TEC SC-1 IO Expansion Port Adaptor – T2SC

Connect SC1 Expansion port-based peripherals to your TEC

By Craig Hart

Introduction

The TEC-1 has never truly had a full featured IO expansion port. Instead, the second RAM socket has served as a minimal solution for many years.

The main issue with the TEC Expansion Port, is the lack of useful signals, owing to its original intent of being a second 6116 2k RAM socket.

Sure, the power, data bus and but things like IO select lines, CPU signals etc. are missing, Hence, 'creative' solutions like the DAT board have come into existence to work around the limitations.

This project fixes that, by breaking out the full Z80 CPU into a full 40 pin connector. For the first time, designers have full CPU bus access.

The new connector is the same pinout as the Southern Cross SC-1 computer, and also the Multitech MicroProfessor MPF-1), which means peripherals designed for these platforms become usable on the TEC for the first time.

Circuit Design

The adaptor sits above the TEC's Z80 CPU socket (yes, I see the irony here – 'fixing' the hovering PCB issue by using a hovering PCB!!) and provides the SC1 type connector with the same orientation as it is on the SC1.

The "circuit" could not be simpler – CPU signals are passed directly to the corresponding pin on the TEC and the SC1 connectors; there is no circuit as such, only connecting wires. A single 100nf power filtering cap is provided just for good measure.

Installed view on the TEC-1F.

Assembly

There are a couple of gotchas with this board – mainly, ensuring you place the correct part on the correct side of the PCB.

Start by inserting the 2 x 20 pin headers on the SOLDER side of the PCB – into the holes highlighted by the white rectangles. Solder these headers on the component side.

You must solder the headers first as the 40-pin IC socket will block access to solder the pins later.

To ensure the headers are exactly vertical, you can insert the headers into the TEC's CPU socket before soldering, If in doubt, solder just the two end pins first and check – its easy to heat that one pin and adjust if necessary, before soldering all 20.

After the header is mounted, solder the 40 pin socket and the IDC connector in the usual way.

Soldering the IC socket requires working between the two rows of header pins and is a little tricky, but certainly within the skillset of anyone who has built a TEC previously.

Take your time here; the solder mask is very good at helping prevent accidental shorts between pins so don't be shy.

Finally, solder in the 100n cap.

Fitting the PCB to the TEC

We are assuming your TEC has the Z80 socketed. If not, fit one!

We suggest the use of a dual wipe socket if you're using square pin headers, but a machine socket will work with the suggested round type header pins.

The round type is our preference as they are universal and more closely

match the dimensions of a standard IC leg. They are harder to source, but we obtained ours from Mouser Australia.

The Z80 CPU is orientated with pin 1 down, same as the original TEC. This sees the new connector to the left (Facing the TEC ROM & RAM) and orientated the same as the SC1 connector with pin 1 up. The photo on the previous page should make things clear.

Simply plug the pin headers into the TEC CPU socket, aligning pin one. Make sure not to 'offset' the pins as this could potentially damage the CPU or TEC.

The TEC should power on normally with or without anything connected to the new header.

The new board will partly obscure the Expansion slot, but there is still plenty of space underneath for a second 6116 chip or a connector plugged to the original expansion port.

Diagram showing where to solder the Pin Headers on the Reverse Side
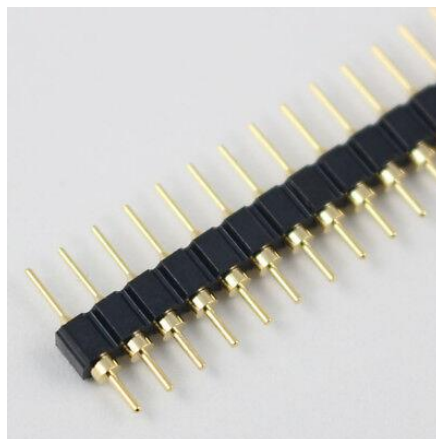
Parts List

1 – 100n Monolithic
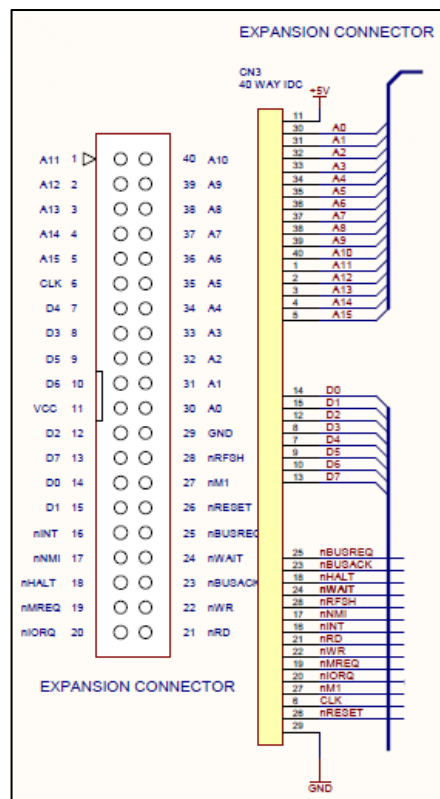
1 – 40 pin IC Socket

2 – 20 pin header strip
Preci-dip 350-80-120-00-001101 or similar recommended

1 – Tec to SC bus Adaptor PCB

Preci-Dip round Header pins are recommended for best results

Pinout of the SC1 Expansion Connector – courtesy of Craig Jones

Making a Connection

I have found that old 40 wire IDE Hard Drive/CD-ROM cables from junked PC's make great cables for connecting up your add-on boards. These can usually be scrounged from old gear at no cost. Most computer shops usually have a stash and will often give them away as they're no longer used in modern machines.

The IDE cable length (typically 50cm) doesn't seem to be any issue at all, as the TEC's bus speed isn't very high and the capacitance of IDC cables is also quite low at around 25-35pF (according to various data sheets).

I have found there is no need to add bus driver chips or terminating resistors either.

I have also daisy-chained 2 add-on boards successfully using the IDE cable method.

Conclusion

The addition of a true IO bus (Well, really the breakout of the Z80 CPU pins) opens up a new world of possibilities.

TEC owners can now experiment with interrupts, expanded IO decoding, memory expansion beyond 2k, more complex peripherals such as the Z80 family peripheral chips, and well just about anything really.

The support of SC1 and MPF-1 peripherals also opens up new options, with completed products already available in these markets.

The author already has 3 new add-on boards for the SC1 which will also work with the TEC – see TEC Journal #1 for the first board, my SPI2C SPI and I^{2}C bus adaptor.

Gerbers and more are available at:
https://github.com/1971Merlin/T2SC