

Serial Interface Boards as Altair Cassette Interface

Any serial board that might serve as a drop-in replacement for the 88-SIO board used in the original Altair Cassette Interface (88-ACR) is going to have to use the same UART as found on the 88-SIO. This UART is an early UART for which the status register is formed external to the UART by the board designer. This UART (or at least an equivalent UART) was made by numerous manufacturers, but all with different part numbers. Here's an informal list. If I'm missing any or have an error – let me know.

- General Instrument AY-5-1012, AY-5-1013A
- Texas Instrument TMS6011
- AMI S1883
- SMC Microsystems COM2502, COM2502H, COM2017, COM8502, COM8017
- Western Digital TR1402/1602/1863/1865
- Intersil 6402

Following is a list of boards that use one of these UARTS and can be configured to look like the 88-SIO used with the Altair Cassette Interface:

- Altair 88-SIOA (rev 1, or rev 0 with the rev 1 update applied. The RS-232 version, "SIOA", drops into the configuration shown in the video)
- Solid State Music IO-4 (SSM-IO4)
- ICC (Gould) 100-0062 (same as SSM-IO4)
- California Computer Systems (CCS) 2718A
- Electronic Control Technology (ECT) R2IO
- CompuPro Interfacer I (minor trace cuts/blue wires required)

The requirements to work as a drop-in replacement for the 88-ACR serial board are:

- Status port at I/O address 6
- Data port at I/O address 7
- Transmit ready flag on bit 7 (MSBit)
- Receive data ready flag on bit 0 (LSBit)
- Negative logic (0 when true, 1 when false)
- 300 baud, 8N1

The following pages document how to configure each board listed above.

Altair 88-SIOA

The 88-SIOA uses RS-232 levels on the I/O connector and drops into the same configuration shown in the video. The board must be a Rev 1 board or be a Rev 0 board with the Rev 1 updates (very common – the update is considered “errata”). Follow these steps to configure the board for use as a cassette interface:

- 1) Set I/O address jumpers to set the port base address to 06h
- 2) Set UART jumpers for 8N1
- 3) Set baud rate jumpers for 300 baud
- 4) Wire the harness from the 10 pin I/O connector to a female DB-25 as follows:

10 Pin Header	DB-25
+5v	18
Gnd	7
RSI	2
TSO	3

This makes the DB-25 connector look like DCE and places a +5v supply on pin 18 of the DB-25. This matches the configuration shown in the video. You can swap the connections to pins 2 and 3 on the DB-25 to make the DB-25 look like DTE. This allows the external DB-25 cable to connect the serial board to the modem to be a straight-through cable instead of a null modem/crossover cable.

Solid State Music IO-4 (or ICC/Gould 100-0062)

The SSM-IO4 board has two serial ports. Port B (the port on the left) is used as the cassette interface port. Follow these steps to configure the board for use as a cassette interface:

- 1) Set the serial address switches to start the serial registers at I/O address 04h
- 2) Set the parallel address switches to something other than 04h (e.g., 80h)
- 3) Set the UART switches for 8N1 and set the PR (port reversal) switch OFF (open)
- 4) Wire the port B status header (W1) to connect TBMT to D7 (pin 5 to pin 16) and RDA to D0 (pin 4 to pin 9)
- 5) Set the baud rate jumper for port B to 300 baud
- 6) Install an inverting buffer (74LS368) in U16
- 7) Wire the harness from the 14 pin “Serial B” connector to a female DB-25 as follows:

Serial B	DB-25
1 (Rcv)	2
7/8 (Gnd)	7
11 (Xmt)	3
13/14 (+5v)	18

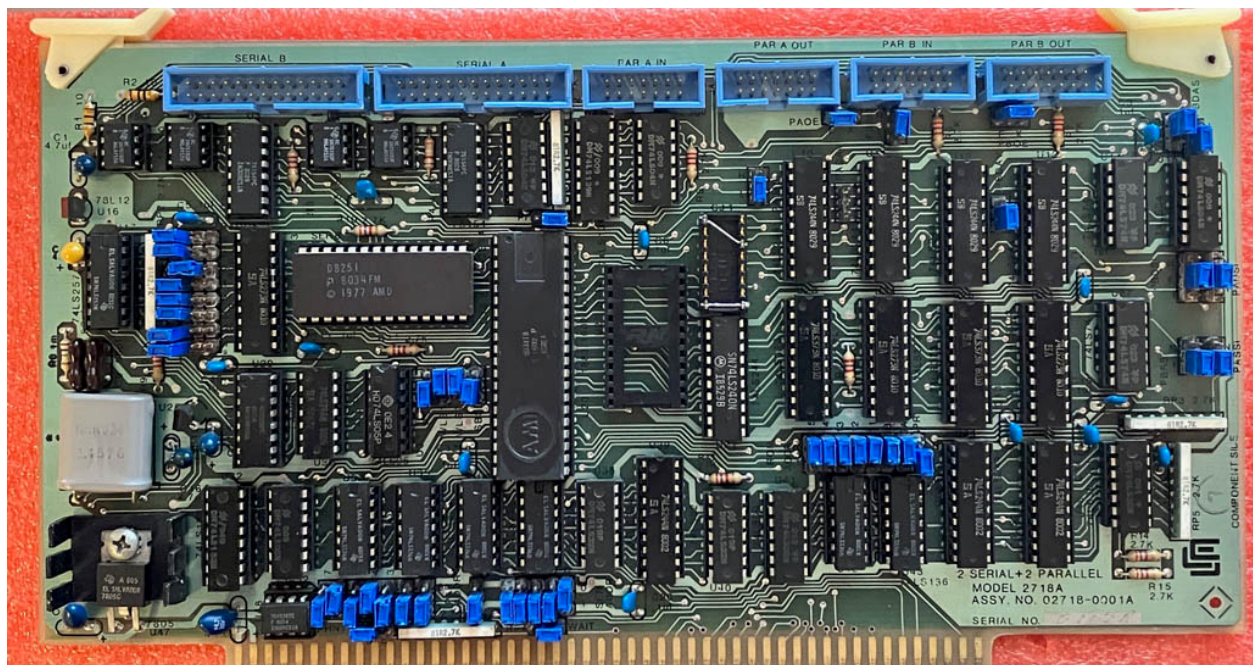
This makes the DB-25 connector look like DCE and places a +5v supply on pin 18 of the DB-25. This matches the configuration shown in the video. You can swap the connections to pins 2 and 3 on the DB-25 to make the DB-25 look like DTE. This allows the external DB-25 cable to connect the serial board to the modem to be a straight-through cable instead of a null modem/crossover cable.

California Computer Systems (CCS) 2718A

The CCS 2718A board has two serial ports. Port A (the 40 pin IC) is used as the cassette interface port. Follow these steps to configure the board for use as a cassette interface:

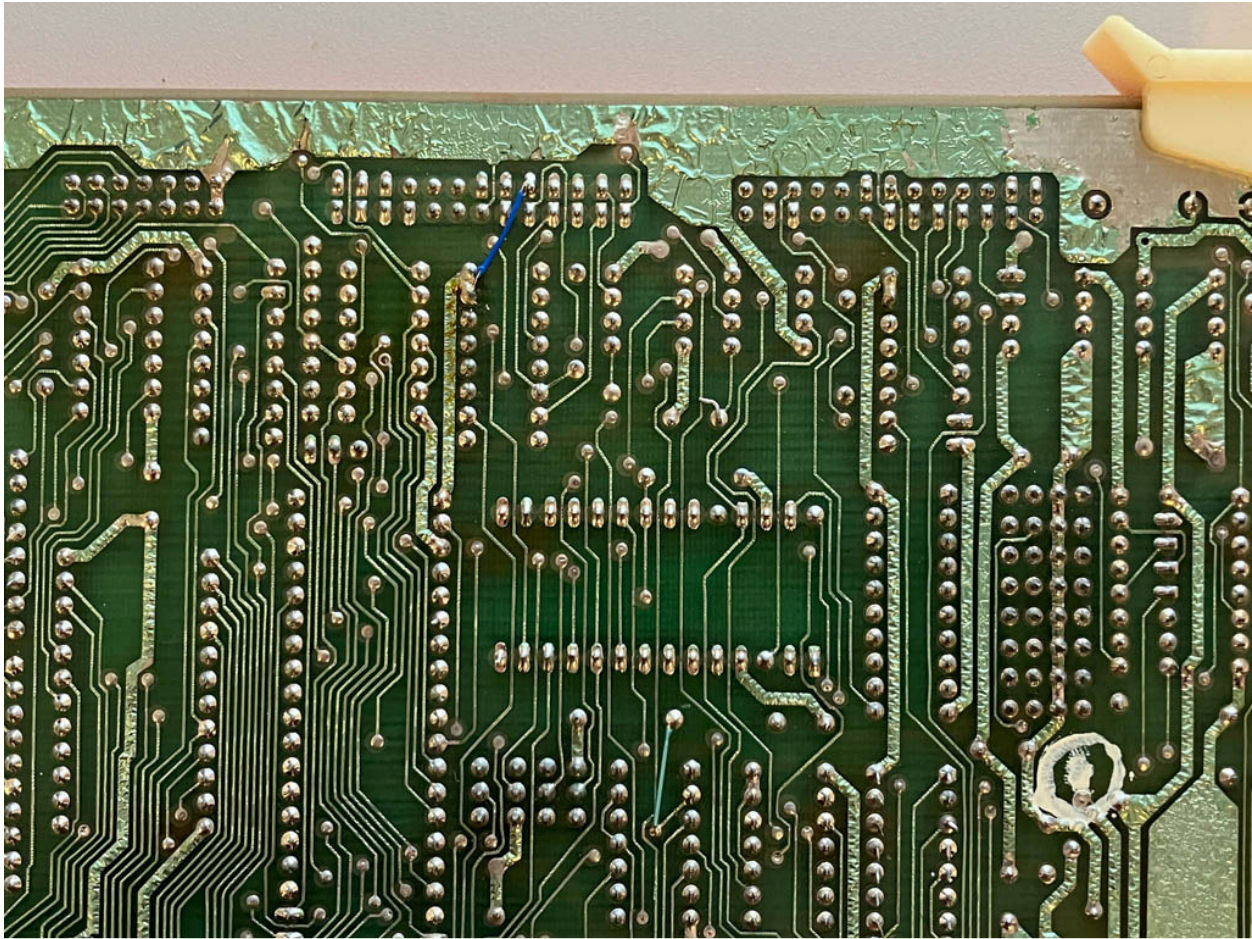
- 1) Set SPR (Serial Ports Reverse) to the "1" position to have the 40 pin UART selected when A1=1.
- 2) Set SAI (Serial A Invert) to the "N" position so that A0=0 selects the status register and A0=1 selects the data register.
- 3) Set Serial Address jumpers A7-A2 to 000001. This setting in combination with SPR=inverted (step 1) addresses the UART at I/O addresses 6 and 7.
- 4) Set the UART format jumpers as follows: PS=x (parity select is don't care), WLS2 and WLS1 both set to 1 (8 bits), SBS=0 (one stop bit), PI=1 (no parity).
- 5) Set Serial A Baud Rate Jumpers to 1101 (300 baud).
- 6) Wire the Serial A Status Header as shown in the picture. This connects DR (data ready) to D0 (pin 14), and THRE (Transmit Holding Register Empty) to D7 (pin 9).
- 7) To invert the status bits, install a 74LS240 in U22 instead of a 74LS244.

IMPORTANT: The silkscreen on some 2718A boards is incorrect next to the address jumpers for the parallel ports, the serial ports, and for the EPROM. For all three of these jumper blocks, the "1" position is towards the top of the board and the "0" position is towards the bottom (edge connector) of the board.



CCS-2718A Jumper Settings for Altair Cassette Emulation

To put +5v on DB-25 pin 18, connect a jumper wire on the pack of the PCB to the “Serial A” header pin 10 as shown here:

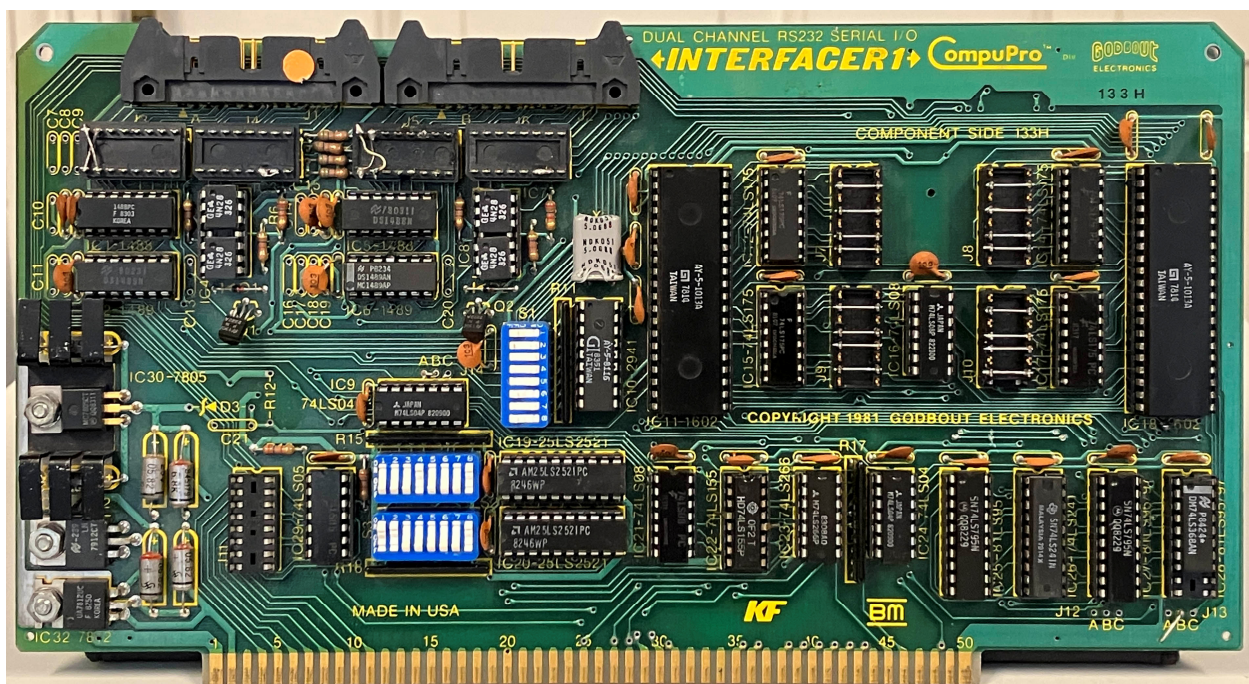


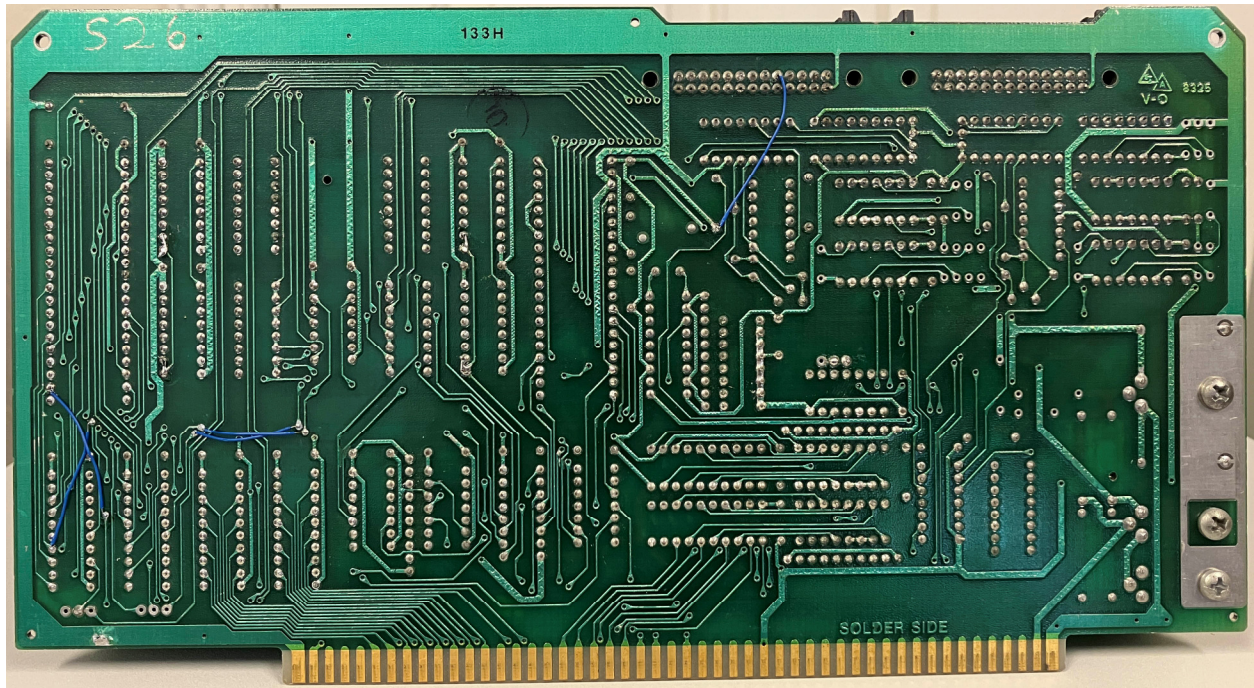
CompuPro Interfacer I

The Interfacer 1 board has two identical serial ports that both use the proper UART needed to look like the 88-SIO port of the Altair ACR. Unlike many serial boards, the I/O address of each port is independently selectable, so we can use one port for the ACR and use the other port as a console port by making it look like the 88-2SIO serial port. These instructions configure port A as an 88-2SIO at I/O address 10h/11h (Altair standard) and port B as an 88-SIO at I/O address 6/7 for use as the ACR serial port.

- 1) Set S1 switches: 1-on, 2-off, 3-off, 4-off, 5-off, 6-on, 7-off, 8-on. This sets the baud rate for the console (port A) to 9600 baud and the cassette (port B) to 300 baud.
- 2) Set S2 switches: 1-on, 2-on, 3-on, 4-off, 5-on, 6-on, 7-on, 8-off. This sets the I/O address for the console (port A) to 10h and enables the port.
- 3) Set S3 switches: 1-off, 2-off, 3-on, 4-on, 5-on, 6-on, 7-on, 8-off. This sets the I/O address for the cassette (port B) to 06h and enables the port.
- 4) Configure headers J3-J6 as shown in the photo to make both DB-25 connectors look like DCE.

- 5) Configure headers J7-J10 as shown in the photo to make both ports default to 8 bits, no parity, one stop bit.
- 6) Lift IC22 pins 4 and 12 out of the socket. This prevents accidental updates to the 8N1 port settings.
- 7) On IC12, IC14, IC15 and IC17, short pins 9 and 10 to each other on the back of the PCB. This ties pin 9 (floating due to step 6) to a low output from pin 10.
- 8) Install an 81LS96 or 98 in IC28 to give a negative logic output for the cassette status register (port B). Or, use a 74LS368 and install jumper from B to ground as shown in the picture.
- 9) Lift IC6 pin 11 out of the socket to free up IC28 pin 4 to use for "transmit empty" status.
- 10) On the back of PCB, cut trace from IC18 pin 22 to IC28 pin 14. This frees status bit 0 to connect to "receive data available" for the cassette port.
- 11) On the back of the PCB, jumper from IC18 pin 22 to the feedthru next to IC28 as shown in the picture. This connects "transmit empty" to status bit 7 for the cassette port.
- 12) On the back of the PCB, jumper from IC28 pin 14 to pin 6. Pin 6 can be accessed using a feedthru above IC28 if preferred (see picture). This connects "receive data available" to status bit 0 for the cassette port.
- 13) On the front of the board, cut both of the two 1 inch parallel traces located below the word "Electronics" in the copyright notice on the silkscreen. These cuts are visible if you zoom in on the front picture. This allows swapping of the transmit ready and receive ready signal bit positions for the 2SIO serial port.
- 14) Install wires to cross the two parallel traces just cut. These wires can be seen on the back of the board photo. This puts transmit ready and receive ready on the proper bits for the 2SIO port.
- 15) Install jumper between 5v and port B pin 10 to provide 5v power to the DB-25 pin 18. This jumper can be seen on the back of the board photo.





S26

133H

8325
V-0

SOLDER SIDE