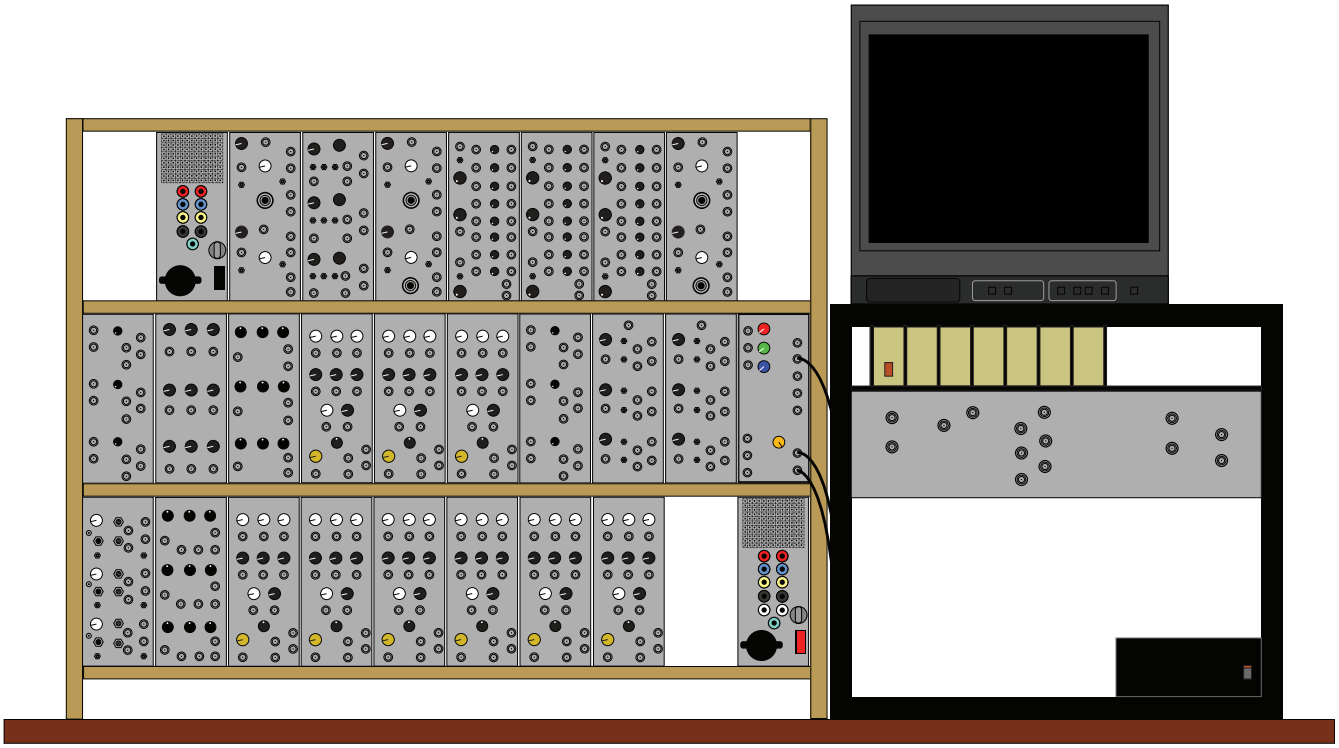
2023 GUIDE TO THE FVNMA SANDIN IMAGE PROCESSOR

REALTIME, FVNMA 3812

JAMES CONNOLLY



THIS IS A USER MANUAL THAT COVERS THE INTERFACE OF THE SANDIN IMAGE PROCESSOR. USE THIS GUIDE TO LEARN HOW THE BASIC MODULES WORK AND HOW TO PATCH THEM TOGETHER TO MAKE HIGHLY COMPLEX SIGNAL PATHS THAT GENERATE, RECEIVE, AND PROCESS VIDEO IN REALTIME.

USE THIS GUIDE AND THE RESOURCES UNDER WEEK 2 OF THE CANVAS PAGE TO USE AND CAPTURE FOOTAGE FROM THE IMAGE PROCESSOR.

THIS GUIDE COVERS SEVERAL PATCHES THAT INCREASE IN COMPLEXITY, INCLUDING:

- GENERATIVE VISUALS USING THE IP'S OSCILLATOR MODULES
- PROCESSED LIVE VIDEO FROM THE BLACK AND WHITE VIDEO CAMERAS IN ROOM 807
- PROCESSED VIDEO FROM YOUR LAPTOP OR ANY OTHER VIDEO SOURCE GOING THROUGH THE V40HD VIDEO MIXER

HERE ARE SOME SUPPLIES YOU NEED TO WORK WITH THE MACHINE:

1. AN EXTERNAL HARD DRIVE TO CAPTURE SANDIN IP FOOTAGE TO (REQUIRED!)
2. IF YOU WANT TO USE THE BLACK AND WHITE CAMERAS TO BRING A LIVE FEED INTO THE IP, CHECK OUT A TRIPOD FROM THE MEDIA CENTER
3. IF YOUR LAPTOP DOES NOT HAVE AN HDMI JACK, CHECK OUT THE PROPER CABLE TO BRING HDMI VIDEO OUT OF YOUR LAPTOP (SUCH AS A USB-C TO HDMI ADAPTER)

TURNING THE IMAGE PROCESSOR ON AND OFF

ONLY USE THIS MACHINE IF YOU HAVE RECEIVED CERTIFICATION TO DO SO!

ALWAYS FOLLOW THIS ORDER WHEN TURNING THE SANDIIN IMAGE PROCESSOR ON:

1. TURN ON THE SONY TELEVISION VIA THE BUTTON AT THE BOTTOM RIGHT

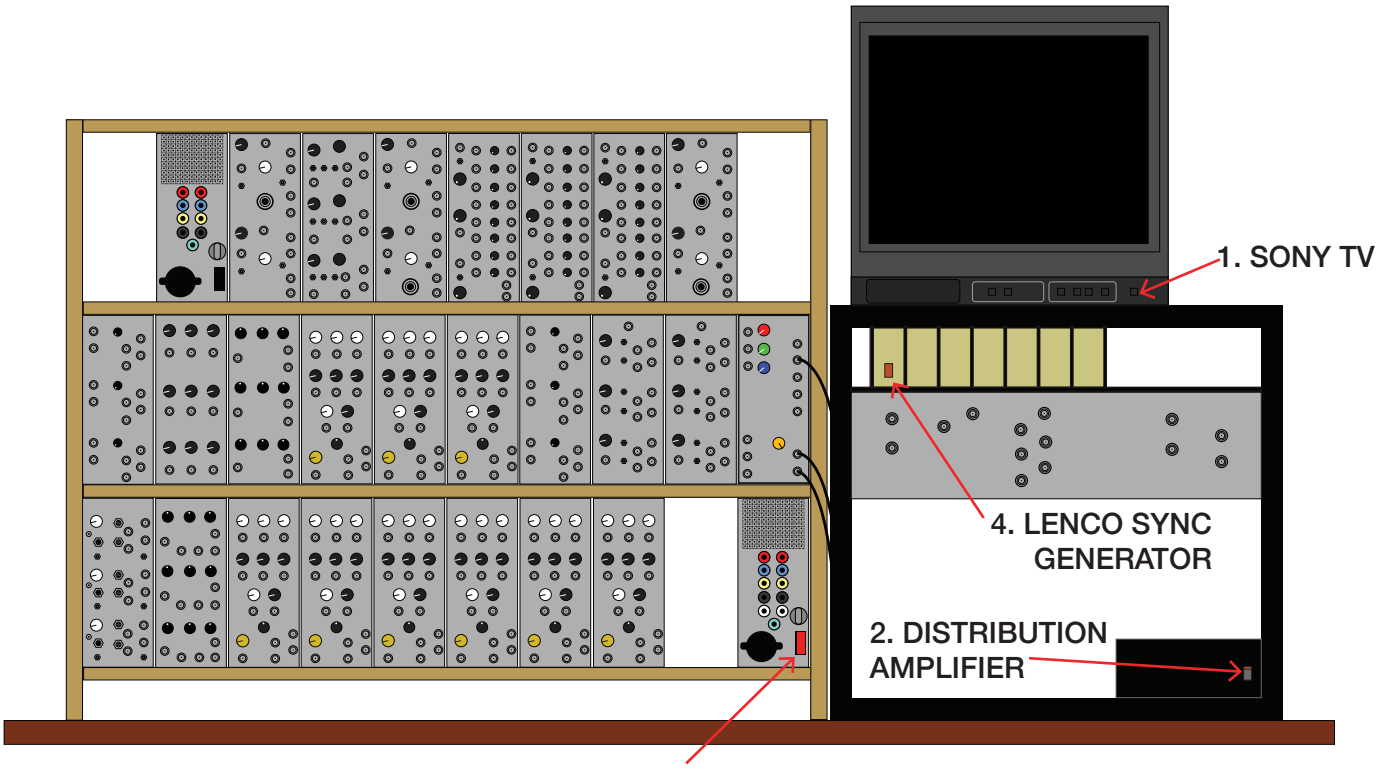
2. TURN ON THE BLACK DISTRIBUTION AMPLIFIER AT THE BOTTOM RIGHT OF THE ENTIRE SYSTEM

3. TURN ON THE SANDIN IMAGE PROCESSOR VIA THE POWER MODULE AT THE BOTTOM RIGHT

4. TURN ON THE CREAM-COLORED SYNC GENERATOR BELOW THE SONY TELEVISION

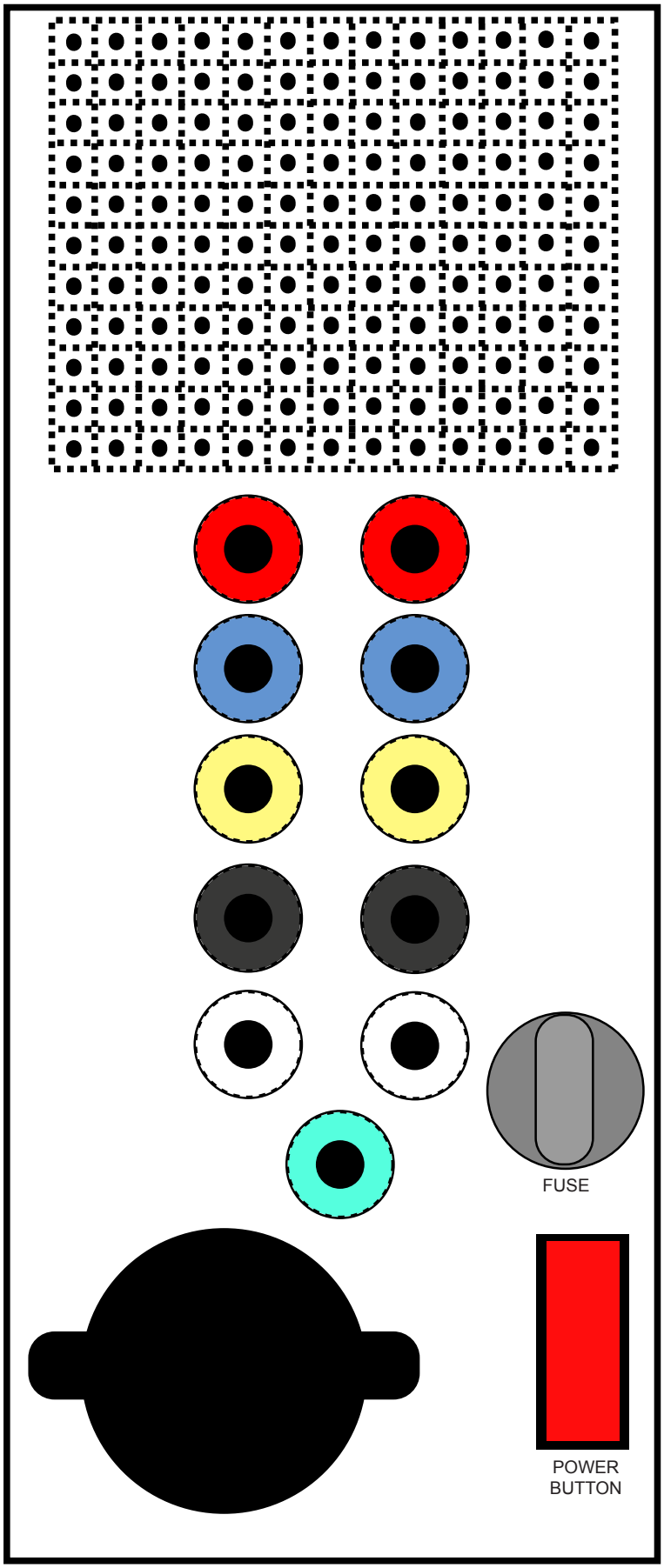
5. TURN ON ANY DIRECT INPUT DEVICES, SUCH AS THE VIDEO CAMERA OR V40 HD VIDEO MIXER

TO TURN THE SANDIN IMAGE PROCESSOR OFF, FOLLOW THESE STEPS IN REVERSE ORDER



5. ANY EXTERNAL VIDEO INPUTS YOU ARE USING, SUCH AS THE VIDEO CAMERAS OR THE V40HD VIDEO MIXER

POWER MODULE



COMPONENTS

POWER BUTTON

The Power Module turns the system on and off via the rectangular button at the bottom right. Ignore all other components.

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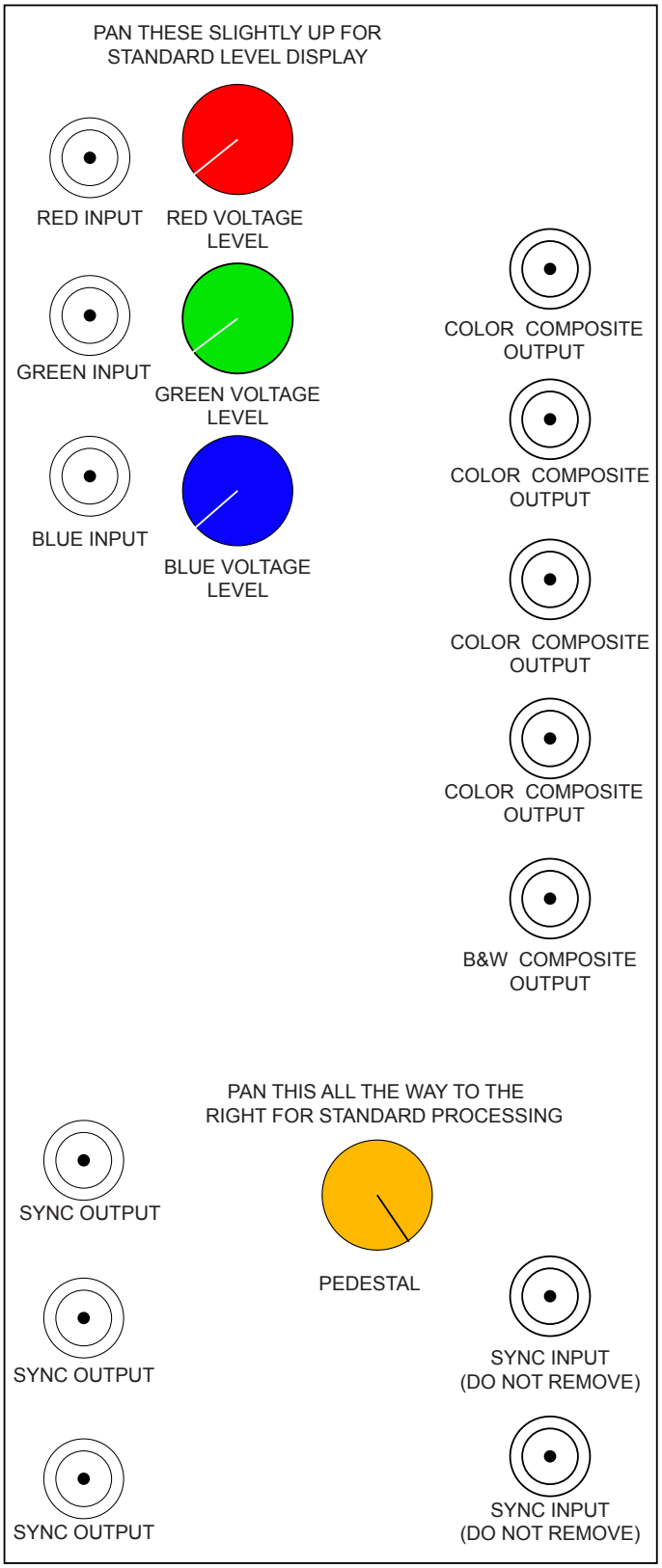
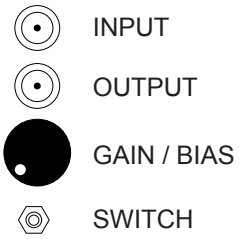
COLOR ENCODER



COMPONENTS



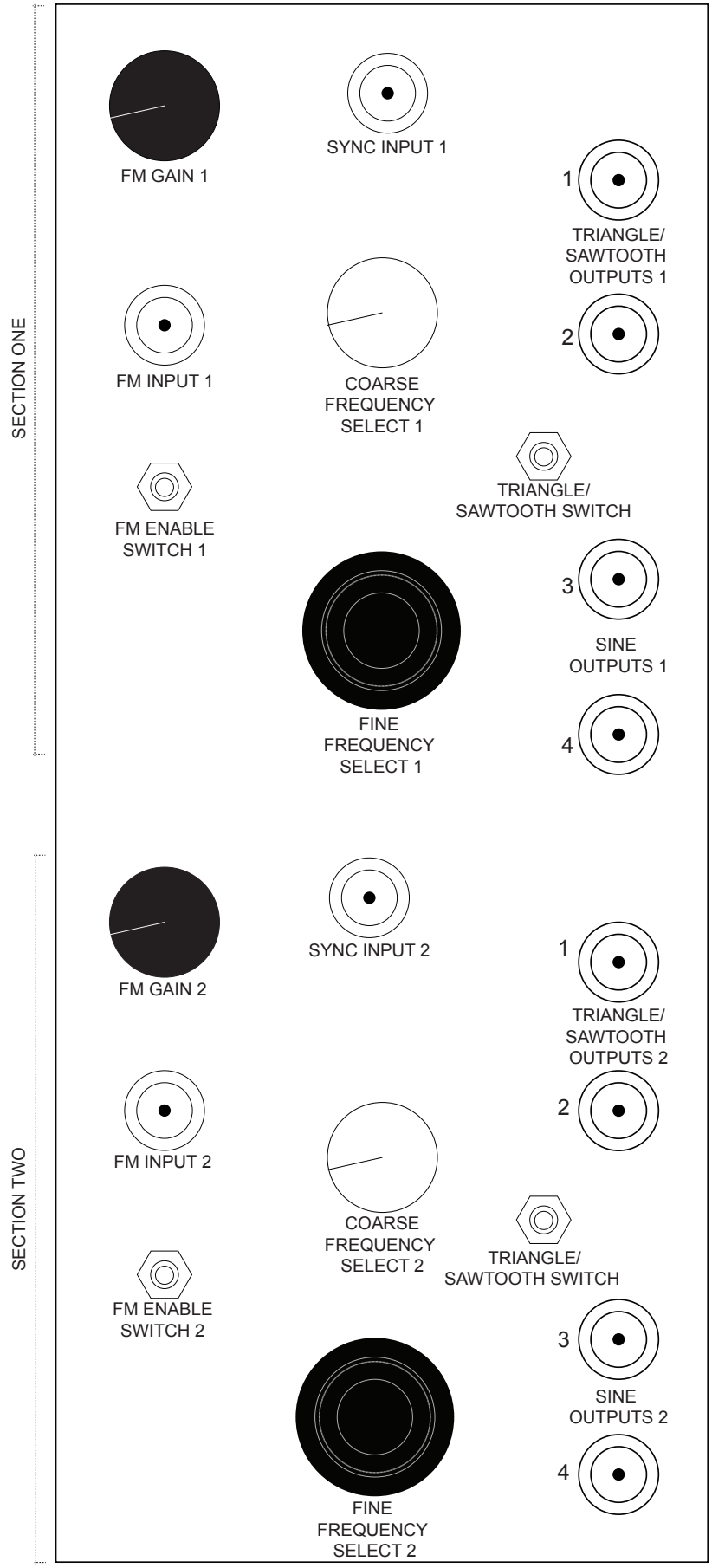
The color encoder is that master output for the Sandin Image Processor. This module encodes whatever is sent into the red, green, and blue inputs into a composite video signal. The red, green, and blue inputs have voltage knobs that can be used to test the machine and turn the video voltage up. They only need to be turned up slightly for the video to be displayed properly.

The pedestal knob controls syncing information. Turn it all the way up and to the rigth, as it is shown here, for standard video display. Turning it to the left breaks the imahe sync, glitching it.

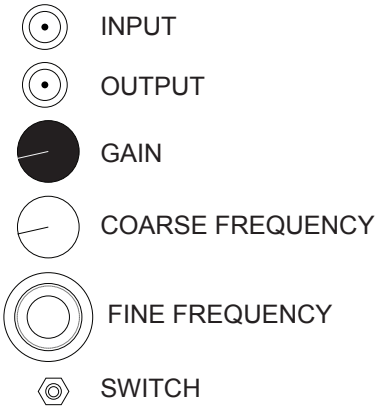
FOR STANDARD OPERATION: turn the red, green, and blue voltage knob up *slightly*, to the level they appear on this diagram. Turn the pedestal knob all the way to the right.

The module provides 5 composite outputs, 4 color, and one black and white. Leave these connected as they are, with the second output going to the TV and computer.

OSCILLATOR



COMPONENTS



The OSCILLATOR generates a triangle wave at outputs 1 and 2, and a sine wave at outputs 3 and 4. If the switch is down, outputs 1 and 2 produce sawtooth waves, outputs 3 and 4 produce “S” waves.

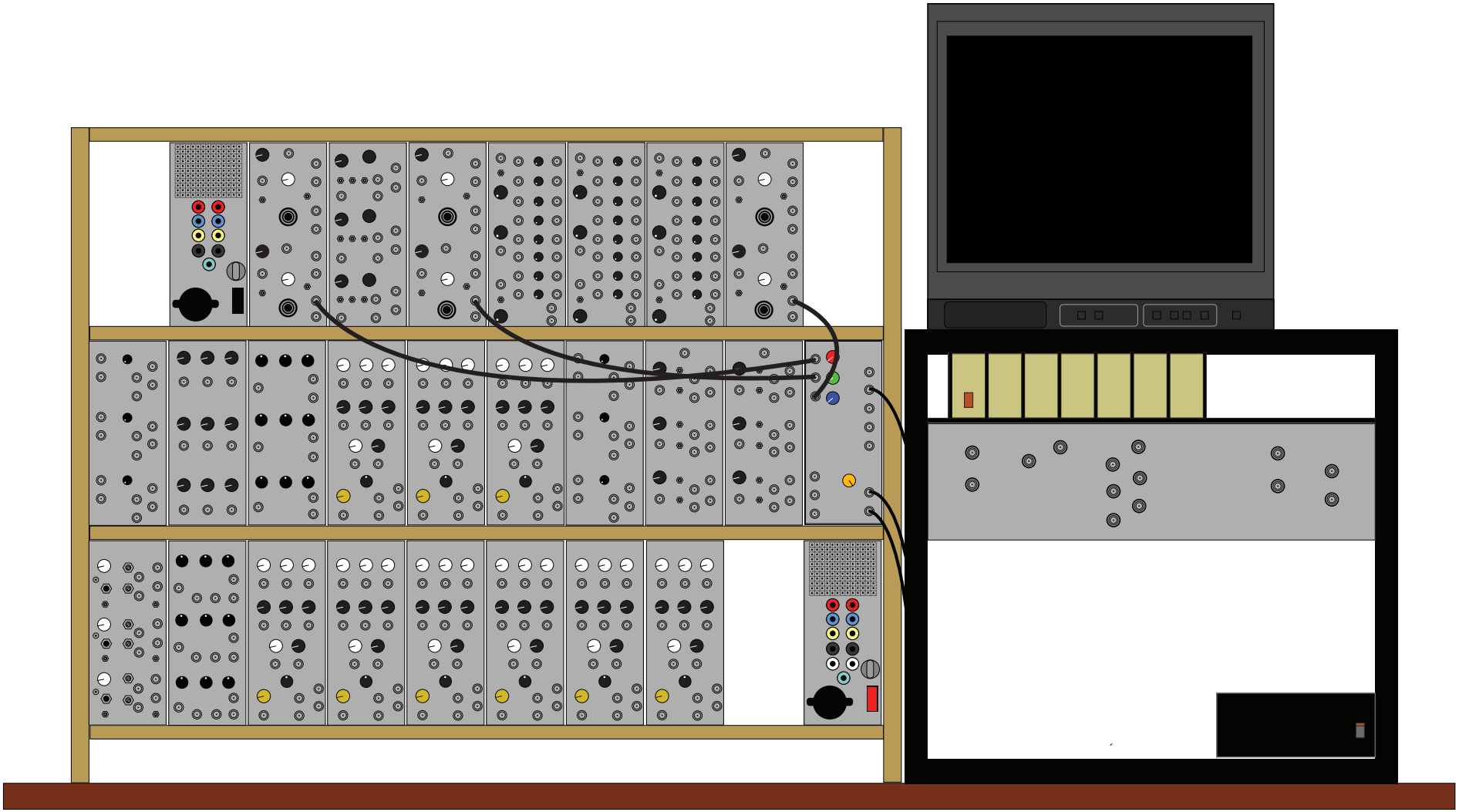
FM stands for frequency modulation. If the FM Enable switch is up, a control voltage entering the FM input will modulate the frequency of the oscillator.

The Coarse Frequency Select sets the gross frequency range from 1/100 Hz to 500,000 Hz. The Fine Frequency Select continuously adjusts the frequency between steps set by the Coarse Frequency Select knob.

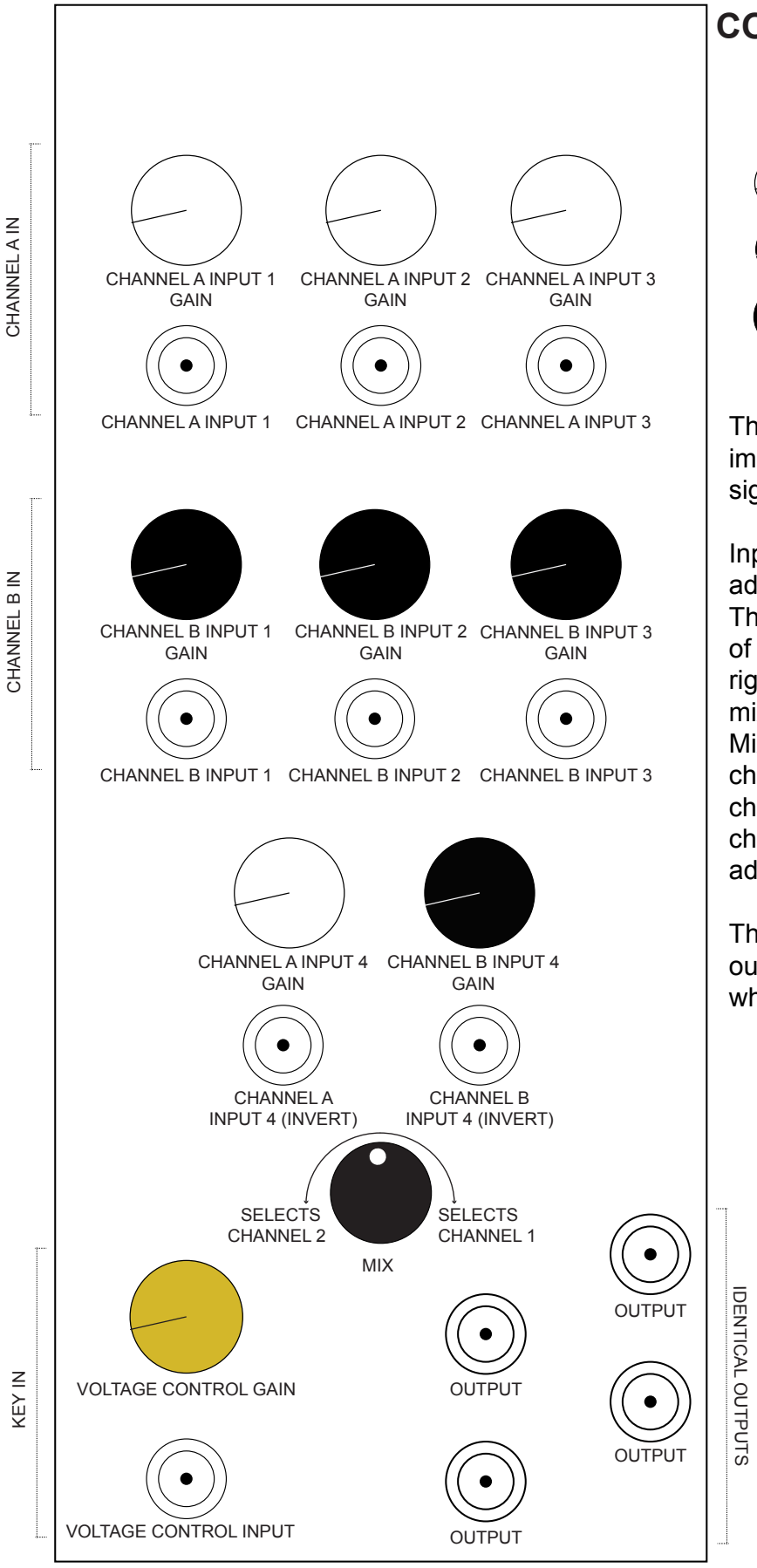
A sync signal into the signal input will trigger the oscillator to stabilize patterns.

PATCH 1: SIMPLE OSCILLATORS

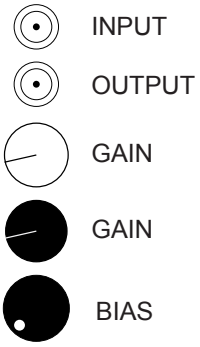
For the sake of demonstration, this is the most simple possible patch that generates red, green, and blue video by connecting outputs of Oscillator Modules directly into the red, green, and blue inputs of the Color Encoder. In the next pages, you will learn how to use the Adder/ Multiplier module to combine multiple simple waveforms into complex waveforms before sending them to the Color Encoder.



ADDER/MULTIPLIER



COMPONENTS



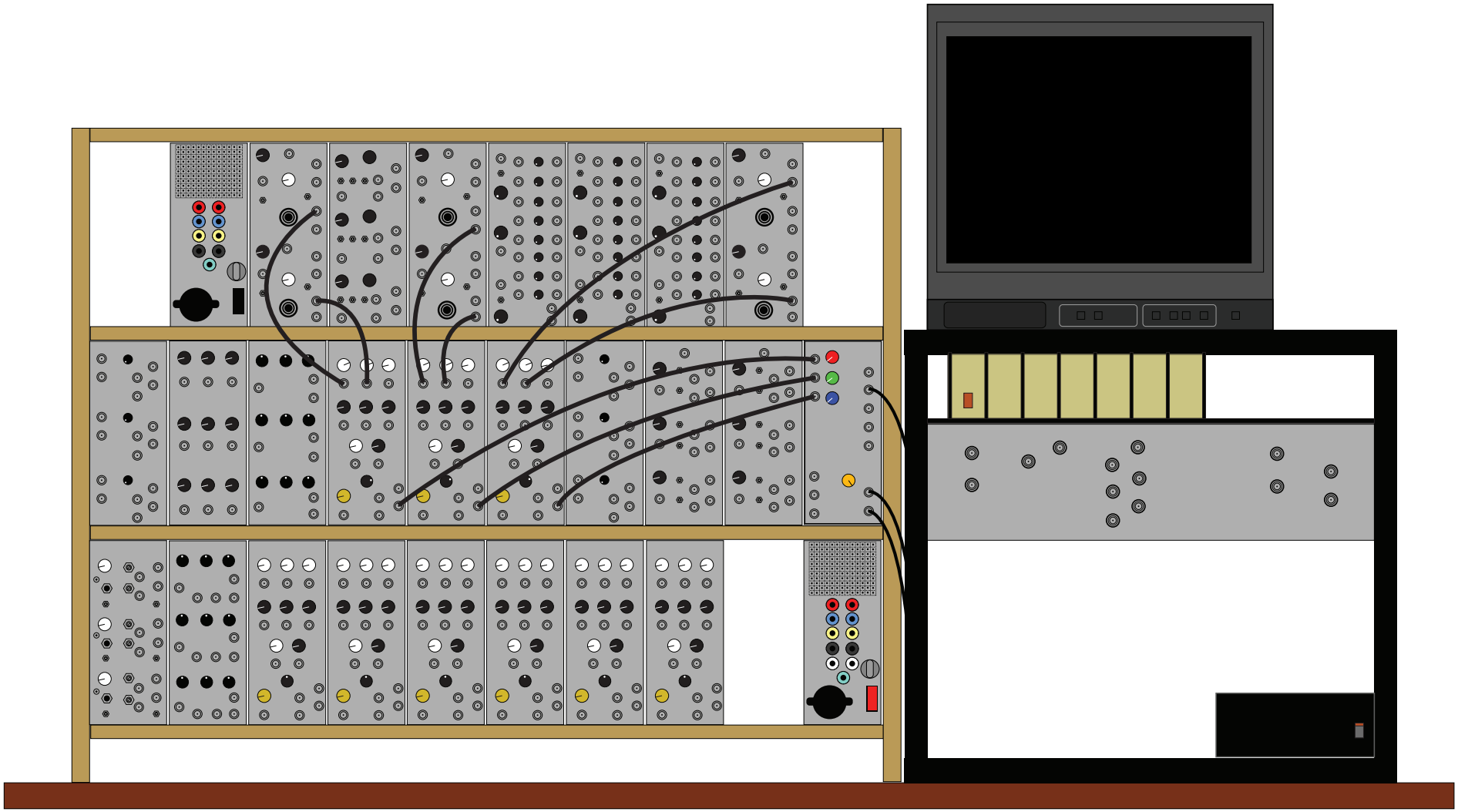
The Adder/Multiplier is used to add (super-impose), fade, and gain control (multiply) signals.

Inputs 1-3 and the invert of input 4 are added together to form channels A and B. The knobs above the inputs control the gain of each signal. The 4 outputs at the bottom right are identical. The amount of A and B mixed into the four outputs depends on the Mix knob: turning it to the right displays channel 1, turning it to the left displays channel 2, and centering it will cause half of channel 1 and half of channel 2 to be added together.

The voltage control input automates the output selection between channels A and B when its gain is turned up.

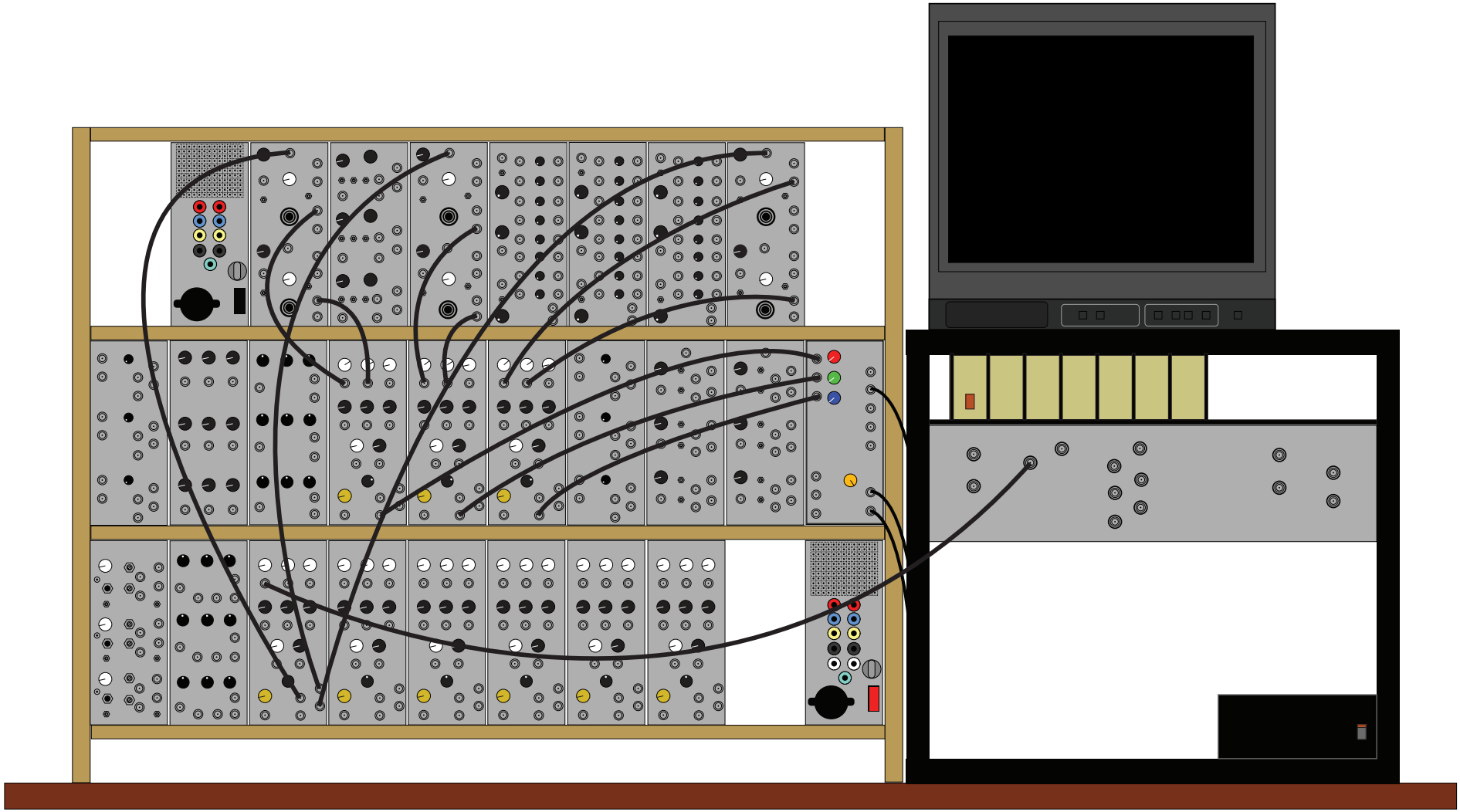
PATCH 2: COMPLEX OSCILLATORS COMBINED USING ADDER/MULTIPLIERS

In this patch, two outputs from each Oscillator Module are sent to inputs on Adder/Multiplier Modules to combine simple waveforms into complex waveforms before sending these signals into the red, green, and blue inputs on the color encoder. This will give you more complicated visuals to explore, enabling 6 separate frequencies to miix at different levels.



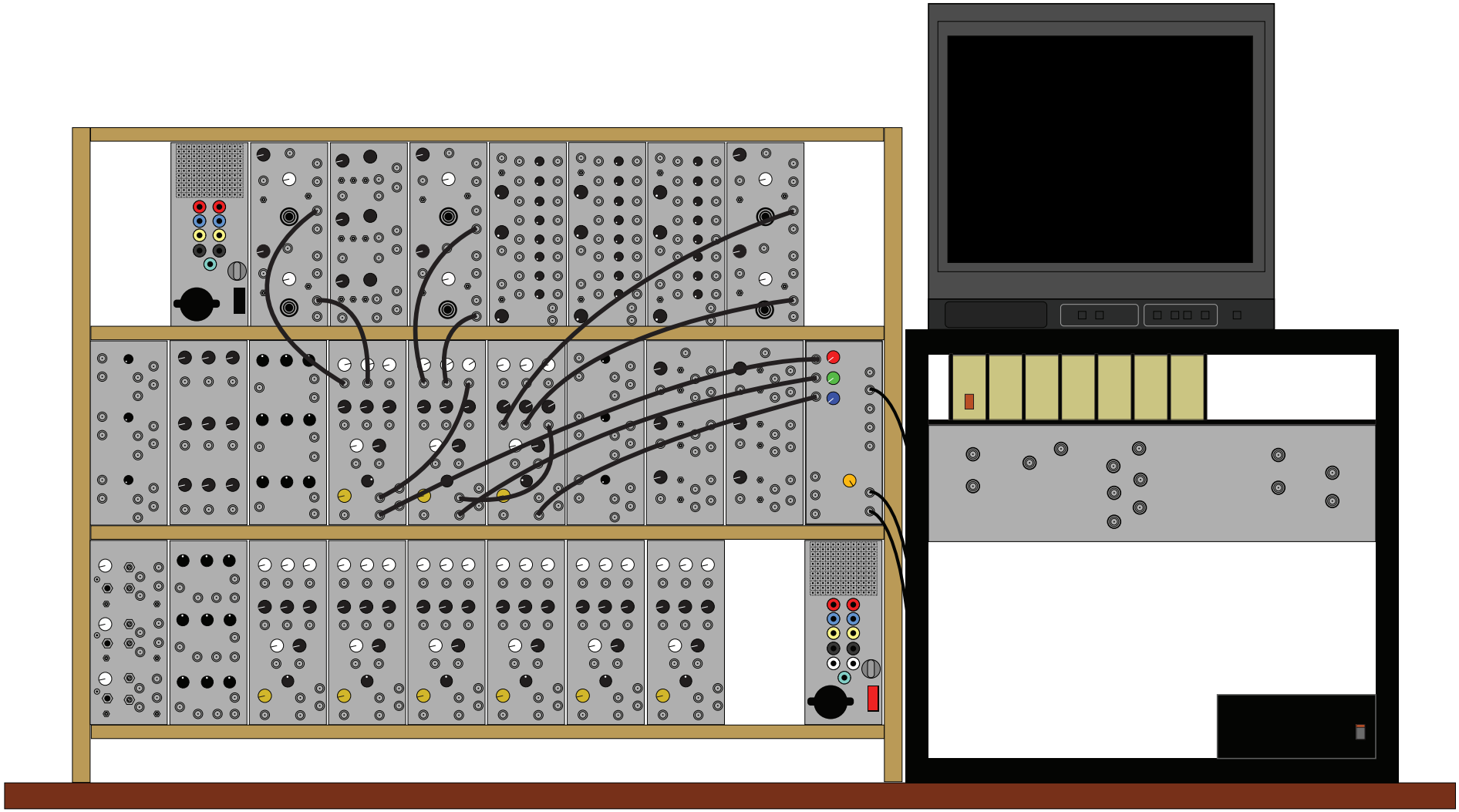
PATCH 3: COMPLEX OSCILLATORS WITH STABILIZING SYNC COMBINED USING ADDER/MULTIPLIERS

This patch is identical to patch 2, but the top oscillators of each Oscillator Module is synced/stabilized using the sync outputs below the sync generator at the right. When the sync input of the Oscillator Module receives a gen sync signal, they will be stabile and will no longer drift. This can be used to generate more purposeful visualizations that do not change and shift as much as the previous patch. I like to combine synced oscillators with unsynced oscillators, which is how this is set up. Sync is not necessary to use with oscillators, but you might prefer this method.

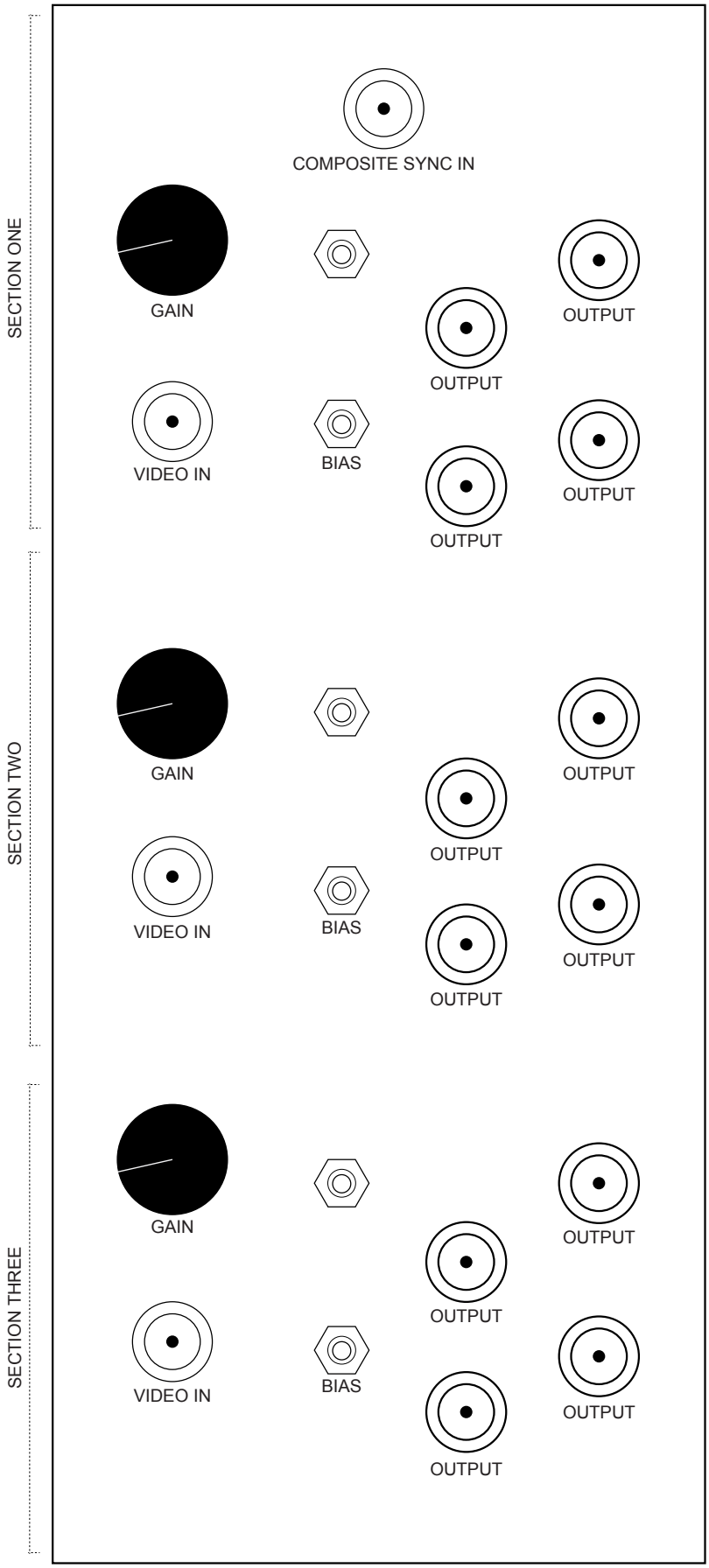


PATCH 4: COMPLEX OSCILLATORS COMBINED USING DAISY CHAINED ADDER/MULTIPLIERS

This patch is identical to patch 2, but each Adder/Multiplier Module's output goes to the next Adder/Multiplier Module as an input that can be turned up, enabling the visuals going into the red, green, and blue inputs of the Color Encoder to overlap with each other, generating cyan, yellow, magenta, and white if they properly align. This gives even more color to explore. NOTE: not shown here, if you send an output from the right-most Adder/Multiplier Module as an input to the left-most Adder/Multiplifer Module, you can create a noisy full black and white feedback loop!



INPUT



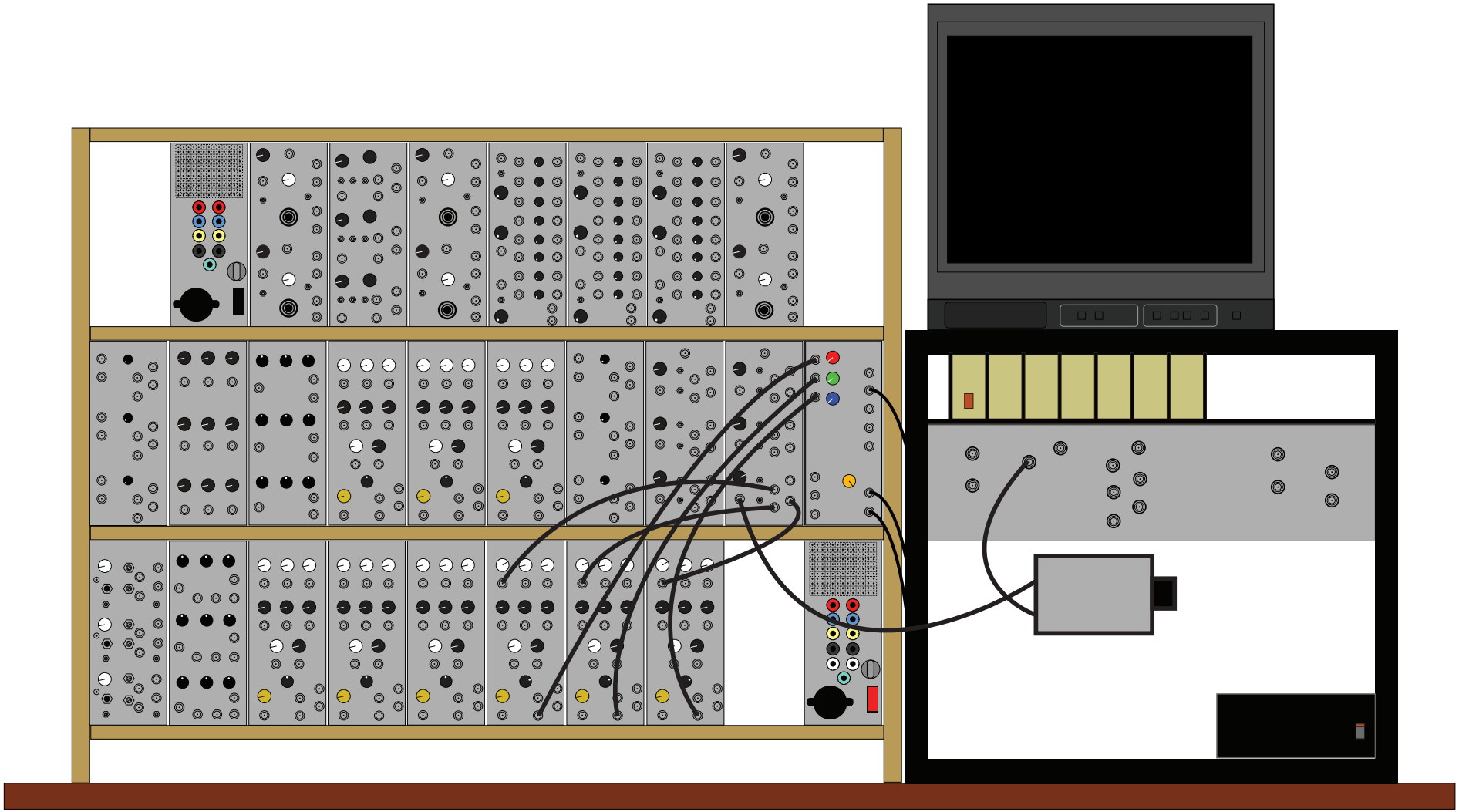
COMPONENTS

- INPUT
- OUTPUT
- GAIN
- BIAS KNOB

The Input module generates four identical outputs based on one video input signal, and is divided into three discrete sections. It can be used to split and distribute video signals.

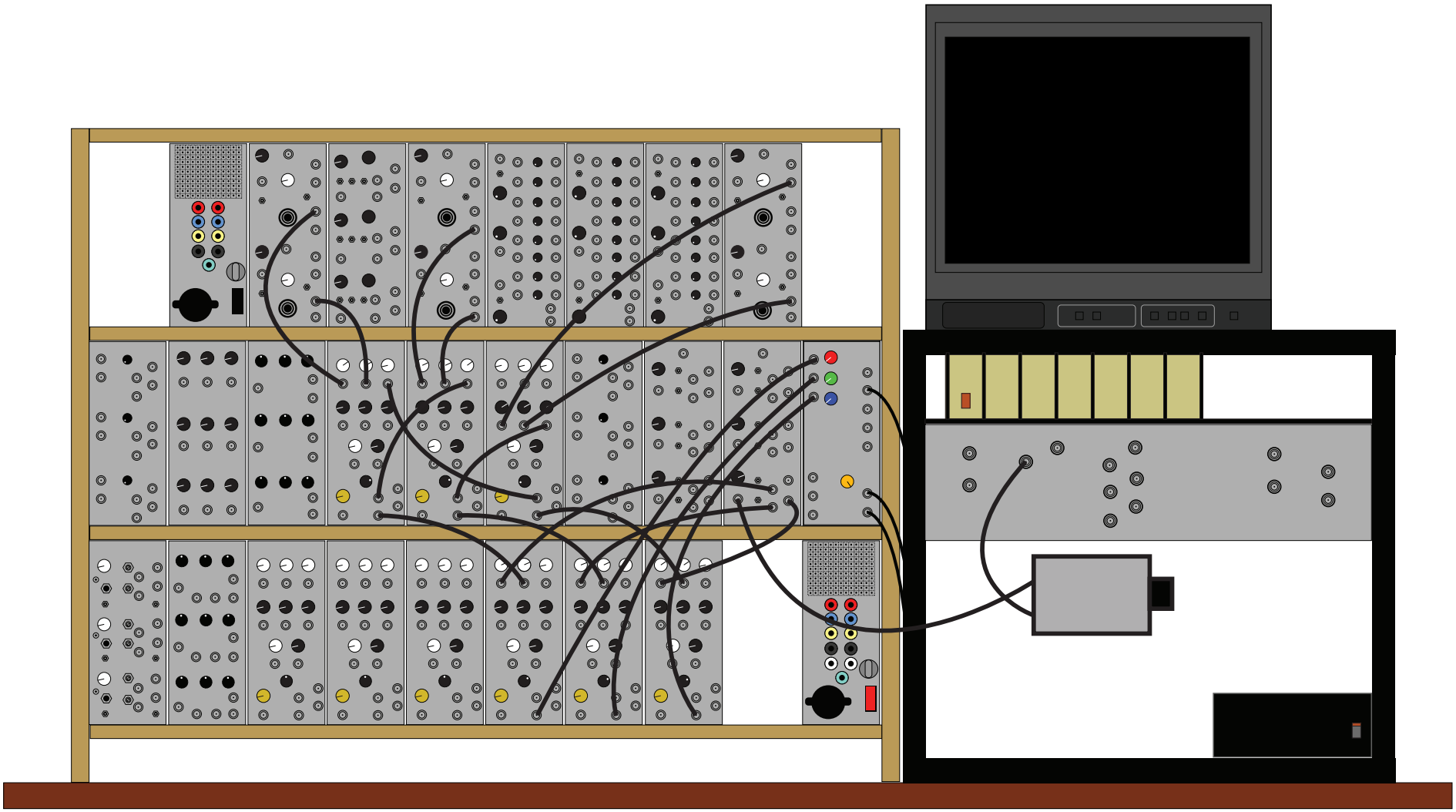
PATCH 5: SINGLE BLACK AND WHITE CAMERA WITHOUT PROCESSING

For the sake of demonstration, this patch show how to connect a single black and white camera using the Input Module and 3 Adder/Multiplier Modules. The black and white camera needs to be plugged in, it needs to receive a sync signal from the interface below the LENCO sync generator, and its video output needs to be connected to the Input Module, which will then output 4 identical outputs based on the gain level of the video.



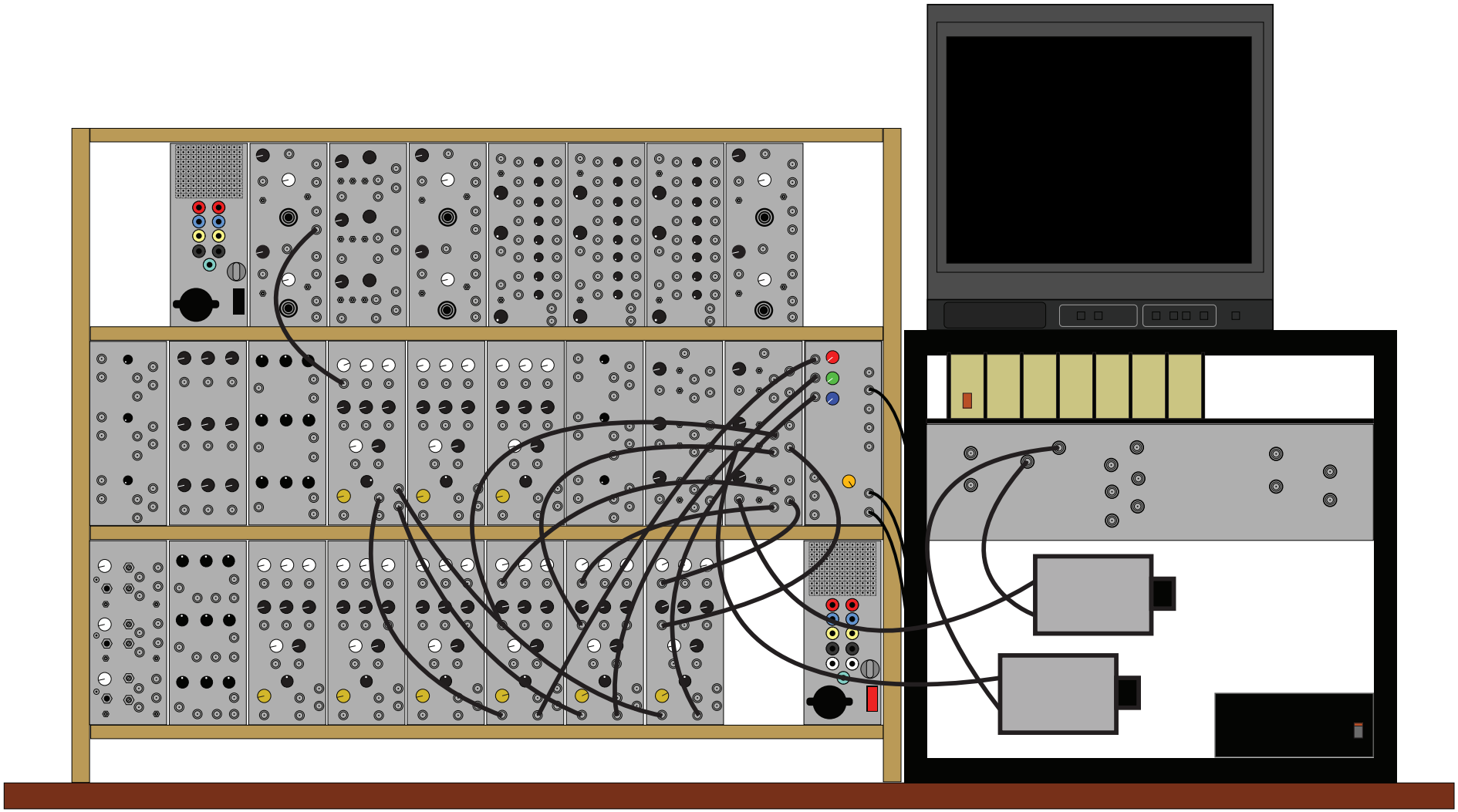
PATCH 6: SINGLE BLACK AND WHITE CAMERA WITH COMPLEX OSCILLATORS WITHOUT VIDEO PROCESSING

This patch is identical to patch 5 and patch 2 combined. It includes complex oscillators that can be mixed in with the video input from the camera.



PATCH 7: TWO BLACK AND WHITE CAMERAS WITH AUTOMATED PANNIING VIA AN OSCILLATOR MODULE

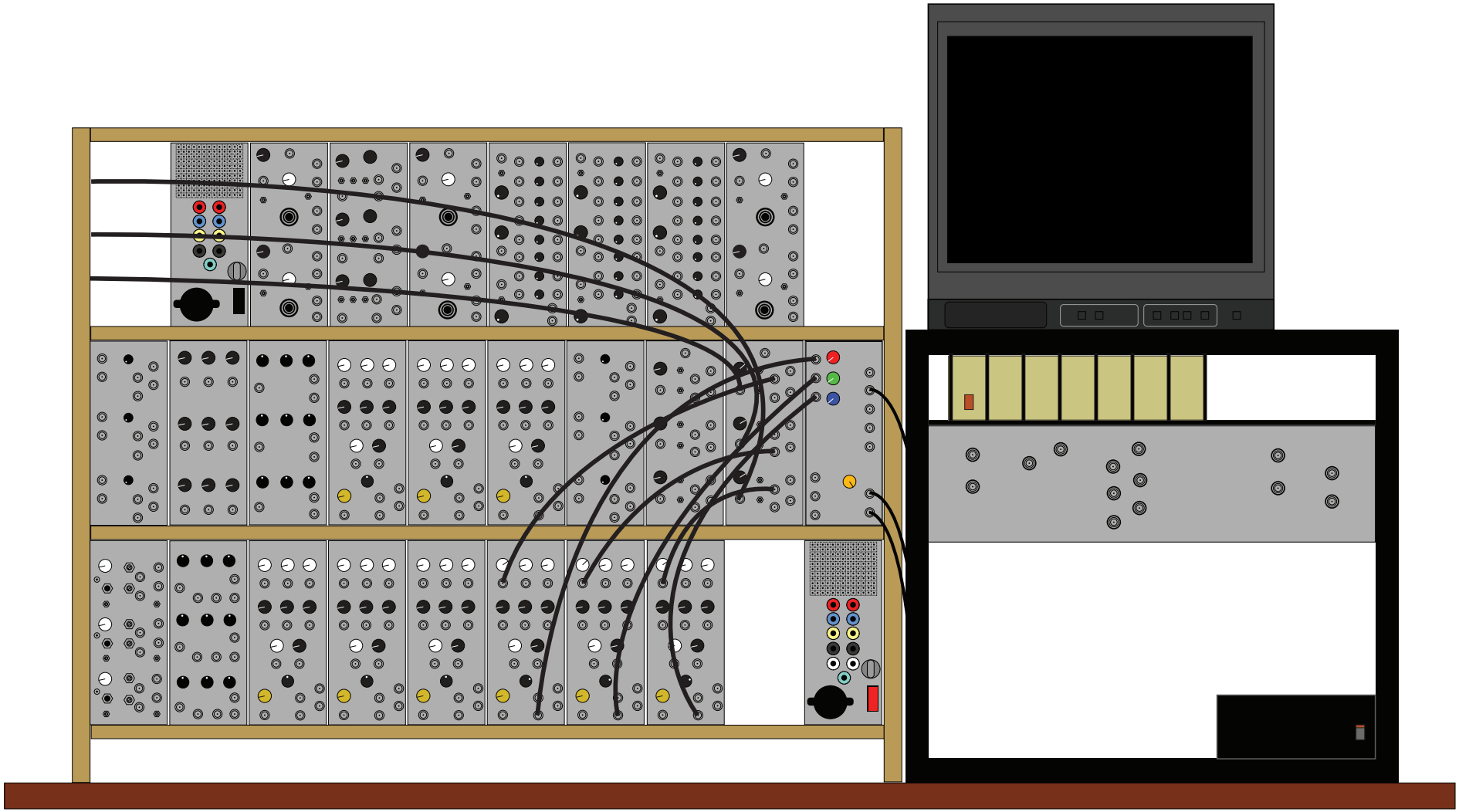
In this patch, two cameras enter the IP through the Input Module and are sent to the A (white) and B (black) channels of Adder/Multiplier Modules. Separately, an Oscillator Module's output is sent to an Adder/Multiplier in the second row that is then sent to the gold voltage control input of all 3 adder multipliders. When the A/B panner of these three Adder/Multiplier Modules are set to pan between the two channels and the gold voltage control gain knobs are turned all the way up, the visualization of the oscillator will pan from channel A to channel B.



PATCH 8: FULL COLOR LAPTOP VIDEO PROCESSED THROUGH THE INPUT MODULE AND SENT TO PROPER COLORS

In this patch, the user is sending video into the Sandin Image Processor through the V40HD video mixer on the table to the left of the Sandin Image Processor. The red, green,. and blue inputs from the V40HD are marked, and in order for your video input to be displayed with proper color, you need to make sure the red, green, and blue signals end up in the corresponding red, green, and blue inputs of the Color Encoder Module.

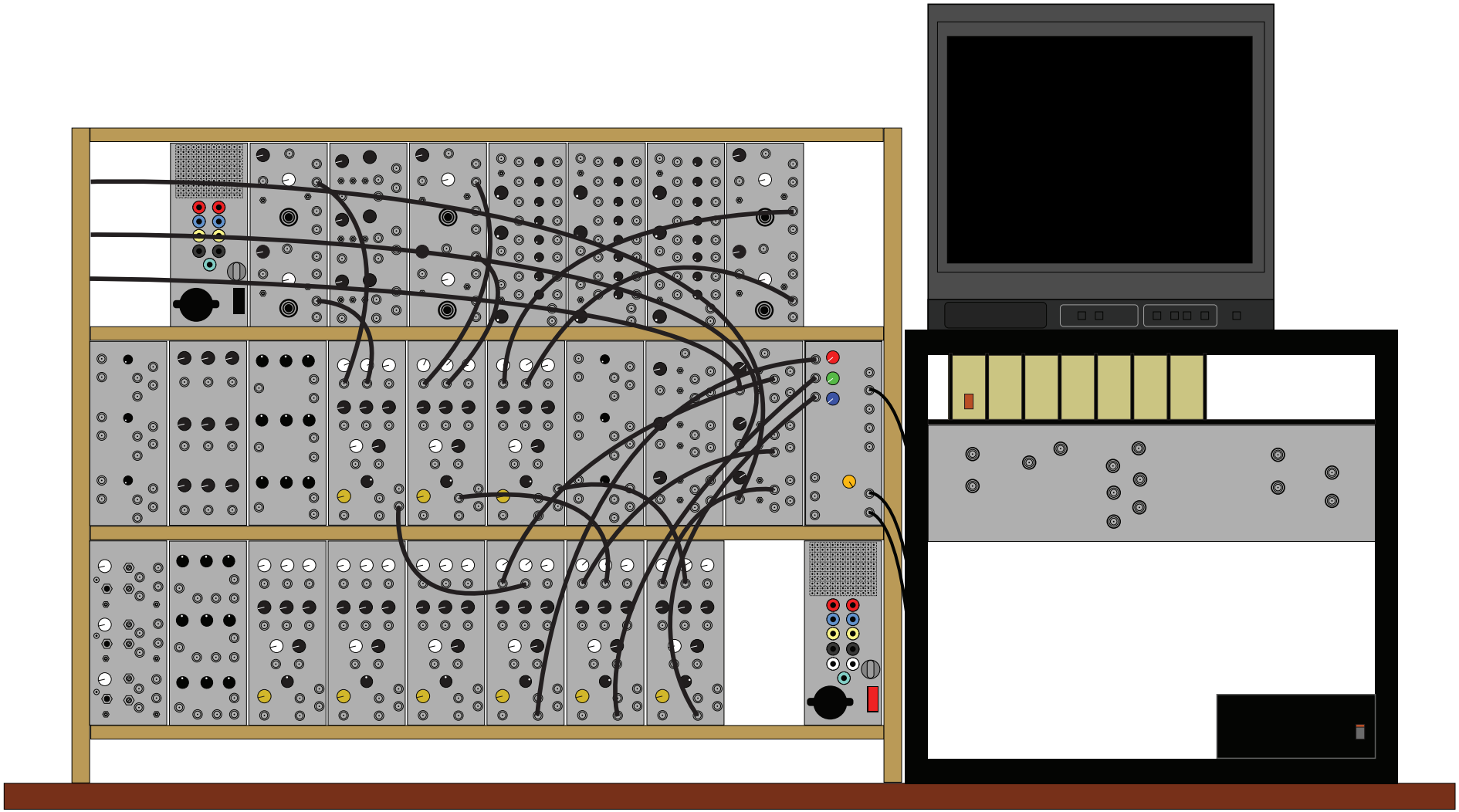
See the canvas page Sandin IP Resource for information on using the V40HD video mixer.



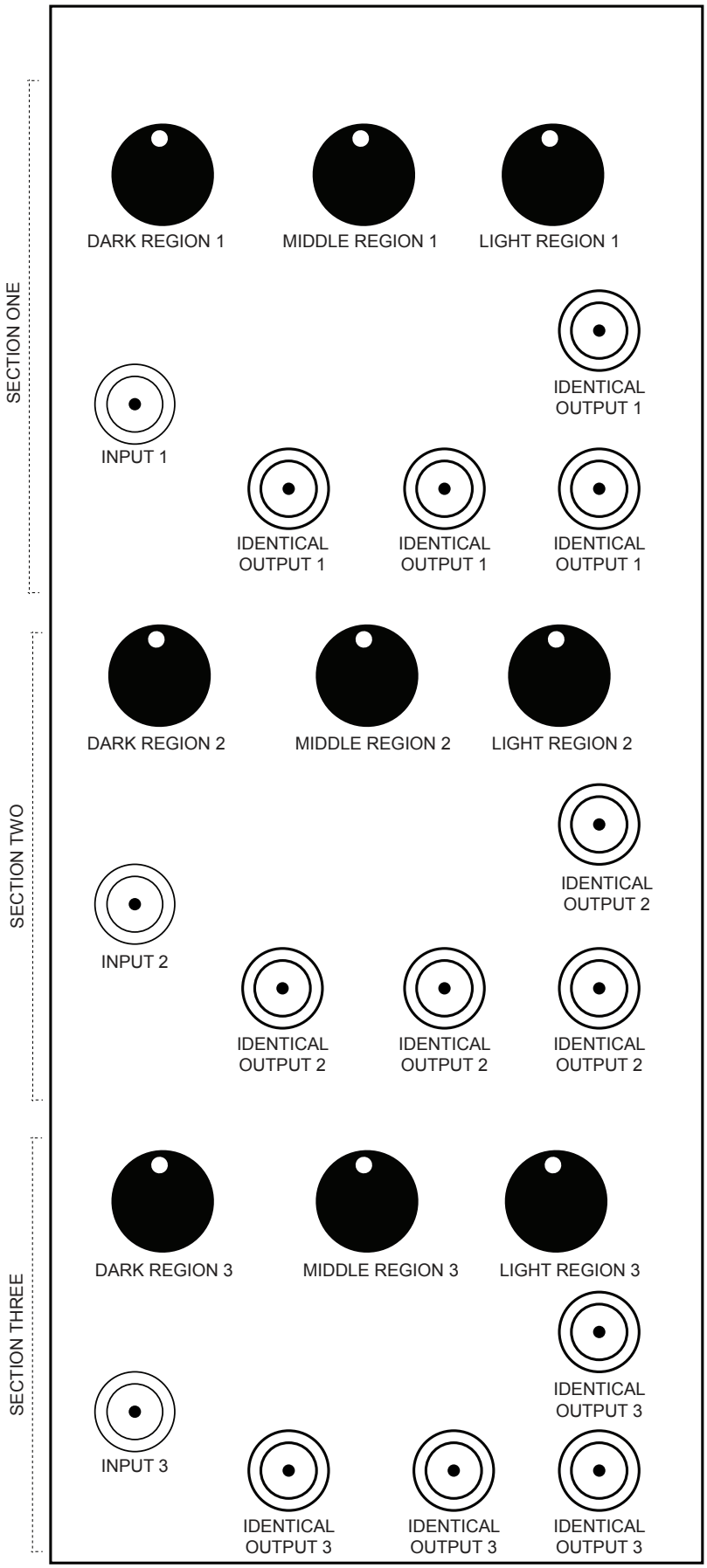
PATCH 9: FULL COLOR LAPTOP VIDEO PROCESSED THROUGH THE INPUT MODULE AND SENT TO PROPER COLORS WITH COMPLEX OSCILLATORS

This patch combines patch 8 and patch 4, showing laptop video with complex oscillations.

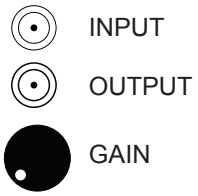
See the canvas page Sandin IP Resource for information on using the V40HD video mixer.



FUNCTION GENERATOR



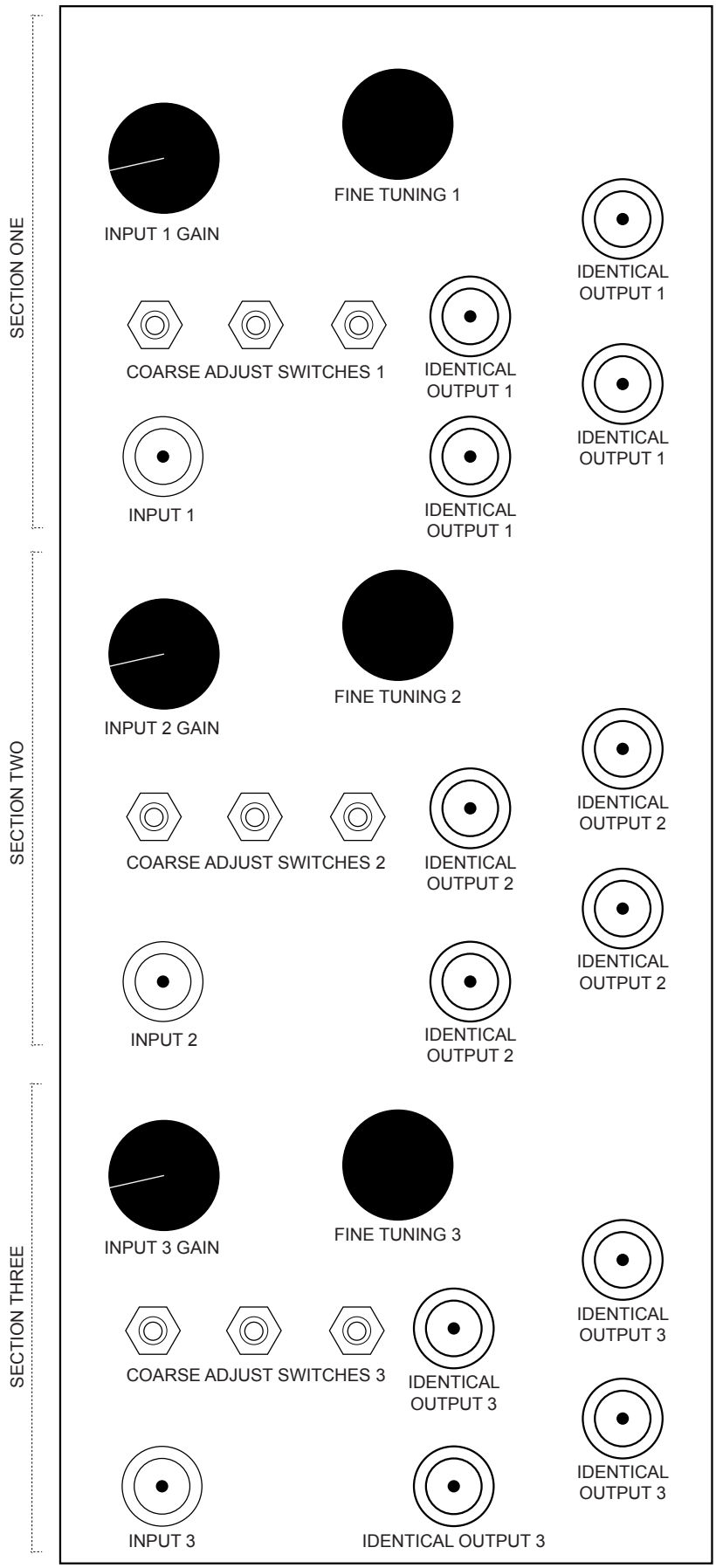
COMPONENTS



The Function Generator is a non-linear amplifier with an effect more complex and controllable than photographic solarization. Adjustments for negative, positive and near zero signals are adjusted through knob controls on the front panel.

Dark, middle, and white regions of image can be individually adjusted from positive to negative to give solarization-like effects. (Start with middle region gain knob at about 1 o'clock.)

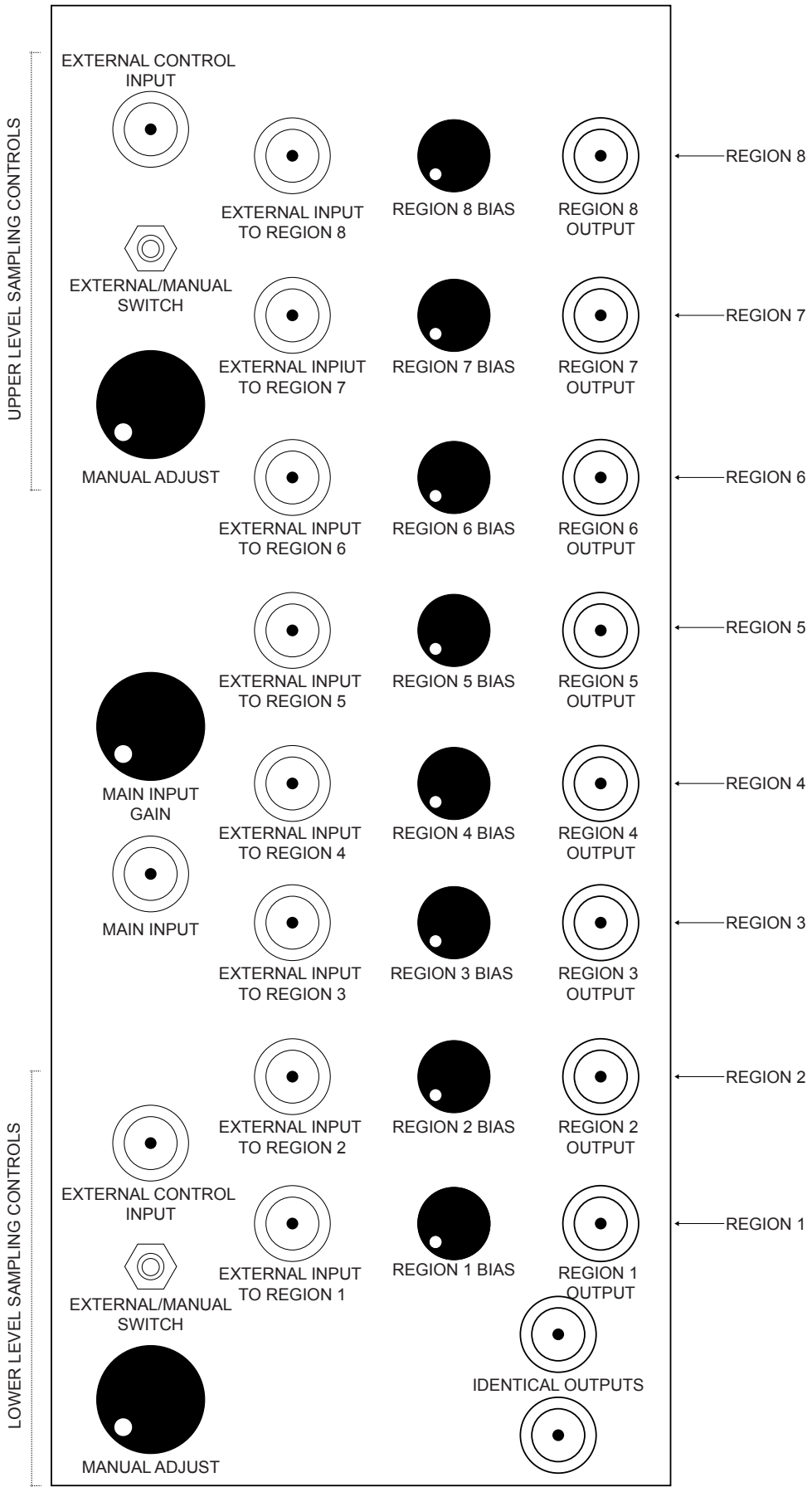
DIFFERENTIATOR



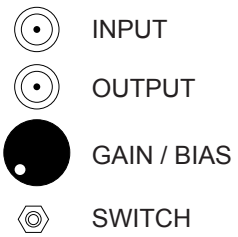
The Differentiator produces an output which is proportional to the rate of change to the input signal. Fast rates of changed correspond to edges in a picture and are preferentially amplified by the module.
looks at edge change (from left to right scan). White to dark gives a dark line/dark to white gives a white line.

The course adjust switches are designed in such a way that each switch has twice as much effect as the switch immediately to the right of it.

AMPLITUDE CLASSIFIER



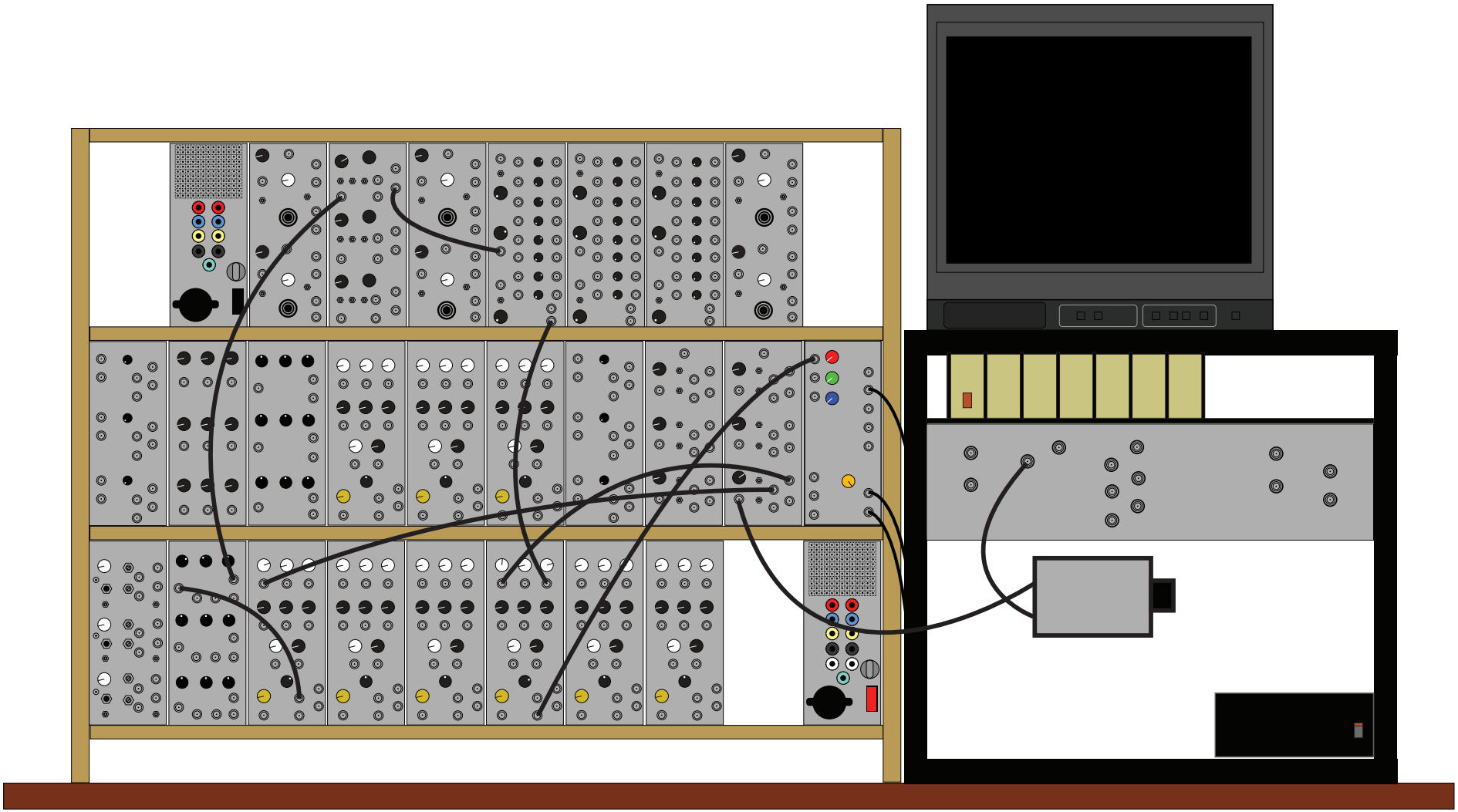
COMPONENTS



The Amplitude Classifier is a string of comparators assembed to compare an input video signal against a ladder of brightness levels. The output of the classifier is 8 discrete “digital” channels (region 1 - 8 outputs), forming a set of intensity bands, corresponding to 8 contigious gray levels evenly spaced from black to white. The sum of these signals is available through two identical outputs at the bottom right. The Main Input Gain knob is sent to all comparitors.

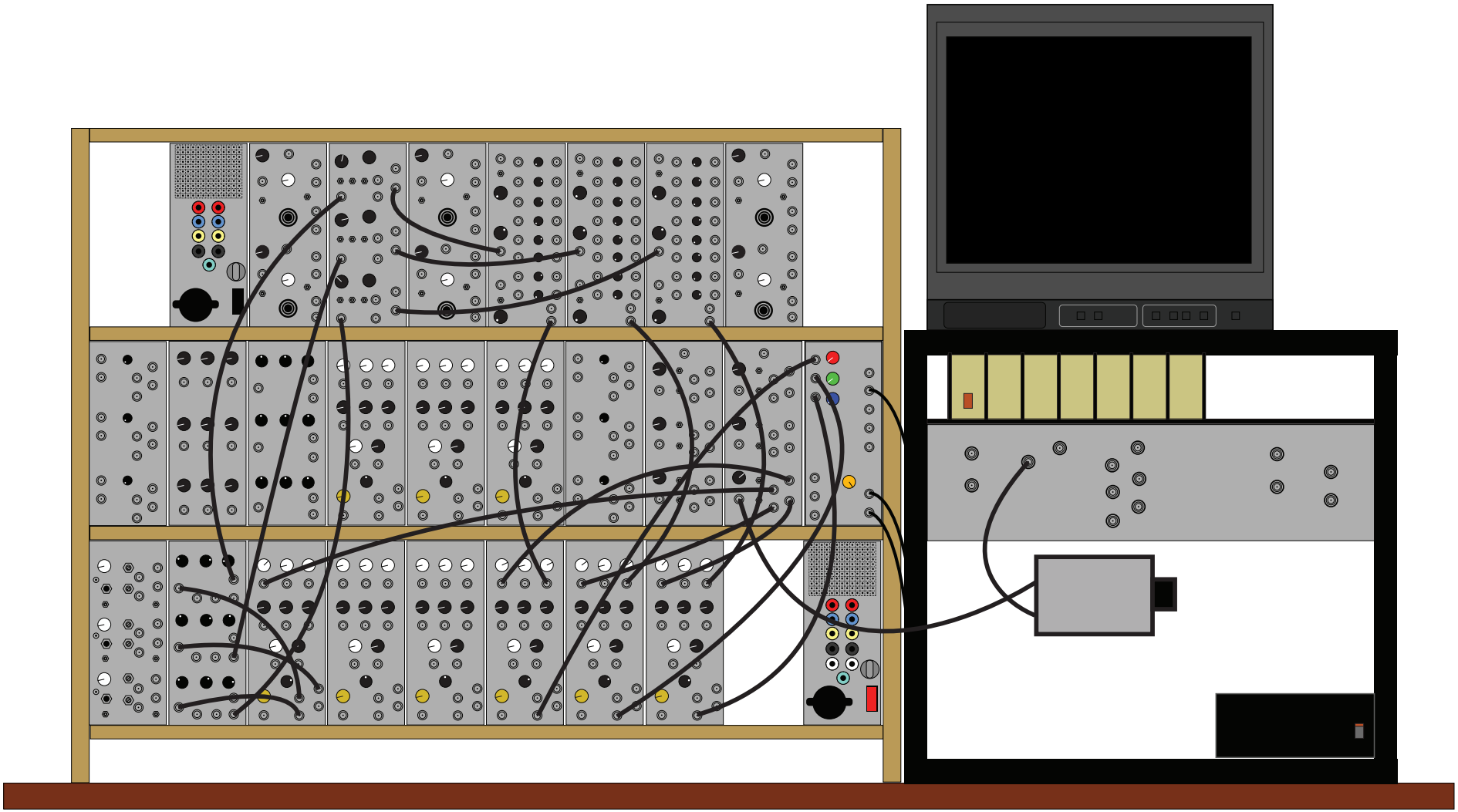
PATCH 10: SINGLE BLACK AND WHITE CAMERA FULLY PROCESSED THROUGH THE FUNCTION GENERATOR, DIFFERENTIATOR, AND AMPLITUDE CLASSIFIER MODULES

For the sake of demonstration, this patch shows a single black and white camera signal sent through three video processing modules to creatre a complicated iinterface that can be extensively explored. The Function Generator Module allows the user to adjust the dark, medium, and light regions of video signals. The Differentiator will further break the image up. The Amplitude Classifier will break this processed video into 8 separate regions of liightness and darkness that can be turned up or down, and receive oscillations. This is a single color signal path that will be duplicated to generate full red, green, and blue color in the next patch.



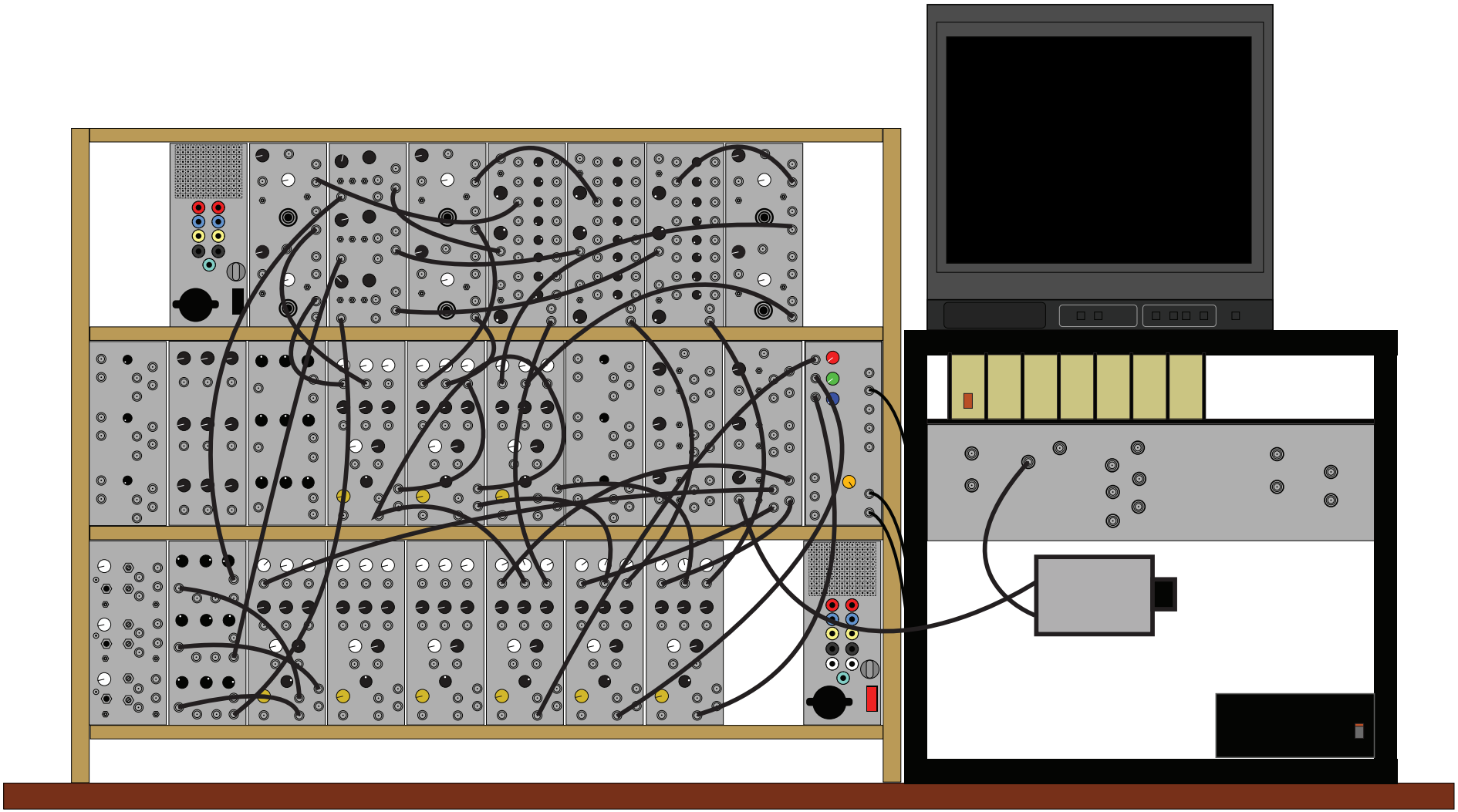
PATCH 11: BLACK AND WHITE CAMERA FULLY PROCESSED THROUGH THE FUNCTION GENERATOR, DIFFERENTIATOR, AND AMPLITUDE CLASSIFIER MODULES X3 TO GENERATE RED, GREEN, AND BLUE VIDEO

In This patch is identical to patch 10, but duplicates the single signal path two more times so that a black and white camera can generate three separately controllable red, green, and blue monochromatic video signals. This is an advanced Sandin Image Processor patch that fully integrates its image processing capabilities.Note that in this patch, a clean video signal and a fully processed video signal are sent into the Adder Multiplier Modules, allowing the user to mix between unprocessed and processed video.



PATCH 12: BLACK AND WHITE CAMERA FULLY PROCESSED THROUGH THE FUNCTION GENERATOR, DIFFERENTIATOR, AND AMPLITUDE CLASSIFIER MODULES X3 TO GENERATE RED, GREEN, AND BLUE VIDEO

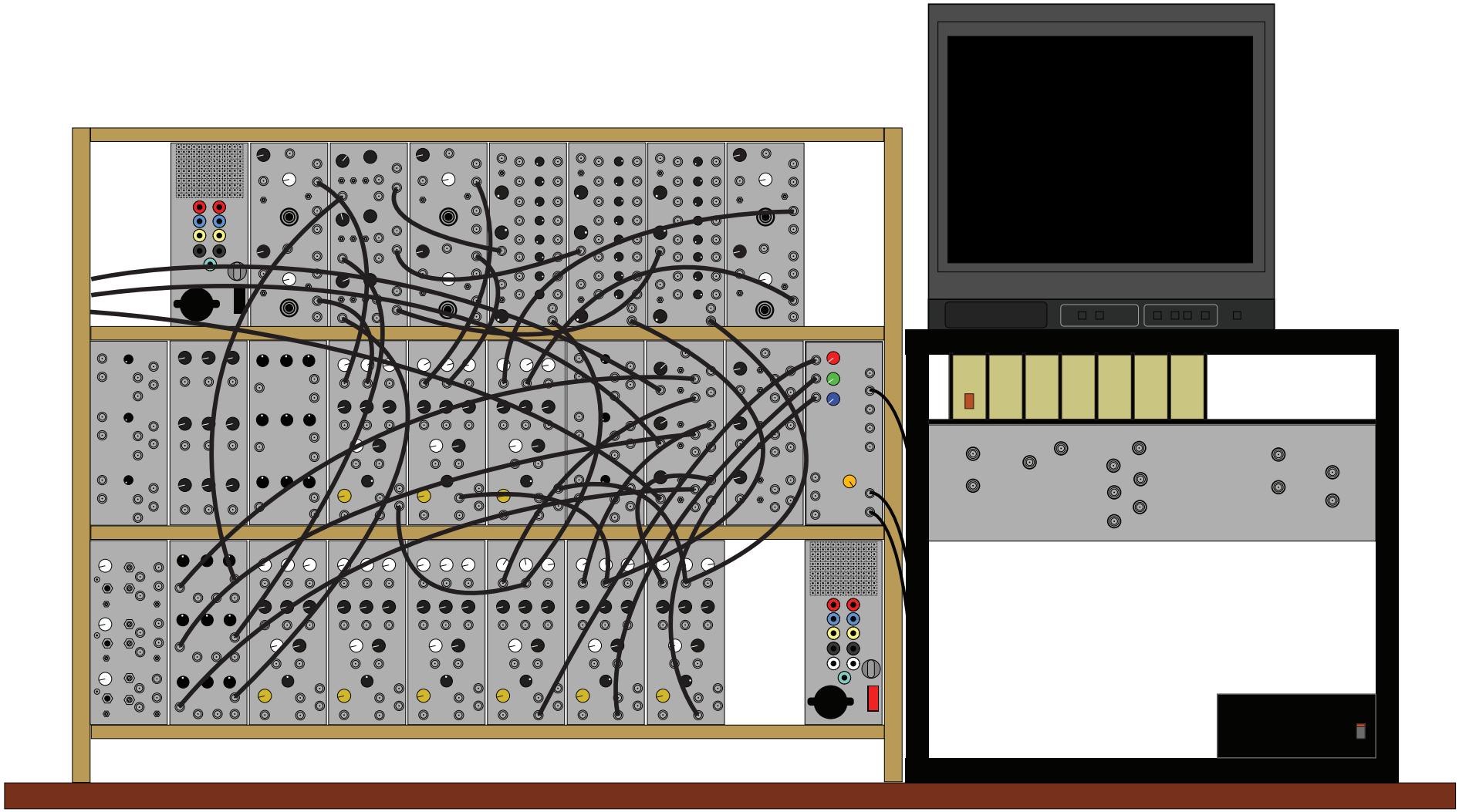
In This patch is identical to patch 11, but adds complex oscillators through additional Adder Multipliers. It also sends oscillations into certain regions of the Amplitude Classifier Modules, which send those visuals only to the specific regions of the video that match this Amplitude Classifiers lightness/darkness value. This is a very advanced Sandin Image Processor patch that fully takes advantage of the system's most unique features with a black and white camera.



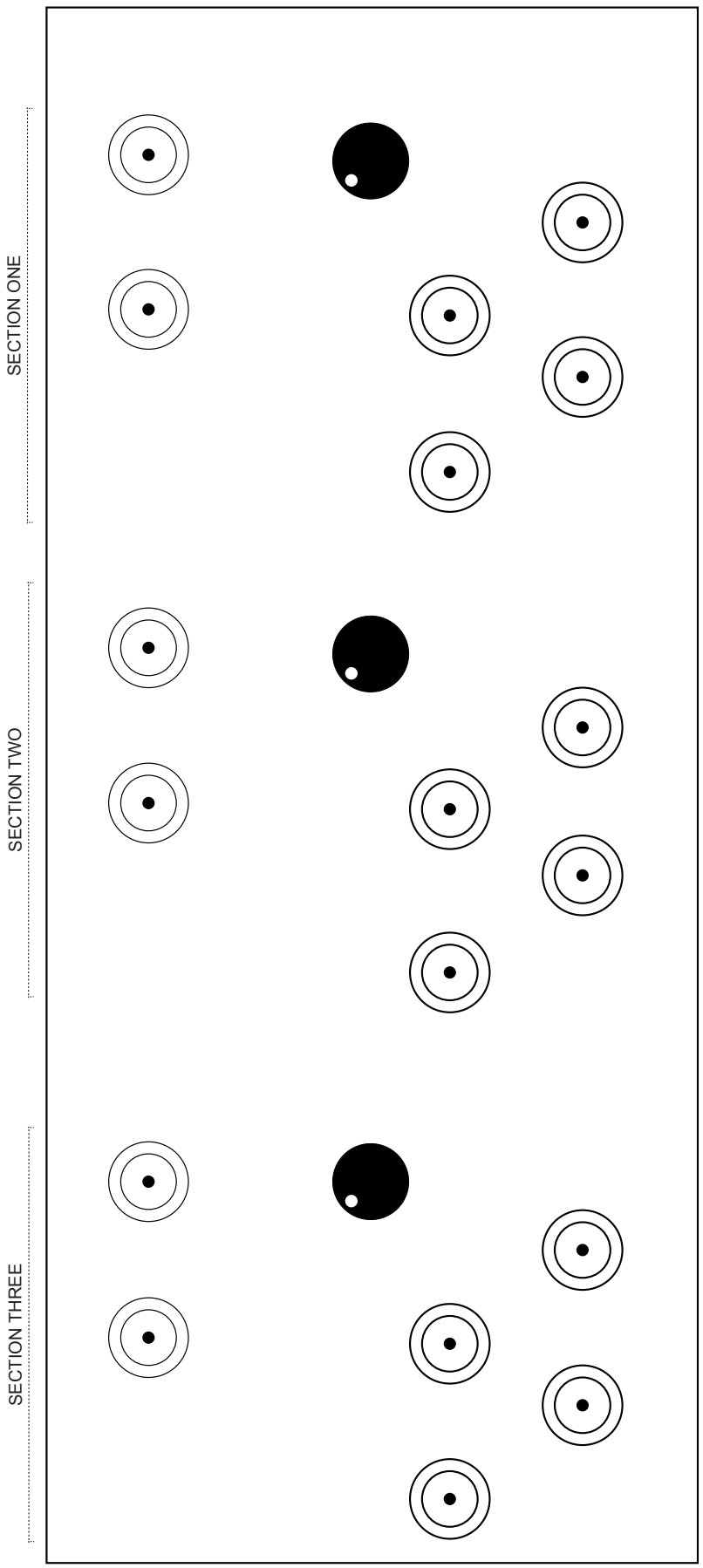
PATCH 13: FULLY PROCESSED LAPTOP VIDEO WITH COMPLEX OSCILLATIONS

This patch fully processes video from the V40HD video mixer through the three modules used in the previous patches and includes complex oscillations. This is a very advanced Sandin Image Processor patch that fully takes advantage of the system's most unique features with video input from a laptop or other source going into the V40HD.

See the canvas page Sandin IP Resource for information on using the V40HD video mixer.



COMPARITOR



COMPONENTS

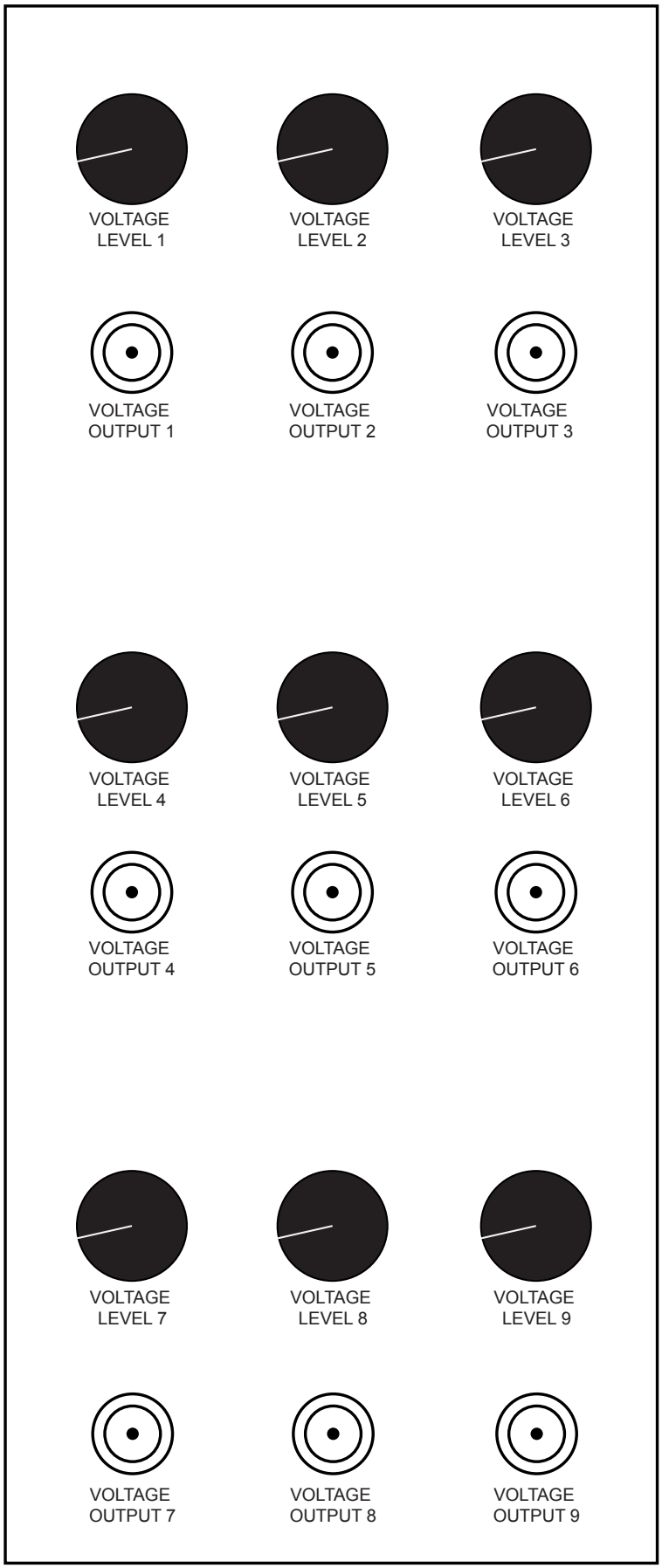
INPUT

OUTPUT

GAIN

The Comparitor has two inputs which are compared to each other to yield an output that is either white or black. The effect is similar to A photographic kodalith image, with more control of the transfer point.

REFERENCE MODULE



COMPONENTS

VOLTAGE LEVEL POTENTIOMETER

VOLTAGE OUTPUT

The Reference Module is a collection of 9 potentiometers with nine corresponding outputs. The potentiometers generate control voltages neededd to drive other processing modules.

Each potentiometer generates a voltage through its corresponding output.