

## 16. ADDING YOUR OWN KEYBOARD

### INTRODUCTION

This chapter explains in detail how you can build a keyboard interface which will plug directly into the rear edge connector. It will operate in parallel with the original Spectrum keyboard so that two keyboards can be used simultaneously. Chapter 17 explains how you can use this keyboard interface for Sinclair compatible joysticks. The possibilities are enormous. You could add a numeric keypad (an old calculator keypad for example), a hexadecimal keypad for machine code programming, or a complete full size keyboard.

### CIRCUIT DESCRIPTION

You should refer to the circuit diagram illustrated in fig 12a. The keyboard connections EKBD1 — EKBD13 shown on this circuit diagram are equivalent connections to KBD1 — KBD13 shown in fig 6. The signals IORQGE, AO, and RD are all combined so that the common inputs to NOR gates IC1b, IC2a and IC2a — IC2d are only low when these signals are all low. This extra keyboard interface is therefore selected whenever the ULA (port 254) is addressed to be read from. If none of the keys are pressed then the inputs to the NOR gates are pulled high by resistors R2 — R6. Outputs to the NOR gates are low and are inverted by IC3 to give a high on the data bus lines D0 — D4. Since IC3 hex buffers have 'open collector' outputs, the ULA can easily set any of D0 — D4 at logic 0 if any of the Spectrum keyboard keys are pressed. Now imagine that EKBD10 is connected to EKBD6. If you look at fig 6 you will see that this indicates that the 'F' key has been operated. When a read occurs with A9 low the input to IC2d is pulled low. The output to IC2d goes high and D3 is pulled low by IC3d. The CPU can then read D0 — D4 directly from its data bus and register that the 'F' key has been pressed.

### PARTS LIST

Resistors

R1 4K7  
R2 — R6 10K

all 5% ¼ watt

Capacitors

C1 22µF 6 volt electrolytic  
C2 0.1 µF disc ceramic

Semiconductors

IC1 74LS02  
IC2 74LS02  
IC3 74LS05

D1 — D8 IN4148 diodes

Miscellaneous

3 off 14 pin DIL IC sockets  
28 way Spectrum edge connector  
2.3" x 2.6" (or larger) piece of 0.1" pitch copper strip veroboard  
wire and solder

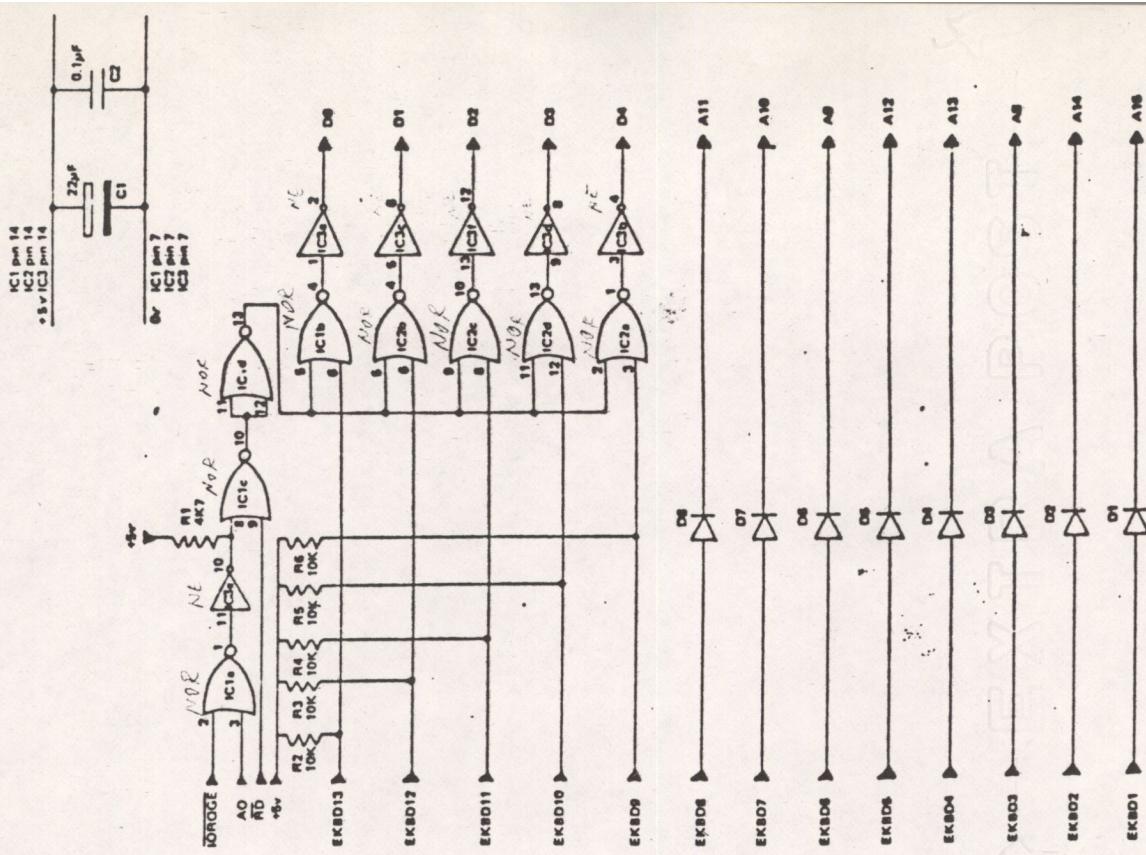


FIG 12a — ADDITIONAL KEYBOARD CIRCUIT DIAGRAM