

Tynemouth Software

TYNEMOUTH SOFTWARE 9 WAY D JOYSTICK PORT FOR RC2014

OVERVIEW

This card will add a 9 way D joystick port to an RC2014 system or a Minstrel 4th. It could also be used to add a second joystick port to a Minstrel 4D at a different address.

PARTS LIST

CAPACITORS – CERAMIC RATED 6.3V OR HIGHER

2 x 100nF axial (*usually marked 100n or 104*)

RESISTOR ARRAYS – ALL ¼W 5% OR BETTER

2 x 8 commoned 10KΩ resistors (*usually marked 9X-1-103LF*)

1 x 8 commoned 10KΩ resistors (*usually marked 9X-1-103LF*) (*Optional*)

Dot on package and square pad on PCB indicate pin 1

SEMICONDUCTORS

1 x 74HC540

1 x 74HC688

CONNECTORS / JUMPERS

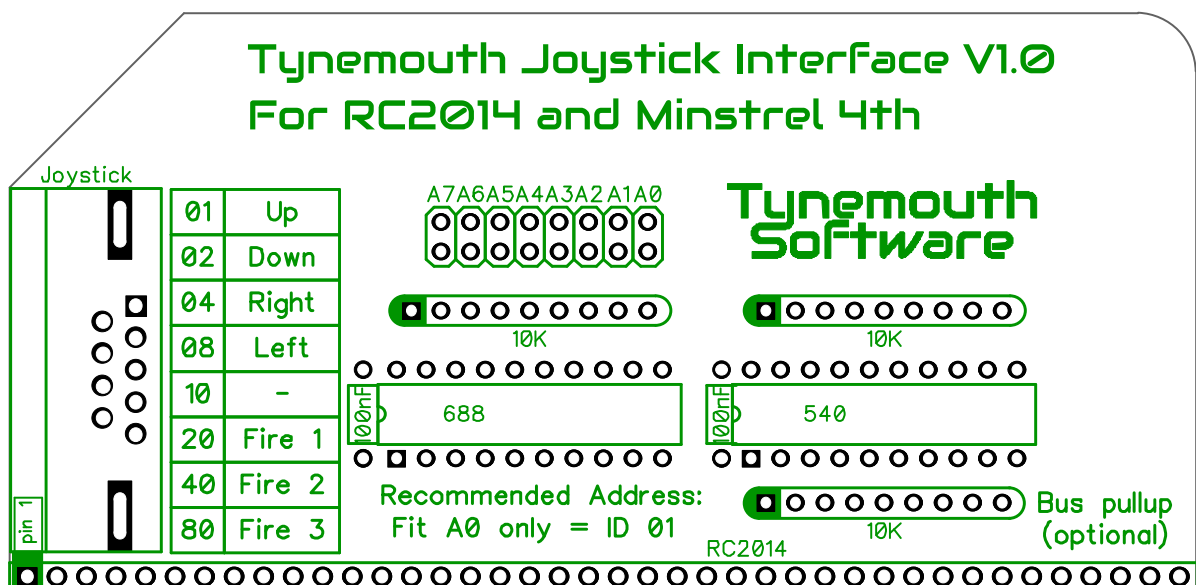
1 x 40 way 0.1" right angled header

1 x 9 way D Male Right Angled PCB connector

2 x 20 way IC sockets (*Optional, turned pin recommended if fitted*)

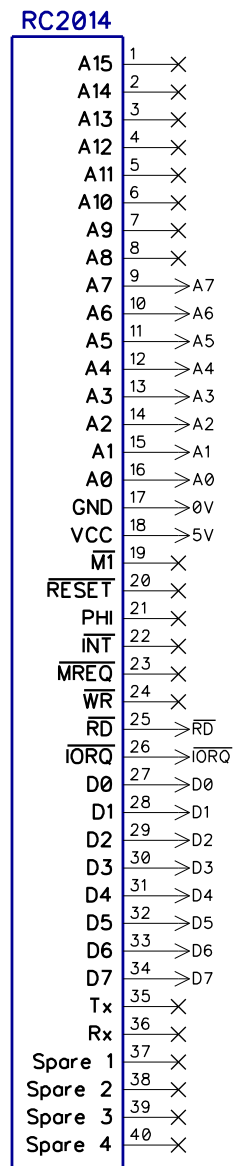
2 x 8 0.1" jumper block + jumpers (*Optional or fit wire links as required*)

COMPONENT PLACEMENT

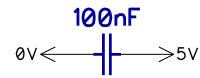


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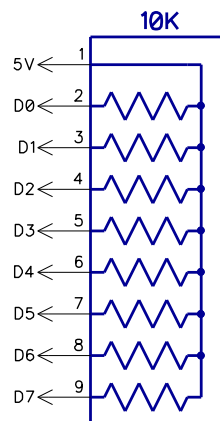
RC2014 BUS CONNECTOR AND PULLUP



Decoupling



Bus Pullup (Optional)



The standard 40 pin RC2014 bus connector is used to access the address and data busses and control lines.

RC2014 is copyright RFC2795 Ltd. The 9 way D Joystick Interface is '*designed for RC2014*'.

There is a position to fit an optional pullup resistor array to pull the data lines high. This will ensure that any reads of an unused IO or memory address will always return the value 0xFF. Without this, the value returned will not always be consistent and will depend on the system.

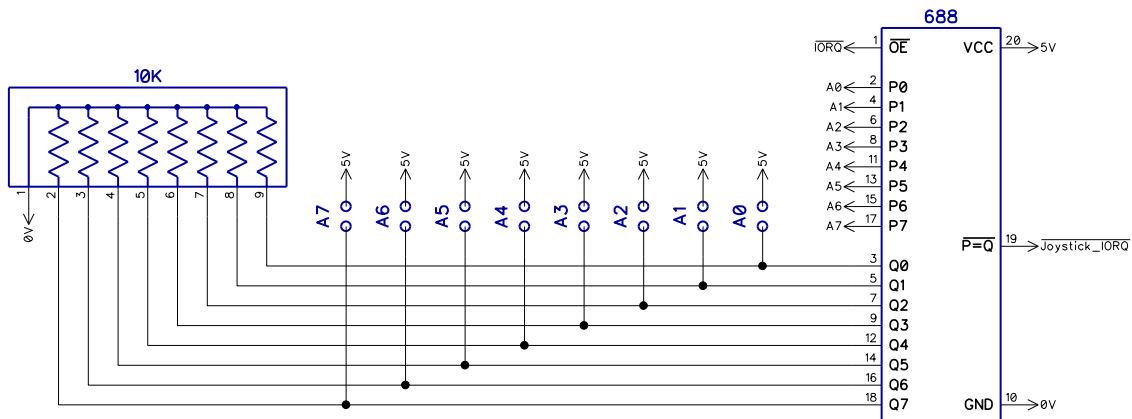
| System | Value read from unused addresses without pullups | Value read with pullups |
|--------------------------------|--|-------------------------|
| RC2014 | Depends on system components | 0xFF |
| Jupiter Ace | 0x20 (Most of the time, but not consistent) | 0xFF |
| Minstrel 4th | 0x58 | 0xFF |
| Minstrel 4D | 0xFF | 0xFF |
| Jupiter Ace Emulators | 0xFF or 0x20 | - |

This should not cause any issues if fitted, but may be left out if desired.

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ADDRESS DECODING

SCHEMATIC



OVERVIEW

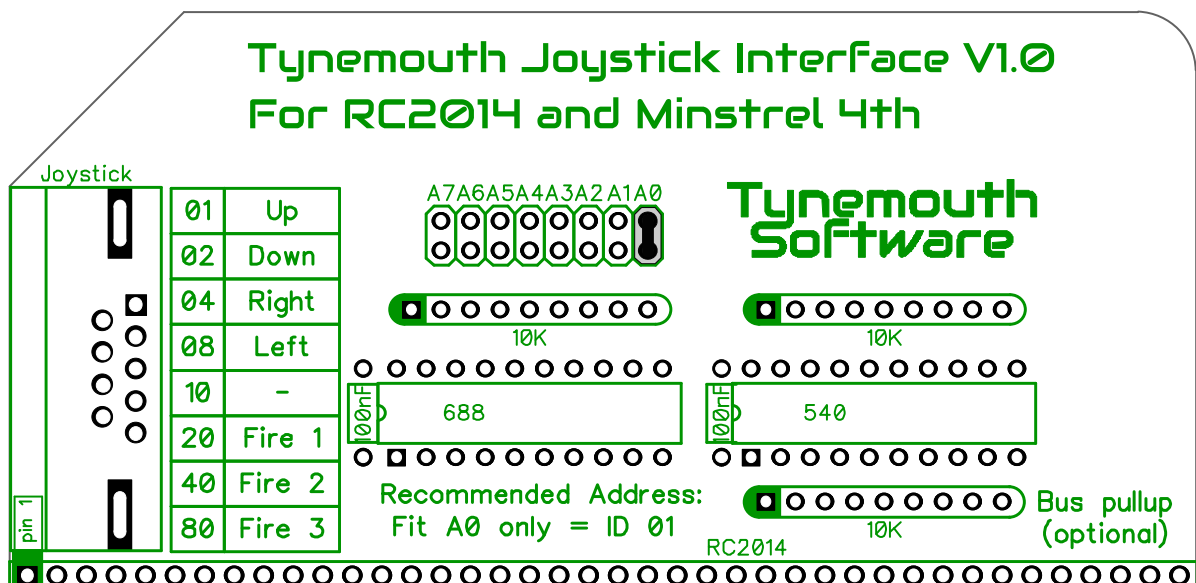
A single 74HC688 magnitude comparator is used for the address decoding. This compares two 8 bit values and the output goes low if they match and the enable line is low.

The first value is the low 8 bits of the address bus. The second value is the desired device address. Enable is the IO request line from the RC2014 bus. The output will only go low if there is an IO operation at the selected address.

The resistor array will set this value to 0x00 if no jumpers are fitted. Jumpers should be fitted to set the desired address. Where a jumper is fitted, there will be a 1 in the address. This way any address from 0x00 to 0xFF can be set. Wire links can be fitted in place of the jumper block for any address bits that should be a 1.

RECOMMENDED SETTING

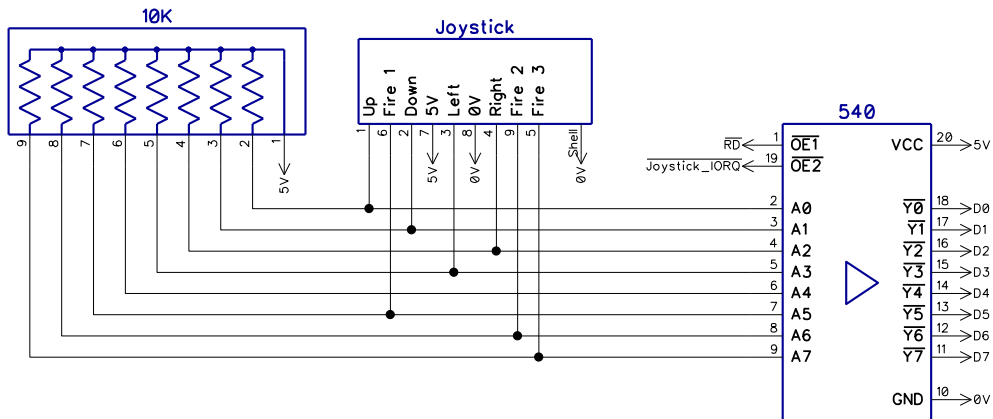
To be compatible with the Boldfield joystick for the Jupiter Ace, address 0x01 should be used. To set this address, fit a jumper or wire link at position A0, as shown below.



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JOYSTICK

SCHEMATIC



OVERVIEW

A 74HC540 is used as a data buffer. This has two enable lines, both of which need to be low to activate the buffer. One is connected to the read signal on the RC2014 bus, the other to the decoded address. The buffer is only enabled for IO read operations at the selected address.

This is an inverting buffer, so will read as a 1 when the input is 0 and vice versa. The inputs are all pulled high, and will be active low when the switches inside the joystick are pressed. When this happens, the corresponding bit in the value read will be high. The default resting value is 0x00.

The original Boldfield joystick only used the lower 6 bits, here the extra 2 bits are used for Fire 2 and Fire 3.

| Bit | Bitmask | Signal |
|-----|---------|--------|
| 0 | 0x01 | Up |
| 1 | 0x02 | Down |
| 2 | 0x04 | Right |
| 3 | 0x08 | Left |
| 4 | 0x10 | Unused |
| 5 | 0x20 | Fire 1 |
| 6 | 0x40 | Fire 2 |
| 7 | 0x80 | Fire 3 |

The joystick connector is the standard 9 way D pinout used on Atari and Commodore systems, Kempston interfaces etc. (note this is not the same as the Atari 5200, Spectrum +2 or Sega Genesis).

| Pin | Signal |
|-----|------------------------|
| 1 | Up |
| 2 | Down |
| 3 | Left |
| 4 | Right |
| 5 | Fire 3 |
| 6 | Fire 1 |
| 7 | 5V (for autofire etc.) |
| 8 | 0V |
| 9 | Fire 2 |