# Digitimer D330 MultiStim: OPERATIONAL MODES

Simple External Control

The figure shows the connections of the **Gate** and **Pulse** inputs in relation to the overall system. The waveforms show the function of the **Gate** and **Pulse** signals in relation to the stimulus output.

If the external **Pulse** starts before the **Gate** is 'high' (both external TTL signals in this example) no stimulus is produced (a). Similarly, if an external **Pulse** starts before the **Gate** has 'shut', the full pulse is passed as the stimulus output (b). In this way the **Gate** functions as an 'enabling' signal to 'whole-pulses' only.
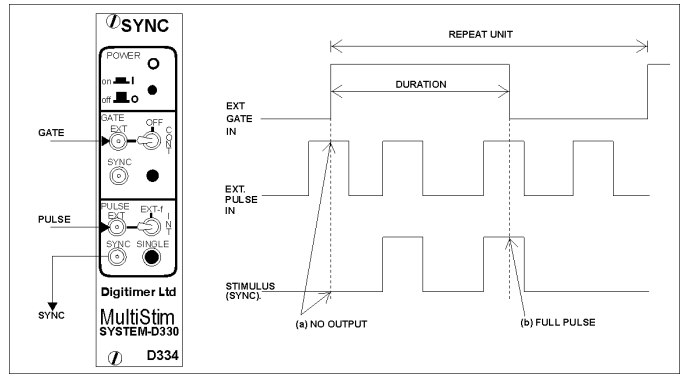

External Gating of Internal Pulses
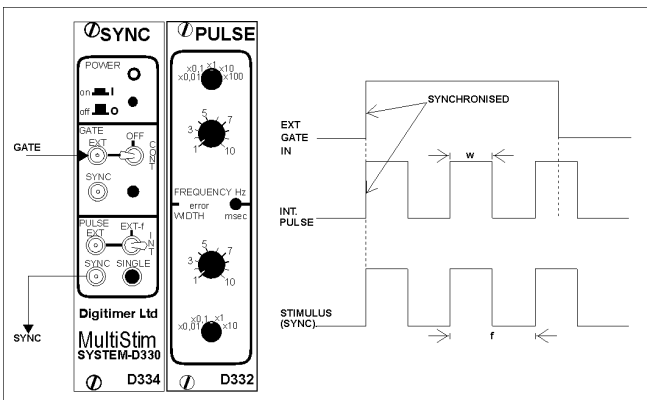
Here the **Width (w)** and **Frequency (f)** are being controlled internally by the **D332**. Note that Pulse 1 starts synchronously with the start of the **Gate** 'opening'. Note also that, since pulse 3 starts **before** the **Gate** 'closes', the whole pulse is delivered to the preparation.

External Control with Internal Pulse Width

The situation here is similar to that shown above except that the pulse **Frequency (f)** is being controlled by the frequency of the external TTL input. The **Width (w)** of the stimuli, however, is still controlled by the **D332** module.
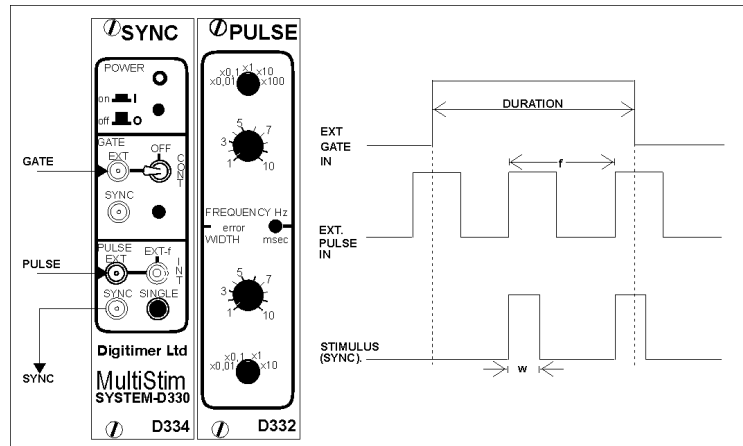

Internal Control of Gate & Pulse
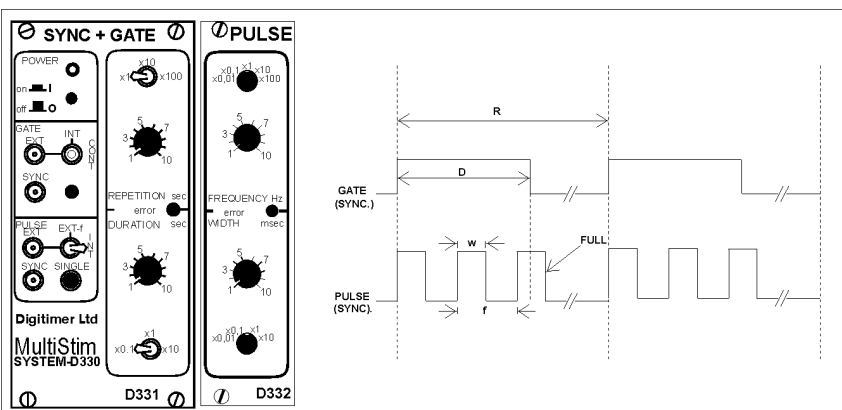
The **D331** module allows the user to set the **Repetition Interval (R)** and **Gate Duration (D)** independently. The pulse **Frequency (f)** and **Width (w)** are both controlled by the **D332** module.
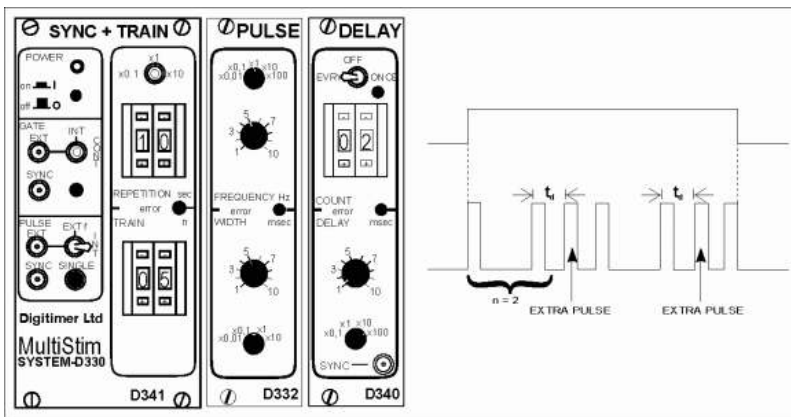
If no internal control of the **Gate** is required, then the **D334** can be substituted for the **D331**.

Internal Control of Train & Pulses

The **D341** module allows the user to set a fixed **Number of Pulses (n)** within the gated **Train**. The pulse **Frequency (f)** and **Width (w)** are both controlled by the **D332** module.
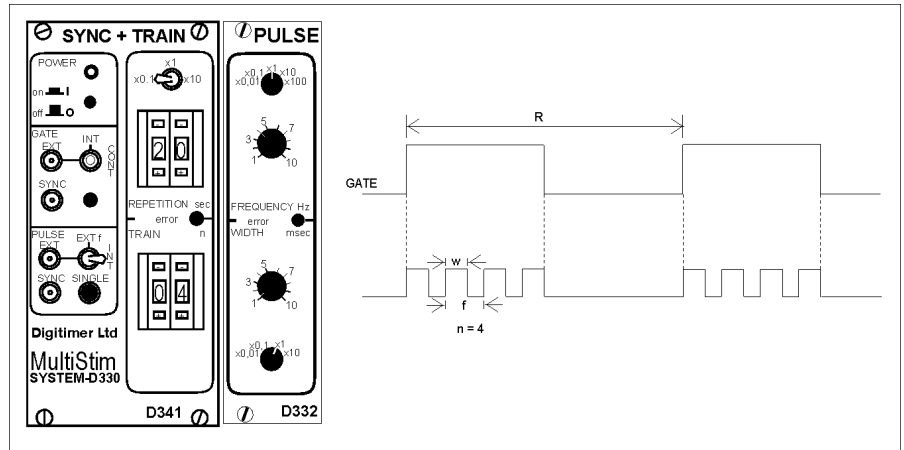
(Additional) Delayed Pulse

The addition of a **D340** to the system enables a delayed extra pulse to be generated that can be used for determining Effective Refractory Period. In the example shown, **#d = 2**, which means that an extra pulse is generated after every second pulse. t_d is the delay from the start of the second **(02)** pulse to the start of the additional pulse. The **D340** module allows the extra pulse to be selected either after **Every n**th regular pulse within the gate (as shown) or just **Once per Gate** burst.

An internal jumper within the **D340** allows the selection of *just* the delayed pulse being the stimulus.

Independent External Logic Control

The **D344** module accepts external TTL inputs to independently control the timing of each stimulation channel using multiple **D333/D343** (4 channels in **D338**; 10 channels in **D337**).