CASSETTE-TO-CASSETTE INTERFACE

Here's a way to make bulk copies of programs and save all that tedious work.

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■Making back-up copies of programs on tape cassettes can be a real chore. The program must be loaded into the computer from your original cassette, then the blank back-up cassette must be swapped for the original and the program saved on the back-up. This process must be repeated for each program on the original. The circuit described here permits bulk back-up copying. It is an interface circuit that allows two Commodore cassette tape recorders to be connected for directly reading and writing.

The connection between a Commodore computer, and its data cassette recorder is shown in Figure 1. This shows the cassette recorder's cable connector as it would be seen if you held it looking into the hole in the connector housing with the contact fingers at the top of the hole. The edge-connector of a Commodore computer is also shown as it would plug into the cassette cable's connector socket—with the contacts on top of the board. Contacts are identified by the numbers 1 through 6 along with their function names and signal directions (the computer supplies power and ground to the cassette recorder so the direction of both of these signals is from the computer edge-connector to the cable connector attached to the recorder). Connections to pins 1, 2, 3 and 4 are needed to read data out of the data cassette recorder and connections to pins 1, 2, 3, and 5 are needed to write data into the recorder.

The Commodore cassette tape recorder does not use the two-frequency FSK (*Frequency Shift Keyed*) system found on many other computers, but uses a digital pulse sequence to store data. The interface shown in Figure 2 is a digital circuit. Using an external power supply, it provides the DC voltages and logic level signals needed to interface two Commodore data recorders.

The most important part of this circuit is IC3—a 74LS14 hex Schmitt-trigger inverter. Its main function is to accept a READ input on IC3 pin 1 and produce a WRITE output on IC3 pin 2.

The circuit (see Fig. 2) is powered externally by 9V to 15V brought into terminal strip TS1. Switch S1 provides power control so the external power supply does not have to be turned on and off. Diode D1 protects the circuitry against reverse polarity if the power supply is accidently connected backwards to TS1. Capacitor C1 provides filtering for the inputs of the voltage regulators IC1 and IC2. IC1, R1 and R2 produce +6V for the cassette recorder motors. IC2 produces +5V for the logic in the cassette recorders and the circuitry on the interface board. Since IC3 contains six inverters, it was convenient to provide buffered outputs for driving LEDs. LED1 is on when connector pin 4 of the READ cassette is inputting a logic low. LED2 is on when the READ cassette is inputting a logic high. Test points TP1 and TP2 provide a buffered output for connecting an audio amplifier or oscilloscope to monitor.

Construction

The prototype was assembled on a plug-in

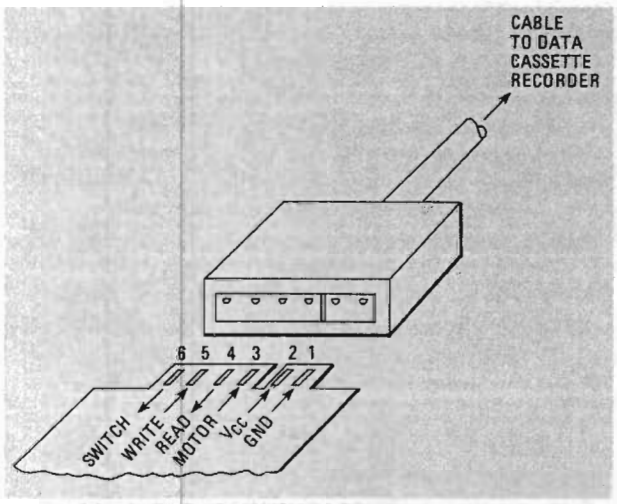

FIG.1—COMPUTER CIRCUIT BOARD edge-connector and cable connector from data cassette recorder showing pin numbers, function names and signal directions.

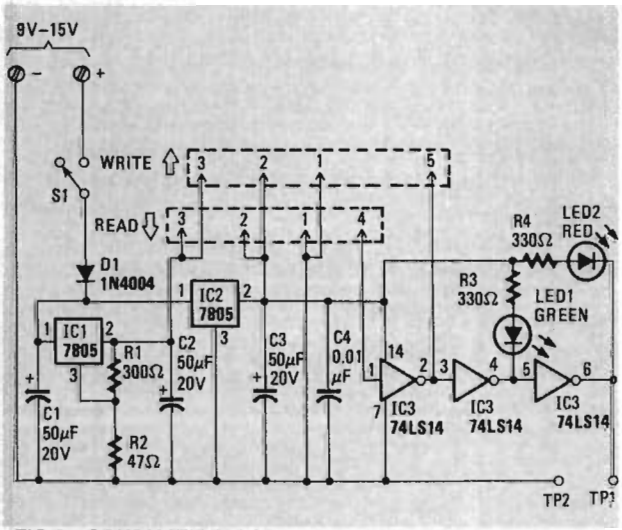

FIG.2—SCHEMATIC DIAGRAM OF INTERFACE through which two Commodore data cassette tape recorders can be interconnected to read out of one and write into the other.

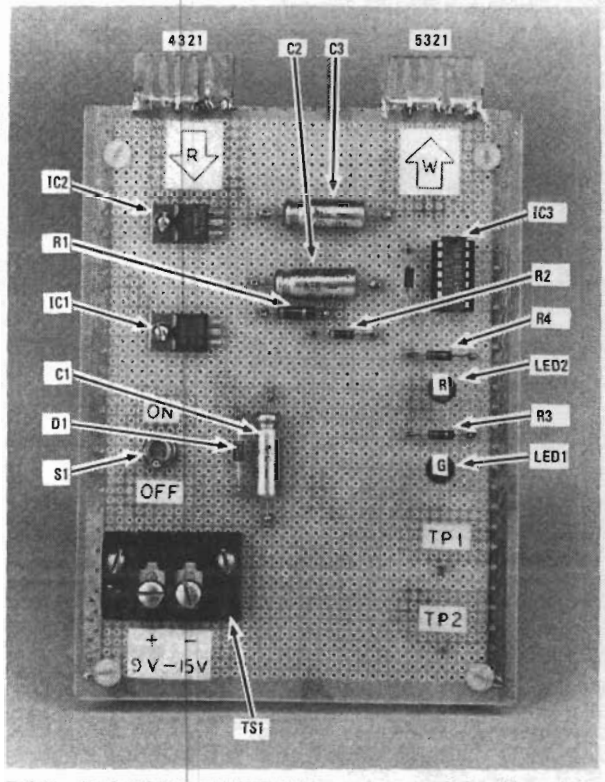

FIG.3—COMPONENT LAYOUT for point-to-point wiring of the interface board.

perfboard having a 22-pin edge connector with 0.156-inch (5/32-inch) spacing between the centers of the connector pins. A coping saw was used to rim the circuit board edge connector to accommodate the cable connectors of two data cassette recorders. A slot must also be cut between pins 2 and 3 so the keyed cable connectors will fit on the circuit board.

Parts layout is not critical. Figure 3 identifies the component locations on the prototype. The components were mounted on flea clips and point-to-point wiring was used. It is advisable to use a 14-pin DIP socket to avoid soldering directly to the pins of IC3 Another perfboard (without an edge connector) was fastened to the bottom of the interface board, using

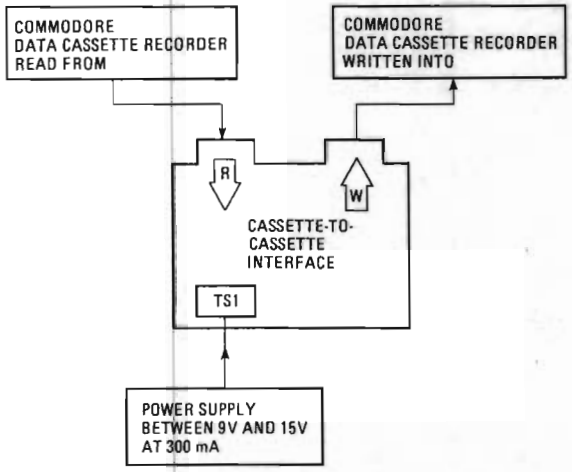

FIG.4—CASSETTE-TO-CASSETTE interface showing connections to power supply and data cassette recorders.

spacers to protect the wiring side of the board.

Testing

After construction is completed, check all wiring and verify that polarized components like D1, C1, C2 and C3 are installed correctly. Leave IC3 out temporarily

PARTS LIST

Resistors
All resistors are 1/4-watt 10% unless otherwise indicated
R1—300 ohms ± 5%
R2—47 ohms
R3, R4—330 ohms
Capacitors
C1–C3—50 uF, 20 volts electrolytic
Semiconductors
D1—1N4004 Diode
LED1—Green LED
LED2—Red LED
IC3—74LS14 Hex Schmitt-trigger
IC1, IC2—7805 5-volt regulator
Miscellaneous
Plug-in perfboard with 22-pin edge connector with 0.156-inch spacing between centers of connector pins, 14-pin DIP socket, connectors, terminal strip, miniature toggle switch, mounting hardware.

and connect a power supply to terminal strip TS1 that can provide between 9V and 15V at 300mA (see Fig. 4). Close the power switch S1 and measure the DC voltages between pins 1 and 3 of both READ and WRITE connectors—pin 1 is the ground and pin 3 should be at +6V if IC1 is wired properly. Also measure the voltage between pins 1 and 2 of the connectors—pin 2 should be +5V if IC2 is working correctly. Measure the voltage between pins 7 and 14 of the socket for IC3—pin 7 is ground and pin 14 should be +5V. Open S1 and check that all voltages decrease to 0v.

Plug in IC3 and close S1 again—the red LED2 should be lit. Measure the voltage between pins 1 and 5 of the WRITE connector—pin 5 should be less than +0.5V. Use a clip-lead to short pins 1 and 4 together on the READ connector while still observing pin 5 on the WRITE connector—it should now measure more than +2.7V, the red LED2 should be off and the green LED1 should now be lit.

Turn S1 off and connect the READ and WRITE data cassette recorders to the interface board as shown on Figure 4. Insert your master cassette into the READ recorder and a blank cassette into the WRITE recorder. Turn S1 on, push RECORD and PLAY on the WRITE recorder and then push PLAY on the READ recorder.

A small audio amplifier and speaker can be connected across TP1 and TP2 for more convenient monitoring. A high-pitched tone appears on a cassette tape at the beginning of each program. This tone is used to synchronize the computer to the tape during a read operation to allow for variation in tape speed during a read from tape cassette. The sound of data which follows the tone can be described between a hiss and a buzz.◀CD▶