Analog 2.0 documentation

Vol. 8

LFO production

Version: 2.2

Created : December **30 , 2009**

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1. About this document

This document is made by **the** LFO **module of the analog synthesizer system Analog** 2.0 .

I will explain how to make it.

This document should be produced by the user with reference to the following documents.

It is written on the premise of.

--Analog 2.0 **Starter Kit**

--vol.4 **Manufacture of noise generator and mixer**

--vol.5 **Production of** VCA

--vol.6 VCO **production**

--vol.7 **Production of envelope generator**

Change log

Version date		**Changes**
2.0 2.0	2009/11/19	Analog2.0 **Document version** 2.0 -Review **the circuit design.** -Revised **the document accordingly.**
2.1 2.1	2009/12/05	-Fixed **a mistake in the parts list and C9 .** **(Error) Electrolytic capacitor (Correct) Multilayer ceramic capacitor**
2.2	2009/12/30	-Fixed **the omission of description of the number of pins in the parts list and pin header.**

2. LFO production

2.1. Production flow

The module production flow is the same every time as follows.

-Obtaining **parts** - **Installing** parts on the board - **Installing panel parts-** Checking **the wiring on the board-Checking** the **operation**

2.2. Outline of the module to be manufactured 2.2.1. Functions In this article, the LFO module is manufactured.

LFO is an abbreviation for Low Frequency Oscillator , **and as the name suggests, it oscillates at low frequencies.** It is the same as **a VCO in the sense of an oscillator, but differs in the following points.**

1. **Oscillation frequency is fixed**
2. **Low oscillation frequency**
3. **Waveforms are only triangular and square waves**

None are essentially different from the VCO . **In fact, some modular systems do not have an LFO, as the LFO function can also be achieved with a VCO . With Analog2.0 , by having a dedicated module, a highly effective modulation function can be realized with a circuit simpler than** a VCO. **Reveal.**

This LFO **module also has an LFO delay function.** The **LFO delay means that the output amplitude is zero when the gate rises, and the amplitude gradually rises over time. It is a function (Fig.** 2-1).

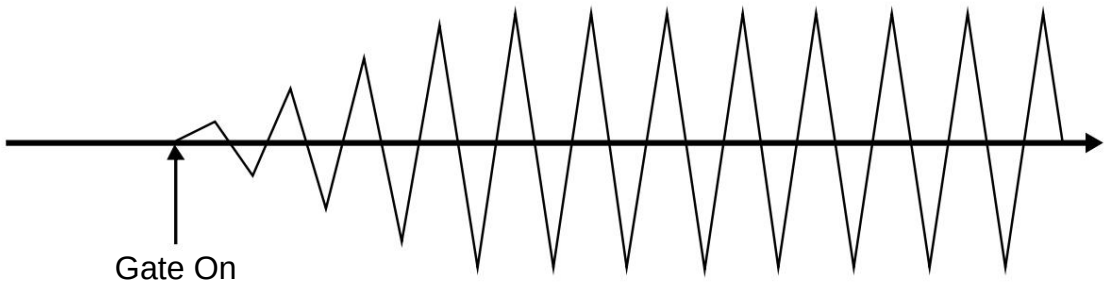

Figure 2-1 LFO **delay**

2.2.2. Positioning in the system

Figure 2-2 shows the position of the LFO in the configuration of the Analog 2.0 **production system . LFO is Similar to the** Envelope Generator , it is a control module that **changes the operation of sound processing modules such as VCF and VCA.**

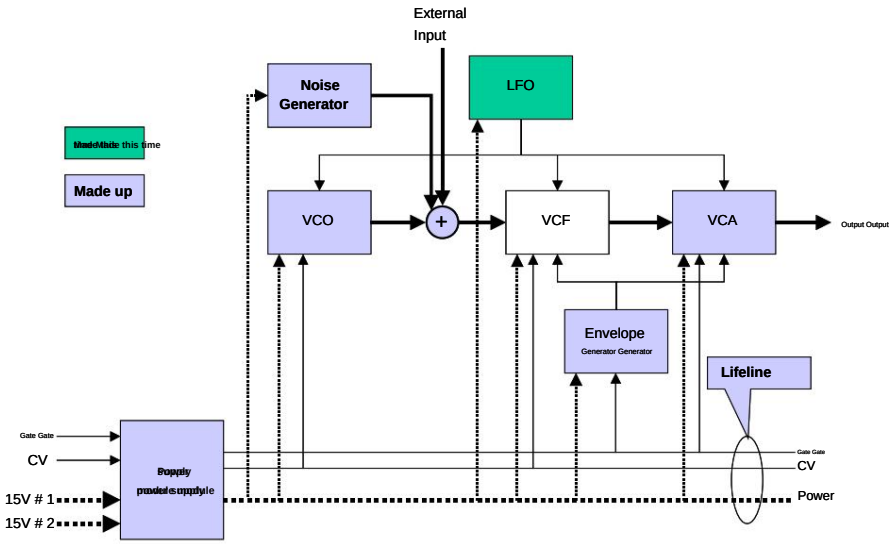

Figure 2-2 **Positioning of the** LFO

Within the panel, the EG is **positioned as shown in Figure** 2-3 .

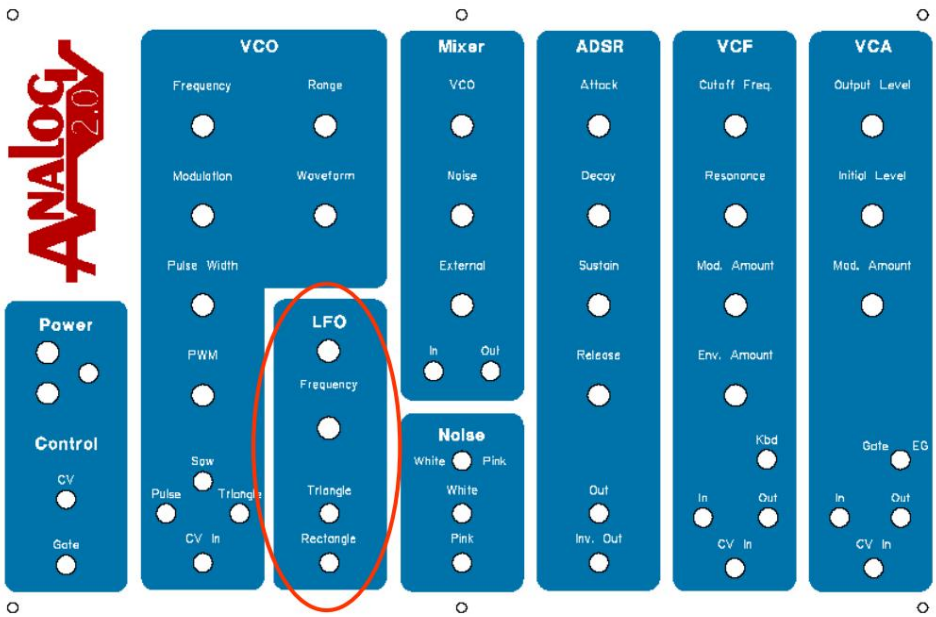

Figure 2-3 **Positioning in the panel**

2.2.3. Specifications

The LFO **specifications are as follows.**

-Output signal level : ± 5V- Output

waveform : Triangle wave, Square wave

-Parameters : Frequency, Delay **2.2.4. Circuit**

The circuit diagram of the LFO to **be manufactured** is shown in Figure 2-4.

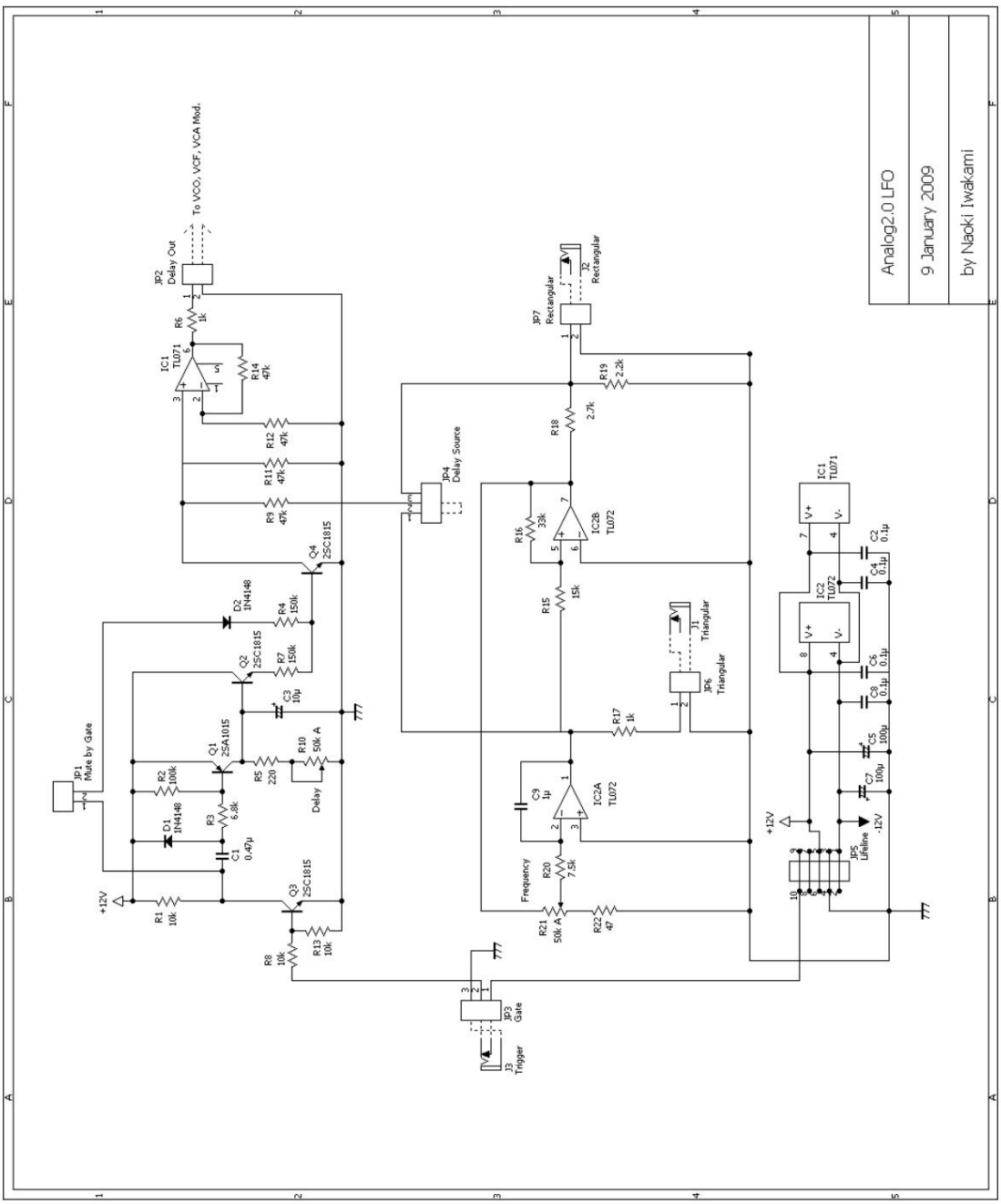

Figure 2-4 Schematic of the LFO module

2.3. Obtaining parts

Well then, it's finally time to start production. The parts required for production are as follows. For production
So, get these parts first. Modules in this parts list
Not only the parts to be mounted on the circuit board, but also the switches and jacks to be mounted on the panel are included.
vinegar. The parts list does not include the knob. The knob is suitable for your taste
Please get it.

Table 2-1: **Parts required for LFO production** (inside **the board)**

parts number	**Device name**	**Value / model number**	**remarks**
C1	**Multilayer Ceramic Capacitor**	0.47ÿF	
C2	**Multilayer Ceramic Capacitor**	0.1 ÿF	
C3	**electrolytic capacitor**	**10 ÿF**	
C4	**Multilayer Ceramic Capacitor**	0.1 ÿF	
C5	**electrolytic capacitor**	100 ÿF	
C6	**Multilayer Ceramic Capacitor**	0.1 ÿF	
C7	**electrolytic capacitor**	100 ÿF	
C8	**Multilayer Ceramic Capacitor**	0.1 ÿF	
C9	**Multilayer Ceramic Capacitor**	**1 ÿF**	
D1	**diode**	1N4148	
D2	**diode**	1N4148	
IC1	**operational amplifier**	TL071	
IC2	**operational amplifier**	TL072	
JP1	**pin header** 2.5mm **pitch**	2x1	Mute by Gate
JP2	**pin header** 2.5mm **pitch**	2x1	Delay Out
JP3	**pin header** 2.5mm **pitch**	3x1	Trigger In
JP4	**pin header** 2.5mm **pitch**	3x1	Delay Source
JP5	**pin header** 2.5mm **pitch**	5x2	Lifeline
JP6	**pin header** 2.5mm **pitch**	2x1	Triangular Out
JP7	**pin header** 2.5mm **pitch**	2x1	Rectangular Out
Q1	**transistor**	2SA1015	
Q2	**transistor**	2SC1815	
Q3	**transistor**	2SC1815	
Q4	**transistor**	2SC1815	

R1 **resistor**	10kÿ	1 / 4W 5%
R2 **resistor**	100kÿ	1 / 4W 5%
R3 **resistor**	6.8kÿ	1 / 4W 5%
R4 **resistor**	150kÿ	1 / 4W 5%
R5 **resistor**	220ÿ	1 / 4W 5%
R6 **resistor**	1kÿ	1 / 4W 5%
R7 **resistor**	150kÿ	1 / 4W 5%
R8 **resistor**	10kÿ	1 / 4W 5%
R9 **resistor**	47kÿ	1 / 4W 5%
R10 **variable resistor**	50kÿ A	Delay
R11 **resistor**	47kÿ	1 / 4W 5%
R12 **resistor**	47kÿ	1 / 4W 5%
R13 **resistor**	10kÿ	1 / 4W 5%
R14 **resistor**	47kÿ	1 / 4W 5%
R15 **resistor**	15kÿ	1 / 4W 5%
R16 **resistor**	33kÿ	1 / 4W 5%
R17 **resistor**	1kÿ	1 / 4W 5%
R18 **resistor**	2.7kÿ	1 / 4W 5%
R19 **resistor**	2.2kÿ	1 / 4W 5%
R20 **resistor**	7.5kÿ	1 / 4W 5%
R21 **variable resistor**	50kÿ A	Frequency
R22 **resistor**	47ÿ	1 / 4W 5%

Table 2-2 **Parts required for LFO production** (outside **the board)**

parts number	**Device name**	**Value / model number**	**remarks**
J1	3.5mm **pin jack**		Triangular Out
J2	3.5mm **pin jack** 3.5mm		Rectangular Out
J3	**pin jack**		Trigger In

2.4. Attaching parts to the board

Figure 2-5 is the wiring diagram of the printed circuit board to be manufactured this time.

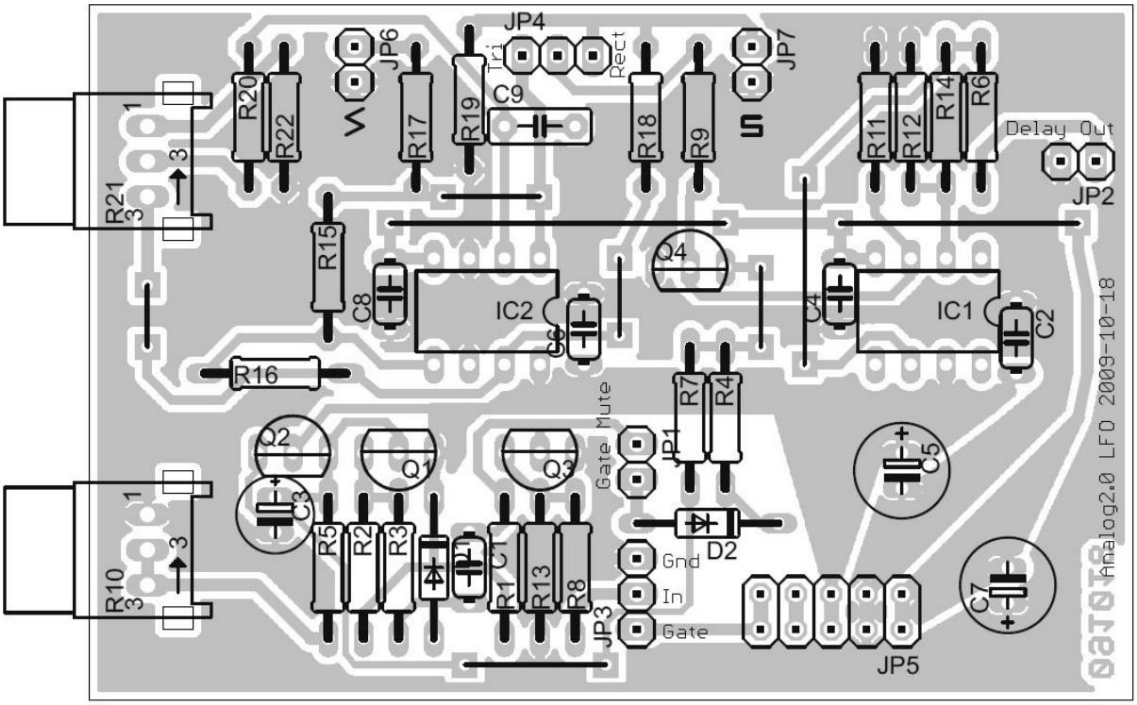

Figure 2-5 Wiring diagram of EG board

2.5. Installing panel parts After

installing the board parts, wire the parts to be attached to the panel (parts outside the board). Connect the pin header and the mini jack with lead wires as shown in Figure 2-6 . **After outputting the triangular wave to the jack, extend it and** connect it to the Mod In terminal of **each of** the VCO **module and** VCF module . Since the **VCF module is not completed yet, prepare only the connection line and leave it unconnected.**

As for the jumper of JP4 , the one used for **PC parts can be used. (Fig. 2-7)**

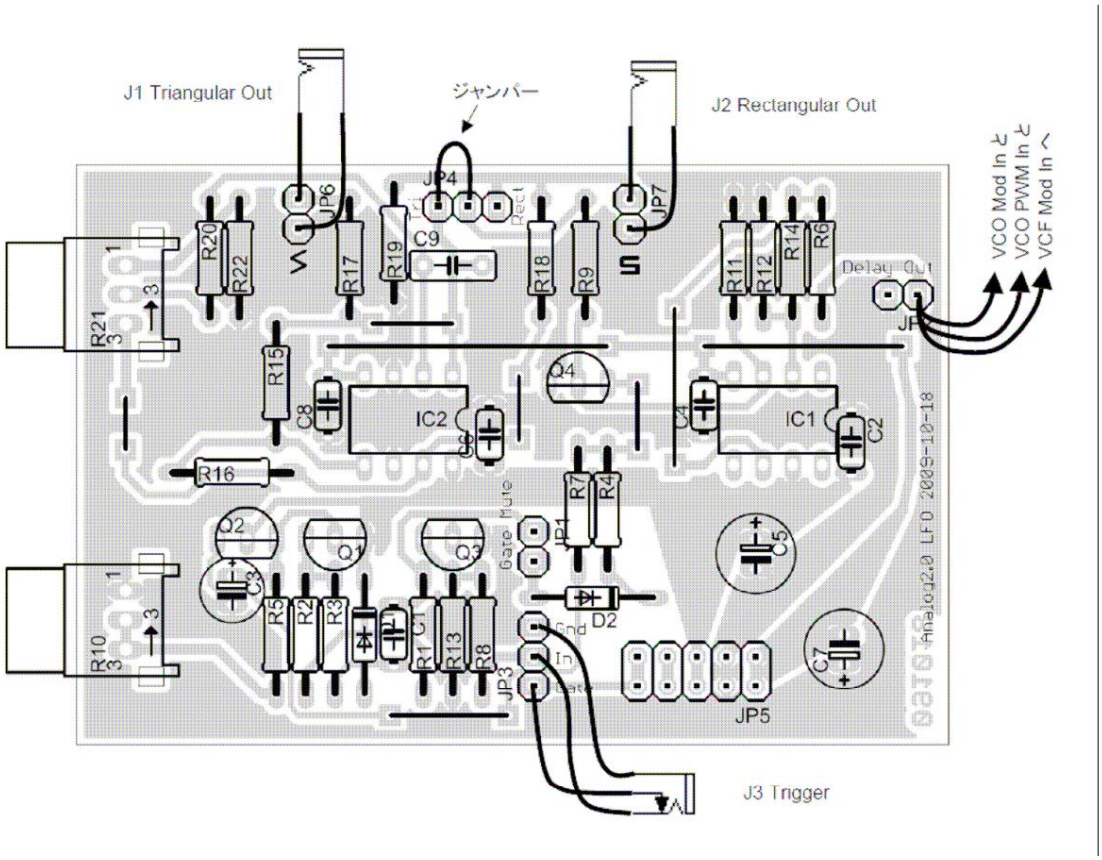

Figure 2-6 **Wiring of panel parts**

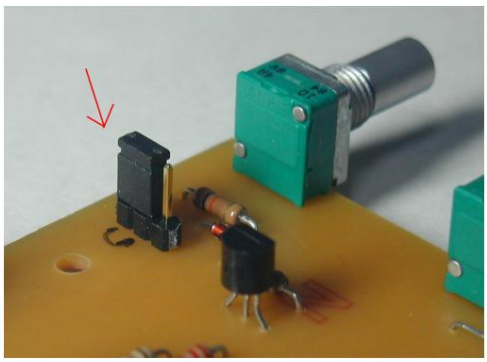

Figure 2-7 **How to install the jumper**

2.6. Checking the wiring on the board

At this point, the assembly of the EG module is complete. As always, before powering on
Be sure to check the wiring. If there is a wiring mistake, not only will it not work properly, but if
Some parts will be damaged. Wired correctly while looking at the checklist below
Please check if it is.

[] Is the resistor installed in the correct place and with the correct value?

[] Is the capacitor installed in the correct place, with the correct type and with the correct value? [] Is the electrolytic capacitor installed in the correct orientation? [] Is the diode installed in the correct place and in the correct orientation? [] Is the transistor installed in the correct place and in the correct orientation?

[] Is the IC **installed in the correct place and in the correct orientation? [] Is the jack pin header installed in the correct place? [] Turn the board over and check the soldering points. The adjacent copper foil pattern is Han**

Is there a solder bridge that is short-circuited in the da?

[] Is there any place where the soldering is immo soldering? If the body of the part is shaken and the lead at the soldering point moves, it is almost certainly immo solder. The potato solder will peel off over time, so if you find it, re-solder it.

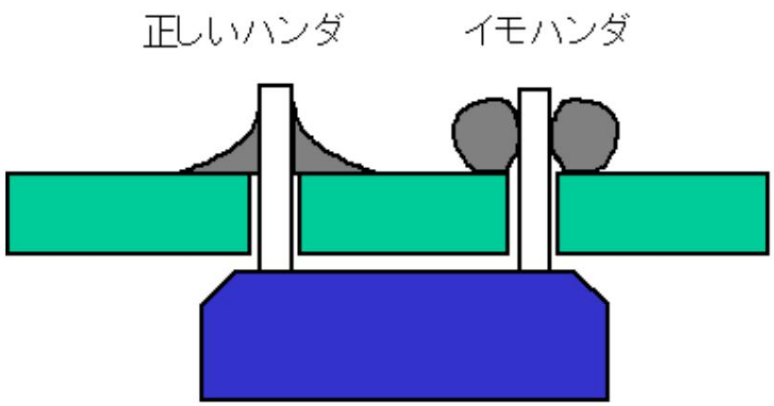

Figure 2-8 Correct solder and immo solder

2.7. Operation check

Now, let's check the operation. Since there are no adjustment points this time as well, we will only check the operation. Movement

Please prepare the following to confirm the work.

--VCO

--Gate **generator** (MinI-Board , **etc.)**

-Patch **cable**

-Monitor **speaker**

Use a 3.5mm -3.5mm **cable for the patch cable .**

Follow the procedure below to check the operation.

1. Connect the output of the VCO **to the monitor speaker.**
2. **Turn on the power.**
3. **Set the Frequency** knob **on the LFO to** 9 o'clock.
4. Set the LFO **'s** Delay **knob to the minimum.**
5. Raise **the** Modulation **knob on the VCO and check that the pitch undulates as the LFO moves.**
6. **Set** Delay **to** 12 o'clock.
7. When the Gate **signal is generated, the LFO output becomes zero once at the rise of the** Gate , and then
   After that, make sure that it gradually grows.
8. Use **a patch cable to connect the LFO** Triangular **output to the** VCO CV In **input for pitch variation.**
   Make sure that is rippling. LFO Delay **doesn't work.**
9. Use **a patch cable to connect the** LFO Rectangular **output to the** VCO CV In input to change the pitch.
   Confirm that the movement is in two stages, high and low. LFO Delay **doesn't work.**

After confirming normal operation, the LFO production is complete.