INTRODUCTION

This simple design has been developed to allow preselected voltage levels to be instantly recalled, but may be used in many ways, e.g. as part of an LFO or a simple sequencer. We are sure that we have not thought of all of its possible uses, so there is plenty of scope for you to use your imagination!

DESIGN

The circuit diagrams for the two parts of this unit are shown in Figure 1. Taking first the "preset board" (80-22B), the design centres around the 4051 CMOS multiplexer IC. This device functions as a 1 pole 8 way electronic switch, selecting 1 of 8 DC voltage inputs, the level of which is adjusted using the appropriate preset. The 1 of 8 function is selected by a 3 bit address input so that 000 (binary 0) selects input number 1, 001 enables input number 2 etc. The voltage out of the 4051 (pin 3) is then buffered by an op-amp (1/2 of a 1458) which may be configured as either a simple non-inverting buffer or as an inverting op-amp with a gain of approximately one. In the latter case the maximum output level is limited to -12.6V due to circuit action.

The input to the 4051 is linked to the controller board (80-22A) which simply provides the facility to increment the preset number selected. This is achieved using a 4024 binary ripple counter (IC 2) with the clock input fed by 1/4 of IC 1 (4011) which suitably debounces and inverts the switching performed by S1 or an external clock signal. Thus, each time the switch is pressed, the binary number present on pins 12, 11 & 9 of IC 2 increases by one. This three bit number drives a 7445 BCD to decimal converter and LED driver which lights one of eight red LEDs to display the currently selected preset group. Simultaneously, the three bit number is brought up to +15V logic levels by the three inverting transistor buffers (TR 1-3), in order to be compatible with the 4051 address inputs. Because of this inverting action, preset selection number 1 will close switch position number 8 on the 4051 - in other words the system counts backwards, which is of little consequence in this application. It should also be noted that on power-up, position number 1 is selected as a power-on reset function is performed by R3 and C2.

CONSTRUCTION

The first step prior to construction is to decide which, if any, of the op-amp buffers should be made to invert and the position of the two resistors and link noted. The printed circuit mounting components should be assembled according to the PCB overlays (Figures 2 and 3) in order of increasing height. Figure 3 depicts two positive going buffers (top pair) and two inverters (bottom pair), but this is only an example - different arrangements can be readily determined from this diagram. Check the orientation of polarised capacitors and semiconductors prior to soldering. Once assembly is complete, it is advisable to clean the PCBs using a solvent cleaner and to inspect them closely for dry joints and solder bridges.

It is recommended that at this stage the units are temporarily connected and powered up to check for correct operation (see Calibration section). Once they are functioning correctly, the constructor must decide on the physical positioning of the two types of PCB. It is suggested that the controller PCB is panel-mounted so that the LEDs, the switch and the jack socket are easily accessible. To this end, a punched (but not printed) panel is

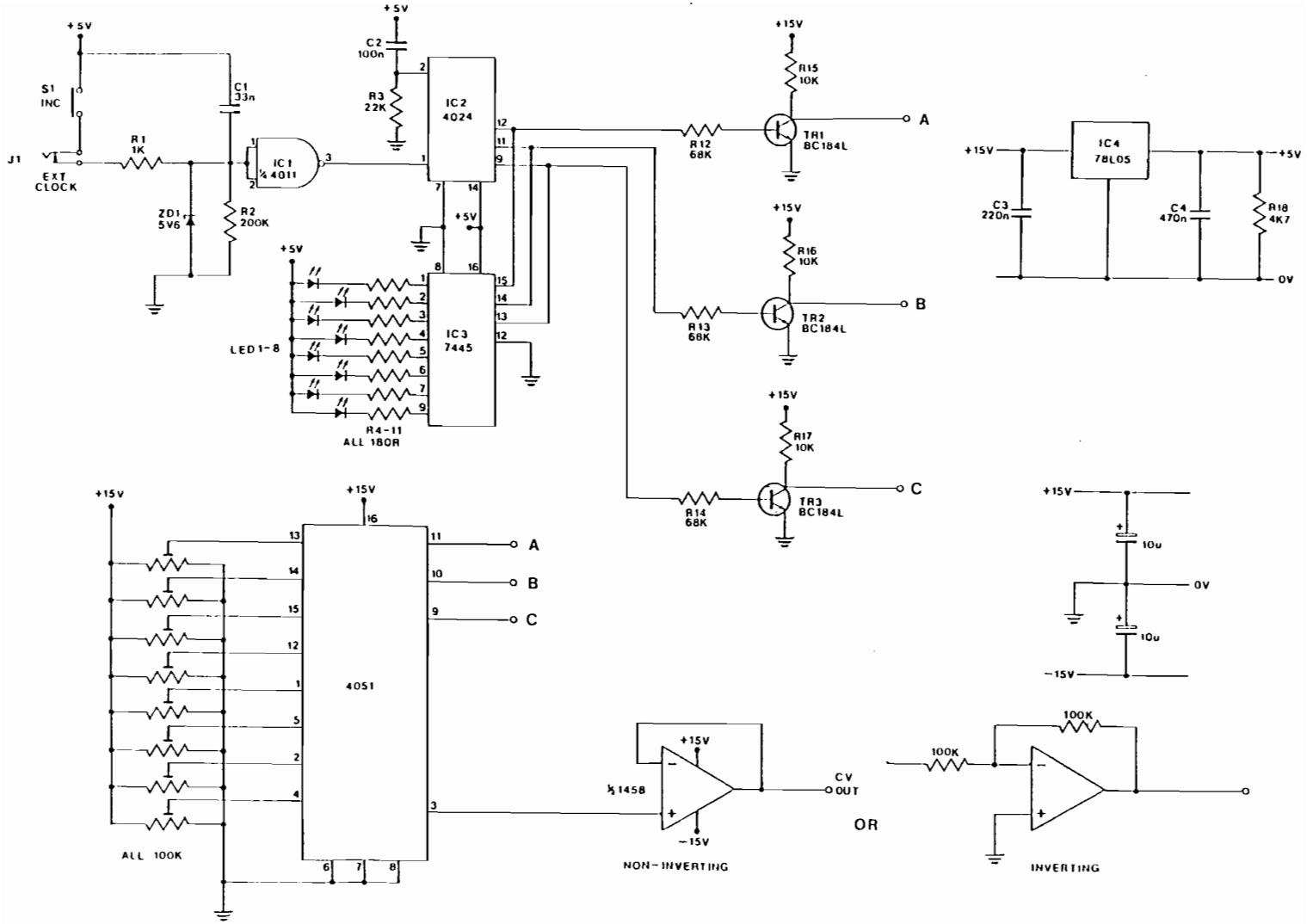

FIGURE 1. 80-22 CIRCUIT DIAGRAM

available. The preset PCB is probably best positioned near to the CV inputs it will control (i.e. behind the front panel of the relevant module). In this type of arrangement, the three control lines (A, B & C) from the 80-22A PCB will have to be distributed to all of the 80-22B PCBs that are being used. However, this may be done in a series manner rather than taking all 80-22B boards back to a single 80-22A board.

The power supply requirements for a 1 + 1 combination are +15V at 75mA and -15V at 7mA. Both circuit boards will accept our standard three way "mains" PCB connector for these connections.

CALIBRATION

No calibration is necessary on either board, except of course for the adjustment of up to 32 presets on each 80-22B board! However, these are best set with the unit connected to the appropriate CV input(s). With power applied to both PCBs, LED number 1 should be lit and the voltages corresponding to the position of all number 1 presets should be present at their respective outputs. A quick check of this may be made by connecting a voltmeter across the output and checking that as the program number is incremented, adjustment of the appropriate preset (as shown in Figure 3) produces a corresponding variation in output voltage. Once this has been done, the unit may be permanently installed and adjusted to the desired preset levels.

IN USE

The Patcher provides a simple yet reliable method of retaining preset CV levels. Each patch control unit (80-22A) can select 1 of 8 "programs" and may control an almost unlimited number of preset boards (80-22B). Thus, with a basic system (i.e. one of each board), it is possible to preset 4 different control voltages on 8 programs. The output voltages could then be hardwired to the break connection of any control input jack socket without losing any flexibility as the preset voltages are disabled on insertion of a jack plug. Alternatively, it may be preferable to use the Patcher to substitute for specific settings of a potentiometer. In this case preset number 1 should be omitted and the wiper of the pot. taken to the wiper position of the omitted preset. In this way preset position number 1 will correspond to normal pot. control, while positions 2 to 8 may be any preset voltage. This type of arrangement is only possible with positive going CVs as a voltage below V_{EE} (0V) will destroy the 4051 IC. However, negative going CVs may be generated by reconfiguring the output buffer to invert the preset voltage (i.e. a preset voltage of +5V becomes -5V etc.).

As a working example, some users may wish to preset seven envelopes together with normal manual envelope control on an 80-18 module. Referring to the construction notes for this module, it can be seen that the Attack, Decay and Release controls require negative going control voltages to increase these three time constants. This can be accomodated by firstly rewiring the three pots. to the +15V PSU rail rather than the -15V rail. The three wiper connections should then be disconnected and taken to the wiper positions of three number 1 presets. With three corresponding 4051 buffers arranged to invert (i.e. using 6 100k resistors) the incoming, now positive, pot. controlled CVs will be negated. This negative output voltage may then be taken back to the A, D & R points on the PCB. It should be apparent that the sustain control may be similarly adapted but without rewiring the pot. and using a non-inverting output buffer configuration.

With the rewiring complete, the 80-18 module will function normally in preset position number 1 (apart from a slightly limited A, D & R range due to the inverting action of the output buffer).

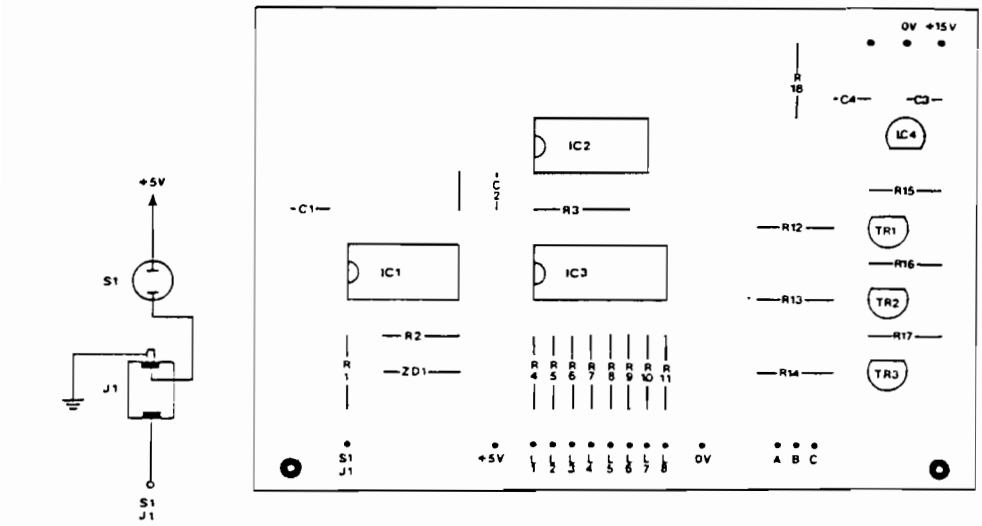

FIGURE 2. 80-22A COMPONENT OVERLAY

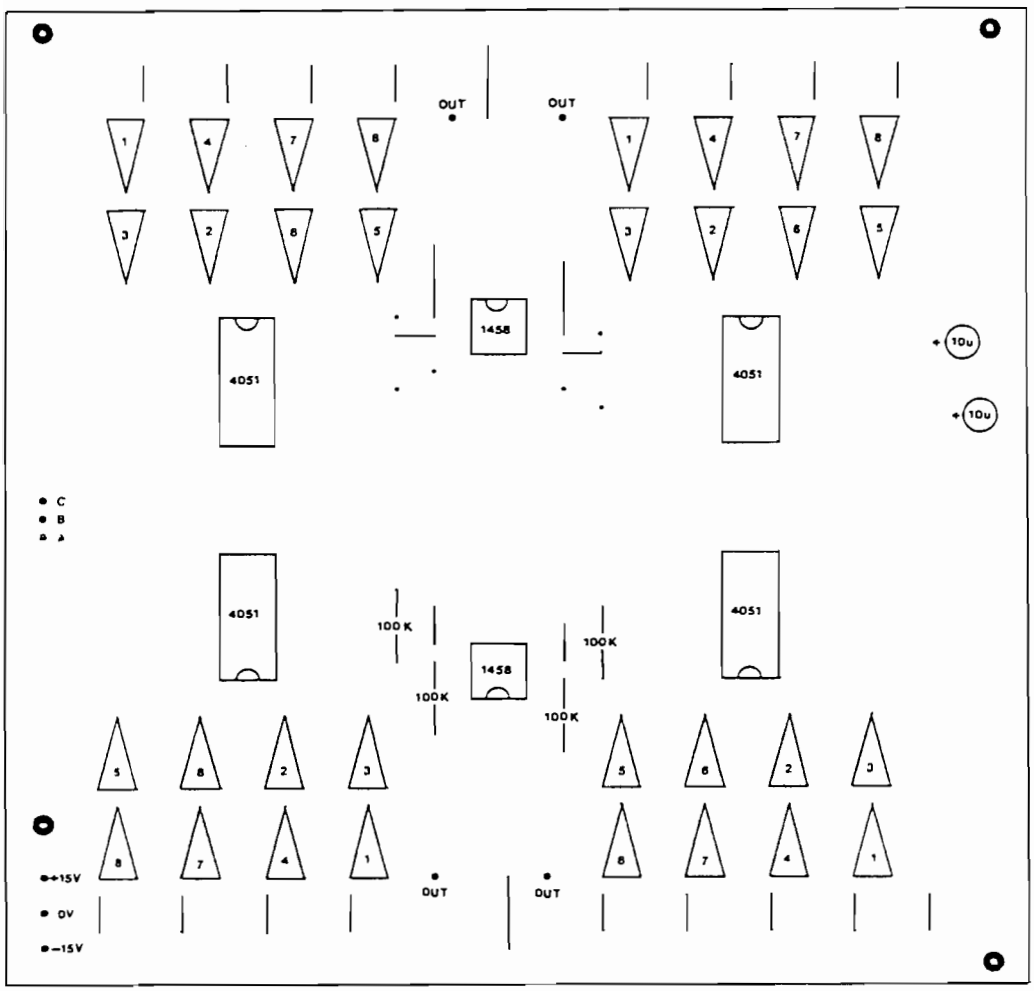

FIGURE 3. 80-22B COMPONENT OVERLAY

Potentiometers which have one track end wired to the negative PSU rail and the other end wired to the positive rail (e.g. VCO frequency) are best adapted to purely positive going CVs, although this will result in a halved control range.

It is worth noting that some particularly interesting (and useful) "sequencer effects" may be generated by using the external clock facility. As an example, the previously described modified 80-18 module could be connected such that the same gate input clocks the program number. In this way a different envelope would result each time a new note is played (repeating after eight notes).

Another, rather different mode of operation involves the use of the Patcher with a clock oscillator. In this situation the combination of one control board and one preset board can function as a simple 4 channel, 8 step/note sequencer, where additional channels may be added in groups of 4. The gate pulse would be the clock input, and if this were a pulse wave with variable pulse width (as from an 80-19 Dual VCLFO), the "gate-on" time is continuously variable.

In addition, the 1 + 1 combination with an oscillator can be used as a four phase, multi-waveform LFO where the frequency is the clock frequency divided by eight. The only drawback to this approach is that the waveform outputs are stepped. This may be alleviated by inserting a slewing capacitor between the 4051 output (pin 3) and ground. The value of this capacitor is dependent on the frequency and degree of smoothing required.

A further mode of operation might be as a signal routing network. In this case, 8 different waveforms would be linked to the 8 positions that the preset wipers would normally occupy (no presets are needed in this application).

The 80-22B PCB may also be adapted for microprocessor control. The three control lines (A, B & C) could be connected to parallel I/O ports and may then be switched in any order. Also, multiple boards may be used with each under individual control rather than bussed together as in the above descriptions. The only modification required would be the use of 7407 O/C buffers to bring the +5V computer logic levels up to +15V.

Almost any combination of control boards and preset boards may be used, depending on the particular requirements of individual users. However, as either a preset memorizer or an interesting modulation source, the possibilities are endless!

COMPONENTS

80-22A

RESISTORS, 5%, 1/4w carbon film

R1	1k0
R2	200k
R3	22k
R4-11 (8 off)	180R
R12,13,14	68k
R15,16,17	10k
R18	4k7

CAPACITORS

C1	33n polyester
C2	100n polyester
C3	220n polyester
C4	470n polyester

SWITCH

S1	push to make button

SEMICONDUCTORS

IC1	4011
IC2	4024
IC3	7445
IC4	78L05
TR1,2,3	BC 184L
L1-8	5mm red LED
ZD1	5V6 400mW zener

80-22B

RESISTORS, 5%, 1/4w carbon film

8 off	100k

CAPACITORS

2 off	10u PCB electrolytic

POTENTIOMETERS

32 off	100k horizontal preset

SEMICONDUCTORS

4 off	4051
2 off	1458