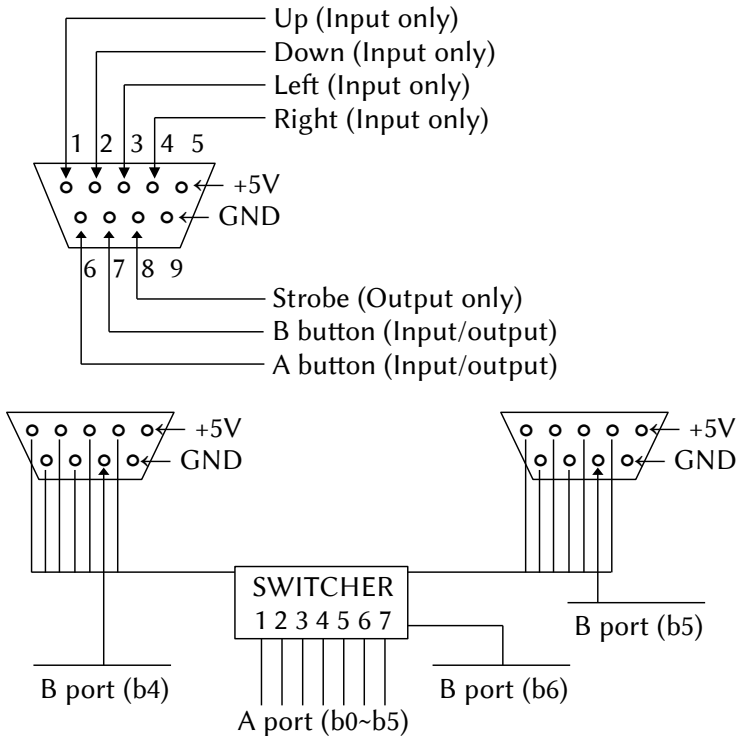GETPNT points to the next character to be retrieved by the CH-GET routine, and PUTPNT points to the next free position in the buffer, to be filled with the value of the next key pressed.
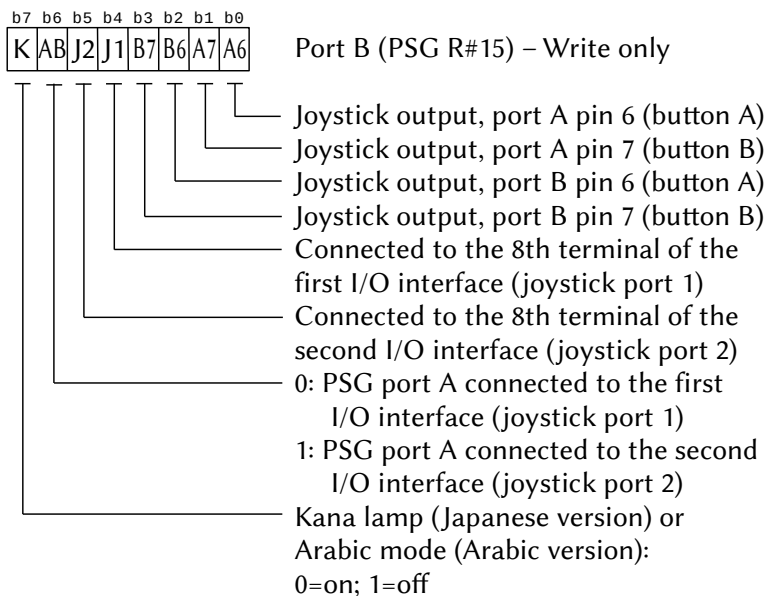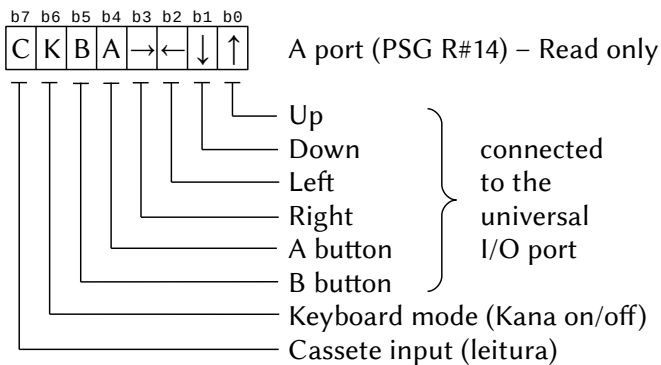
8.4 – UNIVERSAL I/O INTERFACE

As described in Chapter 5, the PSG has two general-purpose I/O ports. These ports are connected to the universal I/O interface (joystick ports). Various devices, in addition to the joystick, can be connected to this port, such as a mouse or paddles. For ease of access, there are some routines in the BIOS that support these ports.

These interfaces are wired as illustrated below.

The two PSG ports are used as described below:

```
b7 b6 b5 b4 b3 b2 b1 b0
┌─┬─┬─┬─┬─┬─┬─┬─┐
│C│K│B│A│→│←│↓│↑│   A port (PSG R#14) – Read only
└─┴─┴─┴─┴─┴─┴─┴─┘
```

- Up ⎫
- Down ⎪ connected
- Left ⎬ to the
- Right ⎪ universal
- A button ⎪ I/O port
- B button ⎭
- Keyboard mode (Kana on/off)
- Cassete input (leitura)

```
b7 b6 b5 b4 b3 b2 b1 b0
┌─┬──┬──┬──┬──┬──┬──┬──┐
│K│AB│J2│J1│B7│B6│A7│A6│   Port B (PSG R#15) – Write only
└─┴──┴──┴──┴──┴──┴──┴──┘
```

- Joystick output, port A pin 6 (button A)
- Joystick output, port A pin 7 (button B)
- Joystick output, port B pin 6 (button A)
- Joystick output, port B pin 7 (button B)
- Connected to the 8th terminal of the first I/O interface (joystick port 1)
- Connected to the 8th terminal of the second I/O interface (joystick port 2)
- 0: PSG port A connected to the first I/O interface (joystick port 1)
- 1: PSG port A connected to the second I/O interface (joystick port 2)
- Kana lamp (Japanese version) or Arabic mode (Arabic version): 0=on; 1=off

Bits b0~b3 of port B are wired to pins 6 and 7 of each joystick connector via open collector TTL buffers in order to be able to send signals to the port. The pulse bits (bit 4 – J1 and bit 5 – J2) send a short pulse through pin 8. If bit 4 is set to 0, nothing is sent. If it is at 1, the pulse is sent. Bits 0 and 1 indicate which pin should be signaled high. Bit 0 corresponds to pin 6 and bit 1 to pin 7. Both can send data at the same time. According to the table below, the different possibilities of sending signal through the joystick port can be observed.

R#15 (Port B)		Pin 6	Pin 7	Pin 8
b7 b6 b5 b4 b3 b2 b1 b0		A button	B button	Strobe
x x 0 0 1 1 1 1		0	0	Vcc
x x 0 1 1 1 1 1		0	0	Pulse
x x 0 0 1 1 1 0		Vcc	0	Vcc
x x 0 1 1 1 1 0		Vcc	0	Pulse
x x 0 0 1 1 0 1		0	Vcc	Vcc
x x 0 1 1 1 0 1		0	Vcc	Pulse
x x 0 0 1 1 0 0		Vcc	Vcc	Vcc
x x 0 1 1 1 0 0		Vcc	Vcc	Pulse

The value xx001111 is always returned to register 15 after each operation. Therefore, to keep any pin connected (6 or 7), it is necessary to create a "loop" that constantly adjusts register 15 to the desired value, according to the table above. Pin 8, unlike pins 6 and 7, keeps the voltage level high.

Access to the universal I/O interface should preferably be done through the BIOS routines described below:

GTSTCK (005DH/Main) - Reads joystick status.
GTTRIG (00D8H/Main) - Reads fire button status.
GTPDL   (00DEH/Main) - Reads information from the paddle.
GTPAD   (00DBH/Main) - Accesses various I/O devices.

The detailed description of these routines can be seen in the Appendix, chapter 9 – BIOS routines, section 9.1.6 – I/O access routines for games.