Understanding and Using Your moogerfooger® MF-105 MuRF™


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Welcome to the world of moogerfooger® Analog Effects Modules! Your model MF-105 MuRF is a rugged, professional-quality instrument, designed to be equally at home on stage or in the studio. Its great sound and jaw-dropping effects come from the state-of-the-art analog circuitry, designed and built under Bob Moog's personal direction.

Your MuRF is a direct descendent of the original Moog™ modular synthesizers and professional rack effects. It contains two basic functions: an 8-band array of resonant bandpass filters, and a pre-programmed "Animation" module that generates sequences of envelopes that modulate the levels of the 8 filters. Several of the performance parameters are voltage-controllable, which means that you can use expression pedals, MIDI-to-CV converter, or any other source of control voltages, such as other moogerfoogers, to 'play' your MuRF.

While you can use it on the floor as a conventional effects box, your MuRF is much more versatile and its sound quality is higher than the single fixed-function "stomp boxes" that you're probably accustomed to. The MuRF is an astoundingly versatile effects device, you will find it provides an incredible variety of effects. You will find that your MuRF is a deep musical resource and will become your creative companion as you explore its possibilities.

The following pages will first tell you how to hook up your MuRF and set the panel controls for the 'basic' setup. Next, we'll explain how the functions of your MuRF work. After that we'll go through the panel features and give you suggestions on how to use your MuRF in specific applications. At the end of this booklet you'll find technical specifications, service and warranty information, information about Moog Music and diagrams of the MuRF's Animation patterns.

GETTING STARTED

Here are some simple instructions on how to quickly plug in and try out your MF-105.

1. Unpack your MF-105. Place it on a table while you become familiar with its features.

2. Check that the power adaptor has a nominal rating of +9 volts, providing at least 300 mA (milliamperes) of current and is also rated at your country's standard power voltage (120 volts A.C. for the United States and Canada; 100 volts A.C. for Japan; and 220 volts A.C. for most other countries). Plug the power adaptor's cord into the MF-105's '+9V' jack. Then plug the power adaptor itself into a power voltage receptacle. ***Note the MuRF uses a different power supply than other moogerfoogers, which is only rated at 200mA. Using a 200mA moogerfooger power supply may result in hum, distortion, and other less than desirable audio artifacts. Make sure to use the proper power supply.***

3. Note that the BYPASS light is on. It will light up either red or green. Red indicates that the MF-105's effect is off-line (bypassed), while green indicates that the effect is on. Pressing the 'stomp switch' will toggle the BYPASS light between red and green. For now, leave the BYPASS light on red.

Refer to Figure 1 for steps 4. and 5.
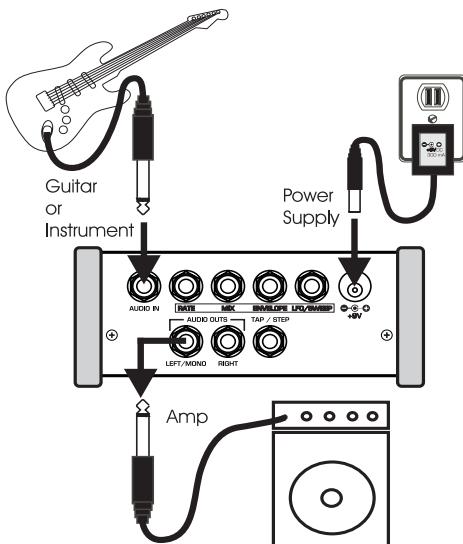
Figure 1 - Basic Connections to MuRF

4. Connect an instrument cable from the LEFT/MONO jack to a line-level input on your amp or mixer. Turn the volume control on your amp down but not off.

5. Connect an instrument cable from your signal source to the AUDIO IN jack. You can feed virtually any instrument-level or line-level signal through your MF-105. Examples are guitar, bass, keyboard, theremin, drum machine, or Effects Send output on your mixer. Play your instrument (or turn on the signal source). Adjust the volume control on your monitor amp so that the sound level is comfortable.
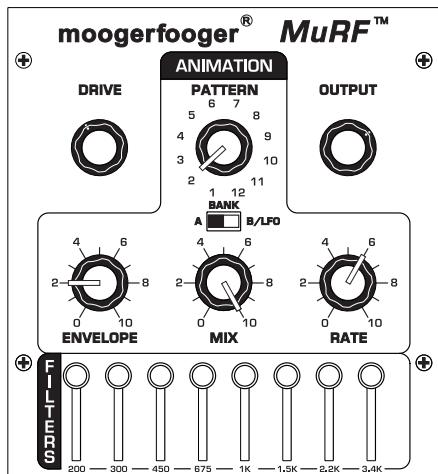
Figure 2 - Basic Settings

6. Now set the MF-105 panel controls as follows (See Figure 2):

PATTERN	2
ENVELOPE	2
RATE	6
MIX	10
BANK A/B	A
Filter Sliders 1-8	All the way up.

Press the stomp switch. The BYPASS light will now turn green. Playing your instrument, set the DRIVE control so that the DRIVE indicator lights up yellow most of the time. You will also hear the filtered signal. Adjust the OUTPUT control so the MuRF's effected signal is about the same loudness as the bypassed signal.

7) Continue to play your instrument, playing sustained sounds like ringing chords. Your instrument's signal is going through the MuRF's filters. Listen to how it affects the quality of your

instrument's tone. You will hear the level of each of the 8 filters being turned up and down automatically in sequence by the Animation at a tempo determined by the RATE control. Note that changing the ENVELOPE control affects the shape that turns the filters up and down. The PATTERN rotary switch selects different patterns that dictate the sequence that turns the Filters up and down automatically. The MIX control is used to blend the direct sound of your instrument with the effected sound.

8. In the next sections we'll explain exactly how the MuRF's Filters work and what the Animation does. For now, get a feel for the controls by experimenting with different settings.

FREQUENCIES and FILTERS

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   Let's start with some definitions. Please read this section carefully, as it will help you to understand the basic ideas behind the MF-105 MuRF's filters.

   Sound is a vibration of the air. The speed of vibration is called the frequency. It is measured in Hertz (Hz). One Hz is one vibration per second. We hear vibrations from 20 Hz to 20,000 Hz.

   Musical sounds generally have many frequency components. They're called harmonics, or overtones, or partials. They are what give a sound its characteristic tone color, or timbre. A graph showing the strength of each of a sound's harmonics is called a spectrum. A typical spectrum of a musical sound is shown in Figure 3.

   A filter is a signal-modifying device that colors a sound by emphasizing some parts of the audio spectrum and attenuating

Figure 3 - Typical spectrum of a musical sound.

(cutting down) other parts. In general, a filter has a 'quality' of its own which is superimposed on the tone color of the original

sound. Some types of filters (like the bass and treble controls on your sound system) have subtle, gentle effects on a sound's timbre. Other types of filters have stronger and more dramatic effects, and are frequently used as vital elements in the music-making process. Strong filters include phasers, flangers, and wah-type resonant filters.

A graph showing what a filter does is called the filter's frequency response. The horizontal axis is frequency. The vertical axis is the filter's gain. A gain of "1" (unity) means that, at that frequency, the output of the filter is just as strong as the input. A gain of less than unity means that the filter's output is attenuated at that frequency, while a gain of greater than unity means that the output is actually greater than the input.
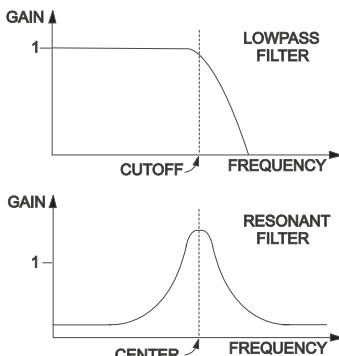

Figure 4 - Frequency responses of typical filters.

Figure 4 shows examples of the frequency response characteristics of two common types of filters: (a) a lowpass filter, which passes frequencies without attenuation up to a so-called 'cutoff frequency', and attenuates the frequencies above cutoff; (b) a resonant filter, which emphasizes frequencies around the filter's 'center frequency'.

Both of these filter types are widely used in contemporary music performance. Each of them has its own distinct sound, a large part of which is directly related to the shape of its frequency response graph. The first type is embodied in the moogerfooger MF-101 lowpass filter, and the second type is embodied in the MuRF.. There are eight separate resonant filters in your MF-105.

The MuRF's FILTERS

The MuRF's eight resonant filters have a fixed center frequency, shown on the legend underneath the filters' sliders. Their frequencies are: 200 Hz, 300 Hz, 450 Hz, 675 Hz, 1 KHz, 1.5 KHz, 2.2 KHz, and 3.4 KHz.

Each filter has a slider that adjusts the gain of that filter. In this respect, the MuRF resembles a graphic equalizer. When a filter's slider is all the way down, the gain for that filter is zero, and the filter's output is zero. When the slider is all the way up, the filter's output is maximum. However – the resemblance to a graphic EQ ends there. The MuRF's filters have characteristics that set them far apart from a graphic equalizer. First, they are resonant filters. They boost the signal at the center frequencies of the filters. Second, they are tuned so they don't overlap. A graphic equalizer will theoretically <u>not</u> color the signal at all when all the sliders are set to the same level. The MuRF's resonant filters on the other hand color the signal a great deal, adding warm analog resonances at pleasing intervals through out the frequency spectrum. We'll now show how the MuRF's filters affect your MF-105 frequency response. We will always start with this 'basic' panel setup, which is:
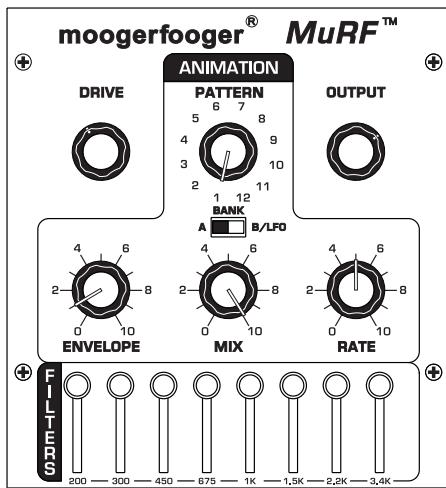

Figure 5 - Basic Settings for checking out the filters.

1) Set each of the filters' sliders to all the way up.

2) Switch the PATTERN to Bank A, Pattern 1. Pattern 1 turns off the Animation so you can hear the effect of *just* the filters.

3) Make sure the effect is on, and MIX is at 10.

4) Connect just the "left/mono" output to your amplification.

You may want to experiment with the panel controls and switches as we discuss each of the parameters.

5) Now, play a bright, sustained sound, preferably of low pitch into the MuRF - keep in mind that filter effects work by *removing* frequencies, so you must have a bright sound to hear the effect! Figure 6 shows the MF-105's basic frequency response, the response that you hear when the panel controls are set up as in the basic setup. Note that there are 8 resonances – they impart warmth and color to the sound. For a moment press the bypass switch and turn the effect off. Note the change in character of the sound. Now switch the effect back on.

GAIN
1

200   300   450   675   1K   1.5K   2.2K   3.4K
FREQUENCY
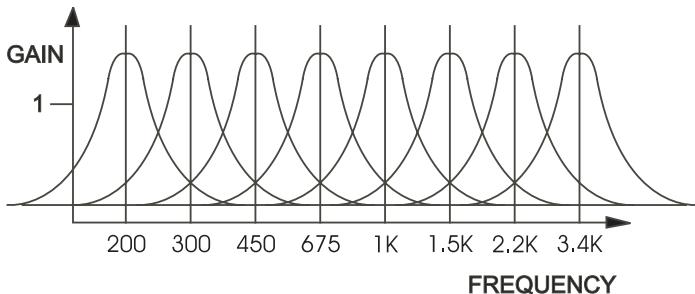
Figure 6 – Frequency Response of MuRF in Basic Setup

6) Now turn all the sliders down except the lowest one. Figure 7 shows the frequency response of just the lowest filter. Experiment by turning each slider up one at a time, while the rest of the sliders are all the way down. Pay careful attention to the sound of each filter. When you have learned the sound of each individual filter, try various combinations, such as the bottom two and top two.

Note that even without Animation, the MuRF is a VERY POWERFUL filter bank with many possibilities to sculpt your tone!

GAIN
1

200
FREQUENCY
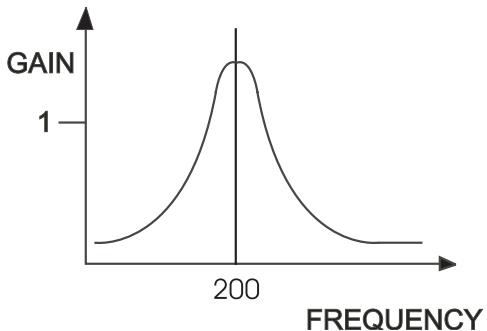
Figure 7 – Frequency response of 200 Hz Filter

7) The Filters' resonant frequencies can be shifted up and down by a small amount to create an effect similar to phasing. Figure 8 shows a graph that portrays the results of shifting a resonant filter's center frequency. In the MuRF this can be done two ways, depending on the position of the BANK slider switch. The switch, located below the PATTERN selector switch is labeled BANK A or B/LFO. When the slider is in the "A" position, the filters' center frequencies can be shifted by an expression pedal (such as the Moog EP-1) or CV plugged into the LFO/SWEEP Jack.
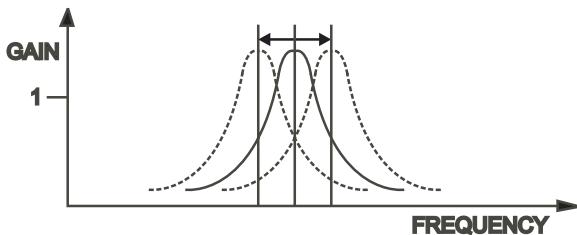
Figure 8 - Resonant Frequency shift

To hear how this works, return to the basic setup described in Figure 5. Plug a Moog EP-1 into the LFO/ SWEEP control input. Then, as you play into the MuRF, rock the EP-1 back and forth. You will hear the filters' frequencies shift with the motion of the pedal.

When the BANK slide switch is in the B/LFO position, an LFO (Low Frequency Oscillator) shifts the frequencies of the filters as a group up and down automatically. The LFO is a sine wave. The rate is determined by the pattern, or an expression pedal (EP-1 or equivalent) or CV connected to the LFO/SWEEP jack.

To hear the effect of the LFO on the MuRF's filters, return to the basic setup outlined in figure 5, then move the BANK slider switch to "B/LFO". Now as you play through the MuRF, you'll hear the filters swept up and down automatically. To change the speed of the LFO, plug a Moog EP-1 expression pedal into the LFO/SWEEP Control Input. The EP-1 can now slow down or speed up the LFO.

ENVELOPE GENERATORS

Now that we have explained the MuRF's filters, let's proceed with some more definitions to explain the Animation function of the MuRF.

The term "Envelope" is used to describe the changes that occur to a musical sound, from its start to its end. A musical sound can have a rapid onset, like the plucking of a string or the striking of a drum. It can also have a gradual onset, like a slowly bowed violin. With the term "Envelope", the shape of the start of a sound is called the "Attack". The end of a sound can have different shapes as well – it can be abrupt, like on an organ, or it can be very gradual, fading out like a piano note held down. The shape of the end of a musical sound is called "Decay". Both Attack and Decay are time-related, and can be measured in seconds or milliseconds. Figure 9 illustrates the components of an envelope.
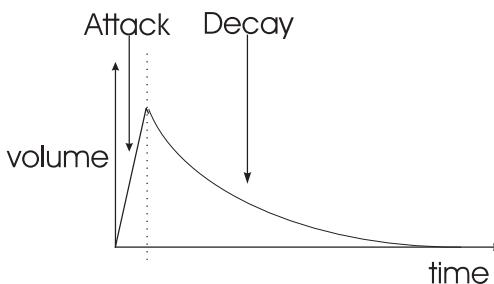
Figure 9 - a representation of a Volume Envelope

An "Envelope Generator" is a circuit that creates a shape that corresponds to the changes in a musical sound. The signal that comes out of an Envelope generator is sent to a control, such as Volume, and is used to automatically turn up and down that control to shape the start and end of that musical sound. An Envelope Generator is started by a trigger - a signal used to start the envelope shape.

In the MuRF, there are 8 Envelope generators, one for each filter, that shape the Volume of that Filter's signal. The shape of the Envelopes are all determined by the setting of the ENVELOPE Control. When the Envelopes are started is determined by the PATTERN selected. To understand that, let's continue.

SEQUENCERS and PATTERN GENERATION

A Sequencer is used to generate reoccurring rhythmic patterns, often by triggering sequences of notes in synthesizers or drum machines. However sequencers can be used for purposes other than triggering notes - they can be set up to create reoccuring changes of timbre as well. Vintage sequencers were typically designed so there were a certain number of "steps". The term "step" refers to the individual components of a pattern. For instance in a bar of music in 4/4 you have four quarter notes. If the rhythmic activity is no more complicated than quarter notes, this would correspond to four steps. In many vintage or analog sequencers, a sequencer typically had eight or sixteen steps available to build a pattern.

In its simplest form, as a sequencer plays back its steps, each step can be programmed to send a trigger signal - or not - a step can be passed over like a musical rest. The trigger signals can then be used to trigger envelope generators according to the way each step is programmed - creating a rhythmically reoccurring pattern.

The MuRF's Animation contains 8 simple sequencers, one for each filter, each capable of triggering an Envelope Generator that shapes the volume of the filter.

ANIMATION

The MuRF's ANIMATION module is designed as a means of automatically turning the levels of the individual filters up and down, using envelope generators, according to a pre-programmed pattern. The ENVELOPE control morphs through different envelope shapes as you turn it, creating effects that are highly rhythmic in nature, or are swirling and ethereal. The RATE control sets the speed of the pattern. The patterns, selected by the PATTERN selector rotary switch in conjunction with the Bank slider switch, have been selected to provide a surprisingly wide variety of rhythmic timbral effects. There are a total of 24 patterns,
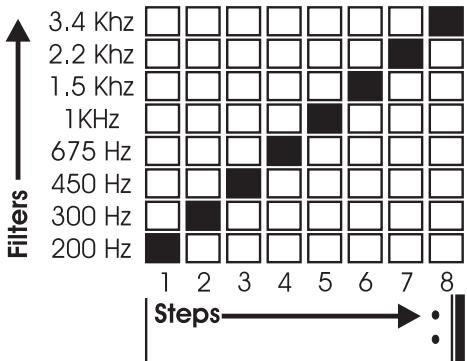
Figure 10 - Diagram of Pattern 2, Bank A

arranged in two banks of 12. An easy way to understand the Animation is to look at a simple pattern displayed on a grid.

Figure 10 shows a graphic representation of pattern 2 in Bank A. The columns going left to right are the steps of the pattern.

The rows going from bottom to top are the individual filters. ***Illustrations of all the Patterns are in Appendix A, page 22.***

Return to the basic setting shown in figure 2, which features pattern 2. As you play your instrument through the MuRF, pay attention to the sound of the effect and how it corresponds to figure 10. You should hear the Animation "stair-stepping" through the filters. Turn the RATE control up and down and notice how the pattern speeds up and slows down.

Now it's time to explore the ENVELOPE Control - one of the most powerful parts of the MuRF.

1) With the ENVELOPE Control set at 2, you should hear each of the filters with a sharp attack and a decay that fades out smoothly but quickly.

2) Turn the ENVELOPE control to 0 as you play through the MuRF. The effect sounds much more choppy - the decay time has been decreased.

3) Now turn the ENVELOPE control up to 5. The effect now sounds smooth - the attack is the same time as the decay - like a tremolo effect.

4) Turn the ENVELOPE control to 6. The effect becomes swirly

and the transitions from filter to filter blurred, as the Attack and Decay become so long that the effect is crossfading from one filter to the next.

5) Finally, turn the ENVELOPE control up to 8. The effect now sounds "backwards" as the attack time is now smooth but fast, and the decay is abrupt.

What happens as you change the ENVELOPE control is that the shape of the Envelopes controlling the gain of the filters morphs. Figure 11 shows the changes to the envelope times at different settings of the Envelope control. The Envelope times also change as the Rate changes - faster Rate settings cause the envelope times to decrease and slower Rate settings slow the envelope times. This makes the MuRF capable of both rhythmic and smooth-changing, swirling effects. Spend some time to get to know how this control interacts with the different patterns and you will be rewarded with some very interesting sounds!

Figure 11 - Effect of the ENVELOPE control on the MuRF's attack and decay times

THE MuRF'S TAP/STEP INPUT

The MuRF's Animation can be synced to the tempo of the music using a Moog FS-1 footswitch or equivalent plugged into the TAP/STEP input. Tapping three times activates the tap tempo feature of the MuRF. The MF-105 calculates the time in between taps and translates this into the rate for the pattern. It is important to make the time between the taps as much the same as possible to get the best results. Note that the Rate light becomes green when the rate is set by the Tap input, and returns to red if the RATE control is changed. The tempo of the Animation is twice the rate that is tapped on the footswitch. In other words, if you tap in quarter notes, the Animation will chug along in eighth notes. If you tap eighth notes, the Animation will proceed in 16th notes.

THE AUDIO LEVEL CONTROLS AND MIXING

The DRIVE control adjusts the signal level at the MuRF's circuit input. With this control you can set the right input level for virtually any instrument or line-level signal source. Turn this control counterclockwise for strong input signals, and clockwise for weaker sound sources.

The DRIVE light tells how strong the input signal is after being adjusted by the DRIVE control. As the signal level increases, the light goes from off, to green, to yellow, and finally to red. Very weak signals do not light up this light at all. When the light is green, the signal is below the level that results in audible distortion. When the light is yellow, some low order distortion may be audible, giving the sound a subtle warm analog quality. When the signal is strong enough to drive the light into the red, the distortion at the output becomes stronger and more distinctly audible. Watch this light when you set the DRIVE control for the desired effect.

The OUTPUT control adjusts the strength of the MuRF's signals that appear at the LEFT/MONO and RIGHT output jacks. Use this control to balance the MuRF's signals with the bypassed signal. Note that neither the DRIVE nor the OUTPUT controls affect the strength of the bypassed signal.

USING BOTH AUDIO OUTPUTS TOGETHER

The MuRF has two audio outputs: LEFT/MONO and RIGHT. When a cable is plugged into just the LEFT/MONO jack, the output of all filters are sent to that jack. If a cable is inserted into the RIGHT jack, then half of the filters are sent to the RIGHT output, and half are sent to the LEFT/MONO output. . Figure 12 shows the frequency response of the left and right outputs when both the left and right output jacks are used.
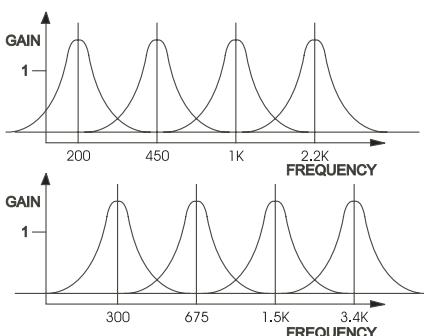
Figure 12 – Left and Right Frequency Response of the MuRF's Filters

Note that the odd-numbered filters are sent to the left channel, and the even-numbered filters are sent to the right channel. This allows for spreading a sound's frequencies between two speakers, which adds a "spacious" feel.

EXPRESSION PEDALS AND VOLTAGE CONTROL

You now know what each of the rotary controls does to the sound of the MF-105. The ENVELOPE, MIX, and RATE controls have expression pedal/control inputs that duplicate their effects. In addition, the MF-105 has a LFO/SWEEP input which is used to adjust the speed of the LFO in Bank B patterns, or to sweep the frequencies of the filters in Bank A patterns. This enables you to plug in up to four expression pedals to play the MF-105 with your feet as well as with your hands. The moogerfooger EP-1 Expression Pedal is designed for this purpose. Or you can use expression pedals with equivalent specifications. See the Technical Information section on Page 17 for more information on pedal specifications.

When you plug an expression pedal into one of the pedal inputs on your MF-105, the pedal adds and subtracts half the range to the setting of the corresponding control. For example, let's say that you plug an expression pedal into your MF-105's ENVELOPE input, with the ENVELOPE control set to 5. With the pedal all the way in the heel position, the Envelope shape is the same as if the ENVELOPE control was set to zero. Then, when you advance the pedal, the Envelope shape begins to morph, just as if you were turning the knob. At halfway, the pedal equals the setting of the corresponding control, and at full toe position, it is as if the control is at 10. A good rule to follow is: when you use an expression pedal, you set the corresponding knob for the middle value you want. From the middle of the pedal, advancing to toe position increases that value, pulling back to heel position decreases the value.

The expression pedal inputs can also be used as control signal inputs. This enables you to use your MF-105 with virtually any control signal source: modular analog synthesizers, MIDI-to-CV converters, etc. You will find information on interfacing your

MF-105 with external control signal sources in the Technical Information section on Pages 17 and 18.

SOME TYPICAL SETUPS

## UPWARD STAIRCASE WITH RHYTHMIC VARIATION
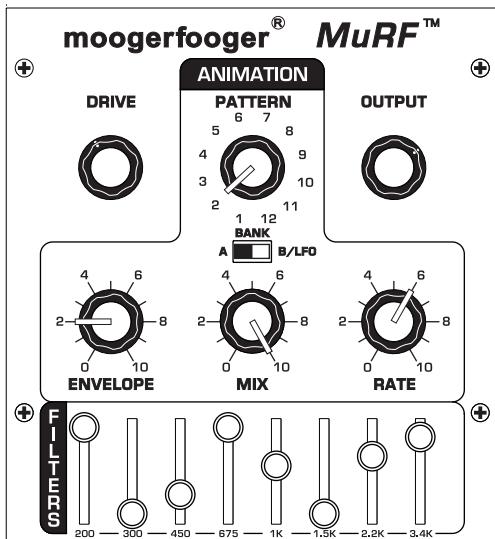
Here is a variation on the basic setting of figure 2 that shows off the ability of the MuRF to create rhythmic variations within the patterns. This is really nice with sustained chords or slowly arpeggiated playing.

SWIRLING CASCADES
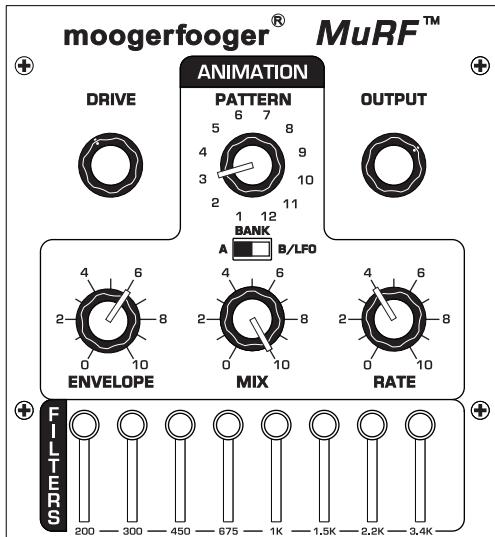
This setup shows off the long envelope times of the MuRF, creating a shimmering, slowly evolving timbral landscape for your playing. This shines on chordal playing, but also gives leads an extra something that makes them stand out.

GROWING and SHRINKING TREMOLO
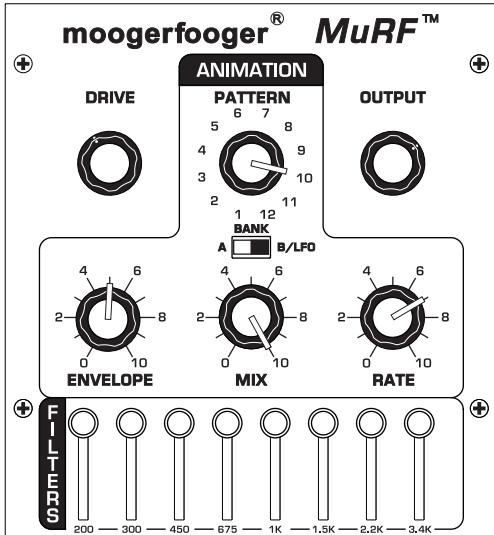
The Envelope control set at 5 gives a nice tremolo feel to the effect; the pattern changes gradually from one filter on to all filters on, making the timbre feel like it is growing and shrinking.

TECHNICAL INFORMATION

NOTE: The following information is intended for use by people who understand analog electronic circuitry and have enough practical experience to interconnect sophisticated electronic equipment correctly.

POWER: The MF-105 works on +9 volts DC and uses a max of about 240 milliamperes of current. *Use only the power supply supplied with the MF-105 or the exact equivalent. Power sources rated with voltages in excess of +9 volts may cause damage to the MF-105's circuit.*
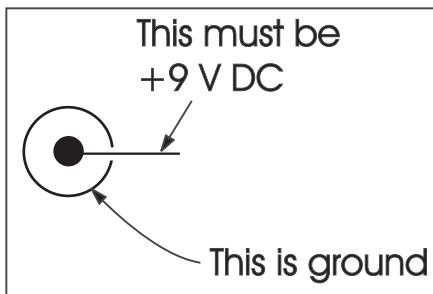
Figure 13 – Correct wiring of power supply connector

PEDAL INPUTS: All pedal control input jacks are 1/4" tip-ring-sleeve (stereo) phone jacks. The sleeves are grounded and the ring terminals are supplied with +5 volts which is current-limited. The tip terminals receive the variable voltages from the pedals.

An expression pedal for use with the MF-105 should contain a 50KW or 100KW potentiometer which is connected from the sleeve to the ring terminals. The potentiometer wiper is connected to the tip terminal.

Figure 14 – Correct wiring for an expression pedal

The pedal cable should be shielded, with the shield connected to the sleeve terminal. See Figure 14.

When connecting one or more pedal control input jacks to a source of external control voltage such as an analog synth or a MIDI-to-CV converter, you should use patch cords with tip-ring-sleeve phone plugs. The ring terminal on the plug should not be connected to anything, so that the MF-105's source of +5 volts is not shorted out. Or, if you do not plan to use any expression pedals with your MF-105 but would like to apply control voltages to one or more pedal control inputs, you can use patch cords with regular two-conductor phone plugs. These

Figure 15 – Correct wiring for a TRS CV patch

will short out the +5 volt supply to the ring contacts. This voltage is current-limited, so you won't burn anything out, - but no pedal will work in any of the pedal control jacks if a tip-sleeve plug is plugged into even one of the pedal jacks.

Applying a varying voltage to the tip terminal of a pedal control input jack has the same effect as turning the corresponding knob. A voltage change of about 5 volts at the tip terminal is equivalent to turning the corresponding knob through its entire range. You can 'program' your MF-105 performance parameters entirely from external control voltages, by turning the ENVELOPE, MIX, and RATE control knobs to 5, and feeding 0 to +5 Volt programming voltages to the tips of the pedal control input jacks. The LFO/SWEEP jack can also receive 0 to +5 Volt programming voltages.

AUDIO PATH: The bypassed signal goes to the LEFT/ MONO output jack. Thus, when the MuRF is bypassed, the signal at the LEFT/MONO output jack is the same as what your instrument is producing, and there is no signal at the right output jack. The MF-105 will not pass an audio signal unless power is applied to it.

LIMITED WARRANTY

Moog Music warrants that its products will be free from defects in materials or workmanship, and shall conform to specifications current at the time of shipment, for a period of one year from date of purchase. During the one-year period, any defective products will be repaired or replaced, at Moog Music's option, on a return-to-factory basis. This Warranty covers defects that Moog Music determines are no fault of the user.

RETURNING YOUR MF-105 FOR REPLACEMENT/REPAIR

You must obtain prior approval and an RMA number from Moog Music before returning any product to us. Wrap your MF-105 carefully and pack it with the power adaptor in its original carton. The warranty will not be honored if the product is not properly packed. Then send it to Moog Music with transportation and insurance charges paid.

A reasonable cost for service and for materials and return freight will be charged to replace materials defective through the fault of the user, or for which the one year warranty period has expired.

Transportation and insurance charges from Moog Music to your United States address, of products repaired or replaced under warranty, will be paid by Moog Music.

MF-105 SPECIFICATIONS

DESCRIPTION:
Analog effects module incorporating two functions: 8 – band Resonant Filter Bank and 24-Pattern Sequencer triggering Volume Envelopes for 8 Filters.

FRONT PANEL FEATURES:
DRIVE rotary control - adjusts the gain of the audio input to the effect.
OUTPUT rotary control - balances the level of MuRF's signal when the effect is on with the bypassed signal when the effect is off.
MIX rotary control - adjusts the ratio of direct to effected signal when the effect is on.
200 Hz – 3.4 Hz slider controls - sets the gain of the 8 resonant filters.
PATTERN 12-position rotary switch - selects one of 12 animation patterns.
BANK A, B/LFO slider switch - selects bank of patterns, bank B patterns include LFO modulation of the filters' frequencies.
ENVELOPE rotary control - morphs the shape of the patterns' envelopes.
RATE rotary control - adjusts the rate of the animation patterns
DRIVE, a three-color LED that shows the level of the input signal.
RATE, a LED that indicates the animation pattern rate.
BYPASS, a two-color indicator LED that tells whether the effect is active or bypassed.
ON/BYPASS, a rugged, smooth-acting 'stomp switch'.

JACK PANEL FEATURES:
AUDIO IN ¼" phone jack – accepts any instrument-level or line-level signal from –16 dBm to +4 dBm. Input impedance is one megohm.
LEFT/MONO OUT ¼" phone jack - -4 dBm nominal maximum output level; +8dBm absolute maximum output level. Output impedance is 1,000 ohms.

RIGHT OUT ¼" phone jack – 4 dBm nominal maximum output level; +8 dBm absolute maximum output level. Output impedance is 1,000 ohms.

RATE, ENV, LFO/SWEEP, MIX, all of which are stereo ¼" jacks that accept moogerfooger EP1 (or equivalent) expression pedals, or control voltages from two-circuit or three-circuit ¼" jacks.

TAP/STEP IN ¼" phone jack – provides a means of syncing the tempo of the MuRF's Animation Patterns to the tempo of the music by pressing on an external footswitch (Moog FS-1, or equivalent) three times.

+9V POWER INPUT jack – accepts +9VDC unregulated 300 mA power adapter with positive center.

GENERAL SPECIFICATIONS

CASE: Black panel with hardwood sides – classic analog appearance.

DIMENSIONS: 9" x 6" x 2-1/2"

NET WEIGHT: 2 lb

SHIPPING WEIGHT: 4 lb, including power adaptor and instruction manual

POWER REQUIREMENTS: 120 volt, 5W. 220 volt power adaptor available on special order

APPENDIX A: THE MuRF's PATTERNS

BANK A

1) No Animation

2) Upward Staircase
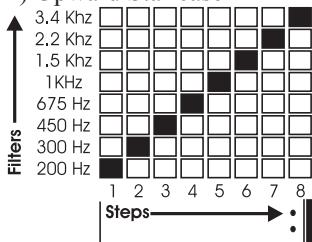
3) Downward Cascade
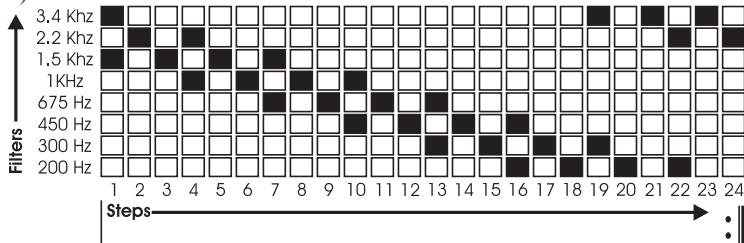
4) Crisscross
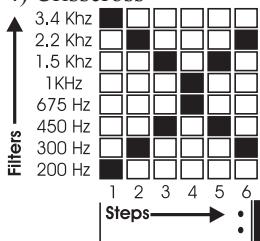
5)Tremolo
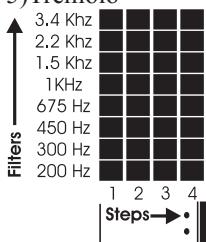
6) Upward Bounce
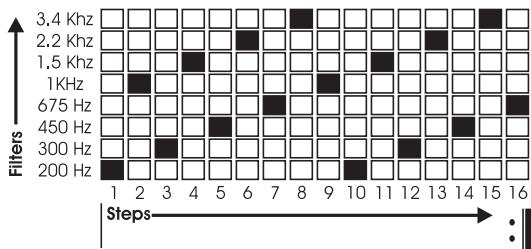
## 7) Brownian Motion
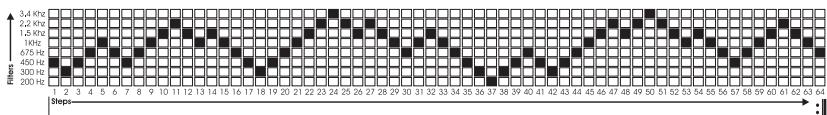
8) Random-like
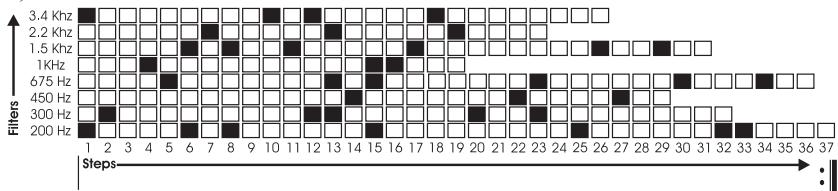

9) Double Up and Down
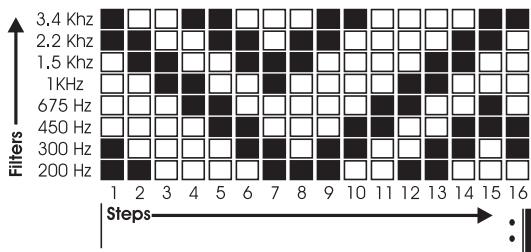
10) Downward Band Expansion
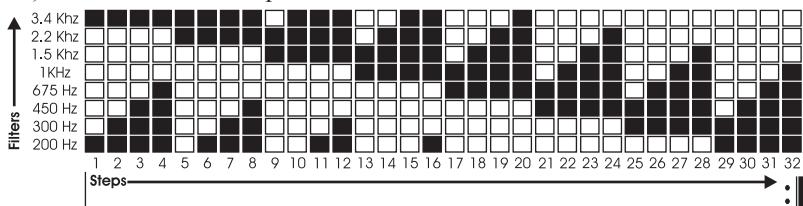
11) Polyrhythm
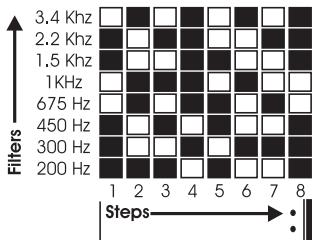
12) Rhythmicon
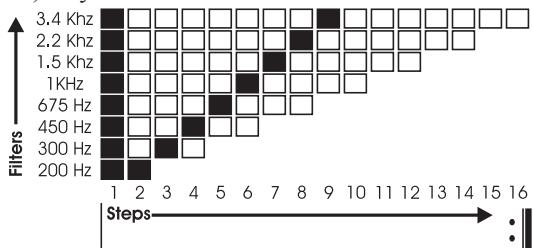
BANK B - with LFO

1) No Animation

2) Downward Staircase
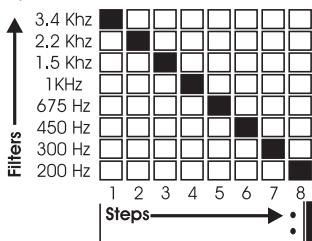
3) Upward Cascade
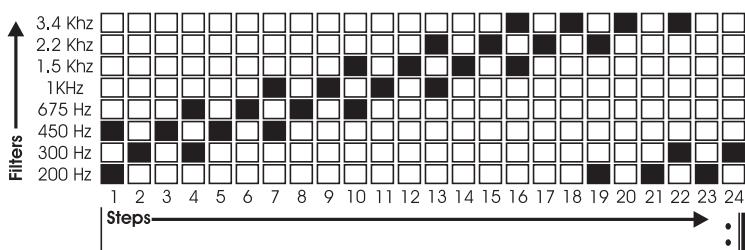
4) Down and Up
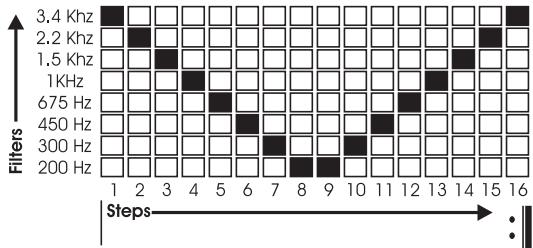


5) Come Together
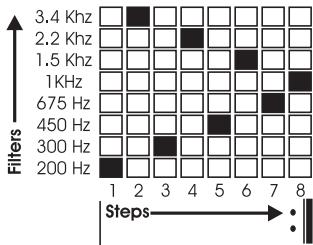
6) Seesaw Panner
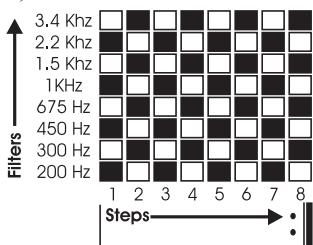
7) Rising Falling
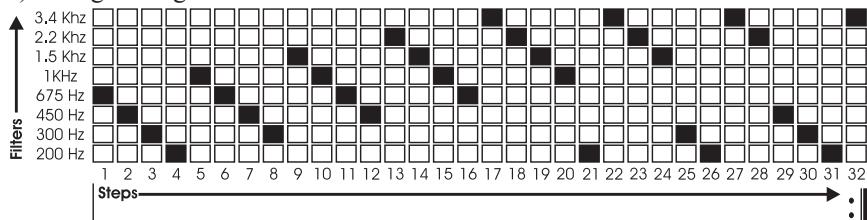
8) Pulsar
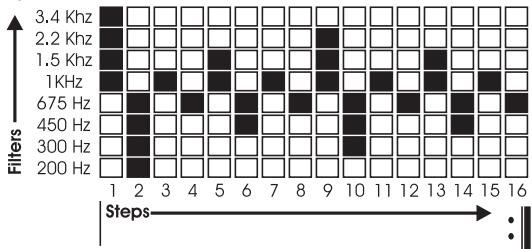
9) Upward Notch
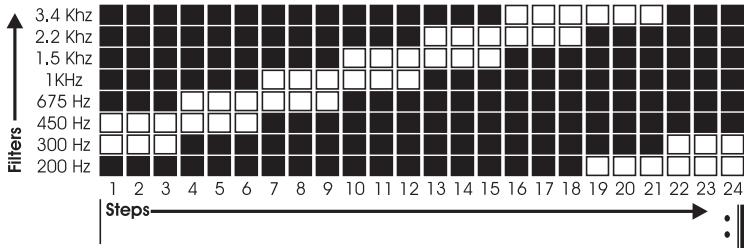
10) Growing and Shrinking Band
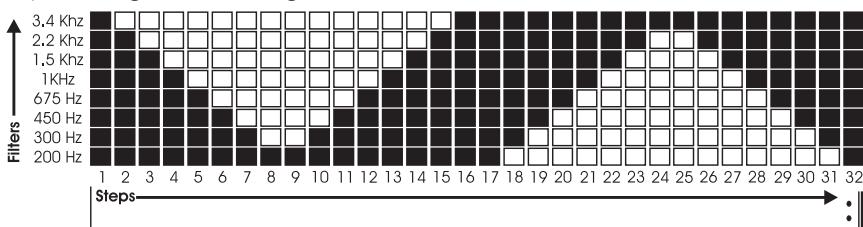
11) Double Cascade
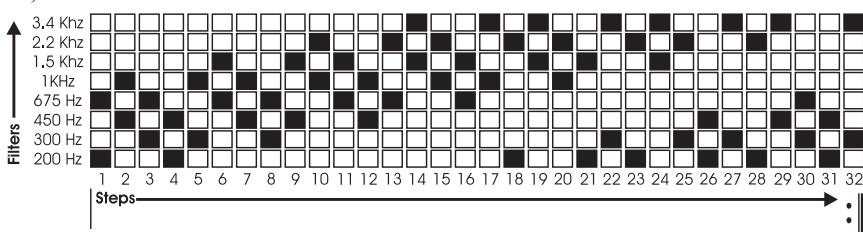
12) Inverted Rhythmicon

Notes:

Notes: