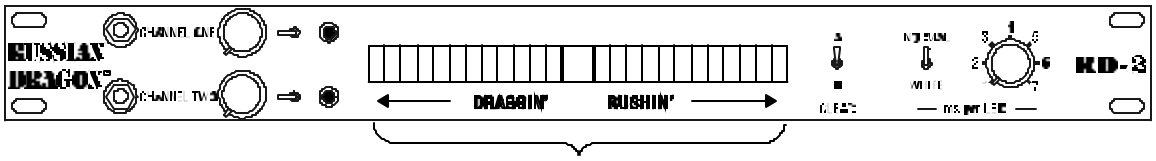
R U S S I A N D R A G O N
M O D E L R D - R 3
O P E R A T I N G I N S T R U C T I O N S



RD-R3 FRONT PANEL

OVERVIEW -

The RUSSIAN DRAGON is a brand new type of measurement meter. It measures the timing accuracy of two sounds that were meant to happen at the same time. For example, it shows how closely a drummer is playing along with a click track; it detects the time delay between an acoustic drum and it's triggered replacement; it reveals timing inaccuracies in MIDI systems; it measures the time offset of a delayed loudspeaker system; it monitors how tightly a percussion overdub it performed. The RUSSIAN DRAGON compares the timing of any two events, and gives an instantaneous visual display of who's rushin' and who's draggin' and by how much.

The Russian Dragon has two inputs. Channel One is the reference or click input. Channel Two takes the signal of the instrument or sound that is to be checked. Both channels use sophisticated circuitry enabling them to accommodate various signals - acoustic drums, drum machines, keyboards, metronomes, percussion instruments, guitars, drum pads, trigger sensors, microphones.

The Russian Dragon uses a row of 25 LEDs as it's display. The big square green LED in the center flashes each time the click or reference (Channel One) occurs. The Channel Two signal will light one of the other 24 LEDs indicating its timing accuracy compared to Channel One. The greater the distance from the lit LED to the center, the more time differential there is between the two input signals. The 12 LEDs to the left of center show that the Channel Two signal is late (draggin'). The 12 LEDs to the right of center indicate that the Channel Two signal is early (rushin'). If the two input signals happen at exactly the same time (within .1 millisecond), the Russian Dragon gives the "Snake Eyes" display - both LEDs on either side of the center are lit.

The ms per LED control sets the time value of the LEDs in the display. It can be varied from 1 millisecond per LED to 9 milliseconds per LED. For example, if the ms per LED control is set on 5 and the 8th LED on the rushin' side is lit, the Russian Dragon is indicating that the Channel Two signal is 40 milliseconds ahead of the reference.

GETTING STARTED -

Plug in the external 12 volt DC power supply. The power switch is located on the right side of the front panel. When power is first applied, the two LEDs on each side of center are lit. The Russian Dragon has two inputs. Channel One is for the reference signal or click track. Channel Two takes the signal of the instrument or sound that is to be checked. The inputs are auto balanced/unbalanced with a standard 1/4" RTS type connector. You can use a regular two conductor (guitar type) connector. Or, if you want a balanced input, use a (stereo 1/4") ring, tip, sleeve connector with tip = plus, ring = minus, and sleeve = ground. There are input connectors both on the front and on the back of the RD-R3. They are wired in parallel - you can use either the ones in front or the back, but not both at the same time. A unused input can be used as an *output* if you need to "Y" the signal to another device.

For ease of illustration, let us assume that we are using the Russian Dragon to monitor how closely a drummer is playing along with a click (metronome). The reference input (Channel One) is connected to the click track. Channel Two is connected to the drummer's snare drum. (Keep in mind that this is only one of the Russian Dragon's many applications.)

Plug the metronome signal into Channel One. Adjust the Channel One sensitivity control while watching the Channel One LED level meter. Adjust the control such that the red LED of the meter just barely blinks. Put the MASK knobs full counter-clockwise. (More on this knob later.) The TRIGGER ONE LED should flash on each click. Plug the snare drum signal into Channel Two. Adjust the Channel Two sensitivity control while watching the Channel Two LED level meter. Adjust the control such that the red LED just barely blinks. The TRIGGER TWO LED flashes once on each snare beat.

THE MASK CONTROLS -
The MASK control determines how fast the channel can retrigger. If the channel seems to be "double triggering" because of extraneous noise after the initial impact (such as snare rattle or reverb) increase the setting of the MASK control. The MASK control can also be used make the Russian Dragon ignore sounds that are not meant to be trigger signals. For example, a loud bass drum in between each snare beat, or the sustain of a crash cymbal.

THE ms per LED CONTROL -
The ms per LED knob sets the amount of time before and after the reference beat that is monitored by the LEDs on the front panel. It can be varied from 1 millisecond per LED to 9 milliseconds per LED. The user selects the appropriate setting depending on tempo of music, ability of player, etc. The tightest setting (1 ms per LED) is impractical for live musicians and should be used only for laboratory type measurements. For the application of a drummer and a click track, a setting of 4 ms per LED is a good starting point. If the front panel display stays within 8 LEDs before or 8 LEDs after the center LED, then all snare hits are within 32 milliseconds of the click.

THE DISPLAY -
The Russian Dragon uses a row of 25 LEDs as its display. The big square green LED in the center flashes each time the click or reference beat occurs. When the drummer plays, one of the other 24 LEDs will light indicating how close to the beat he is playing. The greater the distance of the lit LED from center, the farther the drummer is off from the click. The 12 LEDs to the left of center show that he is behind the beat (draggin'). The 12 LEDs to the right of center indicate that he is playing before the beat (rushin'). The row of LEDs is separated into colors to show quickly just how far off beat the musician is. The LEDs near the center are green - showing he is playing close enough to the beat. The next set of LEDs on each side of center is yellow. They light to indicate caution. The LEDs on each end of the row are red. If one of these illuminates, the Russian Dragon is indicating that the drummer is too far off the beat. He is outside the "window of tolerance". If the drummer plays so far off beat that he is even beyond the red LEDs, the display will be blank. If the drummer plays even farther off so that he is near half way in between click beats, the Russian Dragon will think that he meant to play an "upbeat". In this case the display will not go blank, it will hold the most recent reading of a hit that was near a click. So, beware. If you are monitoring a drummer that is just learning to play with a click, you could be getting misleading readings. It is a good idea to start with a wide setting (9 ms per LED) on a beginning drummer. Then gradually tighten the control as he gets the hang of it.

SNAKE EYES -
Occasionally, the two green LEDs on each side of center will light at the same time. We call this reading "snake eyes". This occurs when the signals coming in the two inputs happen at exactly the same time (within .1 millisecond). You can use this feature in the recording studio to "line up" two sounds that should happen simultaneously. Run the sound that is early through a digital delay and adjust the delay until you get the "snake eyes" reading. You should use a delay device with a resolution down to .1 millisecond - an SPX-90 will do; a Quadraverb will not. If you do not use a delay with .1 millisecond increments, you may not be able to achieve the "snake eyes" reading. In some applications the SMPTE offset can be changed to shift the timing of events. Note: at 30 frames per second and 80 bits per frame, 1 bit = approximately .4 milliseconds.

POLARITY CHECK BUTTONS -
This momentary switch checks the starting direction or polarity of the input signal waveform. The polarity of the signal is important only in specific Russian Dragon applications. For example, if you are aligning two sounds (2 kick drums, 2 snare drums, a kick drum and bass instrument) it is sometimes desirable to make certain that both sounds have the same

polarity - that is, that their waveforms both start in the positive direction. Let's say that you are combining two snare drum samples to make one big snare drum sound. If the two snare sounds have opposite polarity, the result of the combination will be a thin sound without much body.

Figure One. Signal starts in the positive direction

Figure Two. Signal starts in the negative direction

The Russian Dragon triggers at the first positive going part of the waveform that is above the zero crossing point. The above illustrations explains. In Figure One, the Russian Dragon will trigger at Point A. In Figure Two, it will trigger at Point B. For the most accurate alignment of two sounds, the polarity of the two signals should be the same. To check Channel One polarity, push and hold the Channel One Polarity check button. If the display has an LED lit on the left of center, then that signal starts in the positive direction. If the display has an LED lit on the right of center, then that signal starts in the negative direction. To check the Channel Two polarity, push and hold the Channel Two Polarity check button. If the display has an LED lit on the right of center, then that signal starts in the positive direction. If the display has an LED lit on the left of center, then that signal starts in the negative direction. The check marked arrows near the buttons help you remember which is which. Keep in mind that in many applications of the Russian Dragon (a drummer and a click track, for example), the polarity of the input signals is not important.

INPUT LEVEL METERS -
To get the maximum accuracy from the RD-R3, the signals coming in both channels should be approximately the same level. Make sure that the LED meters are indicating similar levels for both channels. Also, it is best practice to run the input level controls near full. There will be less chance for input signal overload with the controls at this position. If large level changes are needed, make adjustments externally.

S P E C I F I C R U S S I A N D R A G O N A P P L I C A T I O N S

U s i n g T h e R u s s i a n D r a g o n t o L i n e U p T r i g g e r e d S a m p l e s i n a M i x

Let's say you are mixing a song that has a good drum performance but the sound of the drums is bad. You decide to replace or augment the drums on tape with better sounding drum samples. You will trigger the samples using the original drums as the trigger source. Let's start with the kick drum. When you set up your sampler and get it triggering from the kick on tape, you notice that the sample is happening a little bit later than the original kick drum. To check this, connect the original kick to Channel One of the Russian Dragon and connect the sample to Channel Two. You will see that the sample is always a few milliseconds late. Use the following procedure to correct the delay.

1. Temporarily, put all the tracks of the tape recorder in SYNC. Bounce the kick to another track. The kick is now on two tracks.

2. Put all the tracks of the tape recorder in REPRO. To make the sample trigger earlier, you must get the original kick drum's signal from the SYNC head of the tape recorder. (All the rest of the music is coming off the REPRO head. The SYNC (RECORD) head is located a few inches to the left of the REPRO head.) So, put the track that has the bounced kick in SYNC.

3. Run the output of that track through a delay device. Run the output of the delay device to the trigger input of the sampler.

4. Adjust the delay time so that the Russian Dragon reads “Snake Eyes”. Don't be alarmed if the reading seems to fluctuate. Most samplers do not trigger consistently. Watch the Russian Dragon and adjust the delay for the most accurate reading on the average. Use a delay device with a resolution to .1 of a millisecond. Also make sure that the levels going into both channels of the Russian Dragon are the same. For maximum accuracy, use the Polarity check switch to check the polarity of both signals. If polarity is incorrect, reverse the phase on the mixing board.

Keith Cohen (Prince, Madonna, Janet Jackson...) told us how he uses his Russian Dragon: “I like to keep the Russian Dragon connected across the two mix bus. When I want to check anything, I just solo those two sounds and pan them hard left and hard right.”

Using The Russian Dragon with Delayed Loudspeaker Systems

1. Set up the Russian Dragon as shown in the diagram on the following page. The delay unit is temporarily connected in the path to the Russian Dragon. The percussive test signal indicated in the diagram can be the click from an electronic metronome or a short sound from a drum machine.

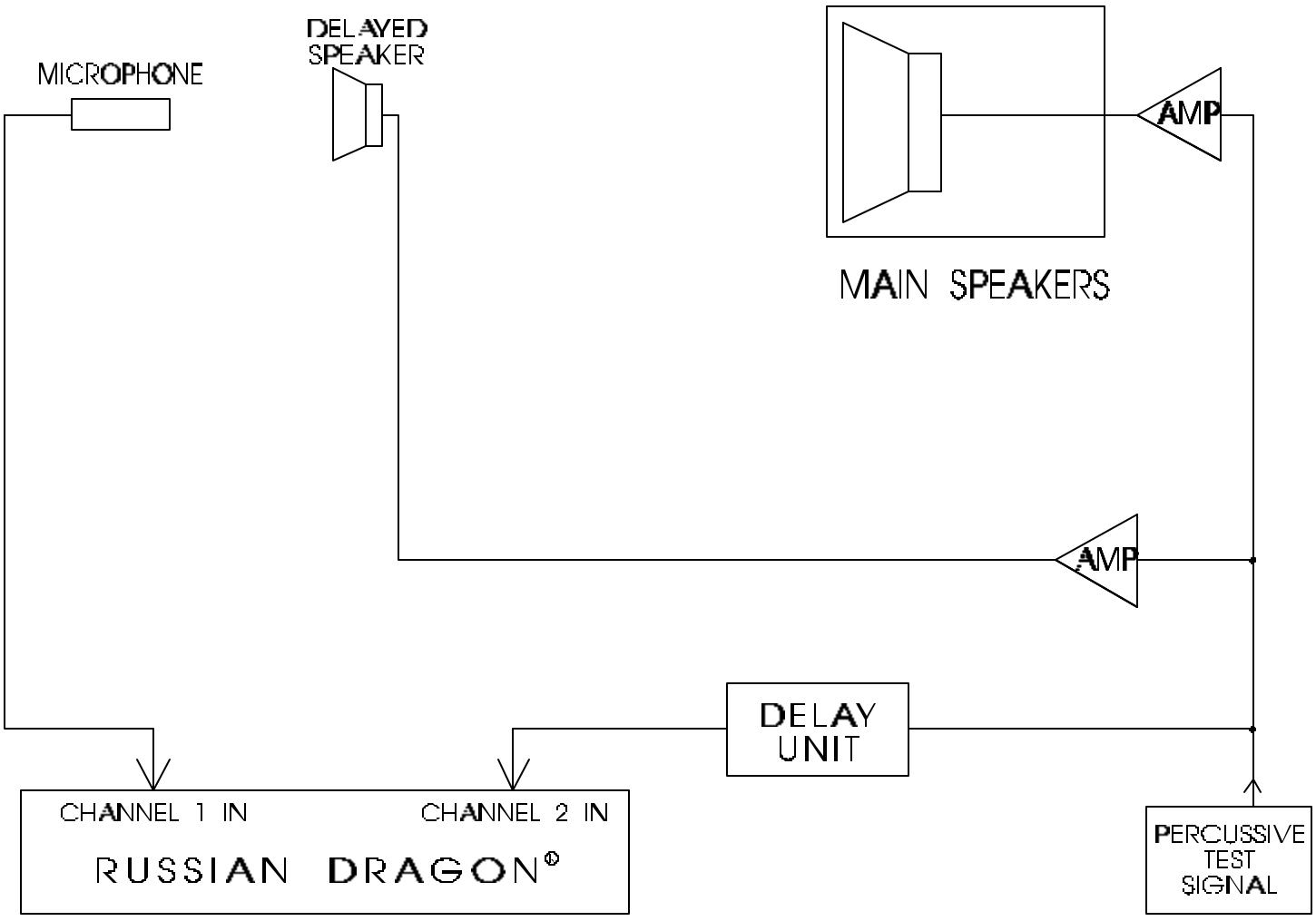
2. Turn the delayed speaker amplifier off and send the test signal to the main speakers only. Adjust the delay unit so that the Russian Dragon reads “snake eyes”. Write down this delay amount. We will call this reading D1. For example: 265.7 milliseconds.

3. Turn the main speaker amp off and send the test signal to the delayed speaker only. Adjust the delay unit so that the Russian Dragon reads “snake eyes”. Write down this delay amount. We will call this reading D2. For example: 23.1 milliseconds.

4. Calculate D3, the difference between the two delay times, by subtracting D2 from D1. (D3 = D1 - D2). In our example, D3 = 242.6 milliseconds.

5. Install the delay unit immediately before the delayed speaker amplifier. Set the delay unit to D3 milliseconds.

6. If desired, increase the delay time a few milliseconds so that the sound from the delayed speakers is in the “Haas zone”.



SETUP FOR USING THE RUSSIAN DRAGON WITH DELAYED LOUDSPEAKERS

Using the Russian Dragon to Check Sequencer Tempo Stability

INTRODUCTION

Sequencers are involved with the majority of the music made in the '90s. Usually we think our machine has perfect timing. It is assumed that the tempo of the machine is steady; that the time in between each beat is consistent. But in reality, most sequencers do exhibit some timing instability - some more than others. A simple test setup is presented to allow the reader to monitor the timing accuracy of his own equipment and take steps to minimize timing errors.

TEST SETUP

Figure 4 on the following page shows the test setup used for the measurements. The machine under test is programmed to put out a steady quarter note pattern using a short percussive sound such as a kick, snare, side-stick, closed hi-hat, etc. If the unit has a metronome, it can be set to quarter notes, and it's timing accuracy checked. The delay time of the delay unit is adjusted to be the same as the amount of time in between each quarter note beat. To explain the setup, let us consider a sequencer set at a tempo of 160 beats per minute (BPM). The time between each beat is computed by the formula: T = 60 / BPM, where T = time between beats in seconds and BPM = tempo of machine in beats per minute. At 160 BPM, the time in between each quarter note beat is .375 second or 375 milliseconds. So when testing a machine that is set at 160 BPM, the delay device is adjusted to 375 milliseconds of delay. Theoretically, the beats occurring at points A and B in the test setup should happen at the same time. The Russian Dragon is used to check the timing accuracy of signals A and B.

DELAY UNIT STABILITY

The focus of the test is the tempo consistency of the machine. The BPM accuracy of the unit is not verified. (In other words, when you set the sequencer on 160 BPM do you *really* get 160 beats per minute?) This was not done because

the accuracy of the delay time of the delay unit is not verified. (In other words, when you set the delay time on 375 milliseconds do you *really* get 375 milliseconds of delay?) For the test presented, a critical factor is the *consistency* of the delay produced by the delay unit. At Jeanius, we use a Yamaha model SPX-90 delay device for testing sequencers. The setup in Figure 5 on the following page was used to check the stability of the delay time of the delay unit. A second delay unit was needed for this test. (We used an Eventide 2016 unit for the second delay.) The same source signal, a quarter note metronome was sent to both delay units. The output of both delays fed the Russian Dragon. Both delay units were set to a delay time of 375 milliseconds. The Russian Dragon indicated that the two signals it was receiving were not happening at exactly the same time. So the delay time of one delay unit was adjusted (by 1.6 milliseconds) until the "snake eyes" reading appeared on the Russian Dragon - indicating that the two signals were within .1 millisecond of each other. The metronome was allowed to run for 15 minutes. For the complete duration of this test, the Russian Dragon read "snake eyes", meaning that the delay units did not fluctuate more than .1 millisecond for the entire test. Hence we can be assured that the instability readings are due to the sequencer, and are not caused by fluctuations of the delay unit.

CONCLUSION

Many sequencers have timing fluctuations. Some machines exhibit more error as the music produced by the unit becomes more complex. This, compounded by random MIDI delays, can create gross timing errors. The test setup presented allows the user to monitor the timing accuracy of his own equipment.

Using the Russian Dragon to Time Correct Distant Microphones

(We got this tip from Hans Zimmer and his engineer Jay Rifkin) When miking up sounds to record for sound effects you can use one close mic and one distant mic. But, when you add the two mics together, the time delay of the distant mic causes the resulting combination to sound weak and messy. Feed the distant mic signal into Channel One of the Russian Dragon. Feed the close mic signal through a delay device and then to Channel Two. Adjust the delay time until the two sounds are lined up. Now the resulting combination will have much more power and impact.

R U S S I A N D R A G O N M O D E L R D - R 3
S P E C I F I C A T I O N S

Components: 1% metal film precision resistors, 2% precision capacitors, gold connectors

Inputs: Auto balanced / unbalanced using 1/4" RTS connectors. Tip = plus, ring = minus, sleeve = ground

Input Impedance: 100K ohms.

Controls: Input sensitivity controls (2), Trigger mask controls (2)

Switches: Polarity check momentary switches (2), ms per LED rotary switch control, Power switch

Accuracy: "Snake Eyes" accuracy = .1 ms, all other display readings = 1 ms times the ms per LED setting

Power: External 12 volt DC, 100 mA adapter. Center pin = negative!

Dimensions: 1 U rackmount (19" x 1 3/4" x 3")

Weight: 3 lbs

1 2 M O N T H
L I M I T E D W A R R A N T Y

Jeanius Incorporated warrants to the user who originally purchased this product, that the product will be free from defects in material and workmanship for the following periods after the date of purchase: Material - 12 months, Workmanship - 12 months.

Warranty applies to the original owner; it is not transferable.

This warranty does not apply if the unit has been subject to physical abuse, improper installation, modification, or if the housing has been removed.

Jeanius Incorporated shall not be liable for any incidental or consequential damages arising from use, misuse, or functioning of the Russian Dragon.

The Russian Dragon is manufactured solely by Jeanius Incorporated. United States patent number 4,919,030. Patent pending in other countries. Russian Dragon is a registered trademark of Jeanius Incorporated.

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