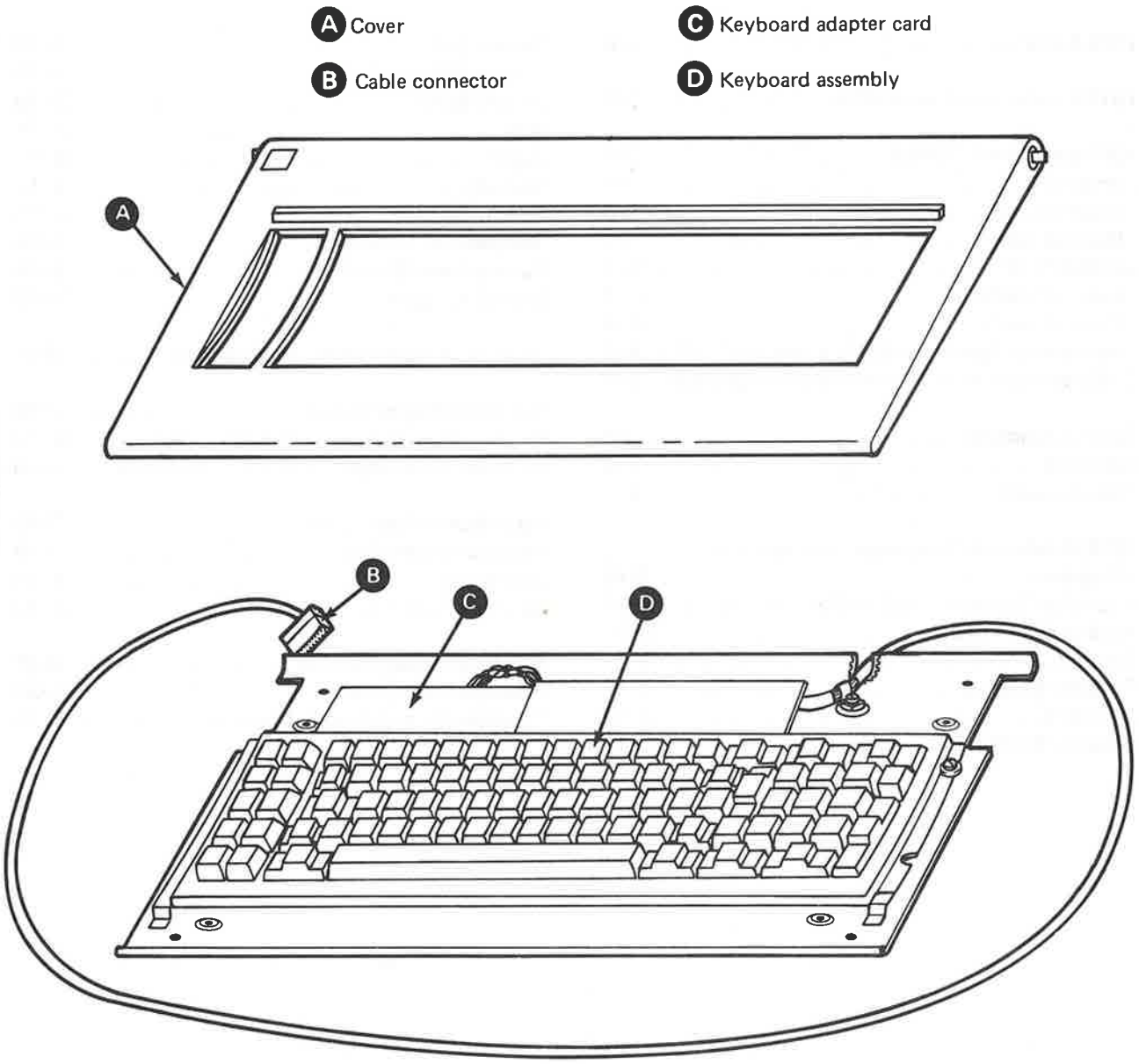
Chapter 3. Keyboard

Contents

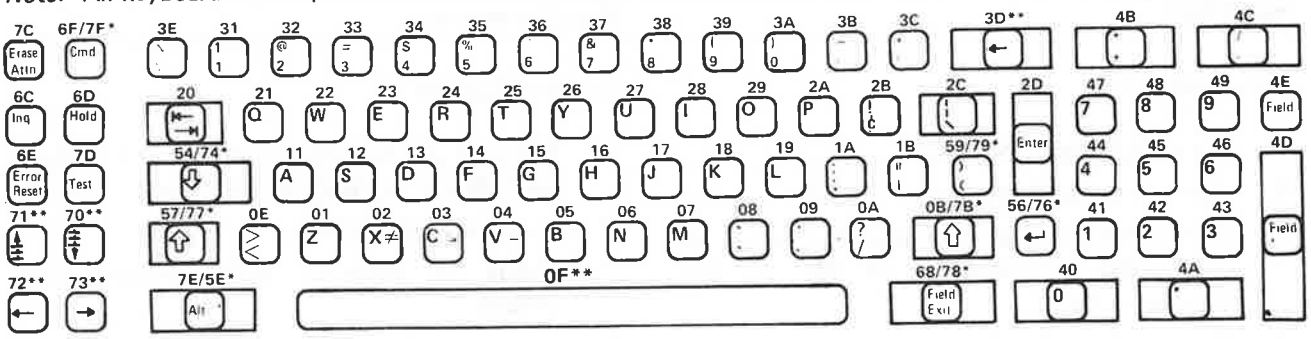
Keyboard

1300 Locations



1310 Keyboard scan codes

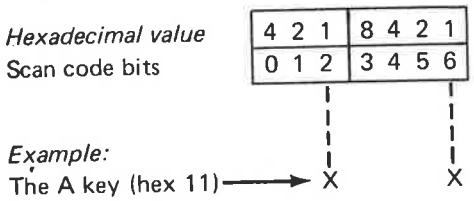
Note: All keyboard models provide the same hexadecimal scan codes. (Key tops may be different for other languages.)



*Make/break key
**Typamatic key

Hexadecimal value to scan code bit conversion:

The scan codes shown in this diagram are hexadecimal values. Scan codes are transferred from the keyboard to the processing unit on scan code bit lines 0 – 6. To determine the relationship of the hexadecimal value to the actual scan code bits, use the following chart:



Keyboard

1320 Keyboard cables

Removal

External cable

1. Switch off the 5324 power.
2. Remove the keyboard cover (1220).
3. Disconnect the external keyboard cable from the keyboard adapter card (A) and the connector panel.
4. Remove the cable clamp.

Internal cable

1. Open the rear access cover (1220).
2. Remove the two connector panel screws (B).
3. Remove the two screws (C) from the connector.
4. Place the CPU planar board in the service position (1230) and unplug the internal keyboard cable.

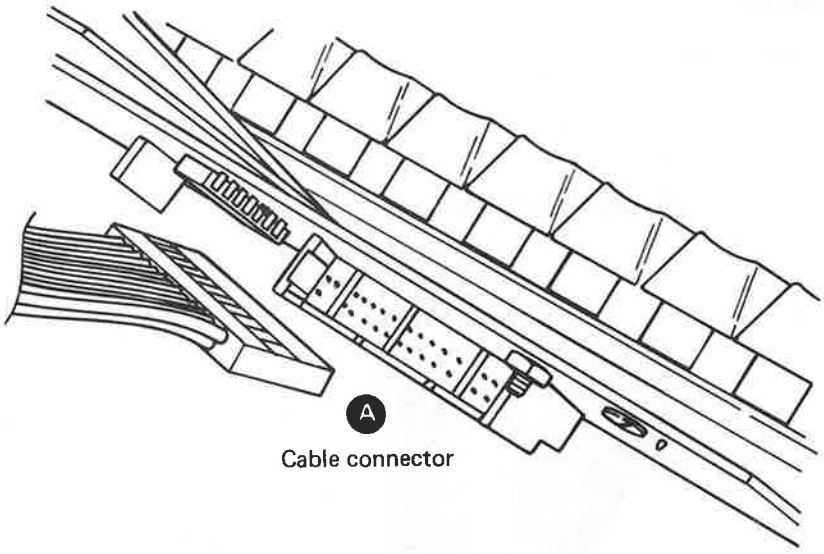
Replacement

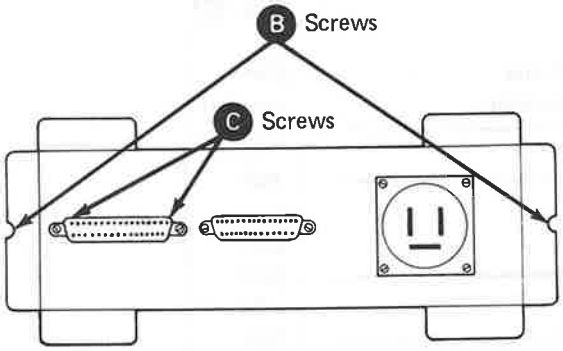
External cable

1. Connect the keyboard cable to the adapter card (A) and to the connector panel.
2. Install the cable clamp.
3. Install the keyboard and keyboard cover (1220).

Internal cable

1. Install the two screws (C) that hold the internal cable to the connector panel.
2. Plug the other end of the cable into the planar board.
3. Slide the planar board into the 5324 and install the two screws (B).
4. Close the rear access cover (1220).

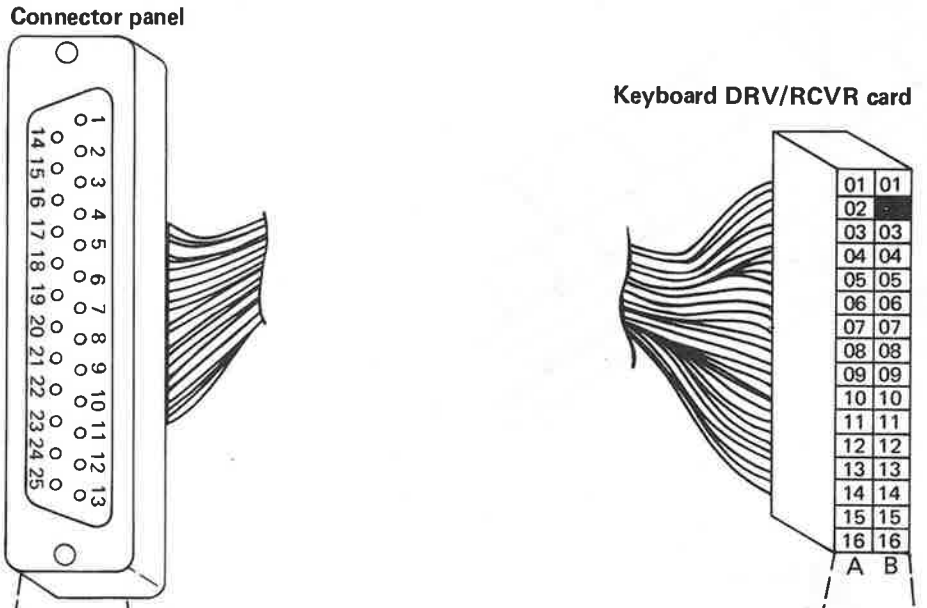

A
Cable connector


B Screws
C Screws

Keyboard

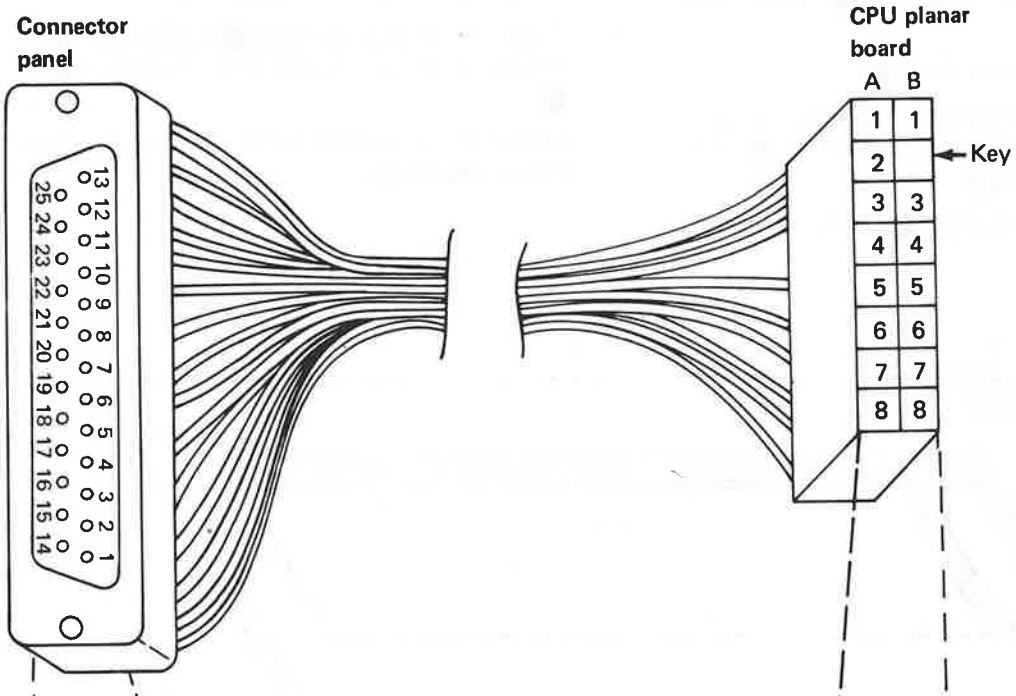
1320 Keyboard cables (continued)

Cable pin assignments for the external cable



Pin number	Line name	Signal Direction	Pin number
14	Return		A01
1	Data strobe	←	B01
			Key
15	Return		A03
2	Scan code bit 6	←	B03
16	Return		A04
3	Scan code bit 5	←	B04
17	Return		A05
4	Scan code bit 4	←	B05
18	Return		A06
5	Scan code bit 3	←	B06
19	Return		A07
6	Scan code bit 2	←	B07
20	Return		A08
7	Scan code bit 1	←	B08
21	Return		A09
8	Scan code bit 0	←	B09
13	Not used		B10
22	Return		A11
9	Delay strobe	→	B11
23	Return		A12
10	Program reset	→	B12
24	Return		A13
11	Not used		B13
25	Return		A14
12	+12V		B14

Cable pin assignments for the internal cable



Pin number	Line name	Signal direction	Pin number
13	Not used		A1
10	Program reset	←	B1
9	Delay strobe	←	A2
			Key
12	+12 Vdc		A3
1	Data strobe	→	B3
2	Scan code bit 6	→	B4
8	Scan code bit 0	→	A5
3	Scan code bit 5	→	B5
4	Scan code bit 4	→	B6
7	Scan code bit 1	→	A7
5	Scan code bit 3	→	B7
14-25	Ground		A8
6	Scan code bit 2	→	B8

Keyboard

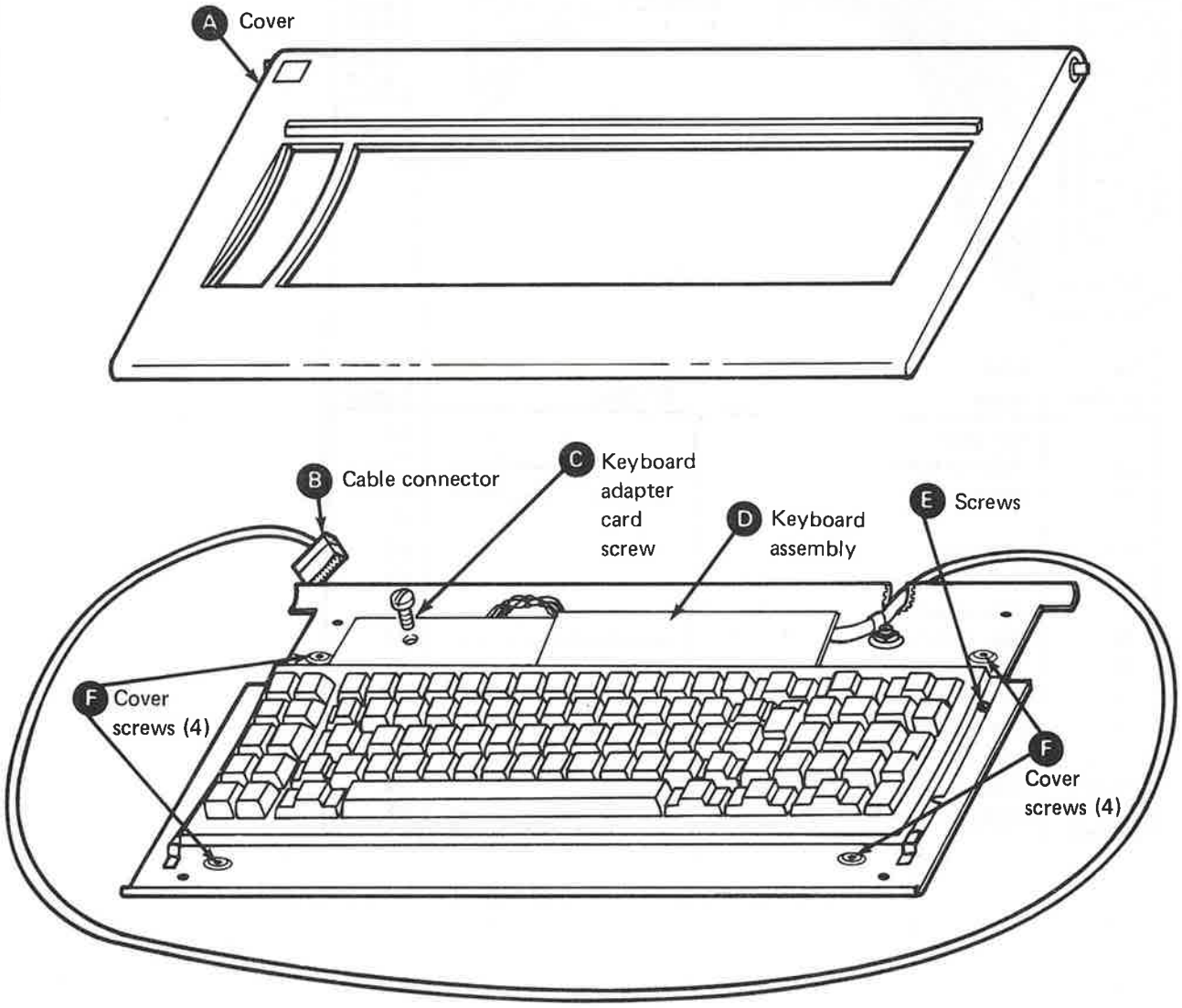
1330 Keyboard

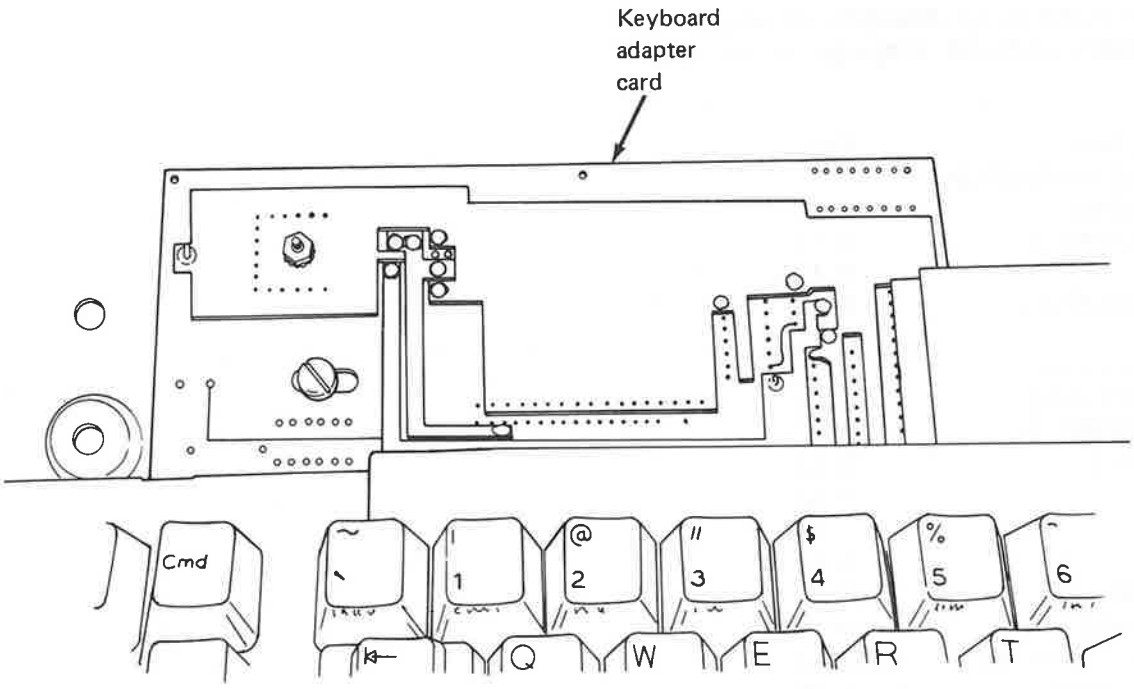
Removal

1. Switch off the 5324 power.
2. Remove the four screws (F) from the keyboard cover.
3. Remove the keyboard cover (A).
4. Remove the mounting screw (C) and disconnect the keyboard adapter card from the keyboard assembly (D).
5. Remove the two screws (E) from the base assembly.

Replacement

1. Place the keyboard in position and replace screws (E) in the base assembly .
2. Connect the adapter card (C) to the keyboard assembly (D) and install the mounting screw (C).
3. Install the keyboard cover (A) and the four cover screws (F).



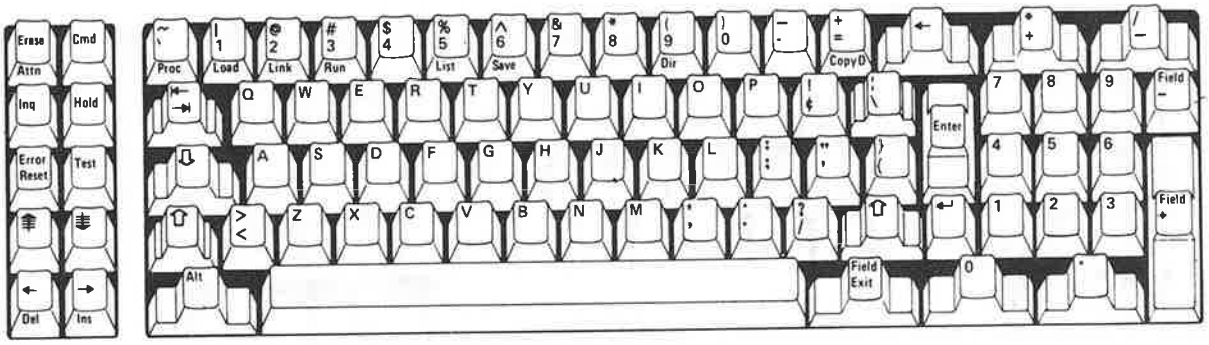

Keyboard
adapter
card
Cmd
~
`
1
@
2
#
3
$
4
%
5
6
Q
W
E
R
T

Keyboard

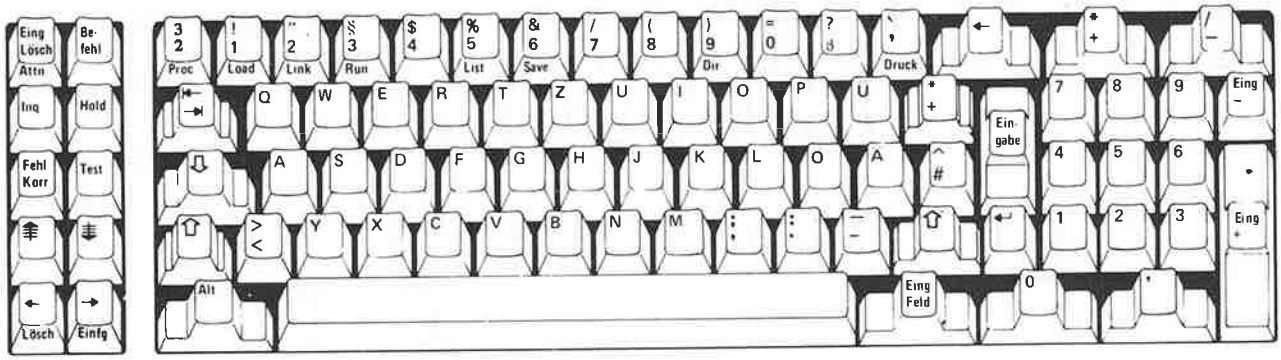
1340 Keyboard/language arrangement diagrams

This section contains the arrangement diagrams for the various keyboard language groups, as follows:

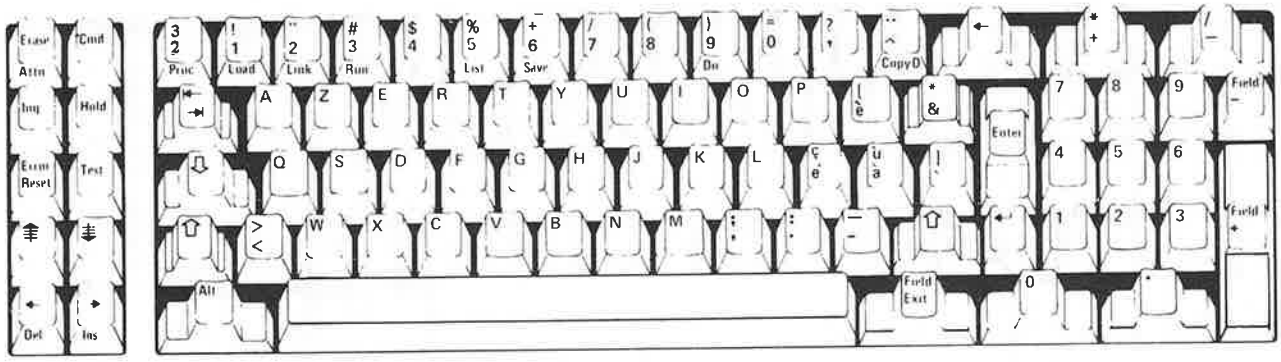
Australia/Canada (English)/United States



Austria/Germany



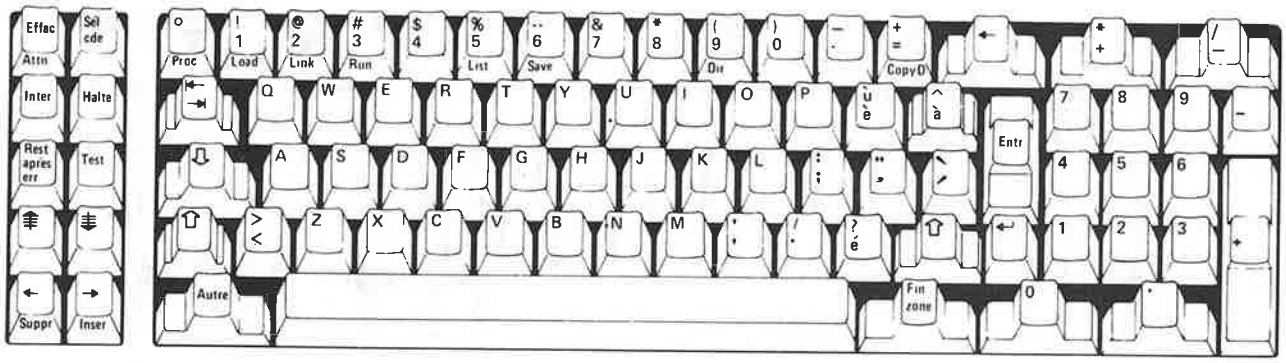
Belgium



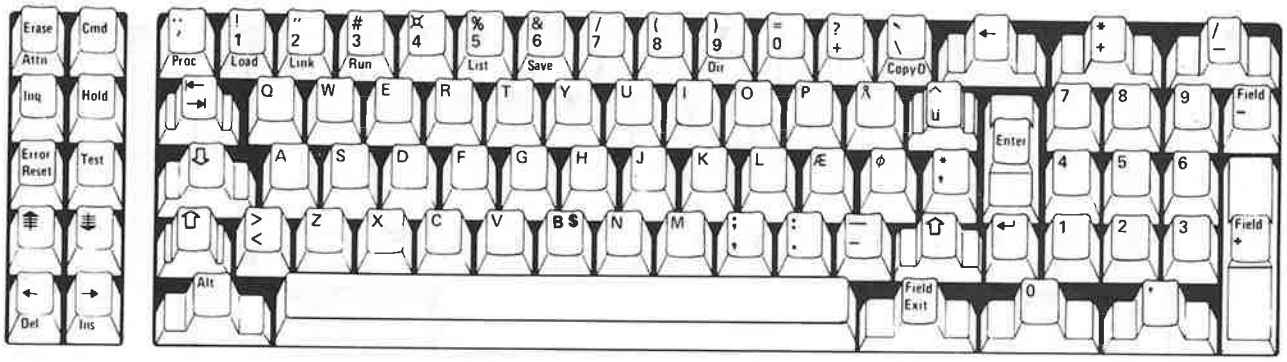
Keyboard

1340 Keyboard/language arrangement diagrams (continued)

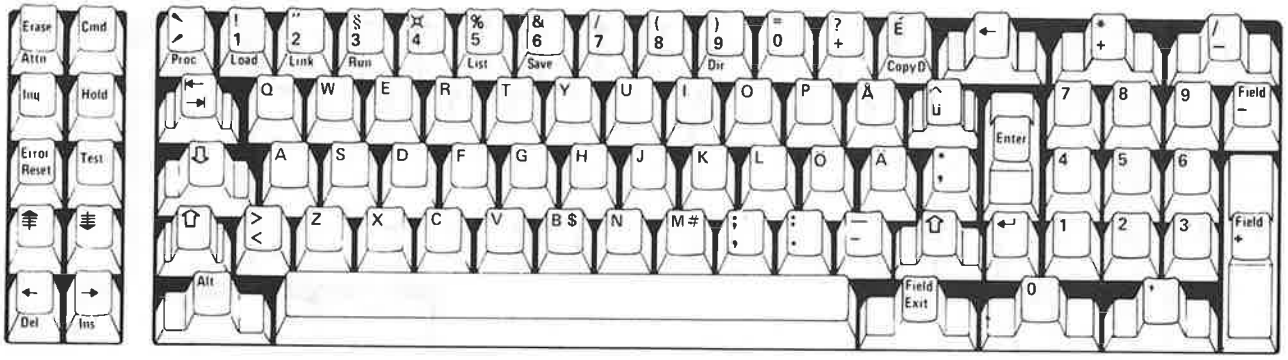
Canada (French)



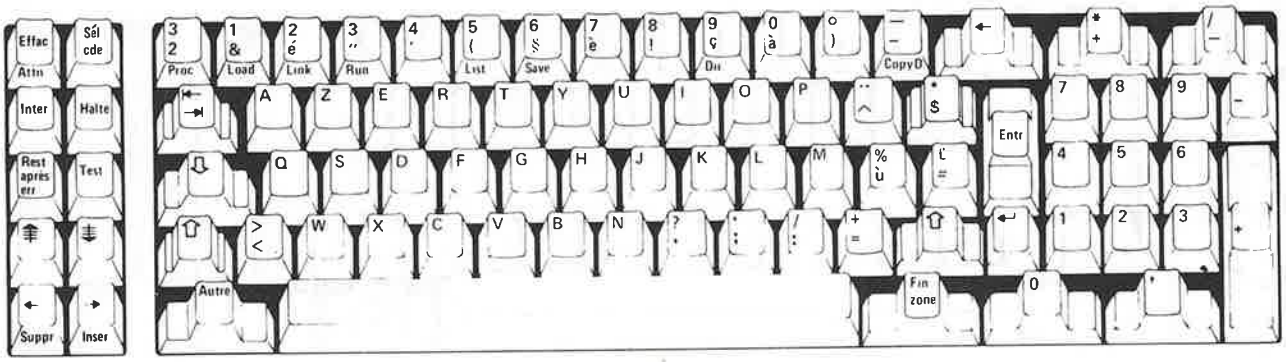
Denmark



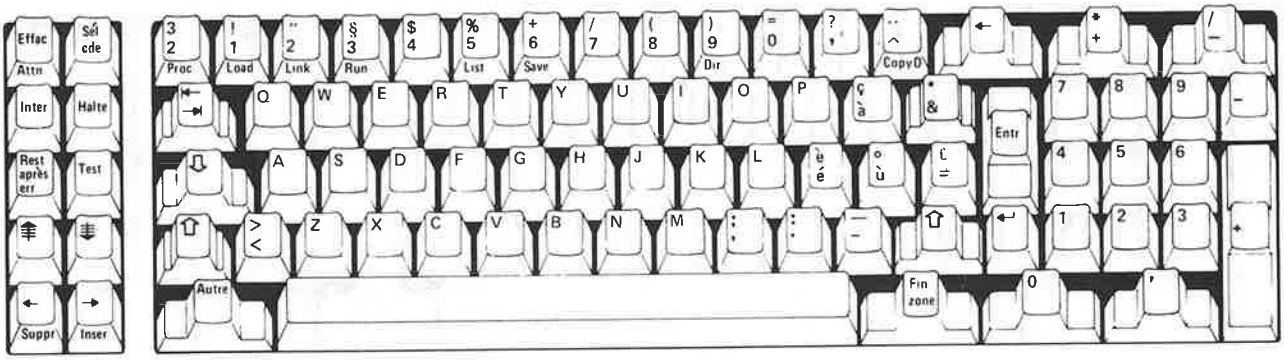
Finland/Sweden



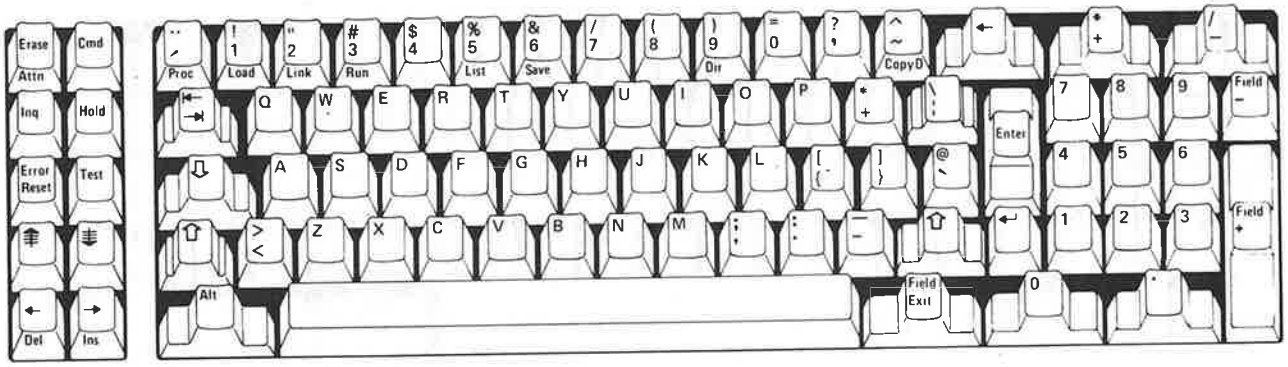
France (AZERTY)



France (QWERTY)



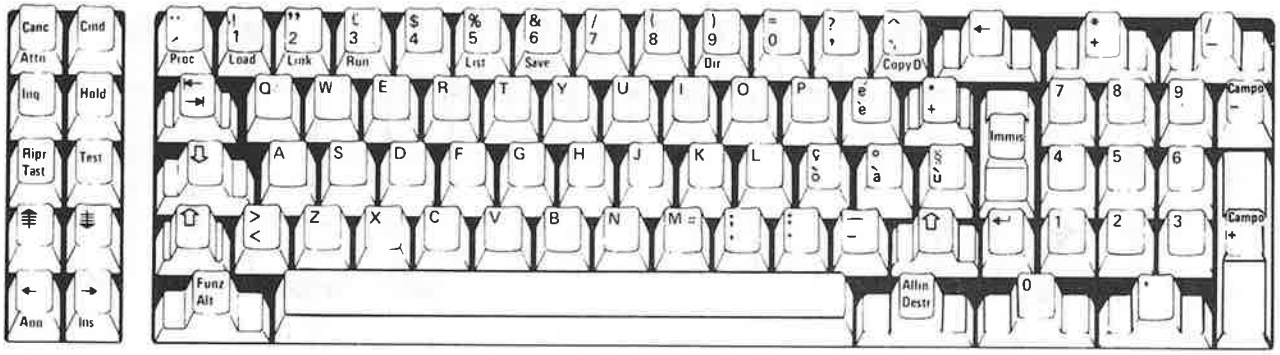
International



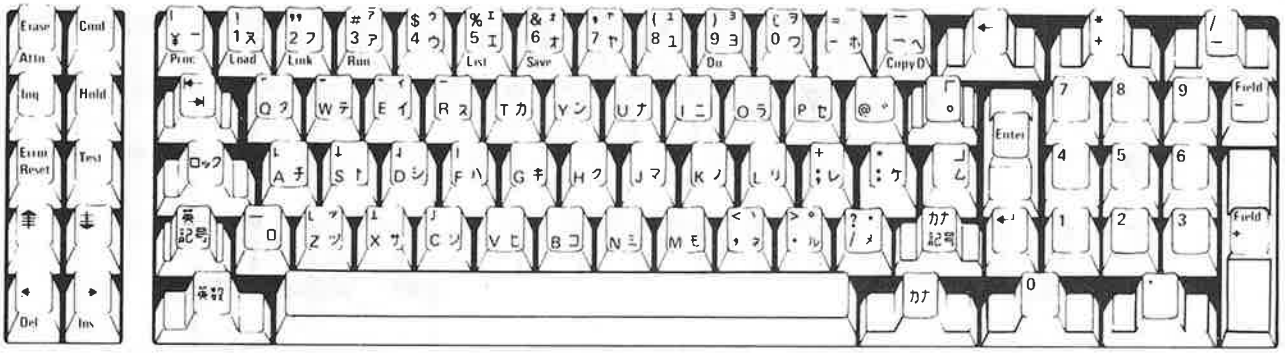
Keyboard

1340 Keyboard/language arrangement diagrams (continued)

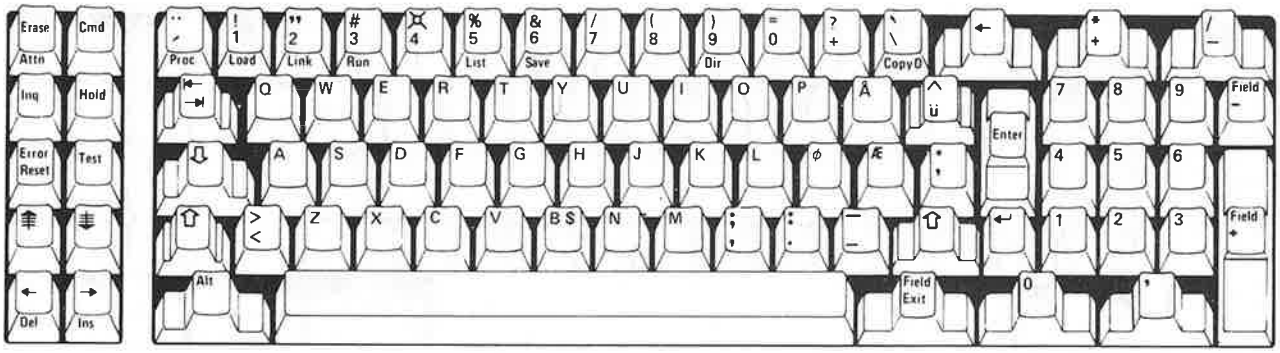
Italy



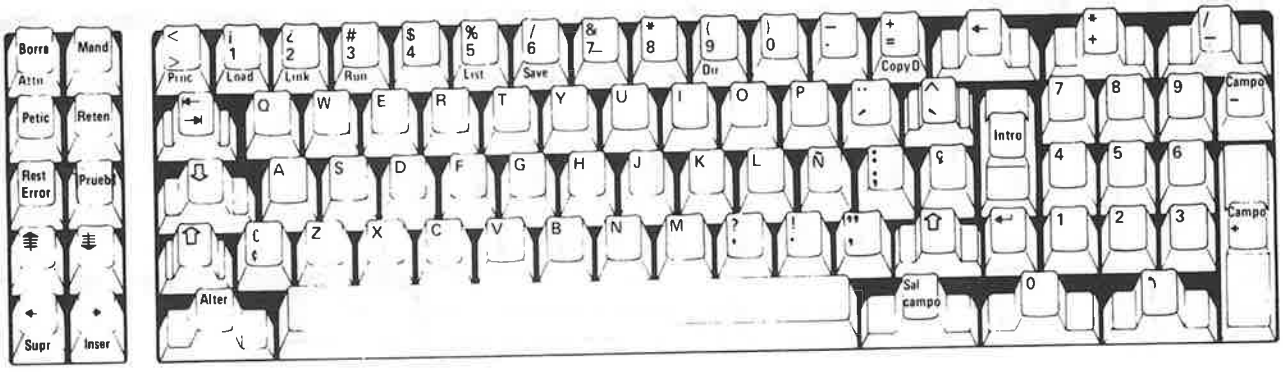
Japan



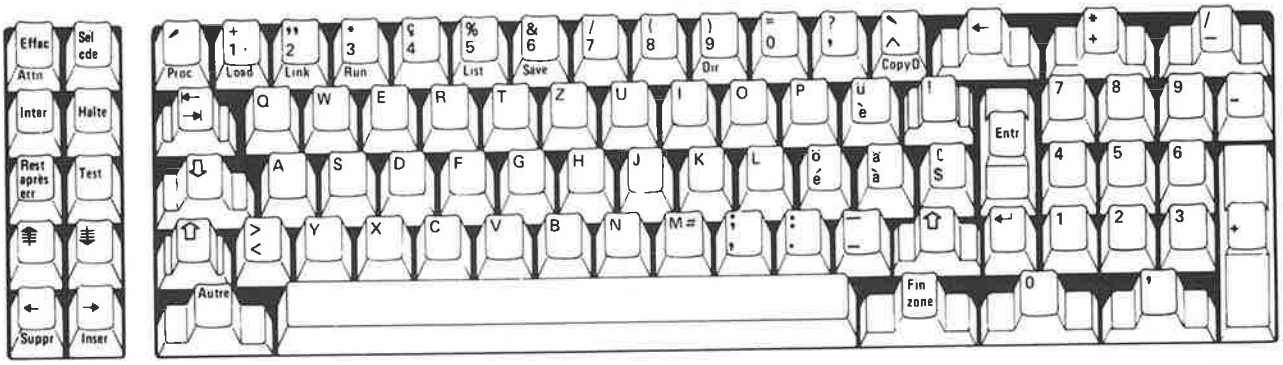
Norway



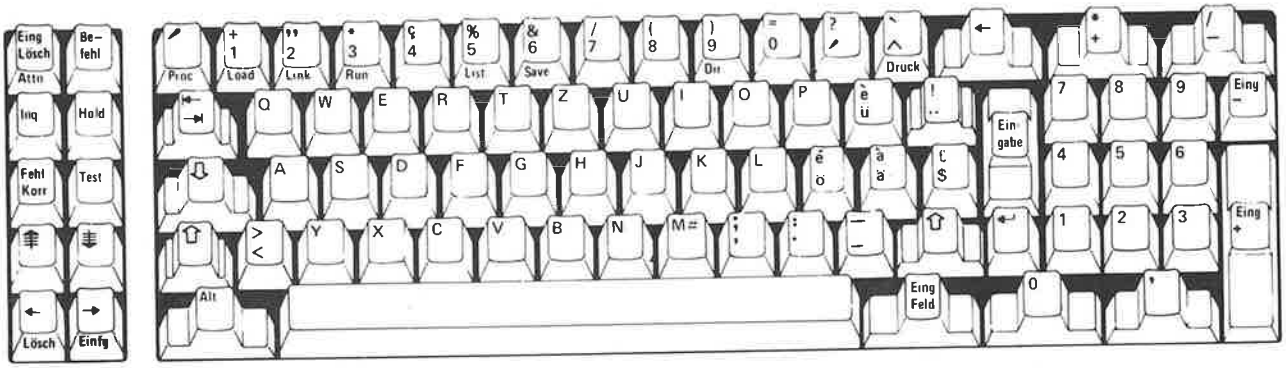
Spain/Spanish



Switzerland (French)



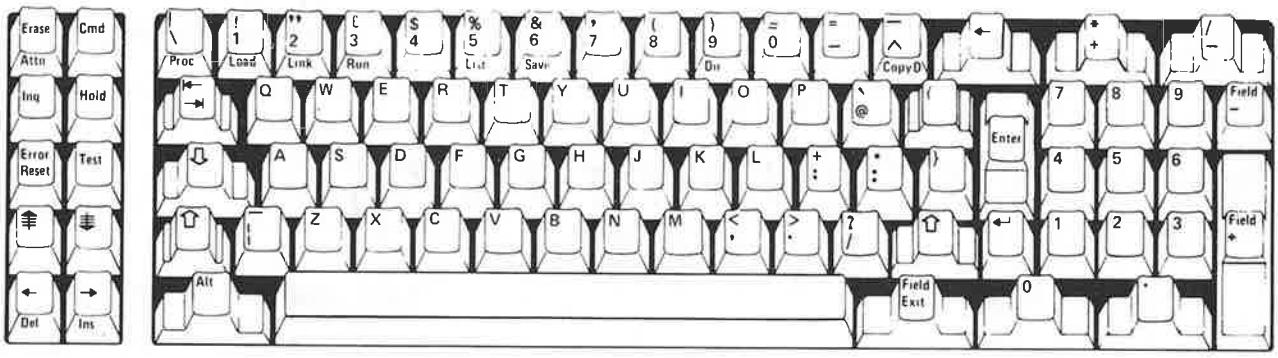
Switzerland (German)



Keyboard

1340 Keyboard/language arrangement diagrams (continued)

United Kingdom

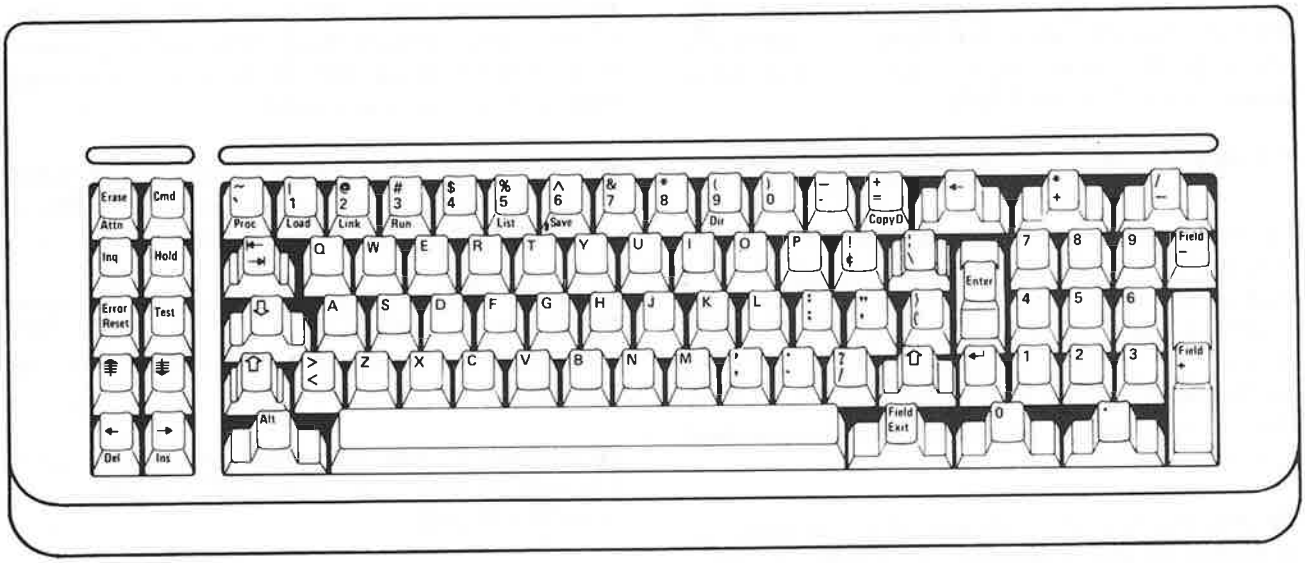


Theory of operation introduction

The keyboard is used to enter data, BASIC program commands, and control functions into the 5324 computer. The keyboard contains 83 keys, which are divided into three groups:

- Standard typewriter (alphameric) keys
- Numeric keys
- Function and control keys

When the 5324 is powered-on and operating under control of the BASIC control program, the keyboard permits the operator to enter programs and data, communicate with the executing program, and control the operation of the system. When the 5324 is operating under control of the diagnostic control program, the keyboard is used to call, enter responses to, and control the diagnostic programs.



Keyboard

Keyboard operations

Keyboard operations in BASIC mode

In BASIC mode, the keyboard is fully operational, and all keys (alphameric, numeric, function, and control) can be used. A complete description of BASIC keyboard operations is located in the User Library manual, *Operator Reference*, SA34-0108.

BASIC mode can be canceled and the 5324 put into diagnostic mode by holding down the Cmd (Command) key G and pressing the Test key H, then by holding down the Cmd key again and pressing the Error Reset key. Only a 5324 power-on will restart BASIC.

Keyboard operations in diagnostic mode

In diagnostic mode, keyboard operations are limited, and only the keys described in this section are used to communicate with the diagnostic programs. The United States keyboard is shown in the diagram. See "1340 Keyboard/language arrangement diagrams," in this chapter, for the keyboard arrangements used in other countries.

A **Attention key**. This key (Attn) is used, as described in the diagnostic user guide, to interrupt or control the executing sequence of the diagnostic programs.

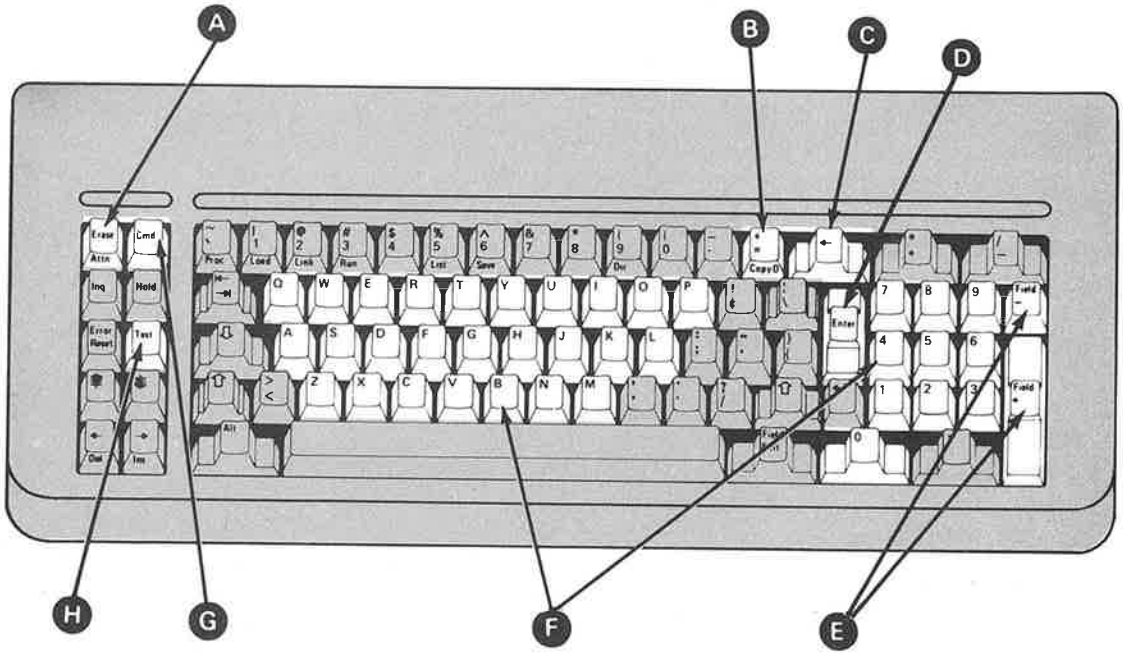
B **Copy Display key**. This key sets the alternate print option in the diagnostic control program. Pressing the Attn (Attention) and the Copy D (Copy Display) key causes all following CRT screen displays to print on the system printer (if attached). The alternate print option can be canceled by pressing the Attn (Attention) and the 0 (Zero) key.

C **Backspace key**. This key causes the cursor, which is displayed on the display screen, to move one position to the left. If there is a character above the cursor, it is erased.

D **Enter key**. This key causes the 5324 to either start processing data entered from the keyboard or to restart an interrupted operation.

E **Field - and field + keys**. These keys are used for the ROS resident diskette diagnostic (PID 1500) and are described in that section of the diagnostic user guide.

F **Alphabetic and numeric keys**. These keys are used to select the diagnostic programs and program options.



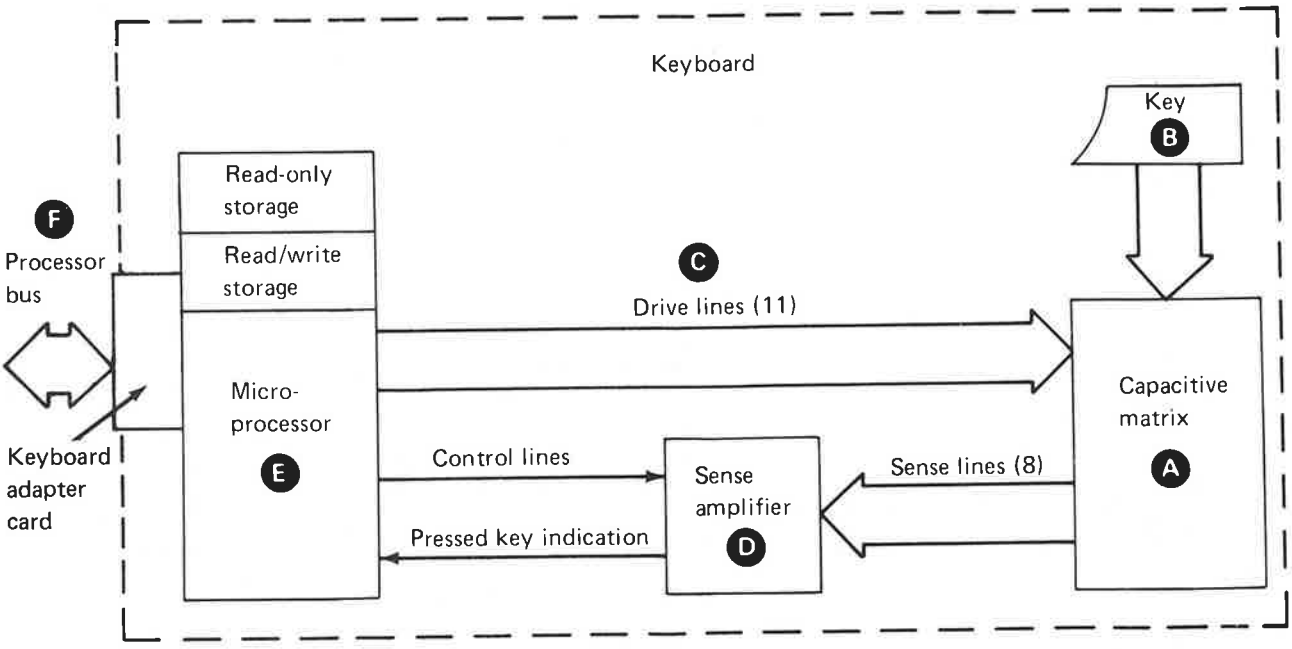
Functional description

Keyboard data flow

The keyboard assembly contains 83 keys, a keyboard base, capacitive matrix, and an electronic circuit card. The electronic circuit card contains a sense amplifier, a microprocessor with read-only and read/write storage, and the circuits needed to communicate with the 5324 data, address, and control buses. The complete keyboard assembly is a field replaceable unit (FRU).

The following sequence describes the data flow for a keyboard operation:

- **A** The capacitive matrix contains a capacitor for each key. The capacitors are located under the keys and are part of the keyboard base.
- **B** When a key is pressed, the capacitance of the key's capacitor increases.
- **C** The keyboard microprocessor uses eleven drive lines to repeatedly scan the capacitive matrix.
- **D** The increased capacitance of the active key's capacitor permits the drive-line scan pulse to appear at one of the eight input lines to the sense amplifier.
- **E** The keyboard microprocessor uses the combination of the active drive line and sense amplifier input line to generate a scan code character (1 of 88) to determine which key was active when the scan pulse was sensed. Only 83 of the 88 scan codes are used for the 5324 keyboard.
- **F** An interrupt request, indicating that the scan code character is available, is sent to the 5324 processing unit. Any additional keyboard interrupts are inhibited until this interrupt is serviced and the scan code character is read by the 5324.



Functional description (continued)

Key types

Three types of keys are used in the 5324 keyboard: make-only, make/break, and typamatic.

Make-only keys. A make-only key causes one scan code character and interrupt to be generated when the key "makes."

Make/break keys. A make/break key causes one scan code character and interrupt to be generated when the key "makes" and a second scan code character and interrupt to be generated when the key "breaks."

Typamatic keys. A typamatic key causes a scan code character and interrupt to be generated repeatedly at the rate of approximately 10.4 characters-per-second for as long as the key is pressed down.

Keyboard scan codes

A scan-code chart is located in "1310 Keyboard scan codes" in the maintenance section of this chapter. The chart also indicates the type of key (make-only, make/break, or typamatic).

Keyboard diagnostics

Power-on diagnostic

The power-on diagnostic is contained in the 5324 read-only storage (ROS) and executes (1) at every system power-on, (2) when the ROS resident diskette diagnostic is ended by a "9" key command, or (3) when the diagnostic control program is terminated.

The keyboard section of the power-on diagnostic issues a program reset to the keyboard. This reset causes the keyboard microprocessor to perform a "self-test," which checks the operation of the keyboard's microprocessor, read-only storage, and read/write storage. The test also includes a keyboard scan to check for any active (binding) keys. When the test ends, the keyboard starts normal scanning operations.

See the diagnostic user guide for a description of the power-on diagnostic error codes.

CE diskette resident diagnostics

The CE diskette resident diagnostics for the keyboard are located on the CE diskette and execute under control of the diagnostic control program. These tests permit you to verify the manual keyboard operations and to display the scan code character as each key is operated.

A complete description of the CE diskette resident diagnostics is located in the diagnostic user guide.