



# EXPLORE SOUND

## *The Aries System 300 Electronic Music Synthesizer*

Welcome to the world of electronic music with the Aries Synthesizer. The System 300 is the most straightforward and universal sound synthesizer ever to be introduced. The modular "Building Block" approach allows you to expand as new technology becomes available. Start with a few economical modules and expand as your imagination demands. The Aries "Building Blocks" will allow you to express your creativity to its maximum because you will not be directed into preconceived ideas by a preconnected system. The Aries is certainly the system for now and for the future.

Aries Inc.  
119 Foster Street  
Peabody, MA 01960



High praise for the new

# ARIES MODEL 300

## ELECTRONIC MUSIC SYNTHESIZER

A FEW OF OUR SATISFIED CUSTOMERS.

... The Aries Electronic Music Synthesizer is truly a spectacular value for its price and has the capability of other synthesizers in the \$3000 and up range. ... I truly admire the design of your VCO, the heart of any synthesizer. It wasn't clear at the outset just how versatile this unit can be. All the outputs are available simultaneously, due to the effective buffering of one output from another. Then to add to the flexibility of multiple control inputs, as well as pulse width and frequency modulation make for an oscillator that can do just about anything. The purity of the four output waveforms is excellent.

I am particularly fascinated by the variety of automatic tones I can generate using the Sample/Hold unit triggered by the Clock. I'm just beginning to explore the virtually unlimited capabilities of the System 300, but it is one rare case nowadays when the advertising would have a hard time doing the product justice. . .

Engene Erdren, Trumbull, N. Y.

... Tests done on my completed modules show the most perfect scope displays. Although I am not yet through with all the modules' construction, I know it will be a beautiful sounding instrument. I want to thank you and let you know I have complete confidence in the company.

Bob Lewis, Ithaca, N. Y.

... I love the VCO's - they are simple, practical, and accurate. I am impressed by the purity of the waveforms and the deceptive flexibility available. Kudos.

The Envelope Generators have expanded the time parameters to the point that they are doubly useful. The modulators are clear and the attenuators have been helpful. The Sample/Hold is extremely flexible and comfortable. . . I have become comfortable with the keyboard and enjoy the touch.

I'm primarily a musician and secondarily a "synthesist". I see the instrument as the most exciting and potentially universal ever to be produced.

David Gordon, Brighton, Mass.

**ARIES, inc.**  
119 Foster Street  
Peabody, Mass., 01960  
617/532-0450

# Aries Keyboard • AR-311 • AR-313 • AR-320



## Keyboard Interface Keyboard Case Keyboard

- Ultra Stable, Low Drift, Accurate Dual-Voice Outputs
- Full 5 Octave Range
- Exponential or Linear Portamento (glide) Selection
- 1 Octave Range Tuning Control With Instant Zero Return
- Voice Outputs Are Linear Over Whole Range, For Maximum Flexibility With Aries Exponential Voltage Controlled Oscillators and Filters
- 14 Output Jacks for Multiple Connections to Gate, Trigger, and Voice Outputs

The AR-313 Keyboard has four outputs: Gate, Trigger, Voice and Aux. Voice. The Gate Output has a D.C. output (1 + 10 Volts that remains on as long as at least one key is held down). The Trigger Output is a momentary pulse that appears only when striking a key. The Gate and Trigger are used to turn on the ADSR. The Voice Output has a D.C. level proportional to the lowest key being held down. It remains at the last level it had when no keys were depressed. The Voice Output is used to control the frequency of the Voltage Control Oscillators (VCO). With the Tuning Control at Center, the lowest key (C) provides 0 Volts output. The next key (C#) provides 1/12 Volts, and so on. Each octave (12 keys) adds 1 Volt, which raises the oscillator's frequency by one octave. The Aux. Voice Output provides a voltage only when more than one key is depressed. This voltage is proportional to the interval number of keys between the lowest and the highest key depressed. If it is plugged into a VCO control input (unmodulated, such as no. 2, 3, or 4) and the Voice Output is connected to another input, then this VCO will follow the highest key played. If another VCO is only connected to the normal Voice Output at the same time, then one can play two notes at the same time.

The Keyboard also has four controls: Tuning, Portamento, Portamento Mode, and Portamento On/Off. The Tuning Control adds or subtracts voltage from the main Voice Output. It has no effect at or near its center position. The Portamento causes a glide or time lag when going from one key to another. The Portamento Mode has a glide time about the same for small intervals and large intervals in the normal position. In the Linear mode, the glide takes longer for large intervals and is a more uniform glide. The Portamento On/Off Control allows the musician total control of when he desires to use this effect.

The Keyboard also contains two more: Voice and Aux. Voice. These adjustments set the output intervals to 1 volt per octave. They should normally not be needed but if necessary can be adjusted in five simple steps.

## Aries 311 • 313 • 320 Specifications

Gate Output:	= 12V, whenever at least one key is depressed
Trigger Output:	2.5V, 1mS, pulse appears each time a key is depressed
Voice Output:	1 volt per octave, 5 octave range
Aux. Voice Output:	1 volt per octave, 5 octave range
Tuning Range:	1.5V = 1.0 octave
Portamento:	Variable lag in voice output. Eric 5.0 sec.
Control Impedance:	Gate - 1000 ohms, Trigger - 1000 ohms, Voice - 10 ohms
Controls:	Tuning, Portamento
Connections:	Auxiliary outputs, 4 gate outputs, 4 trigger outputs
Power:	+ 15.0V, D.C. @ 10 mA - 15.0V, D.C. @ 10 mA



Top waveform shows Trigger output when Keyboard is played rapidly. Bottom waveform displays Gate output at same time scale as upper waveform.



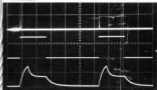
Displays semi-characteristics as picture on left with Portamento.



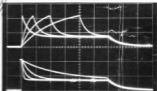
Top waveform shows Trigger output at 1mS per division. Center waveform at 50mS per division. Bottom waveform shows Gate output at 50mS

# ENVELOPE GENERATOR ADSR AR-312

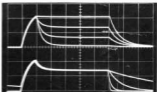
- 4 Independent Controls Over Dynamics of Each Note
- Attack, Decay, and Release Times Variable from .001 to 2 Seconds
- Variable Sustain Level, 0 to +10 Volts
- 4 Gate Inputs, 4 Trigger Inputs, and 4 ADSR Outputs
- Manual Gate Switch
- Compatible with ARIES Keyboard and Many Other Synthesizer Keyboards



Top waveform displays Trigger input. Center waveform displays Gate input. Bottom waveform shows two cycles of ADSR output.



Multiple Exposure of ADSR output. Top — 4 different Attack times. Bottom — 4 different Decay times.



Multiple Exposure ADSR output. Top — 4 different Sustain levels. Bottom — 4 different Release times.

The AR-312 Envelope Generator (ADSR) allows perfect control of the dynamics of your notes. Exact control over Rise and Decay can be obtained to achieve the precise sounds you are looking for.

The Envelope Generator provides a Control Signal which is usually used to turn on the Voltage Controlled Amplifier (VCA) or Voltage Controlled Filter (VCF). When connected to the Keyboard Gate and Trigger it provides an output whenever a key is depressed. The four controls of the Envelope Generator—Attack, Decay, Sustain and Release allow for changing the dynamics of the note. For example, if the ADSR Output is connected to the VCA output with some signal at the VCA Signal Input (audible) then the output will rise from zero when a key for the ADSR Manual Trigger is depressed.

The rate of rise is set by the attack Control. It will then Decay (as by that control) until it reaches a level set by the Sustain Control. When the key is released the signal will decay to zero at a rate determined by the Release Control.

## Envelope Generator Specifications

Attack Time:	2mS. to 4 sec.
Decay Time:	2mS. to 2sec.
Sustain Level:	0 to +10V.
Release Time:	2mS. to 2sec.
Gate Input Impedance:	20K ohms
Trigger Input Impedance:	20K ohms
Output Impedance:	1K ohms
Controls:	Attack, Decay, Sustain, Release, Manual Gate
Connections:	Gate Input, Trigger Input, Output
Power:	+15.0 Volts D.C. @ 4mA. -75.0 Volts D.C. @ 2mA.



Top waveform in all 3 pictures displays 300-Hz Square wave input. Next wave is VCF output at 16 kHz cutoff. Next wave is VCF output at 10 kHz cutoff. Bottom wave is VCF output at 250-Hz cutoff. Picture at left Q = 0.5, Center Q = 2, Right Q = 5.

## Voltage Controlled Filter • AR-314

- **Wide Range:** MHz to **200MHz Cutoff Frequency** (wide Range of Hearing!)
- **Extremely Accurate, Stable, Outputs 1 Octave per Volt Control Characteristic Over Entire Range**
- **Variable Resonance or Peak Control Allows Cutoff Slope of from 12dB per Octave to Over 50 dB per Octave.**
- **4 Audio Inputs, and 4 Control Inputs Allow Flexible Mixing of Synthesizer Sources and External Sounds, such as Electrical Outputs.**
- **Variable Resonance Control Generates Boost for Positive Control, as well as soft-soft and other effects.**

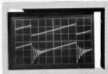
The AR-314 VCF allows dynamic control over the tone quality of synthesized sounds, as well as external instruments such as electrical guitars. The VCF will accurately track with its oscillators when controlled from the Keyboard Voice, over the entire hearing range. Used with the Envelope Generator it can generate the dynamics of horns, voices, guitars, and other instruments. In addition, the Resonance Control can add warping wah-wah effects and howling and like sounds, due to its sharp frequency peaking ability.

Audio signals are fed into any of its four input jacks (one has a level control) and mixed. These sounds are filtered and appear at the two output jacks.

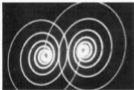
The VCF passes tones up to a certain pitch (cutoff frequency). Frequencies above this are attenuated (cut down in level).

Now, the cutoff point is manually adjustable by a knob. At 16 Hz (the left end) almost no signals within the range of hearing will get through. At 200 Hz (the right end), however, almost all such signals pass through unaffected. The filter is then "wide open". In between these extremes, the filter will modify the sounds of a waveform such as a pulse or sawtooth, or white or harmonic. Filtering these out makes the tone "duller". Of course, the sine wave has no harmonics, so the filter cannot change its sound; it can only lower its level (amplitude).

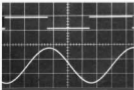
The cutoff frequency can also be voltage controlled. Any positive voltage such as an envelope Generator Output, applied to any of the four VCF Control Inputs, will raise the cutoff above the manual setting. Conversely, a negative voltage will lower it. (One of the Control Inputs has a level control.)



Top waveform is 100Hz Sawtooth input. Bottom is VCF output at 10kHz cutoff. Q=5. Photo below same, but, pulse input.



Resonance Spiral: Excessive deviation from relation between VCF input and output.



Top waveform is 100 Hz Square input. Bottom sine wave shows filtering of fundamental due to 100 Hz cutoff. Q = 5.

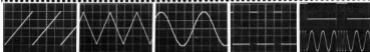
### Voltage Controlled Filter Specifications

- **Response Type:** 12 dB/octave (boost with additional +6 dB)
- **Cutoff Frequency:** 20 Hz to 200 kHz
- **Q (Slope at Cutoff Freq.):** 0.5 to 50
- **Maximum Signal Level:** 3 V<sub>rms</sub> peak
- **Signal-to-Noise Ratio:** at least 40 dB
- **Control Input:** 0 to 1 octave increase in Cutoff or Peak Frequency per Volt of Control Input
- **Signal Input Impedance:** 50K ohm-min
- **Control Input Impedance:** 10K ohm-min
- **Output Impedance:** 7.5 ohm
- **Tuning:** when Control Input is connected to the Keyboard, the Freq. of Cutoff or Highest Resonance will track the VCO's to within a small fraction of a Semitone over the full 5 Octave Range
- **Controls:** Input Freq., Resonance (Q), Signal Input, Control Input
- **Connections:** 4 Signal Inputs (1 with attenuator) 4 Control Inputs (1 with attenuator) 2 Outputs
- **Power:** -15.0V, D.C. @ 200mA, -15.0V, D.C. @ 200mA.





# Aries Voltage Controlled Oscillator • AR-317



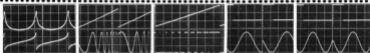
Sawtooth wave

Triangle Wave

Sine Wave

Pulse Wave

FM of Sine wave by Pulse.



Self frequency modulation (FM). FM, Upper waveform Sawtooth, Lower waveform Sine wave, Controlled by Sawtooth. Lower waveform Sawtooth output. Pulse with modulation (Upper waveform) by Sawtooth waveform. Sine wave (Upper) Sine wave (Lower) Sine wave (Upper). Same characteristics as picture to left except for change in Sine wave frequency.

- **Wide Range: Less Than 1 Cycle per Minute to Over 50,000 Cycles per second in Two Ranges**
- **Extremely Accurate: Oscillators Track Together in Tune Over Entire Heating Range**
- **No Drift: Fully Temperature Stable**
- **Very Pure Sine Waves Plus Sawtooth, Triangle, and Variable Width Pulse (square) Waves Simultaneously Available**

- **Phase Synchronizing (sync) Input**
- **Pulse Width Modulation Input Gives Phasing and Chorus Effects**
- **4 Control Inputs (1 Octave per Volt) 1 Control Input Attenuator**
- **Coarse and Fine Frequency Control**
- **Pulse Width Control (0 to 100%)**



Displays VCO phase relationship.



Displays 3 different VCO pulse widths: 30%, 50%, 80%.

The AR-317 Voltage Controlled Oscillator (VCO) is an extremely versatile package which represents a major improvement over other oscillators. It generates all the basic synthesizer waveforms simultaneously: sawtooth, triangle, variable width pulse (square) and sine. An engineering breakthrough in sine converters provides a pure, low distortion sine wave, which allows truly clean balanced modulation.

Ordinary 10 synthesizer kits which use linear oscillator control, the AR-317 VCO, along with the AR-314 VCF, uses accurate full range exponential control. This type provides 1 octave per volt (1/12 V per semitone) control of frequency over the entire range of hearing. Only exponential control (with a linear keyboard, such as the AR-319) allows unlimited flexibility in controlling any number of oscillators from any number of sounds.

The AR-317 VCO has 4 control inputs, 1 of which has a level control, to 1 octave per volt characteristic means that signals may be summed, and each positive volt doubles the frequency, and each negative volt halves it, over an extremely wide range.

A Sync input allows an external square or pulse wave to drive the VCO at exactly the same frequency, or any multiple (harmonic) of the external source. This can generate all sorts of unique speech-like tones. In addition, the width, or duty-cycle of the pulse wave may be voltage controlled (modulated) from an external source.

The AR-317 VCO also has many uses in the electronic lab: as a function generator, audio sweep oscillator, frequency response tester, transient generator.

The low frequency range, together with the Sync feature, can be used to create unique envelope signals and vibrato type modulation waveforms.

## Voltage Controlled Oscillator Specifications

**Frequency Range:**  
Manual Control: Octave ranges 8.83 to 16,314, 16,314 to 32,630 Hz  
May be driven by voltage control from 1 cycle every 32 minutes to 50,000 Hz to 50,000 Hz typically.

**Control Inputs:**  
8 to 1 octave per volt

**Control Input Level:**  
1.125 volt

**Sync Input:**  
Positive going edge triggers all waveforms 10 times. Requires at least 2V. Max Level = 10V.

**Pulse Width:**  
Variable 8 to 100% duty cycle.  
80% = Square Wave

**Pulse Width Modulation:**  
50% per Volt. Maximum Input = 1.125V

**Sine Wave:**  
Many Synthesizers only provide a roughly shaped approximation to a sine wave. The AR-317 VCO incorporates a significant advance in waveform converter circuitry which provides a very clean, low distortion, pure sounding sine wave.

**Frequency Accuracy and Tracking:**  
The oscillators will track one another and follow the standard 300Hz tone over the whole audible range of 16 Hz to 16 kHz to within a small fraction of a semitone.

**Arrival Impedance:**  
50 Ohms min.

**Output Impedance:**  
All outputs, 1K Ohms

**Control:**  
Control Frequency, Fine Frequency (± 1.1 Octaves)

**Control Input 1, Pulse Width:**  
Control

**Connections:**  
4 Control Inputs (1 with Attenuator)  
Sync Input  
Pulse Width Modulation (PWM) Input  
8 waveform outputs

**Power:**  
+18.0V D.C. 0.028 amp  
-15.0V D.C. 0.028 amp



#### WHAT EXACTLY IS A SYNTHESIZER?

- a) A synthesizer is a musical instrument.
- b) Like most musical instruments, a synthesizer can play notes and control their pitch, loudness, duration, and dynamics.
- c) Unlike most instruments, a synthesizer is **NOT LIMITED TO A FIXED CONFIGURATION**. With an electric guitar (fig a) or a clarinet (fig b) you can play different notes, but you cannot change the basic sound generating system. Also, your choice of pickers is limited to notes of the scale.

A synthesizer, on the other hand, is a sonic **error set**. The oscillators, which control pitch and basic waveform, can be controlled **reversibly**, from a keyboard, external instrument, or even from each other. In fact, all the functions can be connected in any way, in each other, at will, resulting in a tremendous variety of possible sounds (fig c).

- d) A good synthesizer also allows flexible, rapid, and accurate **CONTROL** over many aspects of the sound (parameters).

#### WITH A SYNTHESIZER, CAN I PRODUCE THE SOUND OF A VIOLIN?

Yes, to a degree. The degree depends on how much time one spends at it. Natural sounds, such as from violins, can be extremely complex, especially in their minute variations. It would take great pains to imitate a violin realistically. However, the beauty of a synthesizer is in its versatility in creating completely new sounds. Some synthesizers can modify the sound of external instruments, or even be controlled (played) by them.

#### WHAT IS THE SOUND OF THE ARIES?

The Aries is a fully modular synthesizer, using the highest quality circuitry, allowing you to:

- a) Individually develop your own sounds,
- b) Purchase a minimum of modules at first,
- c) Expand or change the system later at will, and
- d) Use our newly designed modules as they become available.



Fig. a) FIXED-CONFIGURED SYSTEM



Fig. b) FIXED-CONFIGURED SYSTEM

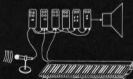


Fig. c) FLEXIBLY CONFIGURED SYSTEM

#### DOES IT

#### SOUND

The sound of a synthesizer is not like that of a traditional instrument. It has a unique character, and its sound is not limited to the notes of the scale.

On the other hand, you can quickly

#### WELL

#### CHOOSE

the sound of a synthesizer, and you can choose from a wide variety of sounds, which can be modified to suit your own taste.

#### DO I

#### NEED

to purchase a minimum of modules at first, and you can expand or change the system later at will.

#### IS THE

#### SYSTEM

flexible, rapid, and accurate control over many aspects of the sound.



#### DO ALL SYNTHESIZERS HAVE THEIR OWN CHARACTERISTIC

...? The sound of any synthesizer is the result of the quality and accuracy of the circuitry, and arrangement, or "patch", of the various functions or modules (oscillator, filter, amplifier, etc.), in particular, the pre-patched, so-called "performance" synthesizer is a result of its inter-connections made internally, according to the manufacturer's conception of how the instrument should be used. This, of course, is preferable to doing standard things.

On the other hand, truly modular synthesizers leave all the connections to the user, so that he can decide in advance whether the connections (patching) can be made and in a conspicuously clear way.

#### IF I WANT A VERSATILE, MODULAR SYSTEM, HOW DO I

##### GO? WHAT IS SPECIAL ABOUT THE ARIES?

Aries designs its of the highest quality, both in precision of circuitry, housing engineering, that is, in convenience of use. It will find Aries helpful in answering your questions about synthesizers, systems, selecting the system you desire.

Try this beautiful instrument in available at an exceptionally low price. It is the smallest, less versatile synthesizer. It is available at even lower prices, if you want to assemble it yourself.

#### DO I NEED TO KNOW A LOT ABOUT ELECTRONICS TO USE A SYNTHESIZER?

No. Many of the finest synthesizer performers approach the instrument in terms of sound production. The technical language may be one, but your own unshakable experimentation is the only important requirement for gaining skill with a synthesizer.

#### ARE ARIES COMPATIBLE WITH OTHER SYNTHESIZERS?

Yes, there is much standardization now; for example, one volt per control signal, and the Aries is designed to be compatible.

#### DO I NEED TO KNOW HOW TO PLAY A KEYBOARD TO USE THE ARIES?

Absolutely not! Although we will use excellent keyboarded, this is merely one way to control the synthesizer modules. Some other ways are:

a) Our soon-to-be-released pitch-to-voltage converter/instrument interface will allow any external instrument, even your voice, to actually play the Aries in tune or in harmony with you.

b) Manual control, using the knobs and switches on the modules.

#### IF I WANT TO TRY JUST A FEW MODULES, WHERE SHOULD I BEGIN?

The obvious first module is the VCO (AR-317) with which you can produce the basic waveforms. You will also need the power supply (AR-322). This power supply is big enough to eventually power over two cabinets full of modules. Next you will probably want to add a VCF (AR-314) and some modules for controlling the others, like the Sample and Hold (AR-318) or Dual LFO (AR-324). The standard System 300 is a good combination of modules which offer great flexibility at a reasonable price.

#### WHAT WILL I NEED FOR KIT ASSEMBLY?

You need to know or be willing to learn how to solder. Instructions on soldering are included, as well as a guide for identifying all parts, and step-by-step assembly instructions. You will need a small soldering iron, rosin core solder, a pair of small diagonal wire cutters, needle nose pliers, wirecutters, a small Phillips screwdriver, a flat blade screwdriver, and a 1/16" allen wrench.

#### HOW DO I ORDER AN ARIES?

Place your order in writing directly to the factory. Use an order form if you have one. We accept prepaid, C. O. D., or MasterCard orders. C. O. D. orders must be accompanied by a 25% deposit. MasterCard orders must include an authorization for an initial 25% deposit charge.

#### WHAT IS THE DELIVERY TIME?

This varies from module to module, so you should contact us for more exact information. As a general guide, allow up to ten weeks for kits, and up to twelve weeks for assembled items. Delivery times can be expected to decrease in the future. Orders are generally shipped via UPS, and are filled in order of receipt.

# SAMPLE/HOLD, CLOCK, NOISE GENERATOR • AR-318

- Trigger, Gate and Sawtooth Output Allow Automatic Control of Envelope Generators
- High Speed, Low Drift Sample and Hold Allows Generation of Wide Variety of Note Patterns, Sequences and Scales
- Noise Generator Has Simultaneous White and Pink Noise, Plus Slow Random Control Voltage Outputs

The AR-318 module contains a precision Sample and Hold circuit, a voltage controlled clock oscillator, and a noise generator with 3 simultaneous outputs.

The Sample and Hold may be thought of as an electronic switch. It takes an input signal, which may be noise or a musical waveform, and converts it to a stepped output of sequences of voltages. The output changes only when a short trigger pulse is applied to the trigger input. At this time, the output immediately jumps to the level of the signal input, and then "freezes" at this level until the next trigger. Thus, staircase waves and all sorts of patterns may be generated, which can create melodies when connected to an oscillator.

The Sample and Hold also has a gate input, which will hold the circuit on continuously. Then the output follows the input. This is called Track and Hold operation.

A manual trigger push button will also trigger the Sample and Hold. A switch selects operation from either an external source, or the internal clock.

The Clock is a voltage controlled low-frequency oscillator with 3 outputs: sawtooth, square and narrow pulse. The last two can function as a gate and trigger to simultaneously operate an Envelope Generator (AR-312) and the Sample and Hold. Because it can be synchronized and/or voltage controlled, a wide variety of melody systems with rhythmic control may be created.

The Noise Generator has three outputs: white noise, pink noise and random noise. White noise sounds like air hissing out of a valve. Controlled by an Envelope Generator and VCA or VCF, it can create drum-like sounds. Used to modulate an oscillator, many complex tones can be created. White noise is a useful audio test signal, since it has equal energy per cycle over the whole audio range. Pink noise is like white noise but filtered to have equal energy per octave. It sounds deeper, like wind, and can create thunder-like sounds. Random noise is a control signal which can, for example, modulate an oscillator and cause a random vibrato effect, similar to a performer's natural vibrato on a musical instrument.

## AR-318 SPECIFICATIONS

Output Impedance: Square = 1 k ohm, Sawtooth = 1 k ohm, Trigger = 2k ohm

### NOISE GENERATOR

Connections: Sample and Hold — Signal Input, Output, Trigger Input, Gate Input  
Clock — Square Output, Sawtooth Output, FM Input, Trigger Output  
Noise Generator — White Output, Pink Output, Random Output

Power: +15 V D.C. 50 mA  
-15 V D.C. 50 mA

White Noise: 2 V RMS, equal energy per cycle between 20 Hz and 15 kHz  
Pink Noise: 4 V RMS, equal energy per octave between 20 Hz and 15 kHz  
Random: 4 V RMS, equal energy per cycle between 0.5 Hz and 10 Hz  
Output Impedance: 1 k ohm all outputs  
Controls: Sample/Hold Output (Level), Clock Frequency, Sample/Hold Trigger Source (External or Clock), Manual Trigger Button

### SAMPLE/HOLD

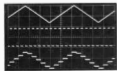
Maximum Signal Level:  $\pm 10V$   
Gain: 1.0  
Trigger Input Level: 50 V rms, requires at least 2 V  
Trigger Signal: Requires a positive-going edge, with an average level of between 2 and 10 V, and a rise time of 0.2 ms or less. Trigger causes the output to suddenly assume the level of the input signal, and hold it until the next trigger.

Sampling Time: 20 microseconds  
Gate Input Level: 10 V rms, requires 2 V  
Gate Signal: Any positive voltage between 2 V and 10 V causes output to follow signal level exactly. When gate is removed output holds its voltage.  
Output Drive: Less than 50 mA per sec.  
Input Impedance: Signal Input = 200 k ohms, Gate Input = 1 k ohm, Trigger Input = 2 k ohms

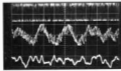
### VOLTAGE CONTROLLED CLOCK

Frequency Range: 0.5 to 30 Hz  
Output Waveforms: Square, Sawtooth, and narrow trigger pulse  
Output Amplitude: 5 to 10 V all waveforms

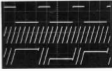
Zero Input: Positive-going edge between 2 and 10 V, causes system and switches to reset, and also causes trigger to appear  
FM Control Input: External voltage ( $\pm 10 V$  rms) causes clock frequency to change by approximately 1 octave per volt.  
Input Impedance: Zero Input = 30 k ohms, FM Input = 50 k ohms



Sample and Hold: Signal Input, Trigger Input and Sample Hold Output.



Noise Generator/Outputs: white noise, pink noise and slow random control signal.



Sample and Hold Gate Mode: Gate Input, Signal Input, Sample and Hold Output.

# Dual Mixer • AR-323

- 2 Separate Mixers with 4 Inputs Each
- Sum Output (A + B) Allows Use as a Single 8 Input Mixer
- Input Polarity Switches Allow Signal Addition and Subtraction
- Wide Range — D.C. to 30 KHz, Allows Processing of Control Signals and Audio Mixing Simultaneously
- Low Noise and Distortion — May be Used for External Sound Sources
- Difference Output (A - B) Used with sum Output Creates Stereo Mosaic Effect



## Dual Mixer Specifications

### Inputs

Each mixer has 4 inputs, 2 each stereo and 2 each mono. Max. Level =  $\pm 10$  V

### Outputs

Each mixer has one output. In addition there is a sum (A+B) output and a difference (A-B) output. This module may be used to add, subtract, attenuate, and mix both audio and control signals.

Frequency Response: D.C. to 30 KHz,  $\pm 3\text{dB}$

### Input Impedance

100  $\Omega$  stereo, all inputs

### Output Impedance

1 K ohm, all outputs

### Controls

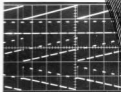
Mixer A — Gain 1, Mixer A — Gain 2, Mixer A Polarity 1 and 2  
Mixer B — Gain 1, Mixer B — Gain 2, Mixer B Polarity 1 and 2

### Connections

A Inputs: 1, 2, 3, 4  
B Inputs: 5, 6, 7, 8  
Outputs: A+B, A-B, S, A-B

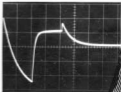
### Power

+10 V D.C. @ 10 mA  
-10 V D.C. @ 10 mA



Upper waveform displays Sawtooth input to mixer. Next waveform shows Pulse also applied to Mixer. Next waveform displays Mixer output with Sawtooth input inverted.

Waveform illustrates moving of 2 Envelope Generator outputs with one inverted.



The AR-323 Dual Mixer is both an audio mixer and a control signal processor. Each mixer has 4 inputs, two of which have level controls and polarity switches. This allows both addition and subtraction of waveforms, envelopes, or other signals, and variable gain inversion or voltage following. Each mixer has its own separate output. In addition, there are sum (A + B) and difference (A - B) outputs. These allow use as a single 8 input mixer, and can provide matrix stereo effects by using the sum as the left output and the difference as the right one.

Some of the AR-323 uses are: Oscillator waveform mixing; Envelope Generator mixing for complex envelopes; Patching in of external instruments or sources; general voltage processing.

# DUAL LFO, LAG, INVERTER AR-324

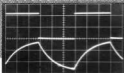


- 2 Separate Low Frequency Oscillators with Sawtooth, Square, and Triangle Outputs
- Phase Synchronizing (sync) Inputs on Each LFO
- LFO's can be Used for Vibrato, Tremolo, and Modulation Effects
- Square Wave Output Triggers Envelope Generator (AR-325) and Sample and Hold (AR-326)
- Variable Lag Circuit Acts as a Low Pass Filter, to Slow Down Control Signals, Generate Portamentos, etc.
- Inverter Has Variable Gain

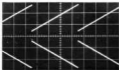
The AR-324 is a versatile control signal package. Its 2 oscillators cover the range from 0.3 Hz (1 cycle every 3 seconds) to 30 Hz. The simultaneously available sawtooth, square, and triangle waves may be synchronized to an external trigger or square wave. The triangle wave provides a natural vibrato signal to control a VCO, while all 3 outputs generate interesting modulations of oscillators and filters. In addition, the square wave outputs can trigger both the Envelope Generator and Sample and Hold, thus creating a wide variety of melodic and rhythmic control possibilities.

The Lag circuit provides a variable delay or slowing effect on a control signal. For example, the keyboard (AR-323) voice can be pitched through the lag into one VCO, but connected directly into a second VCO. This will allow portamento (gliding from one note to another) on one tone, but not the other, which creates a nice pleasing effect of two instruments playing together.

The inverter has variable gain. It allows one to reverse the effect of a control signal. Negative envelope signals are one example, and so is reversing the horizontal section by inverting the voice output. Its wide frequency response also allows inversion of audio waveforms.



Top waves shows Square wave input to Lag. Bottom waveform Lag output.



Top waveform displays Sawtooth input to inverter and Bottom waveform shows inverter output.

## AR-324 SPECIFICATIONS

### DUAL LOW FREQUENCY OSCILLATOR OUTPUT

Frequency Range:	0.3 Hz to 30 Hz
Output Waveforms:	Sawtooth (0 to +10V), Square (0 to +10V), Triangle (0 to +5V)
Sync Input:	Positive-going edge between 2 and 15 V causes all waveforms to reset
Sync Input Impedance:	47K ohms
Output Impedance:	1 K ohm, all outputs

### LFO

Function:	Causes an input waveform to be slowed down or low pass filtered
Gain:	1.00 - Adjustable enough to process the keyboard voice
Lag Time:	Variable, 1 ms to 1 Sec
Input Impedance:	1 K ohm at min. lag, 1 M ohm at max. lag
Input Level:	± 10 V rms

### INVERTER

Gain:	Variable, 0 to -1.0
Input Level:	± 10 V rms
Input Impedance:	50 K ohm
Output Impedance:	1 K ohm

Controls:	LFO 1 Frequency, LFO 2 Frequency, Lag Time, Inverter Gain
Connectors:	LFO 1 - Sync In, Sawtooth Out, Square Out, Triangle Out LFO 2 - Sync In, Sawtooth Out, Square Out, Triangle Out Lag In, Lag Out, Inverter In, Inverter Out

Power:	+18.0 V D.C. @ 200 mA -18.0 V D.C. @ 200 mA
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## POWER SUPPLY AR-322

- Provides All 3 Outputs Required by ARIES Synthesizers
- Well Regulated, Assuring Excellent Stability and Tuning Accuracy of Synthesizer

## OUTPUT AND POWER AR-326

- 2 Separate Audio Output Driver Amplifiers
- Stereo Headphone Jack
- Will Drive High-Impedance (40 ohms or greater) Speakers Directly
- Separate Level Controls and Inputs
- 2 Phone Jacks on Back for Master Output to Stereo Sound System or Musical Instrument Amplifiers
- Short-Circuit Proof Outputs
- Wide Frequency Response — 16 Hz to 30 KHz



Outputs: +25.0 Volts at 1 Amp max.  
-15.0 Volts at 1 Amp max.  
+5.0 Volts at 1 Amp max.

## SYNTHESIZER CABINET AR-310

- Rugged Cabinet Holds 10 Modules Plus Output/Power Control Module
- Modules Easily Replaced or Interchanged
- Holds AR-322 Power Supply
- Female Connector for Each Module Allows Custom Patch Interconnections to be Wired In, if Desired
- Cabinets are Vertically Stackable

# ARIES HITS

ARIES KITS have been developed by a special engineering group established in 1971. Their goals have been to combine the most recent circuitry technology with low cost and practical assembly. The results have been phenomenal—quality equipment at unique, low prices that people really like! They must, because the kits all like crazy! There are several reasons why people build ARIES kits besides saving a lot of money. In building something yourself—you have the opportunity to discover HOW it works and something about the operation of modern electronics. The challenge in itself is very alluring and the personal involvement of accomplishing a goal is always rewarding. Plus—not only do you receive the pride of doing-it-yourself, you have a high quality product that you KNOW works the way it was designed to work. ARIES kits save a variety of needs and interests. Complete instructions are included. Your success is guaranteed! All ARIES kits are under full warranty.

## TESLA COIL KIT AR-510

A basic kit with all the parts for an exciting adventure into high frequency and high voltage. Add your own grounded metal housing—a small chest or universal box—and you're off into the unknown. All of these Tesla coils are patterned after the design of Nikola Tesla (1857-1943), the American electrical genius who built giant wireless hounds of feet tall. His dream was to light and power entire cities with energy radiating from high coils—unfortunately he died before he got all the kinks out! Our Tesla Coil Kit is a high frequency, push-pull oscillator coupled to a television flyback transformer, which steps up an external 12 VDC power supply to many thousands volts. **SPECIAL NOTE:** Although current output is relatively low, some hazard is inherent in all high voltage devices. This kit is intended for the experimenter who is mature enough to observe reasonable precautions in its use.



510

## SIREN ALARM AR-530

A burglar alarm/security system control for your car or home. The control panel consists of a dual input alarm circuit that allows a delay and latch of the alarm. A noise circuit to prevent a siren is also provided on this control board. This unique siren noise circuit has power to drive a 16Ω speaker or rattle horn with an piercing modulated sound. The horn is driven by a 2N5086 power transistor. The security system control contains a P.C. board, all solid state components and instructions. You supply speaker or horn, alarm sensors and control housing. Play it safe, build this alarm before it's too late.



630.611.612.615

## ELECTRONIC COMBINATION LOCK KIT AR-540

A solid state combination lock kit which contains: P.C. board, 2 transistors, LED, 4 555's, some resistors and capacitors—with a 4-digit number combination (10,000 combinations), possible, and a full set of instructions—you supply the switches (push-button or keyboard), and output device.



530

540

## 6-DIGIT LED CALENDAR/CLOCK KIT AR-781

Have fun putting together this very attractive miniature digital clock. This is a complete kit, including a CT 7001 clock/date chip, six red LED displays, P.C. board, all parts, power supply, data sheet, and a beautiful wood and plastic case. When assembled, it stands 2" high and 6-1/2" long.



781

## FREQUENCY COUNTER AR-610

**FUNCTIONS:** Counts frequency in five bit output, or

seven count, parallel hexadecimal measurement.

**DISPLAY:** Six red cathode glow tubes, with red polarized

view window. Cathode ray adjustment one, 0.1 to 0.5

degrees, or infinite. Range meter, Each digit, 0.05 to

high. Total viewing width, 4.5 inches.

**FREQUENCY STANDARD:** 1.000 MHz quartz crystal,

10.00 MHz.

**ADJUSTABLE:** Adjustable to 1.0000, 1 count 0.20°C

COEFFICIENT. Two low voltage switch, double control

switch, single low adjustment, On/Off switch.

**INPUT (OSC Type):** Max input and external pin (max 100V),

impedance, 2 to 10 MΩ. SC-50 coupled, input at antenna,

> 20m, pre-amplifier.

**INPUT RANGE:** 0.1 to 10 MHz, maximum 100MHz with

OUTPUT (HSEL Type): Internal gate delay, internal low

low control (10MHz).

**OPERATING TEMPERATURE:** 10 to 60°C, 15 to 80

°C. OPERATING TEMPERATURE: 10 to 60°C (32 to 100°F)

REPRODUCIBILITY: Integrated circuit, 36, 36, 36, 36, 36

CONSTRUCTION METHOD: Components on two 0-10

precision circuit boards.

**PHYSICAL:** Steel chassis and case, table top mount or

wall-mounting bar.

**DIMENSIONS, OVERALL:** 6 in. high x 10 1/2 in. wide x

1 1/2 in. deep.

**WEIGHT:** 6.0 lbs (2.8 kg) Shipping Weight: 7 lbs.

How do you measure a frequency or a brief time period? Probably your answer is "Not too easily" and "Very costly". Well, with our AR-610 you can make it "Very easy", and at a price far below any other high precision frequency counter. Using a 1 megahertz quartz crystal as a reference, the AR-610 provides a full output resolution of 0.1 to 100,000 (1 count). By switching between the three-range ranges, you get direct readout for a full 50 MHz. The AR-610 provides a counting window of 1, 0.1 or 0.01 second or infinity and you supply the AC signal with optional preamp or DC probe to read frequency or total counts. Additionally, as the AR-610 covers its own internal frequency standard, and you supply the gating signal. A truly versatile test gear.

## 30 MHz PREAMP/CONDITIONER AR-611

### FOR FREQUENCY COUNTER

This useful device allows input of micro-level signals to 30 MHz. Both a pre-amplifier and Schmitt trigger are provided, in an active SMC-coupled housing.

## 320 MHz PRESCALER AR-612

### FOR FREQUENCY COUNTER

Extra good news! A frequency pre-scaler which permits direct measurements to 320 MHz typically. AC input signals down to 250 mV are divided by ten and coupled to the AR-610. You can now read VHF and UHF frequencies at a glance—

## COMBINATION KIT AR-615

Here's a good way to save money—get all three, the AR-610, 611, the AR-611 and the AR-612.

# ARIES KITS

## NIXIE DIGITAL CLOCK

7 DIGITS AR-711

A really fine clock with excellent readability from the six neon-colored digits and quick time setting from the front panel controls. The industry's 7400-series TTL integrated circuit design means that many useful signals are available internally. For example, continuous semi-coded BCD digit data outputs are provided, as is a direct clear. You can drive various displays and computers for alarm and inter-connection functions. 7 digits.

### SPECIFICATIONS:

**FUNCTION:** Two display in hours/minutes/seconds, 12 or 24 hour  
**DISPLAY:** Cold cathode glow tubes and external mirror viewing window. Each digit 3/8" inches high, total viewing width 4 - 1/2 inches.

**ACCURACY:** Dependent on line frequency stability (see also item #2 second set note).

**CONTROL:** Time from past positions (switch), Alarm On, Volume On, and Second Set, one Display Set (high switch).

**ENERGY:** 105 to 125 VAC, 50 or 60 Hz, 5 VA.

**OPERATING TEMPERATURE:** 0 to 50° Celsius (32 to 122° F)

**SEMICONDUCTORS:** Integrated circuit, 16 silicon transistors, 6 silicon diodes, 1 bridge rectifier, 1

**CONSTRUCTION METHOD:** Components on two 5/16" glass epoxy boards.

**ENCLOSURE:** Aluminum housing and cover, soldering on rear mounting feet.

**DIMENSIONS, OVERALL:** 7 1/2 in. high, 10 1/2 in. wide, 4 in. deep.

**WEIGHT:** 2 lbs. 11.64 oz. SHIPPING WEIGHT: 5 lbs.



711,712



720

## NIXIE DIGITAL CLOCK

6 DIGITS AR-712

The AR-712 is the same as the AR-711, except that this model has 6 digits.



735

## GIANT DIGITAL CALENDAR CLOCK

CLOCK AR-717

Six large glowing numbers give you the correct time to the second, and the date - all visible from 50 feet away! Especially useful for sound studios and industrial applications.

### SPECIFICATIONS:

**FUNCTION:** Two display in hours/minutes/seconds, 12 or 24-hour. Alarm, also displayed every 10 seconds.

**DISPLAY:** Six 1/2" cathode glow tubes.  
Each digit: 2 1/2" inches high. Total display width: 17 in.

**ACCURACY:** Dependent on line frequency stability (see also item #2 second set note).

**CONTROL:** 2 pushbutton switches, *See Forward, Size, Alarm and Tone.*

**ENERGY:** 105 to 125 VAC, 50 or 60 Hz, 10 VA.

**OPERATING TEMPERATURE:** 0 to 50° Celsius (32 to 122° F)

**SEMICONDUCTORS:** MOS-LSI integrated circuit, 1 silicon transistor, 12 silicon diodes, 6 over diodes, 2

**CONSTRUCTION METHOD:** Components on two 5/16" glass epoxy circuit boards.

**ENCLOSURE:** Sheet glass front on wood shell, plastic viewing window, 1/2" thick on wall-mount.

**DIMENSIONS, OVERALL:** 8 inches high, 18 in. wide, 4 1/2 in. deep.

**WEIGHT:** 10 lbs. SHIPPING WEIGHT: 15 lbs.

## QUARTZ CRYSTAL CHRONOMETER

AR-720

A high precision and portable electronic time source - this chronometer is one of our most popular. The time reference is a high-frequency quartz crystal and runs off any 12-volt battery. It has a 12 hour or 24 hour readout. The advanced MOS/LSI integrated circuits & LED's make this incredible miniaturization possible.

The AR-720 provides your six-digit alarm accuracy in a 5-1/2" square aircraft-style instrument housing. A really nice kit to work on plus a really fine accurate reliable chronometer to have - what more could you want!

**OVERSAMPLING DIVISOR:** 212 in. square, 2 1/16 in. deep, 107 1/2 in. x 108 in. 1

**FACEPLATE WINDOW:** 2 1/8 in. dia. x 2.32 in. deep, 10/16" thick, 1/16" from surface of faceplate, hole 5/16" in. dia. from center, on 4" diameter ring right, bottom hole spacing: 2 1/8 in. x 1/16 in. in centers.

**DISPLAY:** Eight digit (two zero) digital LED's. Each digit: 1/8 in. high x 1/16 in. wide.

**DISPLAY:** LED's are double-anode emitting diodes.

**ENERGY:** 18 to 15 VDC, negative ground.  
Using crystal only: 20 mA  
Using crystal + display: 100 mA nominal

**ACCURACY:** Reference to - 200 - 1.0 microsecond/yr. ± 20 C.

**WEIGHT:** 5.12 oz. (145g)

**OPERATING TEMPERATURE:** 0 to 50° Celsius (32 to 122° F)

**SEMICONDUCTORS:** MOS-LSI integrated circuit, silicon transistors 12 silicon diodes, 6 light emitting diodes, 2

**TIME STANDARD:** quartz crystal, NBSM 490, RDS-3 holder

**QUARTZ CRYSTAL:** two 0-10 picosecond timers

## DIGITAL CALENDAR CLOCK

AR-735

The AR-735 is a six digit Calendar Clock that displays the time (hours, minutes & seconds) for eight seconds and the date (months & days) for two seconds - a two second cycle, that repeats continuously. The advanced LSI circuitry gives this clock the same accuracy and performance of our other Aries clocks - plus the advantages of the Alarm option - an hour alarm with a 10 minute "Shower" feature and a 5 hour 45 minute Radio Timer. This interesting timepiece comes in a handsome walnut case, and will definitely enhance your decor in the den, studio, living room, anywhere!

**FUNCTION:** Two display in hours, minutes and seconds, 12 or 24 hour. - also display in months and days.

**DISPLAY:** 1.22" LED seven segment display in red.  
Function indicating LED's includes AM or PM status.

**ALARM OPTION:** 24 hour 1 piece a day feature, with 10 minute snooze capability.  
Radio timer: 5 hour and 45 minute / maximum 1 "shower" snooze - goes off at zero.

**DIMENSIONS:** 2 1/8 inches high, 7 3/4 inches wide, 1 1/2 inches deep.

**WEIGHT:** 2 lbs. 12 oz. Shipping weight: 3 lbs.

## AR-300 SYSTEM SPECIFICATIONS

(See catalog for complete specs)

**AC Power Requirements:** 110 VAC 60 Hz

**AR-322 Supply outputs:** +5 V, current limited to 1A  
+15 V, current limited to 1A  
-15 V, current limited to 1A

**Input impedances:** 100K ohms typical

**Output impedances:** 1K ohms typical

**Usable control voltage input range:**  
0V to +10V, incl. internal bias set by knobs

**Gate voltage:** off: 0V  
on: +10V

**Trigger pulse:** off: 0V  
on: +10V for 1.8 ms. min.

**Waveform voltages:**

Sine: +5V/5V peak

Triangle: +6V/-5V peak

Pulse: 0V to +10V

Sawtooth: 0V to +10V on LFO & Clock  
+5V/5V peak on VCO

**Output amplifier (AR-326):**

Two-channel AC amplifier

+10V/-10V output swing

**Outputs:**

...One stereo headphone jack, 200 ohms output impedance, suitable for high or low impedance headphones.

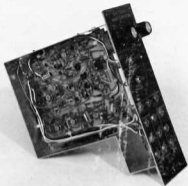
...One RCA phono jack for each channel (two total), 200 ohms output impedance, compatible with audio amplifier inputs or small speakers.

**Keyboard and interface features:**

Five-octave fast-action keyboard

Two voices

Can be re-triggered while another key is pressed  
Linear and exponential portamento



### EXPANDABLE MODULAR CONSTRUCTION

With the modular approach, you can select the right modules to meet your needs, arrange your own configuration, add newly designed modules, or expand your system.



### HUMAN ENGINEERING

Conceptually clear layout of each module. High density jack configuration at bottom of panels gives easy access to controls, while allowing a large number of connections to each module.



### HIGH PRECISION ELECTRONICS

Accurate tracking over large tuning ranges, exceptionally pure wave forms, low noise specs, and wide dynamic range of control.



### KIT OR WIRED FORM

Kit assembly allows better understanding of synthesizer operations. Blank panels, module frames, and parts are available to encourage custom design and modification. Fully wired synthesizer also available.



### VERSATILE KEYBOARD

Two voice keyboard with full five octave range, two portamento modes, tuning control with easy return to center positions.



### FINEST SPECIFICATIONS AT LOWEST PRICE

Because we design, manufacture, and distribute the Aries 300, we can afford to offer you the highest quality synthesizer at exceptionally low cost.

YOUR QUESTIONS  
ANSWERED  
INSIDE

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