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IPC Irwin Rubens Tube Driver

Part Number IPC-4325-W

User Instructions

INTRODUCTION.

The IPC Irwin Rubens Tube Driver provides a simple and convenient way to set up and perform a wide range of Rubens Tube experiments. The unit itself incorporates a very high quality waveform generator which will produce pure sinusoidal, square or triangular waveforms. In addition a separate Audio input function is included to allow waveforms such as music etc. to be demonstrated.

DESCRIPTION.

The Rubens Tube Driver combines a high-quality stereo pre-amplifier and mono power amplifier with a low distortion waveform generator housed in a rugged anodized aluminum enclosure. The Driver unit itself incorporates an LCD colour screen to display the current and stored settings along with two rotary controllers. A Plug-Top Power Supply Adaptor (+5V) is included with the Driver unit along with a Stereo 3.5mm Jack to Jack Audio Input Cable.

INSTRUCTIONS.

When setting up the Rubens Tube Driver you will need the following additional equipment:-

1. A Rubens Tube with a 4ohm to 8ohm speaker attached.
2. A suitable gas supply.
3. A set of 4mm to 4mm Test Leads.
4. A music source (eg. iPad/iPlayer) - this is optional and not necessary when performing simple waveform experiment using the integral waveform generator.

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Check that the Driver unit is switched off using the side mounted control marked “Audio Output Vol / Off”, **note:** fully anti-clockwise is the “off” position.
First connect the Rubens Tube Speaker to the Driver unit sockets marked “Speaker Output 4 – 8ohm” using two 4mm Test Leads, **note:** the polarity is not important.
Connect the power cable connector from the Plug-Top Adaptor into the socket marked “5V Input” and then plug the Adaptor into a mains wall socket.
The Rubens Tube Driver has its own integral waveform generator and it is recommended that this is used for the initial experiment setup. **Note:** connecting a 3.5mm Jack Plug into the “Audio Input” socket will disconnect the integral waveform generator.
Switch the Rubens Tube Driver on by turning the “Audio Output Vol / Off” control clockwise. The LCD screen will now illuminate, displaying “IPC” for a few seconds before displaying the “01,000Hz SINE” setting. The Driver unit always starts with this sequence, at this point you can recall your own saved user settings – please see the “User Settings” sections below.
Now slowly increase the Audio Output volume (clockwise) until you hear the Sine wave from the speaker attached to the Rubens Tube. Sine waves are the purest sound and produce the best standing waves, so use this waveform first - to get the best initial results.
If this is your first time using this equipment, then familiarize yourself with the controls before switching the gas supply on.

SETTING THE FREQUENCY

You will notice that the right-hand frequency digit is red and all of the others are yellow, turn the left-hand rotary control anti-clockwise and the red digit will move to the left. Turning the rotary control clockwise and it will move to the right, this is referred to as the Cursor.
Set it to the second digit from the left (for 1kHz increments), now turn the right-hand rotary control clockwise and the frequency will increase in 1kHz increments up to 20kHz. You will hear the frequency rise until your ears can no longer hear it – the younger ones among us will hear much higher frequencies, turning the control anti-clockwise will decrease frequency. If you reduce the frequency below 1kHz, the cursor will automatically shift to the next digit so that you can continue to decrease the frequency further.
Depending on your ears, the speaker used and the volume setting, the sound will start to diminish below 100Hz.
Note: the cursor will not automatically move to the left when increasing frequency.

SETTING THE WAVEFORM

The Rubens Tube Driver incorporates a very high quality waveform generator which will produce pure sinusoidal, square or triangular waveforms. To cycle through the waveforms repeatedly press and release the left-hand rotary control. The display will show the current waveform being produced and you should be able to hear the difference, a Sine wave is very pure, a Square wave is very coarse and a Triangular wave is somewhere in between. There is also a “Store” setting, please ignore this for now.

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ADDITIONAL FEATURES

The Rubens Tube Driver allows you to quickly double or half the frequency, try this by setting the frequency to 1,000Hz (1kHz). Press the right-hand rotary control once to double the frequency and twice to half it, this is very useful in finding sub-harmonics.
Halving or doubling will (theoretically) give you half or twice the number of nodes displayed by the Rubens Tube, in musical terms this is effectively jumping up and down by an octave. **Note:** there may be some fine tuning necessary for some Rubens Tube designs.
You can also store a favourite setting which will be retained in memory when the power is removed. To do this setup your favourite frequency and waveform and then press the left-hand rotary control twice quickly to store it. The display will show a red "STORED" acknowledgement for one second. You can access this stored setting at any time by cycling through the waveforms as follows: SINE, SQUARE, TRIANGLE & STORE. When you see "STORE" the frequency and waveform will change to your stored settings, press again to continue cycle through the options.
An "Audio Output" Jack Socket is provided so that the set output waveforms can be used for other experiments, this output provides a fairly consistent 1.2V pk-pk waveform through a 25uF capacitor. **Note:** the capacitor will affect the waveform shapes at very low frequencies.

USER SETTINGS

If you wish to use your own music waveform then connect your music source into the socket marked "Audio Input" using the Audio Cable provided. The two stereo channels are mixed in the pre-amplifier to a mono signal, a noise gate is also included to improve the sound quality. When a 3.5mm Jack Plug is inserted into the "Audio Input" socket, the integral waveform generator is disabled.
First set your music source to its lowest volume setting and then switch on Driver unit, **note:** the volume control is not active in this mode, so please adjust your audio source for the ideal volume and to eliminate possible distortion caused by excessive volume.

GAS IGNITING

Please read and follow the User Instructions supplied with the Rubens Tube when connecting the gas supply and igniting the Rubens Tube itself. You will be able to adjust the waveform volume and frequency to get a good difference in flame heights between nodes and anti-nodes, the Sine wave should give the best response.
When setting up adjust the source (audio input mode) and volume control to set an acceptable level, sound should be heard from within the Rubens Tube. By varying the frequency you should be able to find the natural resonant frequency of the Rubens Tube, this frequency will produce a louder sound, multiples of this frequency will also produce a slightly louder sound. A steady Sine wave around 300Hz will produce the most obvious resonance, if distortion is heard, reduce the volume level to provide a purer sound.
Once finished, switch off the gas supply, then switch off the Rubens Driver before disconnecting the power lead. **Note:** please read the Rubens Tube User Instructions for how to dismantle the experiment and store the equipment safely.

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SPECIFICATIONS.

Electrical Supply:	5VDC, using a 5.5mm x 2.1mm, centre positive, power socket (a suitable mains adaptor is included with this product).
DC Current:	400mA maximum.
Frequency Range:	1Hz to 20kHz.
Waveforms:	Sine, Square & Triangle, generated via an internal 28 bit NCO (numerically controlled oscillator), producing very low distortion waveforms (total harmonic distortion -56 dBc).
Audio Input:	3.5mm Stereo Jack Socket, suitable for most smart phones, MP3 players etc. (a suitable Stereo Jack Plug cable is included with this product).
Audio Output:	Mono output via a 3.5mm Stereo Jack Socket, all waveform outputs provide 1.2V pk-pk (nominal - no load) through a 25uF capacitor.
Speaker Output:	Two 4mm Blue Sockets, designed to drive a 4Ω or 8Ω speaker at 2.8 Watts and 1.6 Watts respectively (speaker not included).
On/Off & Volume:	Combined rotary on/off switch and volume control.
Function Controls:	Two rotary encoders control the LCD Colour Screen menus and mode selection, the encoders also have integral push switches for setting certain functions – see "Additional Functions" above for more details.
Additional Functions:	F X 2 push switch for immediate frequency doubling. F / 2 push switch for immediate frequency halving. Waveform and Frequency "Store" function saves current settings in a non-volatile memory for instant recall.
Dimensions:	190 x 103 x 55mm overall.
Mass:	400g.
Enclosure:	Rugged extruded aluminium enclosure, black anodised.

Please Note: This Equipment is for Education, Training, or research Purposes Only.

Thank you for choosing this IPC Irwin product, which has specifically been designed for education and we know it will bring you good service long into the future. This is just one product of a wide range of UK designed and manufactured products to enhance a STEM education. Please see www.ipcirwin.com website for more details on the products and service we provide to support teaching and learning in science and technology.

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