PROCESSOR. 80-5

1. SPECIFICATION

LAG PROCESSOR. EXPONENTIAL DELAY TYPE.
INVERTERS. 2 OFF WITH ATTENUATION.
ATTENUATORS. 4 OFF, WHEN INVERTERS NOT IN USE OR 2 WITH INVERTERS.
POWER REQUIREMENTS: ±15V @ 9mA per rail.

2. APPLICATION

.1 DIGISOUND synthesiser modules have a high input impedance (normally 100k) and a low output impedance (normally 1k). This combin--ation allows one output to be used as a control for, or signal into, several other modules without loading problems. To conserve both panel space and reduce cost this multiple distribution is best accomplished by using the 'Processor' module. In its simplest application one output may be distributed to four inputs, or when two outputs are provided (common practice) to eight other modules. There are four channels on the 'Processor' with this 1 to 4 capability.

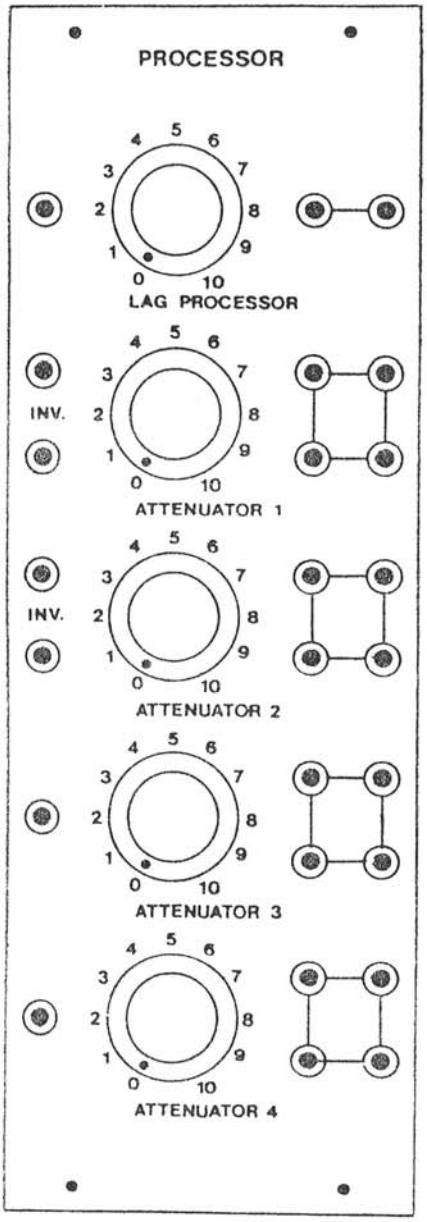


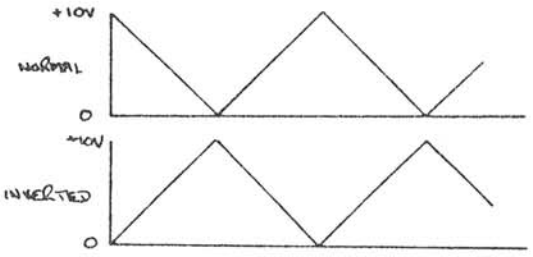
FIGURE 1. PROCESSOR FRONT PANEL

.2 Each of the four distribution channels has an attenuating potentiometer for adjust--ing the level of the output voltage.

.3 Very often, however, one does not wish to have the same level of control voltage to other modules - which would happen if an attenuator was placed on the outputs of the modules. As a simple illustration, assume that an 80-3 VCLFO is being used to modulate a number of 80-2 VCO's. One may wish to vary the depth of modulation to each VCO and the 'Processor' allows this.

.4 There are many useful effects in synthesis which may be obtained by having a control voltage that is simultaneously increasing and decreasing, for example, panning effects. Attenuators 1 and 2 thus have an 'inverting' input which converts a 0 to +10V signal into a +10V to 0V signal. These outputs may be attenuated if required.

.5 The inverters also result in phase invers--ion as illustrated below -



This effect may be used for split phase trem--elo in combination with the 80-9 Dual VCA module.

.6 A so-called 'lag processor' is also incl--uded in 80-5. Essentially this is a crude low pass filter and similar to a portamento circuit. Its main purpose is to slow down control signals, or slew them so that the time taken to reach peak voltage is increased. One application, again with the Dual VCA, would be to take the VCLFO output direct to one channel of the VCA for tremelo and then take the out--put into the second channel of the VCA and modulate it again but this time using the VCLFO signal after it has been delayed by the lag processor. This unit may also be used for smoothing of signals.

3.CONSTRUCTION

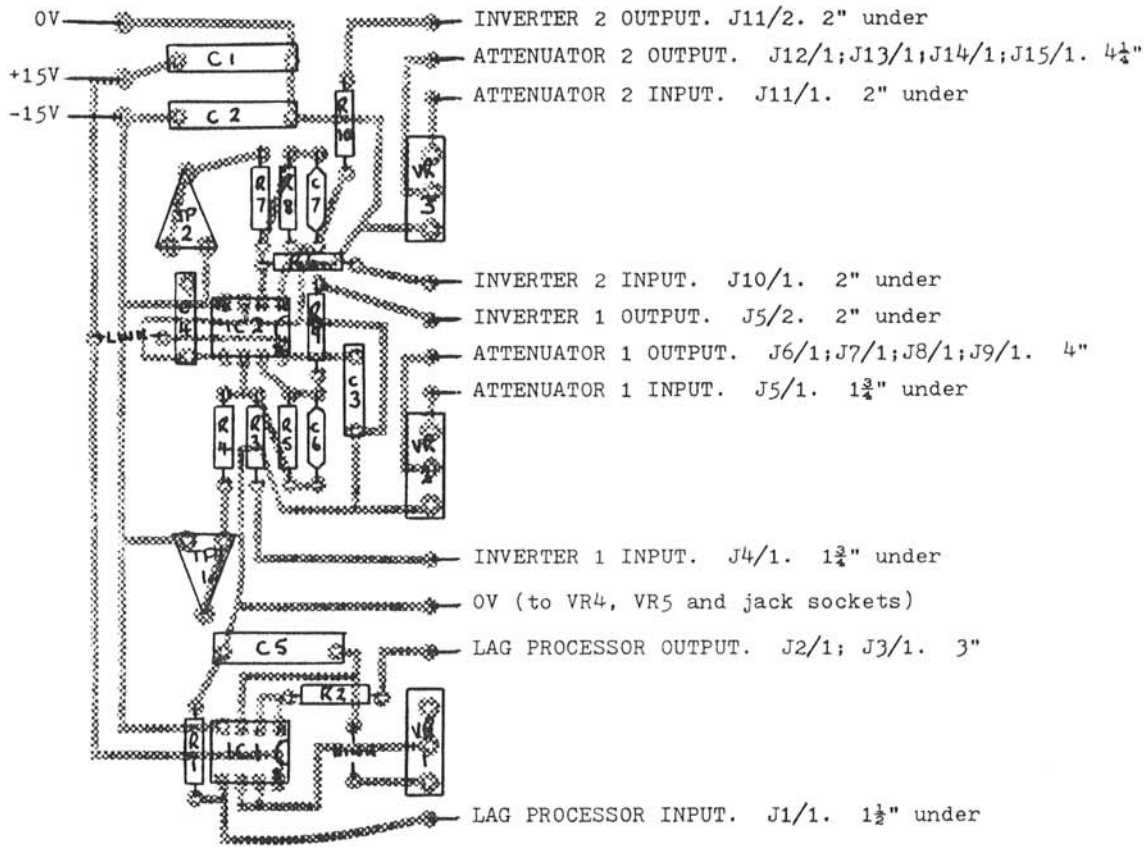
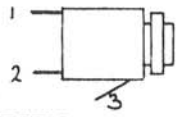


FIGURE 2. COMPONENT OVERLAY AND WIRING CONNECTIONS.

.1 GENERAL

a) WIRE: For wiring between the PCB and panel hardware we recommend a solid wire, such as 1/0.6mm. This is sufficiently rigid to allow neat placement of wires and also to allow bare wire to be used for connecting up a number of commoned jack sockets. Colour coding of wires (3 X power lines; control inputs; signal inputs; and outputs) will aid any fault finding later (if necessary!).

b) JACK SOCKETS: Connecting points will be numbered as shown below. (1) connects with jack plug; (2) connects with (1) with jack plug removed; (3) is grounded - see general construction notes provided with 80 series modules. Thus 'to J2/2' means connect to Jack Socket 2, connecting point (2).



c) POTENTIOMETERS: Potentiometer connections are numbered 1,2 and 3 as shown and when viewed from the rear (normal situation during construction). Thus'to VR2/1' means to potentiometer VR2 and connecting pin 1.

.2 80-5 MODULE

a) The following components are supplied.-

RESISTORS, ¼w, 5% (gold band) carbon film

R 1, 3, 5, 6, 8	100k (br,b,y)
R 2, 9, 10	1k0 (br,b,r)
R 4, 7	130k (br,o,y)

(br=brown;b=black;y=yellow;r=red;o=orange)

POTENTIOMETERS

VR 1	2M2 log.
VR 2, 3, 4, 5	100k lin.

TRIMMERS

TP 1, 2	47k carbon

CAPACITORS

C1, 2	470nF(0.47mfd) polyester
C3, 4	100nF(0.1mfd) polyester
C5	220nF(0.22mfd) polyester
C6, 7	22pF polystyrene

SEMICONDUCTORS

IC 1 1458 - 8pin

IC 2 TL 082CP, or equivalent

MISCELLANEOUS

2 X 8 pin DIL sockets; 3 extra nuts for VR1, 2 and 3; PCB.

b) Refer to the component overlay shown in Figure 2. Solder in the two wire links and then the remaining components except VR 1,2 and 3. Since there is little working space behind the panel after insertion of the PCB the wire connections to the PCB should be soldered in place next. In Figure 2 a guide to the wire length required is given based on an allowance of $\frac{1}{4}$" for connecting to PCB; $\frac{3}{4}$" for connecting to two jack sockets; and 2" when four sockets are to be connected. The word 'under' also appears after some wire lengths which indicates that these wires should be bent under the PCB (towards the foil side) prior to fixing to the panel. Finally place the extra nut provided (for spacing) to VR 1, 2 and 3 and solder these pots to the PCB. Check component placement and inspect the underside of the PCB to ensure that all conn--ections have been properly made and that no solder bridges have formed between the tracks.

c) Mount all panel components and wire up the Attenuators VR 4 and VR 5 (refer to the general construction notes for the 80 series if in doubt). The ground (0V) wire may be omitted at this time. Insert VR 1 to VR 3 with the PCB and wire up using the directions given in Figure 2 and the rear view of the panel shown in Figure 3. Connect a wire to the 0V point on the PCB and take to both VR 4 and VR 5 (pin 1 in each case) and also to the ground point of the jack sockets.

d) Connect $\pm$15V power supplies to the module (do not switch on); set TP 1 and TP 2 to their mid positions; connect a voltmeter to the output of Attenuator 1 (J6 to J9) ; turn VR 2 fully clockwise; switch power on and note the voltmeter is showing a reading of about +8 to +12V. If not, switch off and quickly check whether IC 2 is hot and then re-check wiring and component placement, including IC orientation if IC 2 was hot. When satisfactory check output of Attenuator 2 in the same way. To check functioning of the lag processor connect a low frequency waveform to the input and take the output to an amplifier (or oscilloscope). Gradually rotate VR 1 and note difference in tone (or waveshape).

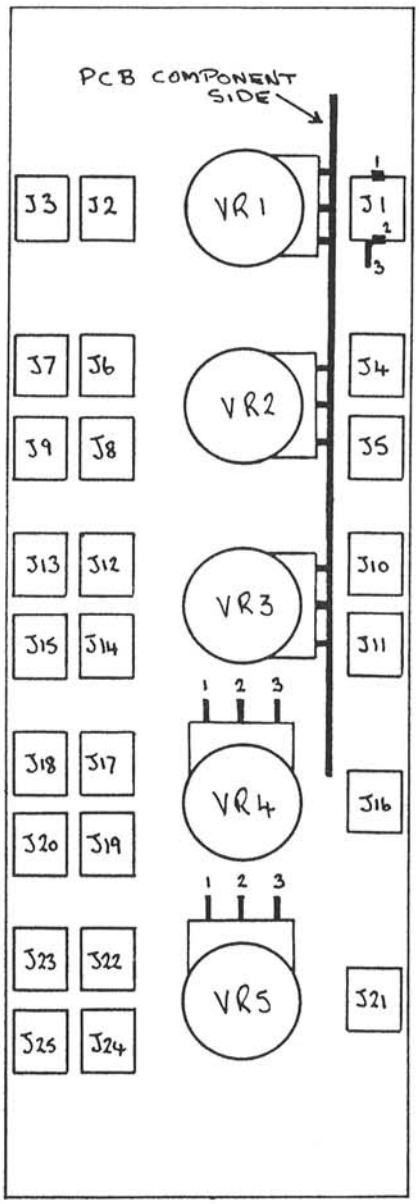


FIGURE 3. REAR VIEW OF 80-5 PANEL

4.CALIBRATION

The only calibration required is trimming the two inverters. Set up as described under construction and with VR 2 fully clockwise adjust TP 1 until exactly +10V is obtained at Jack Sockets 6 to 9. Repeat with VR 3 and TP 2 and outputs at J 12 to 15.

5. DESIGN

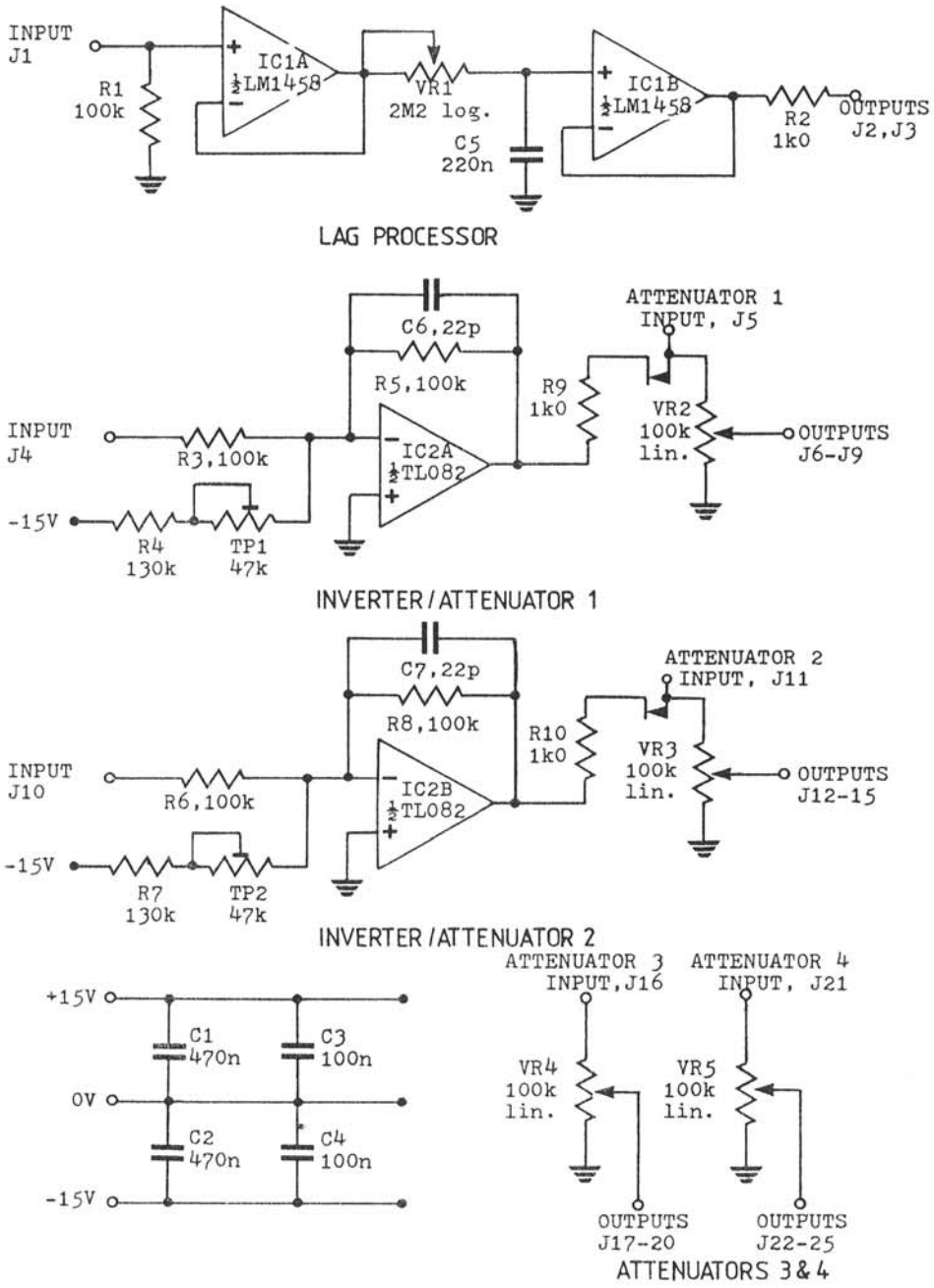


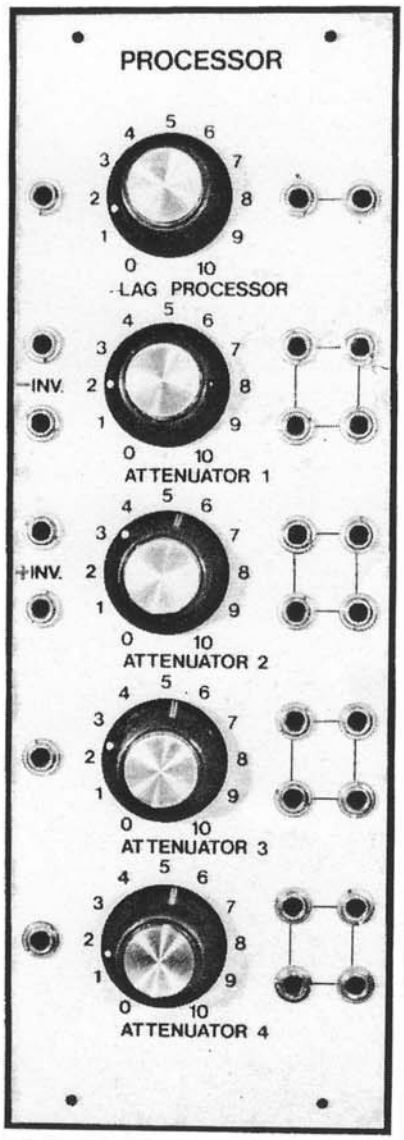
FIGURE 4.80-5 PROCESSOR

LAG PROCESSOR. IC 1A is a voltage follower and VR 1 is used to control the rate at which C5 is charged up. The voltage on C5 at any point in time is available at the output of IC 1B which is configured as a high impedance voltage follower.

INVERTERS. IC 2A (IC 2B) with R3/R5 (R6/R8) is a unity gain inverter and with only these components a voltage of, say, +10V would become -10V at the output. We are, however, injecting -10V into the summing node of the op. amp. via R4 and TP 1 (R7 and TP 2) which means that with 0V into R3 (R6) there is +10V at the output. In this situation +10V into R3 (R6) will result in 0V at the output. The outputs of the inverters may be disabled by a jack plug into J5 (J11) and VR 2 (VR 3) may then be used simply as attenuators without inversion - as is the case with VR 4 and VR 5.

MODULE 80-5 PROCESSOR

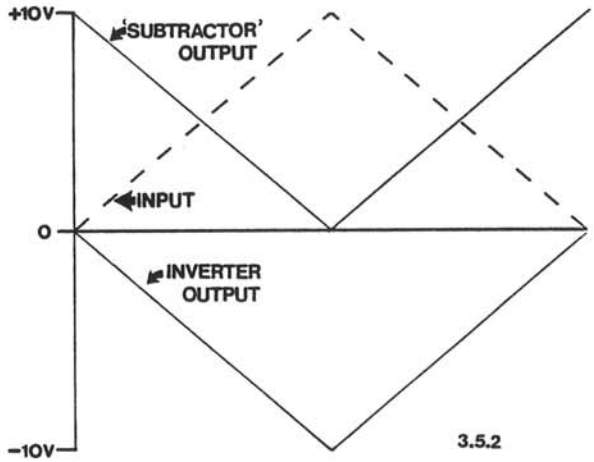
The low output impedance and high input impedance of the DIGISOUND 80 modules allow one output to drive several inputs without overloading or introducing appreciable errors. In order, therefore, that a single output from a module may have individually adjustable levels to each of the modules that it is driving we have placed, whenever practical, attenuators on the inputs to modules. This arrangement also facilitates fading in of various effects, for example, if two modules are being modulated from another unit then one of the former two may be faded in and out without affecting the other. It was stated above that the attenuators are placed on the inputs whenever practical and in most cases it is the limitation of panel space which restricts the number that have been included. To overcome this problem of distribution we have included the 80-5 Processor module and this also includes a few other simple functions to aid synthesis.



Distribution of one output to four other inputs, with any level of attenuation on the combined output from the Processor, may be implemented in various combinations. For example, a single Processor may be used to distribute one signal to twelve other modules and with sets of three outputs at different levels of attenuation. For distribution purposes alone the Processor is invaluable and at least one is required for every ten other modules. Two of the distributors may also be used as 'inverters' or as a source of positive voltage for level shifting. To avoid confusion the term 'inverter' will be changed to 'SUBTRACTOR' since as constructed the effect is to subtract the input voltage from +10V. The main control signal in the DIGISOUND 80 is based on a 0 to +10V amplitude and thus if, say, the output of an envelope generator is taken via a 'subtractor' then the attack voltage will start off at +10V and decrease to zero instead of the normal response of going from 0 to +10V. The output from the 'subtractor' has an attenuator and thus the actual voltage excursion may be adjusted to the range desired. These 'subtractors' find wide application in synthesis patching, as is evident in the next section. It should be noted that signals are also inverted in phase when they pass through a 'subtractor'.

Commonly the term 'inverting', especially as applied to operational amplifiers, means that the input voltage is inverted in polarity, e.g., a +5V input becomes a -5V output. There are some patches in synthesis with the DIGISOUND 80 which require this voltage inversion and it is recommended that one of the 'subtractors' is modified to an 'INVERTER'. The latter is simply achieved by removing the 130k resistor and 47k trimmer connected to the inverting input on one side of the op.amp. In addition to other uses the inverter also allows negative DC voltages to be obtained for offset purposes. If this modification is made then we suggest you mark the panel accordingly and probably the simplest way is to prefix the 'INV' by

an 'S' or 'P' to denote 'Subtractor-Inverter' or 'Polarity-Inverter' respectively. The two modes are illustrated in Figure 3.5.2.



The other facility included in this module is the 'Lag Processor' which as the name implies is a signal delay device akin to the conventional portamento control on the keyboard. Thus control signals may be made to glide from one step to another and provide a more subtle transition. An example of this effect is a sawtooth waveform from a LFO being used to sweep a voltage controlled module. The sharp transition as the sawtooth reaches its peak voltage can result in an obtrusive 'plop' and the effect may be reduced, or totally eliminated, by the Lag Processor without detracting too much from the intended effect.

The Lag Processor is in essence a low pass filter with a manually adjustable cut-off frequency in the lower frequency range. Thus attempts to delay high frequency signals will also result in a decrease in amplitude of the signal. Nevertheless it does find application as a low pass filter especially in the treatment of white and pink noise sources.