 1
console 2
524 CPU
POWER
JACKS
console 1
console 2
OPTION
SWITCHES
voice/data
power
to
console
to
C.O./PABX
lines
Tip & Ring
to monitored
stations
Tip & Ring
to C.O.
music source
(optional)
CPU
Block #1
CPU
Block #2
telco or
PABX
ground

Figure 5

PIN NO.	WIRE COLOR	(left side of block unused)	CONNECTOR #1 DESIGNATION (right)	
26	WHT-BLU	–	1TN	console #1 voice/data
1	BLU-WHT	–	1RN	
27	WHT-ORN	–	1C1	
2	ORN-WHT	–	1C2	
28	WHT-GRN	–	1C3	
3	GRN-WHT	–	1C4	
29	WHT-BRN	–	2TN	console #2 voice/data
4	BRN-WHT	–	2RN	
30	WHT-SLT	–	2C1	
5	SLT-WHT	–	2C2	
31	RED-BLU	–	2C3	
6	BLU-RED	–	2C4	
32	RED-ORN	–	1T	telco/PABX lines
7	ORN-RED	–	1R	
33	RED-GRN	–	2T	
8	GRN-RED	–	2R	
34	RED-BRN	–	3T	
9	BRN-RED	–	3R	
35	RED-SLT	–	4T	
10	SLT-RED	–	4R	
36	BLK-BLU	–	5T	
11	BLU-BLK	–	5R	
37	BLK-ORN	–	–	
12	ORN-BLK	–	–	
38	BLK-GRN	–	–	
13	GRN-BLK	–	–	
39	BLK-BRN	–	–	
14	BRN-BLK	–	–	
40	BLK-SLT	–	–	
15	SLT-BLK	–	–	
41	YEL-BLU	–	–	
16	BLU-YEL	–	–	
42	YEL-ORN	–	–	
17	ORN-YEL	–	–	
43	YEL-GRN	–	–	
18	GRN-YEL	–	–	
44	YEL-BRN	–	–	
19	BRN-YEL	–	–	
45	YEL-SLT	–	–	
20	SLT-YEL	–	–	
46	VIO-BLU	–	–	
21	BLU-VIO	–	–	
47	VIO-ORN	–	–	
22	ORN-VIO	–	–	
48	VIO-GRN	–	MH+	music input
23	GRN-VIO	–	MH-	
49	VIO-BRN	–	–	
24	BRN-VIO	–	–	
50	VIO-SLT	–	–	
25	SLT-VIO	–	GRD	telco ground

Table 1
CPU Block #1 Pinout

PIN NO.	WIRE COLOR	CONNECTOR #2 DESIGNATION *(left)*	CONNECTOR #3 DESIGNATION *(right)*	
26	WHT-BLU	T1	T16	station monitor circuits
1	BLU-WHT	R1	R16	
27	WHT-ORN	T2	T17	
2	ORN-WHT	R2	R17	
28	WHT-GRN	T3	T18	
3	GRN-WHT	R3	R18	
29	WHT-BRN	T4	T19	
4	BRN-WHT	R4	R19	
30	WHT-SLT	T5	T20	
5	SLT-WHT	R5	R20	
31	RED-BLU	T6	T21	
6	BLU-RED	R6	R21	
32	RED-ORN	T7	T22	
7	ORN-RED	R7	R22	
33	RED-GRN	T8	T23	
8	GRN-RED	R8	R23	
34	RED-BRN	T9	T24	
9	BRN-RED	R9	R24	
35	RED-SLT	T10	–	
10	SLT-RED	R10	–	
36	BLK-BLU	T11	–	
11	BLU-BLK	R11	–	
37	BLK-ORN	T12	–	
12	ORN-BLK	R12	–	
38	BLK-GRN	T13	–	
13	GRN-BLK	R13	–	
39	BLK-BRN	T14	–	
14	BRN-BLK	R14	–	
40	BLK-SLT	T15	–	
15	SLT-BLK	R15	–	
41	YEL-BLU	–	–	
16	BLU-YEL	–	–	
42	YEL-ORN	1C+	–	console #1 power
17	ORN-YEL	1C-	–	
43	YEL-GRN	1C+	–	
18	GRN-YEL	1C-	–	
44	YEL-BRN	1C+	–	
19	BRN-YEL	1C-	–	
45	YEL-SLT	–	–	
20	SLT-YEL	–	–	
46	VIO-BLU	2C+	–	console #2 power
21	BLU-VIO	2C-	–	
47	VIO-ORN	2C+	–	
22	ORN-VIO	2C-	–	
48	VIO-GRN	2C+	–	
23	GRN-VIO	2C-	–	
49	VIO-BRN	–	–	
24	BRN-VIO	–	–	
50	VIO-SLT	–	–	
25	SLT-VIO	–	–	

Table 2
CPU Block #2 Pinout

Console Cable Installation

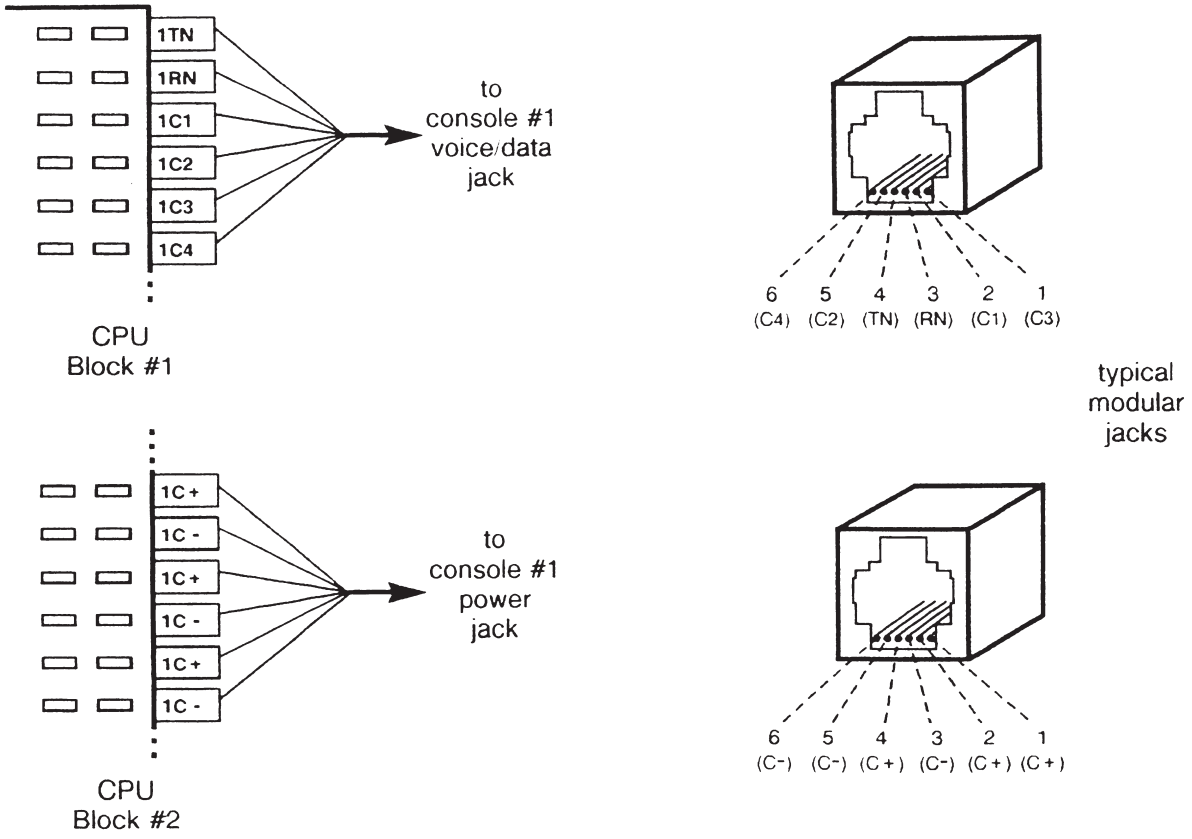


Figure 6

Wall Jack Pinout	Wall Jack Typical Wire Color	Console #1 Designation (connector 1)	Console #2 Designation (connector 1)	Typical 3 Pair Console Cable Wire Color	(actual wire color)
1	WHT	1C3 (WHT-GRN)	2C3 (RED-BLU)	WHT-GRN	
2	BLK	1C1 (WHT-ORN)	2C1 (WHT-SLT)	WHT-ORN	
3	RED	1RN (BLU-WHT)	2RN (BRN-WHT)	BLU-WHT	
4	GRN	1TN (WHT-BLU)	2TN (WHT-BRN)	WHT-BLU	
5	YEL	1C2 (ORN-WHT)	2C2 (SLT-WHT)	ORN-WHT	
6	BLU	1C4 (GRN-WHT)	2C4 (BLU-RED)	GRN-WHT	

***Table 3* – Console "Voice/Data" Jack Pinout**

Wall Jack Pinout	Wall Jack Typical Wire Color	Console #1 Designation (connector 1)	Console #2 Designation (connector 1)	Typical 3 Pair Console Cable Wire Color	(actual wire color)
1	WHT	1C+ (YEL-BRN)	2C+ (VIO-GRN)	WHT-GRN	
2	BLK	1C+ (YEL-GRN)	2C+ (VIO-ORN)	WHT-ORN	
3	RED	1C- (ORN-YEL)	2C- (BLU-VIO)	BLU-WHT	
4	GRN	1C+ (YEL-ORN)	2C+ (VIO-BLU)	WHT-BLU	
5	YEL	1C- (GRN-YEL)	2C- (ORN-VIO)	ORN-WHT	
6	BLU	1C- (BRN-YEL)	2C- (GRN-VIO)	GRN-WHT	

***Table 4* – Console "Power" Jack Pinout**

The total console cable length, including line cord and equipment room cross connects, must not exceed 500 feet.

1. Install two 6 position, 6 contact modular telephone jacks within 6 feet of the console.
2. Label the jacks "524 voice/data" and "524 power".
3. Connect a 3 pair cable to each jack and run them to the equipment room.

   IMPORTANT – Whenever nonkey adapters are used in conjunction with existing multipair cable, verify that the adapters conform to Tables 3 and 4 above.
4. *Only if the colors of your cables differ from the typical colors:* fill out Tables 3 and 4 with the actual wire colors of the cables for each connection.
5. Punch down the "voice/data" cable on the right side of CPU block #1, to the pins listed in the Console #1 Designation column in Table 3.
6. Punch down the "power" cable on the left side of CPU block #2, to the pins listed in the Console #1 Designation column in Table 4.
7. If the system has two consoles (two attendant positions), punch down the second console's cables to the pins listed in the Console #2 Designation columns of Tables 3 and 4.

Console Installation

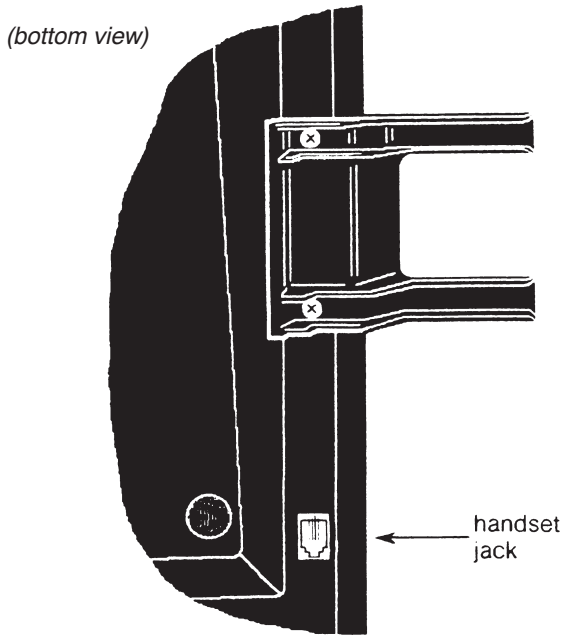


Figure 7

1. Install the handset cradle on the console using the screws provided. The cradle may be installed on either side of the console.
2. Plug the handset's cable into the jack beneath the front left edge of the console.
3. Plug one end of each supplied 6 conductor modular line cord into the "voice/data" and "power" jacks at the back of the console.

   If either line cord must be replaced, be sure to use one with 6 conductors. Many line cords with 6 position plugs have only 4 conductors.
4. Plug the cables into their associated wall jacks, or into the test jacks located on the CPU main circuit board (refer to Figure 5).

   CAUTION – ***Do not*** interchange these two cables! The cable nearest the handset jack must connect to the "voice/data" wall jack or CPU jack.
5. Fill out the keycap labels with line numbers, station names or numbers, and autodial numbers (refer to the configuration sheets). Place the labels beneath the clear plastic key caps, then snap the keycaps onto the DSS and line keys.

Preliminary Testing

At this time, you should have completed the following:

- Mounted the CPU and blocks
- Installed the cables from the CPU to the blocks
- Connected Tip and Ring from each line to the block
- Connected Tip and Ring from each monitored station to the block
- Installed the console cables and jacks
- Assembled and connected the console(s)

It is a good idea to briefly test the operation of the 524 before proceeding with installation or programming.

1. Plug the CPU into a power outlet.

   A. The "heartbeat" indicator at the bottom of the CPU main circuit board should flash.

   If no "heartbeat" is present, check that the power outlet is "live". A blown fuse on the circuit board may indicate a defective CPU.

B.The console should emit two triple beeps, then briefly display "524 OK".

If these indications are not observed, check both voice/data and power cabling.

2. Repeat step 1 at attendant position #2, if the system is so equipped.

C.O. Line Testing

Perform the following tests on each telco/PABX line. Repeat at attendant position #2, if the system is so equipped.

Line Access and Imbalance Testing

1. Press the key representing the line to be tested.

   The associated line lamp (telephone symbol) should flicker while the line is accessed.

   NOTE – Open circuit voltage must be approximately 48 volts.

2. Listen for audible hum or excessive noise.

   PASS – Such noise or hum is not present.
   FAILURE – Such noise or hum is present.

3. Listen for dial tone.

   PASS – Dial tone is heard.
   FAILURE – Dial tone is not heard.

4. Break dial tone by dialing a digit.

   PASS - Dial tone is broken and no audible hum or excessive noise is heard.
   FAILURE - Dial tone cannot be broken; audible hum or excessive noise is heard.

5. Press the RELEASE key.

IMPORTANT – Upon the detection of any failure during the foregoing testing, disconnect the affected equipment from the telephone line to determine if such equipment is the cause of failure. Any equipment determined to be malfunctioning must remain disconnected, and use discontinued until the malfunction has been corrected.

Hold and Autohold Testing

1. Access the line to be tested and establish call to another station.
2. Place the call on hold by depressing the red HOLD key.

   The associated **H i**ndicator will wink slowly.

3. Reseize the call by depressing the line key.

   The associated **H** indicator goes out.
   The line lamp flickers while the line is accessed.

4. Place the call on autohold by depressing another idle line key.

   The line accessed draws dial tone.
   The line under test goes to autohold.

5. Release the line drawing dial tone and reseize, then release the line under test.

Ring Trip and Imbalance Testing

1. Dial the number of the line to be tested from another station.

   The associated line lamp will flash slowly.

   or

   The associated line lamp will flash quickly, if the line has been optioned for ring delay.

2. Press the line key to answer the call.

   The line lamp changes from flashing to flickering.

3. Listen for audible hum or excessive noise.

   PASS – Such noise or hum is not present.
   FAILURE – Such noise or hum is present.

   IMPORTANT – Upon detection of audible hum or excessive noise, disconnect the affected equipment, to determine if such equipment is the cause of failure. Any equipment determined to be malfunctioning must remain disconnected, and use discontinued until the malfunction has been corrected.

4. Press the RELEASE key.

CPU Option Switches

Switches on the CPU control system programming options. The switches are ON when set towards the right side of the CPU. When a programming option is "locked", programming changes are not allowed. The switch location is shown in the figure below and on page 16.

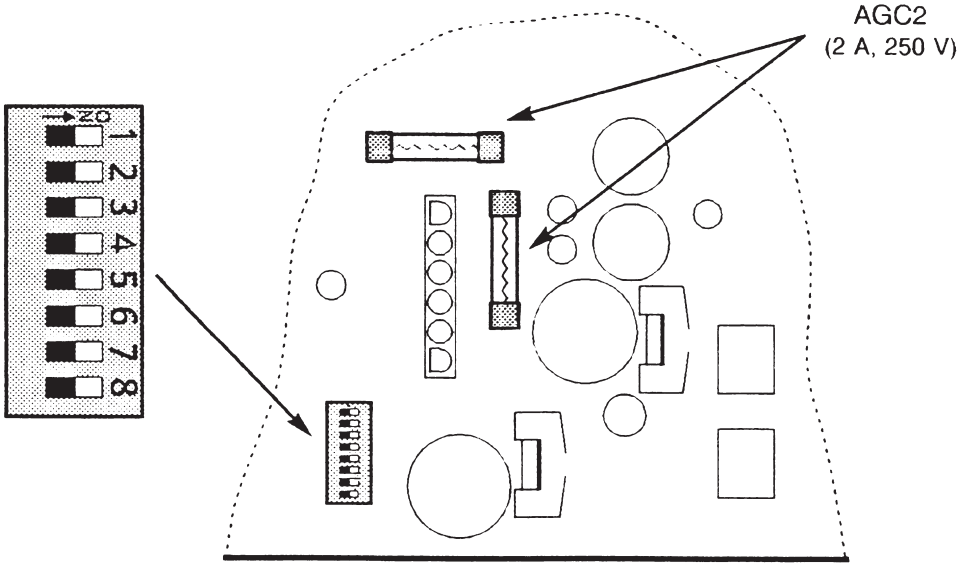


Figure 8 **– CPU Option Switches and Fuses**

SWITCH	FUNCTION
1	OFF – Autodial Program unlocked ON – Autodial Program locked
2	OFF – Configuration Program unlocked ON – Configuration Program locked
3	OFF – Name Program unlocked ON – Name Program locked
4	*not used*
5	*must be OFF!*
6, 7	*not used*
8	OFF – retain new programming ON – restore defaults (when power is cycled off & on)

Table 5 – CPU Option Switches

Optional Equipment Installation

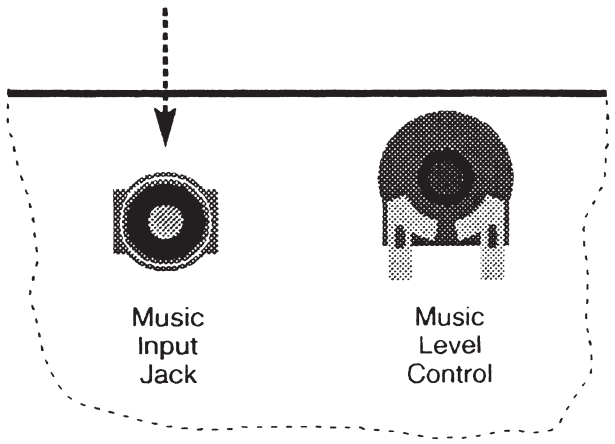
The following options require system programming for proper operation. Refer to the Configuration Programming section.

Music On Hold

An external music source is required for Music On Hold. It will be assigned to the lines during configuration programming. The music input may be connected to any type of compatible music source (refer to the Specifications section).

The music source can be connected to the jack provided on the CPU, or punched down to the block.

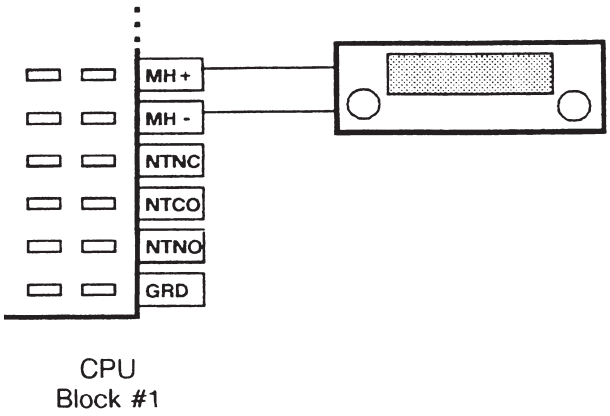
Jack Connections



1. Connect an RCA-type phono plug to one end of a single conductor shielded cable, or obtain a cable with a plug attached. The center conductor connects to the pin of the plug.
2. Plug the cable into the music input jack at the top of the CPU.
3. Connect the other end of the cable to the output of the music source. A plug to fit the music source may be required.

Figure 9

Block Connections



1. Connect a twisted wire pair to *MH+* and *MH-* on the right side of CPU block #1.
2. Connect the other end of the wire pair to the output of the music source. A plug to fit the music source may be required.

Figure 10

Paging

Tone Commander's PA-24 Paging/Chime module interfaces the 524 console to a paging system. The module includes a night ringing chime, and switching for background music control. Power is derived from the 524 CPU.

Paging can be connected to any spare line key on the 524. Refer to the PA-24 Paging/Chime Module Installation Instructions, doc. #13-102595.

Configuration Programming

Various network interface and operation parameters are programmable by the installer, allowing compatibility with a wide variety of central offices and PABXs. The system is pre-programmed at the factory; many installations will require few changes to these values. Programming is retained in the CPU's memory when power is disconnected.

Systems with two attendant positions require programming at both consoles for recall rings and line privacy.

The programming procedures for ring delays, the time of day clock, autodial numbers, and station names are described in their respective sections.

The following features may be set from configuration programming mode by pressing the appropriate DSS key. The letters are printed on the console front panel beneath the DSS keys. Key numbers in parentheses represent the station ports assigned to the keys.

System Programmable Features

DSS Key	Feature
A (1)	Abandoned Ring Time
B (5)	Recall Rings
C (9)	Pickup Code Sequence
D (13)	Dialing Speed
E (17)	Pause Time
F (21)	Hookflash Time
G (2)	Dial Tone Detect Time
H (6)	Hold Recall Time
I (10)	Hold Release Time
* K (18)	Queue Priority
L (22)	Alert Type
* M (3)	Ringing Type
R (23)	Assign Page Key

Line Programmable Features

* O (11)	Line Privacy
* P (15)	Answer Use
Q (19)	Assign Music On Hold to lines

* Features marked with an asterisk have separate settings for each console position in a two-position system. They must be programmed individually at each console.

Using Configuration Programming Mode

The configuration programming mode must be entered prior to attempting any of the following programming procedures. *Enter this mode only when the console is idle, i.e., no calls are in progress or on hold and the time of day is displayed*.

The Configuration Program Lock Switch (switch #2) inside the CPU must be OFF *(unlocked) before proceeding (see page 23).*

To **enter** configuration programming mode:

- Press HOLD.
- Press TRANSFER.
- Press RELEASE.
- Press dial pad key **C** (2).

  The display will indicate that configuration programming mode has been entered.

To **exit** configuration programming mode and store all programming:

- Press RELEASE.

  or

  The mode will be exited automatically 1 minute after the last keypress.

When completed, set the Configuration Program Lock Switch inside the CPU to ON *(locked) to prevent inadvertent changes to the programmed settings.*

DSS keys on the console are used to select the feature to be programmed – letters identifying the keys are printed beneath the keys on the console's front panel.

Default Settings

The default settings, as shipped from the factory, are listed with each feature on the following pages.

Default settings may be recalled by setting CPU option switch #8 to *ON*, then cycling the CPU power off and on (pull out the power plug for a few seconds). ***Set this switch back to OFF to prevent losing your programming during a power outage***.

The switch location is shown on page 23.

Confirmation and Error Tones

The speaker in the console signals correct or incorrect actions during programming. The console's volume control adjusts the level of the tones – use the VOL keys above the dial pad.

Confirmation Tone – double beep Error Tone – single beep

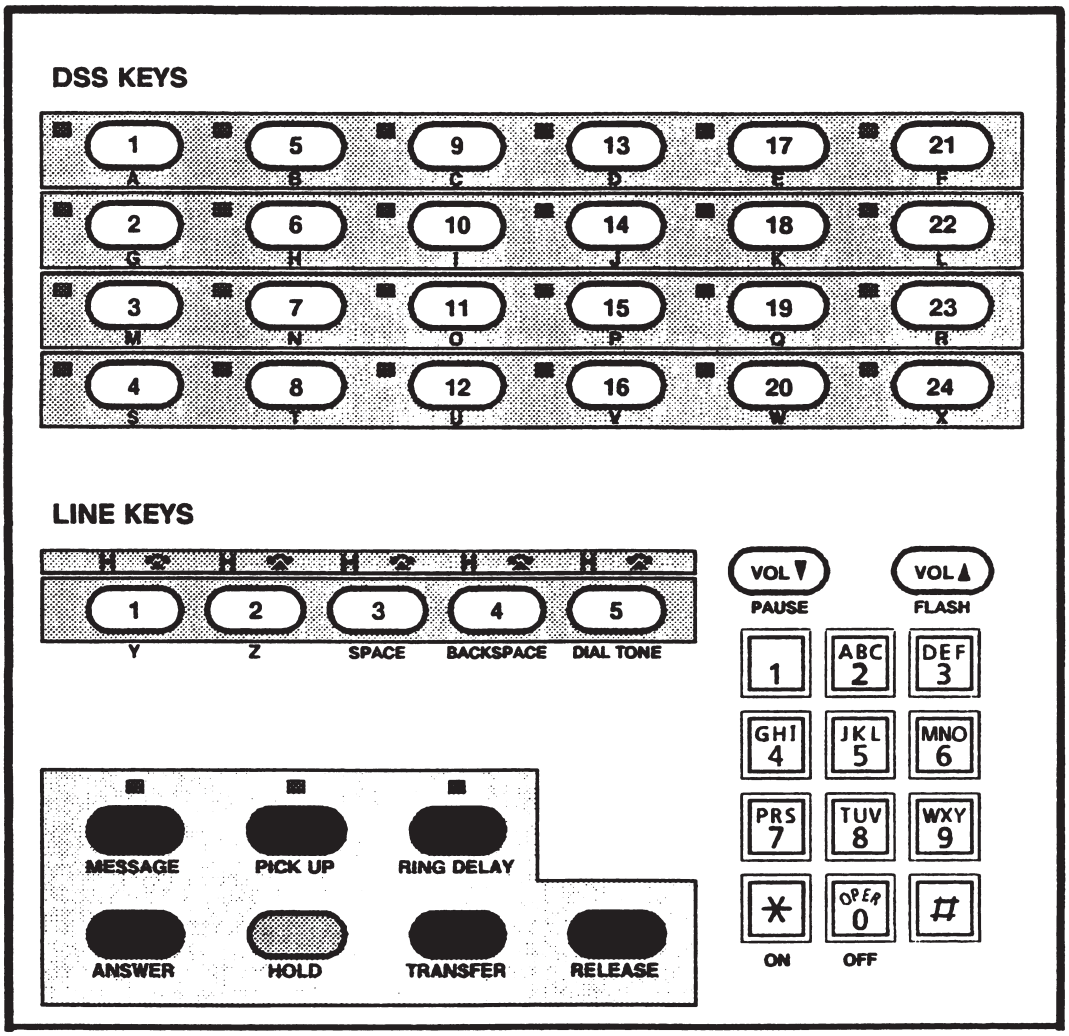


Figure 11 – 524 Console Keys

Programming System-Wide Features

Timing Parameters

- Press HOLD, then TRANSFER, then RELEASE, then **C** (2) on the dial pad to enter configuration programming mode.

  "*CONFIGURE PROG*" *will be displayed.*

- Press a DSS key to select the feature to be programmed.

  The display will show the item name and the current value.
  The station status lamp will light steadily.

- Press a key on the dial pad if you want to change the value.

  The new value will be shown in the display.

- Press a DSS key to select another feature.

  or

  Press RELEASE to exit configuration programming mode (the mode will be exited automatically 1 minute after the last keypress).

NOTE – Systems with two consoles (two attendant positions) have separate Queue Priority and Ringing Type settings for each console. They must be programmed individually at each console position.

For example, to set Hold Recall Time to 50 seconds:

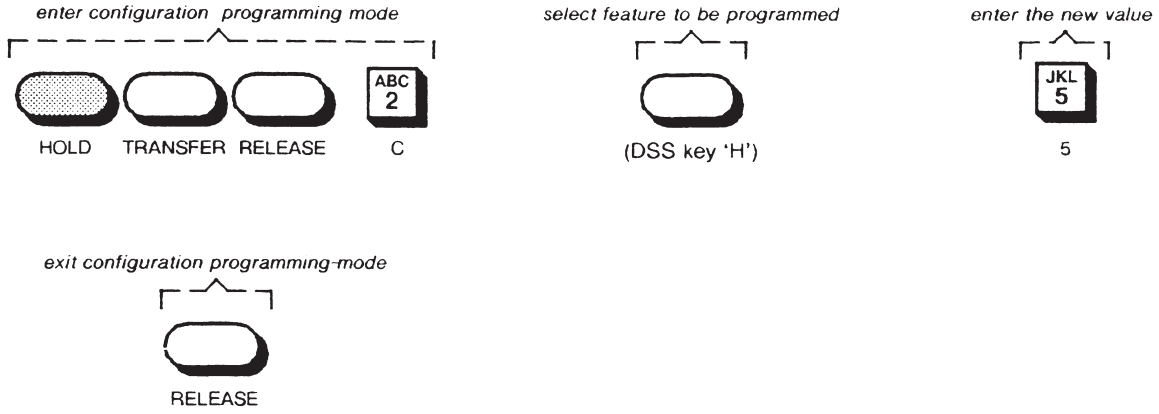


Figure 12

Timing values listed in the following tables are nominal, and may differ slightly from the actual values. Shaded values are factory defaults.

Abandoned Ring Time

Dial Pad Key	Available Values
2	2 sec
3	3 sec
4	4 sec
5	5 sec
6	6 sec
7	7 sec
8	8 sec
9	9 sec
0	10 sec

Table 6

DSS key to select feature: ***A***

Default value: ***5 sec***

This parameter determines the timing for discontinuing ringing of unanswered incoming calls that were abandoned by the caller. It should be set to the next time value longer than the silent interval between ringing bursts.

if too short – each ring burst may be seen as a new call. This can cause erratic line lamp rates and loss of ringing delays.

if too long – abandoned calls will continue to ring for the duration of this timing value.

Recall Rings

Dial Pad Key	Available Values
1	1 ring
2	2 rings
3	3 rings
4	4 rings
5	5 rings
6	6 rings
7	7 rings
8	8 rings
9	9 rings
0	no recall

Table 7

DSS key to select feature: ***B***

Default value: ***3 rings***

This sets the number of rings before a call transferred to an idle station recalls the console.

Set this parameter according to customer preference.

Pickup Code Sequence

Dial Pad Key	Available Values
0	first (before station #)
1	last (after station #)

Table 8

DSS key to select feature: ***C***

Default value: ***first***

This parameter determines when the console inserts the Directed Call Pickup code during a station call pickup dialing sequence, as required by the telephone system.

Almost all installations require the pickup code to be *first*.

Dialing Speed

Dial Pad Key	Available Values
6	slow (6 digits/sec)
0	fast (10 digits/sec)

Table 9

DSS key to select feature: ***D***

Default value: ***fast***

The tone autodialing speed (via DSS key) is set with this parameter.

Use the dialing speed compatible with the central office or PABX. If misdialing occurs with the fast speed, switch to slow speed.

Manual dialing speed is also affected. When *fast* speed is selected, manually dialed digits follow dial pad keystrokes. With *slow* speed selected, digits are buffered and sent with a tone on period of 80 ms, and 80 ms between digits. This guarantees minimum tone periods for slow central offices.

Pause Time

Dial Pad Key	Available Values
2	200 ms
3	300 ms
4	400 ms
5	500 ms
6	600 ms
7	700 ms
8	800 ms
9	900 ms

Table 10

DSS key to select feature: ***E***

Default value: ***700 ms***

This sets the length of a "pause" in an autodial sequence.

Pauses are typically used to insert a delay in a dialing string when calling voice mail or similar equipment. Change this parameter if a delay other than a multiple of 700 ms is required.

For example, for a dialing delay of 2 seconds, set the pause time to 500 ms and insert 4 pauses in the autodial sequence.

Hookflash Time

Dial Pad Key	Available Values
5	500 ms
6	600 ms
7	700 ms
8	800 ms
9	900 ms
0	1 sec

Table 11

DSS key to select feature: ***F***

Default value: ***600 ms***

This parameter sets the length of a timed hookflash generated during call transfer and autodial operations. The default value is adequate for most systems.

if too short – receipt of second dial tone may be intermittent during call transfer operations.

if too long – the calling party may be disconnected during call transfer operations.

Dial Tone Detect Time

Dial Pad Key	Available Values
1	500 ms
2	600 ms
3	700 ms
4	1 sec
5	1.2 sec
6	1.5 sec
7	1.8 sec
8	2 sec

Table 12

DSS key to select feature: ***G***

Default value: ***700 ms***

This sets the time steady dial tone must be present before station digits are autodialed.

Set this parameter to the lowest value that gives reliable dial tone detection.

Hold Recall Time

Dial Pad Key	Available Values
3	30 sec
4	40 sec
5	50 sec
6	60 sec
9	90 sec
1	2 min
2	3 min
0	no recall

Table 13

DSS key to select feature: ***H***

Default value: ***90 sec***

Calls on console hold longer than the Hold Recall Time will recall the console.

Set this parameter according to customer preference.

NOTE – Calls on hold at the telephone system (initiated by a hookflash) will not recall the console.

Hold Release Time

Dial Pad Key	Available Values
1	40 ms
2	80 ms
3	200 ms
4	400 ms
5	600 ms
6	800 ms
7	1 sec
8	2 sec

Table 14

DSS key to select feature: ***I***

Default value: ***600 ms***

A central office disconnect supervision signal (i.e., brief battery removal) on any line must exceed this value. When such a signal from a line on hold is detected, the line will be automatically released.

Set this parameter to a value slightly less than the length of a disconnect signal from the central office.

if too short – may cause calls on hold to be inadvertently disconnected.

if too long – may cause abandoned calls and retrieved parked calls to remain connected to the console.

Queue Priority

Dial Pad Key	Available Values
1	stations only
2	stations, then lines
3	lines, then stations
4	FIFO

Table 15

DSS key to select feature: ***K*** *(per console)*

Default value: ***FIFO***

Calls are queued for attendant processing in the order received. The first call in queue is shown in the display.

Queue Priority determines which type of calls have priority in the queue:

(1) stations only
(2) lines+stations, stations have priority
(3) lines+stations, lines have priority
(4) lines+stations, first calls have priority (FIFO, First In - First Out)

Set this parameter according to customer preference. *FIFO* is recommended for most installations.

NOTE – The call queue is cleared whenever Queue Priority is changed.

Alert Type

Dial Pad Key	Available Values
1	normal ringing
2	distinctive ringing
0	both

Table 16

DSS key to select feature: ***L***

Default value: ***both***

To ignore station-to-station calls, equip the station lines with distinctive ringing from the C.O. Set the Alert Type to *distinctive* if distinctive ringing is provided for outside calls, or to *normal* if distinctive ringing is provided for station-to-station calls.

Ringing Type

Dial Pad Key	Available Values
1	long
0	short

Table 17

DSS key to select feature: ***M*** *(per console)*

Default value: ***short***

This parameter determines the type of audible ringing: short (1 beep), or long (3 beeps), when unanswered station calls are showing in the display.

Set this parameter according to customer preference.

Special Feature Key Assignment

Spare line keys may be programmed to activate special features. Such usage precludes the connection of lines to these positions. Be sure to identify the keys with the supplied key cap labels.

- Press HOLD, then TRANSFER, then RELEASE, then **C** (2) on the dial pad to enter configuration programming mode.

  "*CONFIGURE PROG*" *will be displayed.*

- Press the DSS key to select the feature to be programmed:

  R – Page key

- Press dial pad key * to display the key that is set to activate the desired feature.

  The line lamp (phone symbol) above a line key will be on if the key has the feature assigned to it.

- Press the line key that will be assigned the feature.

  The line lamp above the selected key will light steadily. Any feature assignment for the key will be overwritten.

  The previously assigned key will be cleared (reassigned as a standard line key); its line lamp will turn off.

  or

  Press the currently assigned key to clear its programming and reassign it as a standard line key, if no keys are to be assigned the selected feature.

  The line lamp above the selected key will turn off.

  NOTE – Perform a line test (at both consoles, if applicable) if a key has been reassigned as a standard line key – refer to the Preliminary Testing section in this document.

- Press dial pad key **0** to store the new setting and return to feature selection.

- Press a DSS key to select another feature.

  or

  Press RELEASE to exit configuration programming mode (the mode will be exited automatically 1 minute after last keypress).

Programming Features Selectable Per Line

The following programmable features do not apply to line keys that have been programmed for Page.

- Press HOLD, then TRANSFER, then RELEASE, then **C** (2) on the dial pad to enter configuration programming mode.

  "*CONFIGURE PROG*" *will be displayed.*

- Press a DSS key to select the feature to be programmed.

  The display will show the item name.
  The station status lamp will light steadily.

- Press the line key to be programmed with the selected feature.

  The display will show the line number and the current value (OFF or ON).
  The line lamp (phone symbol) will light steadily.

- Press **ON** (*) or **OFF** (0) on the dial pad if you want to change the value.

  The new value will be shown in the display.

- Press another line key to be programmed with the selected feature.

  or

  Press RELEASE to exit configuration programming mode (the mode will be exited automatically 1 minute after last keypress).

NOTE – Systems with two consoles (two attendant positions) have separate Line Privacy and Answer Use settings for each console. They must be programmed individually at each console position.

Line Privacy

DSS key to select feature: ***O*** *(per console)*

Default Value for each line: ***off***

A line with the privacy option on cannot be accessed by the console when its line lamp indicates a "busy" condition.

Answer Use

DSS key to select feature: ***P*** *(per console)*

Default Value for each line: ***off***

Idle lines in this group will automatically be seized in descending order whenever the ANSWER key is used to pick up station calls.

CAUTION – Lines assigned to this group ***must*** be optioned for Directed Call Pickup, NonBarge-In.

Dedicated nonhunting lines are recommended for this usage. If this is not feasible, assign only the last line in a terminal hunt group.

Music On Hold

DSS key to select feature: ***Q***

Default Value for each line: ***on***

This selects whether the external music source will be connected to a line that is on hold at the console (hard hold, not Centrex hold).

DSS/Autodial Number Programming

Each DSS key may be programmed to autodial up to 24 digits or functions, including 0-9, *, #, dial tone detect, a hookflash (transfer signal), and a pause. The PICK UP key autodials the call pickup code; it must be also programmed with the required digits.

Digits are entered with the dial pad. The VOL keys and DSS key #5 are used to enter the pause, flash, and dial tone detect functions – these functions are printed below the keys on the console front panel.

DIAL TONE delays dialing until steady dial tone is present. *If the telephone system does not send dial tone after receiving a flash, use two PAUSEs in place of DIAL TONE detect*.

FLASH is used to transfer calls or access special features of the telephone system.

PAUSE is used if a delay is required during dialing, for example to access a voice mailbox.

Pause, flash, and dial tone detect times can be changed from the 524 configuration programming mode.

IMPORTANT – The first entry of a dialing routine for any key to be used for DSS operation ***must*** be a FLASH (F). This entry will determine whether associated features with DSS operation will apply (Station Recall or Ring Delays).

Example: *FD4710*

Dialing routines, where the first entry is ***not*** a FLASH, will operate as Autodialing keys.

Example: *D9D5551982*

Programming Procedure

Set the Autodial Program Lock Switch (switch #1) inside the CPU to OFF *(unlocked) before proceeding – see page 23.*

- Press HOLD, then TRANSFER, then RELEASE, then **P** (7) on the dial pad to enter autodial programming mode.

  "*PROGRAM AUTODIAL*" *will be displayed.*

- Press the DSS key to be programmed.

  The station status lamp will light.
  The display will show the number currently programmed, or "*NOT PROGRAMMED*"*.*

- If you do not wish to change the currently programmed number, press HOLD, then select another DSS key.

- Using the dial pad and the PAUSE, FLASH, and DIAL TONE keys, enter the sequence to be dialed.

  The display will show the number being entered.

- Press HOLD to store the number, then select another DSS key to be programmed.

  or

  Press RELEASE to store the number and exit autodial programming mode (the mode will be exited automatically 1 minute after the last keypress, *without* storing the number).

When completed, set the Autodial Program Lock Switch inside the CPU to ON *(locked) to prevent inadvertent changes to autodial programming.*

NOTE – Systems with two consoles (two attendant positions) have a single set of DSS/autodial numbers shared by both consoles. The numbers may be programmed at either console.

For example, to program a DSS key to dial a hookflash, wait for dial tone, then dial station **5314**:

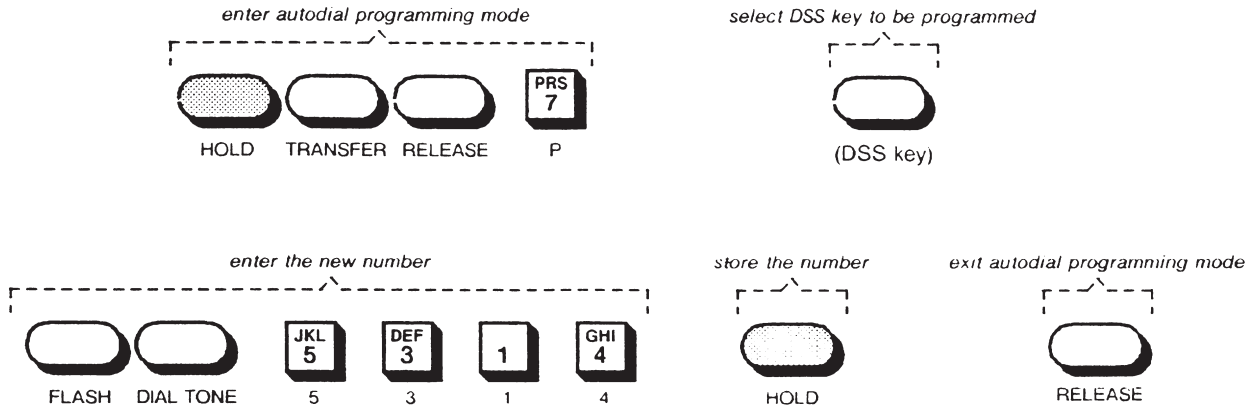


Figure 13

Pick Up Key Programming

The PICK UP key programming procedure is similar to that for DSS keys. Press PICK UP instead of selecting a DSS key, then proceed as illustrated below. Consult the telco for the required pickup code.

IMPORTANT – A DIAL TONE detect must be entered before the Directed Call Pickup code to ensure that steady dial tone is received before dialing begins. This may not apply to the few telephone systems which require the Directed Call Pickup code to be dialed *after* the station number. ***DO NOT precede the pickup code with a FLASH***.

For example, to program the PICK UP key with the code ∗**7**:

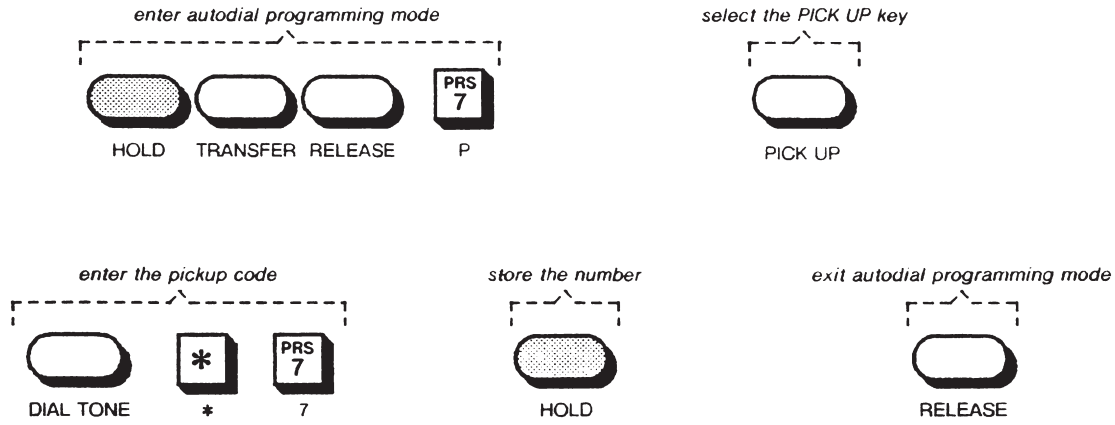


Figure 14

Name Display Programming

Any DSS/Autodial key to be programmed with a name display must already be programmed for autodialing; autodial programming may be changed without reprogramming the DSS name display. This restriction does not apply to line keys, since they cannot be programmed for autodialing.

Set the Name Program Lock Switch (switch #3) inside the CPU to OFF *(unlocked) before proceeding – see page 23.*

- Press HOLD, then TRANSFER, then RELEASE, then **N** (6) on the dial pad to enter name programming mode.

  "*NAME ASSIGN*" *will be displayed, followed by a help display.*

- Press the DSS or line key to be programmed.

  The lamp next to the selected key will light steadily.
  The name will be displayed if the selected key is currently programmed. Press CLEAR to allow reprogramming, or use BACKSPACE to edit the currently programmed name.

- If you do not wish to change the currently programmed name, press HOLD, then select another DSS or line key.
- Enter the name using the DSS and line keys. Letters are printed on the console front panel beneath the keys. Do not exceed 14 characters, including spaces. BKSPACE will delete the last character entered.
- Press HOLD to store the new name.
- Select another DSS or line key to be programmed.

  or

  Press RELEASE to exit name identification programming mode (the mode will be exited automatically 1 minute after the last keypress).

When completed, set the Name Program Lock Switch inside the CPU to ON *(locked) to prevent inadvertent changes to name programming.*

NOTE – Systems with two attendant console positions have a single set of DSS/autodial name displays shared by both positions. The names may be programmed at either console position.

For example, to program the name "Smith" to be displayed when station #4 is ringing:

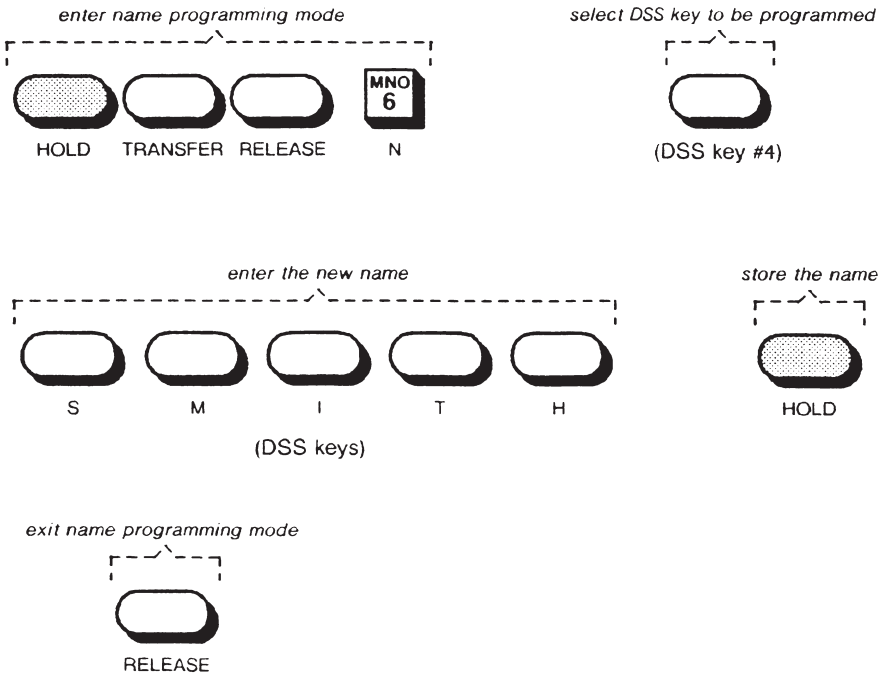


Figure 15

Ring Delay Programming

Checking Ring Delays

- Press RING DELAY twice.

  The lamp above the key will flash, and "RING DELAY CHECK" will be displayed.

- Press the DSS or line keys to be checked.

  The display will show the ring delay setting for each DSS or line key pressed.

- To exit ring delay check mode, press RING DELAY again (the mode will be exited automatically 5 seconds after the last keypress).

Setting Ring Delays

Dial Pad Key	Available Values
1	1 ring
2	2 rings
3	3 rings *stations default*
4	4 rings
5	5 rings
6	6 rings
7	7 rings
8	8 rings
9	9 rings
0	no delay (off) *lines default*
*	no ringing (on)

Table 18

- Press RING DELAY once.

  The lamp above the key will light steadily, and "RING DELAY PROG" will be displayed.

- Using the dial pad, enter the number of rings to delay before ringing at the console begins (**1**-**9** rings, **0** for no delay, or * for no ringing at the console).

  The display will show the selected ring delay value.

  NOTE – The ring delay setting does not affect station ringing, only the delay before the console starts ringing in addition to the station.

- Press the DSS or line keys to be set to the chosen ring delay value.

  To set all stations (not lines) to the same value, press # on the dial pad instead of a DSS key.

  The display will show the number of each DSS or line key that is pressed (or "ALL DELAY" if # is pressed), and the ring delay value.

- To exit ring delay set mode, press RING DELAY again (the mode will be exited automatically 5 seconds after the last keypress).

NOTE – Systems with two consoles (two attendant positions) have separate Ring Delay settings for each console. They must be programmed individually at each console.

Time of Day Clock

The 12-hour time of day clock may be set at either console in a two-position system. The setting affects both consoles.

- When the console is idle, press HOLD, then TRANSFER, then RELEASE, then **T** (8) on the dial pad.

  "*SET TIME*" *and the current time will be displayed.*

- Press RELEASE now if you do not wish to change the time setting.

- Enter the time using the dial pad (hour values less than 10 must be preceded by a "0" digit). For example, to set the time to 9:38, enter **0 9 3 8**.

  The display will show the time entered.

- The time set mode will be exited automatically after the new time setting is entered.

System Description

Consoles

The 524consoles house a 20-character fluorescent display, line status indicators, line and call processing keys, a common audible transducer, an electronic voice network, and a microcomputer to control their operation. The factory-provided hearing aid compatible handset utilizes an electret (carbon clone) element.

Tone Commander consoles are designed to provide superior operating capabilities in any working environment.

- The vacuum fluorescent display is adjustable, can be seen from almost any angle, and is immune to overhead lighting glare. This allows displayed information to be viewed from greater distances than with nonfluorescent versions.
- Whenever possible, call processing routines are accomplished with single keystrokes.
- Multiple indicators are used to improve status recognition.

Following is a description of the keys, indicators, and connectors on the console:

- **Display** – 20 character alphanumeric display gives information about calls ringing at the console, and is used during console programming. A time of day clock is displayed when the console is idle.
- **Line Keys** – when a line key is pressed, the console network is connected to the selected line. If a second line key is pressed, the first line is automatically put on hold and the second line is accessed (Auto Hold). Spare line keys may be used to access paging systems.
- **Hold Lamps (H** symbol) – indicate hold and hold recall states of the lines.
- **Line Lamps** (telephone symbol) – indicate busy and ringing states of the lines.
- **DSS Keys** – when the console is in normal mode, the 24 DSS keys automatically dial programmable sequences when pressed. These keys are also used during programming to enter name displays. They are normally used to autodial the station associated with the key.
- **Station Status Lamps** – indicate busy and ringing states for the stations.
- **HOLD Key** – when the console is on an active line and the hold key is pressed, a hold bridge is placed across the selected line and the console network is released from the connection.
- **TRANSFER Key** – when the transfer key is pressed, a hookflash (momentary open loop) is generated on the selected line. This allows the attendant to transfer calls or access special features of the telephone system.
- **RELEASE Key** – when the console is on a line and the release key is pressed, the console network is released from the connection, the line becomes idle, and its lamp will turn off.
- **ANSWER Ke**y – automatically seizes a call appearing in the alphanumeric display.
- **RING DELAY Key** – used to enter/exit ring delay check mode or ring delay programming mode.
- **PICK UP Key** – used to answer a ringing station not appearing in the alphanumeric display.
- **VOL Keys** – used to adjust the console ringer volume.
- **Dial Pad** – generates DTMF signaling on a selected line. Dial pad keys are also used to enter console programming values.

Attendant Console Cabling

Three pair, #24 gauge, twisted cable is required. The two cable runs should not exceed 500 feet each. One pair on the voice/data cable is analog voice. The two remaining pairs transmit proprietary protocol at 1200 baud using the RS-422 standard.

The second cable uses all three pairs to provide power to the console.

Central Processing Unit (CPU)

The Central Processing Unit is a wall mounted device which contains the power supply, microprocessor-based control logic, 5 line circuits, 24 station circuits, dial tone detect circuits, two console data link circuits, two DTMF dialer circuits, and a Music On Hold input circuit. System memory is retained during power failure.

External connections to the Central Processing Unit are made by using 50 pin Amphenol connectors. Music on hold may be optionally connected to an RCA-type audio jack on the CPU. Modular console jacks on the main circuit board are provided for testing and programming.

System Features

Dual Console Capability

The CPU can support two console positions. Line and station appearances are identical at each console (square line configuration). Holding status is indicated at both console positions. Special line key options (paging access) appear at both console positions when programmed. Certain operating features such as Queue Priority, Ringing Type, Line Privacy, and Answer Use may be programmed on per console basis.

Skinny Wire Console Connection

Six pair cabling is required between each console and the CPU. Three pair are used for data and voice, and three pair are used for power. Two 6 conductor modular jacks are located at the rear of the console, one for voice/data and one for power.

Installer/User Programmability

Both installer and user can program the system from the front panel of the console. The installer programs system configuration options, line programmable features, and special feature key assignments. The user can program customized features such as ring delays, Direct Station Selection (DSS) dialing, autodialing numbers, line/station name identification, Hold Recall Time, Queue Priority, etc.

Ringing Queue

Calls to be answered by a console are placed in queue. The nature of the queue (i.e. station calls only, stations before lines, lines before station, or first in-first out "FIFO") is selectable on a per console basis.

Distinctive Ringing Detection

Used in conjunction with the Distinctive Ringing capability provided by the serving Centrex C.O. or PABX, unanswered station calls can be displayed alphanumerically or ignored, depending on the type of ringing.

Paging Interface

The Tone Commander PA-24 Paging/Chime Module or an equivalent external, battery-feed paging adapter can be connected to any line key programmed as a Page key. When this is done, the selected line position will be conditioned to operate with either 48 VDC or 24 VDC battery feed circuits, the latter being typical of most paging adapters. The PA-24 can be powered directly from the 524 CPU.

Music On Hold Interface

Each line can be set to provide audio programming while in a holding state. Access is via block terminals or phono jack. An input gain control is provided to adjust programming to the desired level.

Console Test Jacks

Six pin modular jacks for both voice/data and power are provided for two console positions. These jacks are intended to provide a quick means to verify console-to-CPU operating integrity.

Console Features

Distinctive Audible Signaling

The system recognizes normal or distinctive ringing from the serving central office/PABX and responds with differentiated audible signaling. The console also signals the attendant when held lines are recalling, calls to stations have gone unanswered for a predetermined period of time, confirming programming entries/storage, or when errors have been made involving operation or programming. Incoming call audible signaling is abbreviated whenever the attendant is active on a line.

Ring Delay

Each line and station appearing on a console can be individually programmed to ring at the console immediately, after a predetermined number of ringing cycles, or never ring at the console. The Ring Delay feature does not affect ringing at the station.

Alphanumeric Display

Calls to be answered are displayed with a three character prefix which indicates the nature of the call (i.e. INC, RCL, HLD, CMP, etc.), followed by the line or station number, then the number of calls in queue. Line or station numbers can be replaced with 14 character names as desired. The display is also used to view programming options and confirm all entries.

Single-key Answering

Calls to lines or stations that are to be answered by the attendant are alphanumerically displayed according to the selected ringing queue. Depressing the Answer key seizes the call displayed.

Dial Pad DTMF Dialing

The 524 console is equipped with a standard 12 button dial pad. The various tones will persist as long as the desired key is pressed if *fast* dialing speed (10 digits/sec.) has been selected during configuration programming. If *slow* speed (6 digits/sec.) has been selected, digits are buffered and sent with a tone on period of 80 ms, and 80ms between digits to guarantee minimum tone periods for slow central offices.

Time of Day

The alphanumeric display shows the time of day whenever the console is idle.

Variable Ringer Volume

VOL▼ and VOL▲ keys are provided on the face of the console to adjust the level of the audible ringer in accordance with the operating environment. A bar graph display is provided for referencing.

Handset Jack Connection

A four pin modular jack is located on the left side of the console.

Handset

A K-type, hearing aid compatible handset with electret transmitter is provided with the console.

Direct Line Access

Each line is accessible via a dedicated key for answering, holding, transferring and originating calls.

I-Use Indication

A fluttering line status lamp identifies the particular line to which the handset or headset is connected.

Line Privacy

Individual lines may be programmed to exclude third party access to ongoing calls by the attendant.

Line Hold

Each line can be placed in a "Hard Hold" condition at the console. Music on Hold, if optioned and a source provided, is connected to the line. A line on "Hard Hold" can be released from the console when bridged by either a telephone set or another console. A valid loop interruption from the central office will also release the line.

Line Hold Indication

A flashing Line Hold lamp **H** indicates a line placed on hold by the attendant. A steady **H** indication identifies a line placed on hold at the companion console.

Automatic Line Hold

Active lines may automatically be placed on "Hard Hold" by either depressing another line key or the Answer key while a call is being displayed.

Hold Recall

A call placed on Hold for longer than a predetermined time period is identified with a unique audible ringing. The **H** indication for the affected line is also unique.

Line Transfer

Calls originating or answered at the console can be placed in a "Soft Hold" or Consultation Hold condition at the serving Centrex Central Office/PABX by "hookflashing" (pressing the transfer key), then dialing the desired station number.

Page Key (optional)

Any line key can be programmed to be a Page key. When this is done, the selected key position is automatically assigned line privacy, answer use exclusion, and automatic line hold exclusion.

Pressing the Page key places the currently selected line on hold and connects the attendant to the paging system.

Autodialing

Any spare DSS key can be used for autodialing while on an active line.

Busy Lamp Field (BLF)

Each station connected to the "console system" has a dedicated lamp that indicates its status (i.e. idle, off-hook, or ringing).

Direct Station Selection (DSS)

DSS keys provide quick and efficient transfer of all calls. Each key position must be programmed with the appropriate dialing instructions - typically a Flash, Dial Tone Detect, then the station digits. *The DSS feature is available only for stations that are monitored by the 524.*

Station Recalls

Calls transferred by a DSS key to idle stations which go unanswered for a predetermined period, re-ring and are displayed at the console.

Station Call Pickup

Unanswered calls that are indicated in the busy lamp field but not in the alphanumeric display can be answered at any time by depressing the Pickup key, then the desired DSS key.

Telco/PABX Requirements

Certain signaling protocols and features of the telco/PABX host are required for proper operation.

Required System Configuration

The C.O. and station lines must originate from either the same Centrex Common Block or the same PABX tenant partition.

Required Signaling Protocols

1. **-42.5 to -56.5 VDC C.O. battery**
2. **40 to 130 Vrms @ 20 or 30 Hz Ring Generator**
3. **Loop start**
4. **Disconnect Supervision for Abandoned Calls**

The central office opens Tip and Ring (removes the source of DC voltage) for a brief interval whenever the calling party disconnects prior to the called party. This protocol is required to support automatic hold release.

Required Attendant Line Features

1. **Touch Tone Dialing** – all manual or auto dialing from the 524 console is DTMF.
2. **Station Call Transfer** – to use the Transfer key or the programmable FLASH command while autodialing to transfer incoming calls. Typically, inbound calls are transferred by "hookflashing", receiving new dial tone, then dialing the desired station. In most instances call transferring is limited to stations within the same PABX or Centrex Common Block.

CAUTION – In some host systems, hookflashing automatically transfers inbound calls to a proprietary attendant position. This feature is often referred to as Call Transfer-Attendant and is not compatible with Tone Commander console operation.

3. **Directed Call Pickup, NonBarge-In** – to retrieve unanswered station calls showing in the alphanumeric display.

Optional Line Features

Dedicated nonhunting attendant lines – used to retrieve unanswered station calls. It is recommended that (1) nonhunting line per console be provided for this purpose. This will allow dedicated access, unaffected by inbound traffic, and prevent call collisions (glare). Refer to the Answer Use line feature described on page 36.

Required Station Feature

Call Pickup – all station lines monitored by the 524 must be assigned to a Call Pickup Group.

IMPORTANT – Call Forward - No Answer is **not** recommended because it conflicts with, and may defeat, the operation of the 524 Ring Delay and Name Display features.

Optional Station/Line Features

Additional features may be optioned as required.

IMPORTANT – Whenever the Call Waiting feature is invoked on a busy station, such a call will not recall to the console. Ring Delay and Recall Ring parameters do not apply because the station in question is in a busy rather than a ringing state.

Compatibility With Other Products

Music On Hold

The Music On Hold input on the 524 CPU is compatible with telco feed, low impedance, balanced subscriber background music services such as Muzak. Always terminate such a line with a resistor equal to the characteristic impedance of the line, usually 600 ohms. AM/FM tuner and tape player outputs are typically unbalanced high impedance music sources which require shielded cable. Characteristic impedances vary from 600 to 50K ohms.

Paging Access

The 524 is compatible with any paging system that provides a Tip/Ring talk battery feed circuit. Such circuits can be cross connected to any spare line position on the console.

Tone Commander's PA-24 Paging/Chime Module interfaces any paging amplifier to the 524, and derives power from the 524 CPU.

Voice Mail

Most on-premise voice mail systems are compatible with the 524 system. Voice mail is usually accessed from a spare DSS key.

524 Specifications

All values listed in this section are nominal, and may differ from the actual values.

Central Office Interface

Line Capacity	5 lines
Local Telco Ground and CPU Ground Differential	±3 V max.
C.O. Battery Range	-42.5 V to -56.5 V
C.O. Ringing Range	40 to 130 V rms @ 20 or 30 Hz, superimposed on C.O. battery
Off-hook/On-hook Detection Point	26 V across Tip and Ring
Loop Resistance to C.O., Including C.O. Battery Feed	400 to 2000 ohms

FCC

Registration Number	AHIUSA-60815-CF-T
Ringer Equivalence	0.0A

Console Interface (CPU to Console)

Consoles	one or two
Max. Distance to Console	500 feet, using 24 AWG wire

Station Interface

Station Capacity	24 stations
Max. Distance to Stations	2000 feet, using 24 AWG wire

Dialer

Dialing Type	DTMF Tone only
Autodialing Speed	6 or 10 digits/sec
Manual Dialing Speed	follows dial pad keystrokes when autodialing speed is set to 10 digits/sec; digits are buffered and sent with a tone on period of 80 ms, and 80 ms between digits when autodialing speed is set to 6 digits/sec

Music Input

Input Impedance	10k ohms, balanced
Typical Input Level	0.5 v to 1.5 v RMS
Gain Adjustment Range	40 dB

Power Requirements

CPU	117 VAC ±10%, 60 Hz, @ 30 VA max.
Console	power supplied by CPU

Fuses

CPU	(2) AGC 2 2 A, 250 V

Physical

Console Dimensions	6 ½" H, 11 ¾" W, 10 ½" D (including handset cradle; display in max. vertical position)
Console Weight	3 lbs.
CPU Dimensions	17 ¾" H, 21 ½" W, 4 5/16" D
CPU Weight	12 lbs.

Environmental

Console Operating Temperature	32° to 104° F (0° to 40° C)
CPU Operating Temperature	32° to 122° F (0° to 50° C)
Console and CPU Storage Temperature	-4° to 140° F (-20° to 60° C)
Humidity	5% to 95%, noncondensing

Installer Programmable Features

Abandoned Ring Time	2 - 10 sec
Recall Rings	1 - 9 rings, or no recall
Pickup Code Sequence	first or last
Dialing Speed	6 or 10 digits/sec
Pause Time	200 - 900 msec
Hookflash Time	500 ms - 1 sec
Dial Tone Detect Time	500 ms - 2 sec
Hold Recall Time	30 sec - 3 min, or no recall
Hold Release Time	40 ms - 2 sec
Queue Priority	stations only lines+stations, stations have priority lines+stations, lines have priority lines+stations, first calls have priority (selectable per console)
Distinctive Ringing Detect	on or off
Ringing Type	long or short (selectable per console)
Line Privacy	on or off (selectable per line and per console)
Answer Use	on or off (selectable per line and per console)

Music on Hold	on or off (selectable per line)
Special Feature Keys	Page (may be assigned to any spare line key)

Attendant Programmable Features

Ring Delays	1-9 rings, no delay, or no ringing (selectable per line and per station)
Autodial Numbers	24 digits (selectable per station)
Line Identification Display	14 alphanumeric characters (selectable per line and per station)

Programming Data Retention

Data Retention	10 years

Maintenance

After initial installation, the 524 requires little or no maintenance, as long as adherence to the criteria discussed in the Site Preparation section is maintained. In this effort the following guidelines are suggested:

DON'T allow stored items to accumulate around the CPU, and therefore cut off adequate ventilation.

DON'T store toxic or fume producing janitorial supplies or chemicals in the near vicinity of the CPU.

DON'T plug any other electrical products into the same circuit as the CPU, even temporarily.

DON'T allow storage items or tools to come in contact with the CPU or punchdown blocks. In case of the latter, plastic block covers are highly recommended.

DON'T spray cleaners or solvents directly on to the 524 console. Use only a very dilute soap/water solution applied to damp rag.

DON'T use adhesive-backed labels on the face of the console. Such labels may impede button travel. Migrating adhesives could also cause permanent damage.

DO use the provided nonadhesive key designations.

DO conduct periodic inspections to check the above mentioned items.

DO provide for ready access.

Operational Checkout

It is a suggested operating practice for an attendant to periodically check all active lines on the 524 for the ability to receive and "break" dial tone.

Recommended Spare Parts

On those occasions where components need to be replaced either due to troubleshooting procedure or obvious failure (i.e., smoke, inactivity, etc.), the stocking of spare parts is highly recommended.

In most cases one (1) console and one (1) CPU will provide adequate backup.

In those cases where a customer demands full backup capability or has to maintain many systems, two (2) consoles and two (2) CPUs are recommended. In this case, full coverage is maintained even when spares are in for repair.

Service

Repair of the Tone Commander 524 must be done by Tone Commander. Prior to equipment removal, call Tone Commander Technical Support for assistance in determining the source of the problem. This critical action can often prevent needless removal of equipment and subsequent customer inconvenience.

Tone Commander
Technical Support Department
11609 49th Place West
Mukilteo, WA 98275-4255 USA

Phone: (800) 524-0024
(425) 349-1000

Fax: (425) 349-1010

E-mail: tech@tonecommander.com

Web: www.tonecommander.com

Tone Commander is committed to meeting the product needs of our customers. Please write or call us with any suggestions for improvement.

Warranty

Tone Commander Product Warranty

For a period of one year from date of dealer purchase, but not to exceed 16 months 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 must be obtained from Tone Commander prior to returning a product for repair. Freight must be prepaid for all units returned to Tone Commander. Units repaired under warranty will be shipped UPS Ground (or equivalent), freight prepaid by Tone Commander.

Products that are older than the warranty period, but less than 7 years old, or still manufactured by Tone Commander may be repaired at the factory for a flat rate charge. Repaired out-of-warranty units are warranted for 90 days from the date of repair.

The repair or replacement of a product under this warranty represents the entire obligation of Tone Commander; 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; Tone Commander, to the extent permitted by law, hereby disclaims all such other warranties.*

FCC Requirements

The Tone Commander Model **524** complies with Part 68 of the FCC Rules. The label affixed to this equipment contains, among other information, the FCC Registration Number and Ringer Equivalence Number (REN) for this equipment. You must, upon request, provide this information to your telephone company.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of those devices ring when your telephone number is called. In most, but not all areas, the sum of the RENs of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

The following jacks must be ordered from the telephone company in order to interconnect this product with the public communication network: **RJ-21X**.

If your 524 causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. if possible, they will notify you in advance. But if advance notice is not practical you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

Connections to party lines are subject to state tariffs. Contact your local telephone company if you plan to use this equipment on party lines.

This equipment cannot be used on public coin service lines provided by the telephone company.

The 524 is hearing-aid compatible (HAC) per Section 68.316, FCC Rules and Regulations.

If you have trouble with the 524 please contact us at the address listed on the back of this manual for information on obtaining service or repairs. The telephone company may ask that you disconnect the 524 from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning.

NOTE – This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada Requirements

The Industry Canada label identifies certified equipment. The certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. Industry Canada does not guarantee the equipment will operate to a user's satisfaction.

Before installing this equipment, make sure you are permitted to connect it to the facilities of the local telecommunications company. You must also install the equipment using an acceptable method of connection. In some cases you may also extend the company's inside wiring for single line individual service by means of a certified connector assembly (telephone extension cord). You should be aware, however, that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designed by the supplier. Any repairs or alterations made by a user to this equipment, or equipment malfunctions, may give the telephone communications company cause to request the user to disconnect the equipment.

For your own protection, make sure that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Do not attempt to make electrical ground connections yourself; contact the appropriate electric inspection authority or electrician.

LOAD NUMBER: See the FCC label.

The load number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to the telephone loop used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices, subject to the requirement that the total of the load numbers of all the devices not exceed 100.

Compliance Notice

This digital apparatus does not exceed the Class A limits for radio noise emissions for digital apparatus as set out in the Radio Interference Regulations of Industry Canada.

Avis de conformation

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class A prescrites dans le Reglement sur le brouillage radioelectriques edicte par le ministere des Communications du Canada.

524 Configuration Sheet
System Programmable Features

STATION KEY	FEATURE	DIAL PAD KEYS	AVAILABLE VALUES	DEFAULT VALUE	ACTUAL VALUE
A	'ABANDON' Ring Time	2 - 9, 0	2 - 9 sec, 10 sec	5	
B	'RECALL' Rings	1 - 9, 0	1 - 9 rings, no recall	3	
C	'DCP DIAL' Sequence	0, 1	first, last	first (0)	
D	'DIAL SPEED'	6, 0	slow (6 digits/sec), fast (10 digits/sec)	fast (0)	
E	'PAUSE' Time	2 - 9	200 - 900 msec	700	
F	'FLASH' Time	5 - 9, 0	500 - 900 msec, 1 sec	600	
G	Dial Tone 'DETECT' Time	1 - 9, 0	500, 600, 700 msec, 1, 1.2, 1.5, 1.8, 2 sec	700	
H	'HOLD' Recall Time	3 - 6, 9, 1, 2, 0	30 - 60, 90 sec, 2, 3 min, no recall	90	
I	Hold 'RELEASE' Time	1 - 8	45, 80, 200, 400, 600, 800 msec 1, 2 sec	600	
K	Queue 'PRIORITY'	1 - 4	stations only, stations > lines, lines > stations, lines + stations (FIFO)	FIFO (4)	
L	'ALERT TYPE'	1, 2, 0	normal ringing, distinctive ringing, both	both (0)	
M	'RNG TYPE'	1, 0	long, short	short (0)	

DIRECTED CALL PICKUP CODE	

524 Configuration Sheet
Line Programmable Features

(Default settings for all lines are shown in ***BOLD ITALICS***.)

LINE KEY NO.	LINE NAME I.D. or PAGE KEY	PRIV. WHEN BUSY		MUSIC ON HOLD		ANS. USE		RING DELAY (***NO RINGING***, NO DELAY, 1-9 RINGS)	TELEPHONE NUMBERS
		OFF	ON	OFF	***ON***	OFF	***ON***		
1									
2									
3									
4									
5									

524 Configuration Sheet
DSS Keys

DSS keys are numbered vertically on the console.

DSS KEY	STATION NUMBER	USER NAME	DSS KEY	STATION NUMBER	USER NAME
1			13		
2			14		
3			15		
4			16		
5			17		
6			18		
7			19		
8			20		
9			21		
10			22		
11			23		
12			24		