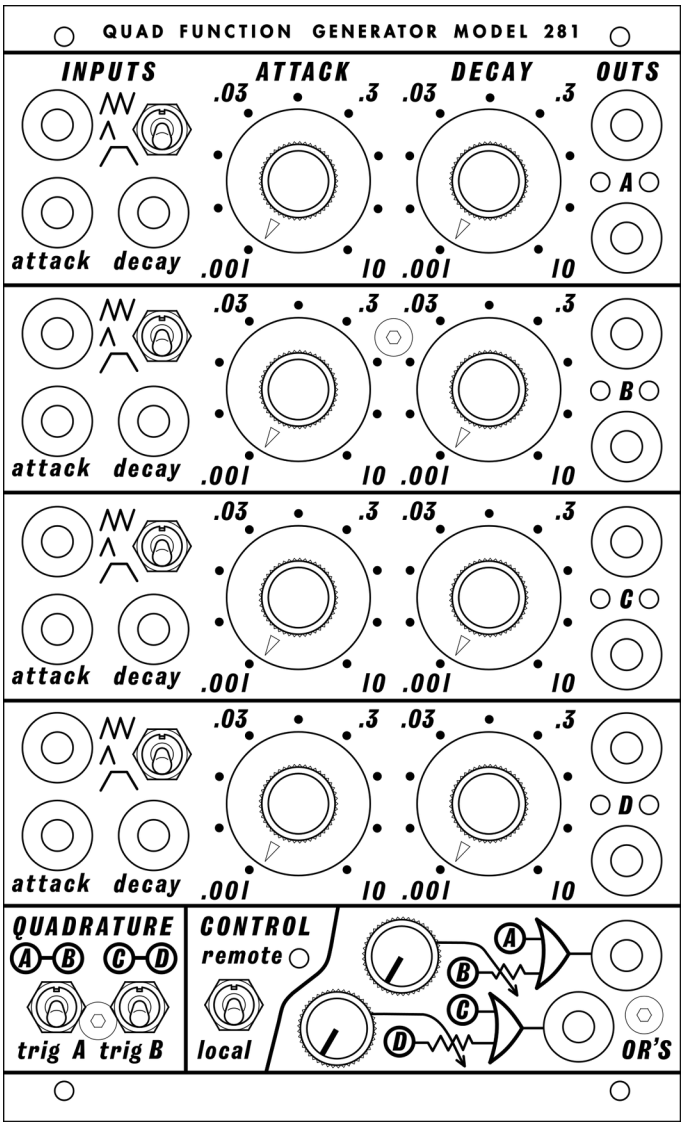
Dunnington Audio

281D Quad Function Generator



The 281D Quad Function Generator is designed to replicate the functionality of the Buchla 281 module using modern construction techniques and readily available parts. It is primarily based on the original circuit designed by Don Buchla, with the following additions/alterations:

- Improved input and mode selection circuitry – no requirement to "kick" the generators when selecting self cycle mode.
- All outputs are buffered, protecting the integrator core and passive end pulse generation circuit from the effects of loading when stacked to multiple inputs.
- End pulse outputs are designed to allow stacking of multiple outputs to a single input without affecting cycling of individual generators, allowing the creation of complex/non-repeating/polyrhythmic pulse sequences. Unlike other solutions that simply add a diode in series with the output, the 281D end pulse outputs can drive a floating input low.

Build Notes:

*** The 281D is designed to be suitable for hand assembly, but it is not recommended as a "learn surface mount" starting point. You should at a minimum have a temperature controlled soldering iron with a reasonably fine point and good quality solder 0.5mm diameter or finer. Some form of magnification may be beneficial for placing/inspecting the SOT-363 packages. ***

It is recommended that the circuit board is populated in the following order:

- SOT-363 packages **(note polarity – these are not symmetrical!)**
- SOT-23 packages
- SOIC packages
- 0805 passives
- Trimmer potentiometers
- Electrolytic capacitors
- Film capacitors C101,201,301,401 (Through hole pads are provided for hand assembly. If hand soldering the 2416 footprint SMT capacitors the minimum temperature/time possible should be used)
- Power wiring harness

Connectors should have their wire links attached and be mounted to the front panel, along with standoffs. Front panel potentiometers and switches can then be loosely fitted into the PCB and the panel and PCB brought together before gently tightening the potentiometer/switch fixing nuts and soldering the potentiometers and connector to PCB wires into place.

Modifications:

A standard build of the 281D uses the two-stage Buchla pulse to differentiate between the transient and sustain settings of the mode switch. If the module is to be used with standard gate signals, the following changes can be made:

- Omit or remove resistors R112,212,312,412
- Fit capacitors C199,299,399,499 (47nF 0805), diodes D199,299,399,499 (BAT54WS) and resistors R199,299,399,499 (4.7M 0805)

Calibration procedure:

Equipment required:

- Power supply delivering +/- 15V, current limit at 100mA and +12V, current limit at 20mA
- Oscilloscope (A DSO will make calibration easier)

1. Set front panel controls as follows:
    - VR101/201/301/401 Attack – Fully CCW
    - VR102/202/302/402 Decay – Fully CW
    - VR203/403 OR Level – Fully CCW
    - SW101/201/301/401 Mode – Centre/Transient
    - SW102/302 Quadrature – Down
    - SW1 Remote Enable – Down

2. Set all trimpots TR101,201,301,401 to halfway.

3. Apply power to the module and check for approx 85mA draw on the +15V rail and 70mA draw on the -15V rail. No current should be drawn from the 12V rail with the controls set as described above.

4. Switch function generator A into self cycle mode and monitor the CV output on the oscilloscope – it should be a 10V saw wave. Check the function of the output LED.

5. Adjust trimpot TR101 to set the fall time of the saw wave to 10 seconds.

6. Repeat steps 4 and 5 for function generators B/C/D, using trimpots TR201/301/401

7. Set front panel controls as follows:
    - VR101/201/301/401 Attack – Fully CW
    - VR102/202/302/402 Decay – Fully CCW
    - VR203/403 OR Level – Fully CCW
    - SW101/301 Mode – Up/Cycle
    - SW201/401 Mode – Centre/Transient
    - SW102,302 Quadrature – Up
    - SW1 Remote Enable – Down

8. Check that all four quadrature LEDs are lit. The behaviour of the function generators should be as follows:
    - A/C should slowly rise to their maximum amplitudes whilst B/D are idle
    - Once A/C are at max, B/D will slowly rise to max
    - Once B/D are at max, A/C will reset and begin to rise again, shortly followed by B/D also resetting

9. Set front panel controls as follows:
    - VR101/301 Attack – Fully CW
    - VR201/401 Attack – Fully CCW
    - VR102/202/302/402 Decay – Fully CCW
    - VR203/403 OR Level – Fully CW
    - SW101/201/301/401 Mode – Up/Cycle
    - SW102,302 Quadrature – Down
    - SW1 Remote Enable – Down

10. Check the OR outputs on the oscilloscope – both should display a slow rise of the minimum voltage from 0V to 10V with rapidly oscillating peaks of 10V superimposed on top.

11. Check the function of the remote enable switch – the LED should illuminate in the centre and up positions of the switch and be extinguished in the down position.