



ARIES MUSIC 77

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INCORPORATED

An Aries Modular Synthesizer system consists of a number of AR-300 series modules. These modules provide a complete set of basic synthesizer component functions: signal sources; controllers and modifiers; and a growing number of more exotic functions. The 300 series is fully modular, allowing maximum system flexibility. We assume some previous experience with synthesizers on the part of our customers, but are happy to give advice and assistance to those who are getting into electronic music for the first time.

It's More Than Another Keyboard

A synthesizer is a group of relatively simple circuits, each performing a relatively simple task. The way in which these circuits are connected to one another (patched) determines the nature of the 'instrument': the range of sounds and the kinds of controls included. While this is true for all synthesizers, some synthesizers, especially the smaller ones, are pre-patched by the factory — the range of 'instruments' available has been defined and limited, along with the range of musical expression possible.

It's been declared a trade-off, that by giving up the enormous range of choices and controls for a few deemed useful by someone else, you get increased 'performability'. "you just can't make changes fast enough with a modular patch cord system to play on stage." — so goes the argument. Five or six years ago that may have been the case, but it's not true today — Aries 'normalised' patching capability makes it as comfortable to use on stage as it is in the studio. The real trade-off, we feel, is one of instant gratification versus long-term satisfaction. It doesn't take as much effort to learn to play a small pre-set system as it does a modular one — but someone else has done all the exploring for you, left you with the sounds he liked, and you haven't much chance of learning what making music with electronic circuits is really all about. If your interest is in learning to play a completely new instrument, an Aries Modular electronic musical instrument will be a satisfying and economical choice.

Aries In The Classroom

The Aries Modular System is uniquely situated to use in the classroom for several reasons:

- we offer several cabinet sizes; each student can be assigned only the modules he or she needs for a given lab exercise.
- being modular, the system can grow as classroom and composition needs grow.
- it's a patchcord system first, giving the beginning student an easy grasp of the relationship between instrument configuration (patch set-up), the sound produced, and its control parameters.

HERE WE ARE:

BOX 3065 SALEM, MA. 01970 (617) 744-2400



Patching & Connectors

No distinction is made between "control signals" and "audio signals". This means that any signal from the system can be patched anywhere else in the system without damage, optimizing overall flexibility. The standard connector is the NTT 311 miniature phone jack (equivalent to a Switchcraft 42A miniature phone jack). Patch cords are supplied (10 free per thousand dollars of kits ordered) and are completely reliable. Much has been argued over the years about the reliability of miniature jacks — some manufacturers believe they are not. The fact of the matter is that there doesn't exist the industry-wide standardization of mini's as there is with 1/4" phone jacks — which means that you've got to have the right patch-cords: either NTT or Switchcraft. The space-saving advantages of mini jacks is obvious when you compare panel space requirements of a Moog or Eu modular system to that of an Aries or other type using miniature jacks. All patch cords are shielded to prevent noise or crosstalk.

Input Structure

Most input impedances are 50K ohms minimum, allowing outputs to drive numerous inputs without significant loading. Most module inputs are summing nodes, which allows easy modification to accommodate additional inputs. Signals at control inputs are summed algebraically.

Output Structure

Most output impedances are 1K nominally, allowing output mixing simply by shorting outputs together at a multiple. This kind of mixing does not sum signals but gives the average voltage of signals mixed.

Power Supply

All modules require ± 15 volt power supplies. For current requirements, consult specific module specifications.

Building Kits

"Can I build my synthesizer from your kits?" is a familiar question. Our answer is — probably — but this answer depends less on your skill and experience than it does on your ability to work slowly with care and patience. People with no experience whatsoever have completed kits successfully, while people who have done other electronic kits have had problems because they've been careless or hasty. It is helpful to have someone demonstrate soldering to you if you've never tried it.

Warranty

Assembled units are fully warranted to be free of defects of material or workmanship for 1 year from date of shipment. Just return the defective module to the factory and we'll repair and return it.

Modules purchased as kits will also be repaired at the factory, but there is a \$15.00 service charge for kit repairs. A bit of quick addition will show that even if nothing works, the kit with full repairs will save you some over an assembled unit.

We have once in a while actually replaced kits which were so badly assembled that they were beyond repair, all for \$15.00. Virtually the only thing you can do to void your warranty is to use acid core solder or acid flux (plumbing-type solder). Rosin core solder, 60/40 lead-to-tin ratio is best.

Replacement parts are available from us — write for prices.

User's Manual

A comprehensive User's Manual is available, written for Aries by Ken L. Perrin of the Boston School of Electronic Music. The Manual covers synthesizer theory in general, and Aries synthesizer operation in particular, in ninety-six thorough pages. We recommend that anyone planning to purchase over \$800. or so in kits or assemblies first purchase and peruse this book. The price of the Manual (\$9.50) is refundable with the placement of an order of \$1000. or more. It is also a useful classroom tool or curriculum guide, coming from one with a good deal of experience in electronic music education.

Documentation

Documentation kits, which include schematic, wiring diagram, and assembly instructions, on any Aries module are available for \$5.00. This amount will be credited towards the purchase of that module.

Authorized Dealers

Prices are the same whether ordering from a dealer or direct from the factory, but delivery schedules may vary, as we ship to the dealer unless otherwise directed. All of these dealers are qualified to do custom work, repairs, and modifications to electronic music instruments.

Ron Rivera
48 Brighton Avenue, #11
Allston, MA. 02134
(617) 782-6554

Dana McCurdy
164 West 83rd Street
New York, New York
10024
(212) 787-1376

The Boston School of
Electronic Music
127 Kilsyth Road
Brighton, MA, 02135
(617) 734-4500

Carl Fravel
Gentle Electric
140 Oxford Way
Santa Cruz, CA. 95060
(408) 423-1561

ADSR ENVELOPE GENERATOR

The AR-312 provides the classic four-stage envelope control source with Gate and Trigger logic.

- Output:** A positive D.C. voltage, variable according to:
 Attack time — governs initial voltage rise to +10v.
 Decay time — governs change from +10v. to Sustain level voltage
 Sustain Level — voltage at which signal remains until Gate is removed
 Release time — governs voltage change from Sustain level to 0v.
- Inputs:** Gate — positive-going edge initiates Attack, Decay and Sustain follow as designated; negative-going edge initiates Release.
 Trigger — initiates new Attack if Gate is still present. This permits legato keyboard playing where each key initiates a new envelope before the first has finished.

The ADSR output may be used to control any v.c. parameter in the synthesizer, and is most commonly associated with VCA and VCF control. In that manner, the ADSR provides four significant controls over dynamics of sound. This is important, as recognition of sounds by the human ear depends more on the timbral envelope, or dynamics of the harmonic spectrum, than on the harmonic content (static waveshape) of a tone.

- Attack time: 2mS. to 4sec.
 Decay time: 2mS. to 2sec.
 Sustain level: 0v. to +10v.
 Release time: 2mS. to 2sec.
 Gate Input Impedance: 100K ohms
 Trigger Input Impedance: 30K ohms
 Output Impedance: 1K ohms
 Power Consumption: +15v. D.C. @4mA.,
 -15v. D.C. @2mA.



The AR-318 is a sophisticated multi-function module. Its three basic elements function independently, allowing more flexible use of sampling and clocking circuitry. Classic Sample & Hold operation (where a new sample of the voltage source appears at the output with the receipt of each trigger) uses the Trig input. "Track and Hold" operation uses the Gate input, where the output tracks the voltage source precisely, until the gate is removed, then remains at the last voltage level tracked, until a new gate appears. The Clock may function as an independent low-freq. oscillator, whose pulse output is normalized to the Trig input of the S&H circuit (toggle switch selectable). The Noise Generator includes two forms of filtered noise, Pink and Random (sub-audio) as well as full-spectrum White Noise.

Inputs:	Level	Impedance
S&H Gate	2v.-10v.	100K ohms
S&H Trig	2v.-10v.	40K ohms
Clk Sync	2v.-10v.	50K ohms
Clk FM	±10v.	100K ohms
S&H In	±10v.	200K ohms
TRIG. and Sync req.	positive-going edge	
FM	1v./octave	
Gain	1.0	
Outputs:		
S&H Out	±10v.	1K ohms
Drift:	1mV./sec. max.	
Clock: Square	0-+10v.	1K ohms
Sawtooth	0-+10v.	1K ohms
Trigger	0-+10v.	3K ohms
Clock Frequency Range:	3-30Hz	
White Noise	7V RMS	1K ohms
equal energy/cycle, 16Hz-16KHz		
Pink Noise	4V RMS	1K ohms
equal energy/octave, 16Hz-16KHz		
Random Noise	4V RMS	1K ohms
equal energy/cycle, 0.4Hz-7Hz		
Sampling Time:	10 microseconds	
Power Consumption:	+15V. D.C. @ 44mA.;	
	-15V. D.C. @ 24mA.	

SAMPLE & HOLD, CLOCK and NOISE SOURCE

VOLTAGE CONTROLLED AMPLIFIER

The AR-316 is a two-quadrant multiplier, allowing dynamic control of the amplitude of a signal, both from the synthesizer and from an external source. The four audio signal inputs are summed together, and two of these have independent level controls. The same applies to control inputs, where only one input has a level control. The control signals are again summed with the Initial Gain voltage level. The audio signals are then multiplied by the control voltages, in either linear or exponential fashion. In ordinary usage, sub-audio or D.C. control voltages, such as those from the A.DSR, are used to control signal amplitude. Some interesting timbral effects may be obtained by using audio-frequency voltages at the control inputs for high-frequency amplitude modulation.

Maximum Signal Input: $\pm 10v$, p.-p.
Maximum Control Input: $+10v$.
Gain: 0db to -100 db
Frequency Response: D.C. to 30 KHz ($-3db$)
Linear Control: Gain = control voltage/10

Exponential Control:
 $(v = \text{control voltage})$
$$\text{Gain} = \frac{10^v - 10}{2} = 10^{(v-10)/2}$$

Input Impedance: 50K ohms min.
Output Impedance: 1K ohms
Controls: Signal level 1, Signal level 2,
Initial Gain Control level 1,
Mode Switch (linear or exponential)

Connectors: 4 Signal Inputs
4 Control Inputs
2 Outputs

Power Consumption: $+15v$, D.C. @6mA.
 $-15v$, D.C. @6mA.



The AR-315 is a four-quadrant voltage multiplier. The voltage present at Input X is multiplied by the voltage at Input Y. If both inputs are in the audio frequency range, the resultant output is a signal whose frequency spectrum components consist of the sum and difference frequencies of the fundamentals and harmonics of the input signal. These are commonly used to produce bell and gong-like tones.

The module is D.C. coupled; when a control signal is applied to one input, and an audio signal to the other, the AR-315 can function as a VCA.

Both X and Y inputs have associated attenuators. Two floating attenuators are provided in this module — these are not electrically associated with the Balanced Modulator, and may be used anywhere in a patch where extra attenuation is needed. Also within this panel is another 4-jack "patch" or multiple.

Frequency Response: D.C. to 20 KHz ($-3db$)
Maximum Input Level: $\pm 10v$, peak-to-peak
Signal-to-Noise Ratio: 80db
Signal Feed-through: less than 1%, X and Y inputs
Input Impedance: 20K ohms, X and Y inputs
Output Impedance: 1K ohms

BALANCED MODULATOR



HEX ATTENUATOR

The AR-321 consists of six floating attenuators. Input to attenuator 1 can be normalised to 2 or more attenuator inputs to allow multiple use of a single control signal with independent attenuation for each output. This module does not require a back frame or p.c. card assembly, as all necessary circuitry is contained on the panel. (No edge connector, no power consumption - look, ma! six hands!)



DUAL MIXER

The AR-323 may be used both as an audio mixer and as a control voltage 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, as well as variable gain inversion. Each mixer has an independent output. In addition, there are sum (A+B) and difference (A-B) outputs, which allows use of the module as a single 8-input mixer. Matrix stereo effects may be obtained by applying the sum and difference outputs to left and right channels respectively.

Inputs: 4 inputs to Mixer A; 4 inputs to Mixer B

Input Level: $\pm 10\text{v}$.

Outputs: 1 - Mixer A; 1 - Mixer B; 1 - A+B; 1 - A-B

Frequency Response: D.C. to 50KHz (-3db)

Input Impedance: 100K ohms

Output Impedance: 1K ohms

Controls: Gain controls 1 & 2, each mixer
Polarity switch (+ or -) 1 & 2, each mixer

Connectors: A inputs 1, 2, 3, 4;

B inputs 1, 2, 3, 4.

Outputs A; B; A + B; A - B

Power Consumption: +15v. D.C. @12mA.

-15v. D.C. @12mA.



See Figures 1a & 1b, page 12.

The AR-331 features a preassembled, tested sub-module which provides the Pre-Amp and Envelope Follower circuitry. Assembly involves a dozen additional components and wiring front panel controls and jacks.

The AR-331 is a multi-function module incorporating a 40db pre-amp for tape-recorded, microphone, and electric instrument signals; a linear envelope follower and inverter, and a comparator or threshold detector circuit which produces a gate output as long as the input is above the threshold level. Pre-amp output is "normally" connected to Envelope Follower input; Envelope Follower output "normally" connected to Inverter and Threshold Detector. These connections are defeated by a jack inserted to the appropriate plug.

Pre-Amp Inputs: Multiple connectors: 1/4" phone, RCA (phono) and mini (1/8") phone for easy interfacing to external sources. Capacitively (AC) coupled.

Controls: Input Level Attenuator

Output: +40db (x100) above input signal

Envelope Follower:

Inputs: 1 w/attenuator
1v, p.-p., input produces 10v, DC output
Direct Coupled

Outputs: Full-wave Rectifier Output
Linear Envelope Output

Inverter: Unity Gain (max.) w/ Input Attenuator

Threshold Detector: (Comparator)

Input: 0-+10v, (positive comparison only)

"ON" Threshold Level: variable from +5v. to +15v.

Threshold Hysteresis: .34v.
Signals below threshold level do not produce gate.

Signals above threshold level produce a gate.

Input Impedances: 50K min., except threshold signal input - 10K

Output Impedances: 1K ohms, except Gate Out: 330 ohms, and Trig Out: 3.3K ohms

Power Consumption: +15v. @16mA.,
-15v. @12mA.

The Gentle Electric Model 101 is represented by Arles, and will be available in standard module form later this year. It is designed to accurately track an input from instrument or microphone sources to produce a 1v/octave control voltage for synthesizers over a range of 25Hz to 10KHz. It also includes:

Linear and Logarithmic envelope followers

Infinite compression — a signal output that remains at a constant, synthesizer-compatible amplitude, regardless of input amplitude

Low-noise mic pre-amp, which can be used independently and accepts microphones or instrument pick-ups

Track and Hold operation on the pitch follower, controlled by a footswitch, synthesizer, or panel switch

A Pulse wave output at the fundamental input frequency. Pulsewidth is controlled by input waveform.

The GE 101 is an ideal alternative to keyboard control for those musicians who play other instruments or who wish to experiment with combinations of synthesis and acoustic music.

Specified Input Level

(SIL): 0db (noise 1) into LINE IN or -40db into MIC IN w/Line

Level control set for 6db atten.

Overhead onset of clipping: 1db above SIL

Overhead indication: 6db above SIL

Pre-Amp Gain: 40db

Compressor Out: 10v, p.-p., (trimmable)

Threshold of Compression: 40db below SIL

Gate Threshold: on: 20db below SIL;

off: 25db below SIL
(3db hysteresis)

Gate Output: 0v, (off) when sig. is below gate threshold
10v, (on) when sig. is above gate threshold

Trigger Output: 3mS, pulse to 10v, when either Gate output goes on OR when sign. amplitude increases at a rate exceeding that which is set up by the RETRIGGER control.

Linear Env. Output: proportional to fullwave peak amplitude (5v, nom. for SIL)

Log Env. Output: 1v, change for 10v, change in amplitude (10v, nom. for SIL)

Pitch: 1v/OCT Output: When signal is above gate threshold, this follows extracted fundamental pitch at 1v/OCT (trimmable). When signal is below threshold (or when HOLD function is activated) it holds the last pitch received.

HOLD Drift: (at Pitch) 1v/OCT output) less than 22mV (1.5%) per minute.

PRE-AMPI/ENVELOPE FOLLOWER

(not shown)

PITCH and ENVELOPE FOLLOWER

The AR-317 generates all the basic synthesizer waveforms simultaneously: sawtooth, triangle, variable width pulse (square) and sine. An exceptionally well-engineered sine converter provides a pure, low-distortion sine wave allowing very clean balanced modulation. The AR-317 uses exponential frequency control providing 1/2 octave control of frequency over the entire audio range. Control voltage inputs are summed; each positive volt doubles the frequency, and each negative volt halves it, over an extremely wide range (negative control voltage may be used to drive down as low as .002Hz, positive as high as 50KHz).

- Frequency Range: (Manual Control) 0.03Hz - 30Hz low range 18Hz - 16KHz high range
- Control Input Level: $\pm 10v$, max.
- Sync Input: positive-going edge causes all waveforms to reset
- Sync Input Level: 2v, min. - 10v, max.
- Pulse Width: variable 0 to 100% of duty cycle (50% = square wave)
- Pulse Width Modulation: 10% per volt at input. Max. input $\pm 10v$.
- Input Impedances: 50K ohms min.
- Output Impedance: all outputs, 1K ohms
- Controls: Course Frequency, Fine Frequency (1/12 octave)
- Control Input Level 1, Pulse Width
- Connectors: 4 control inputs (1 w/attenuator)
- Sync. Input, Pulse Width Modulation Input
- Four Waveform Outputs
- Power Consumption: +15v. D.C. @36mA.; -15v. D.C. @39mA.

See Figure 2, page 12



The AR-332 features two pre-assembled and tested voltage controlled sawtooth generators. This simplifies greatly the time required for successful assembly.

The AR-332 is two fully independent sawtooth pulse VCO's. These waveforms have the highest harmonic content of all the basic synthesizer signals, and though the AR-332 omits the triangle and sine wave outputs, it is in all other respects like two AR-317's and offers a savings of costs and space over that module. One oscillator of the AR-332 is 'normally' sync'd to the other - this is defeated by the insertion of a dummy plug into the sync input jack.

See Figure 3, page 12



All spec's like AR-317, except:

- Controls: Dual Concentric potentiometers for all controls. Each oscillator has course and fine freq. control. Control signal input attenuator and pulse width setting. High-or-Low Range switch
- Output levels: 0v. to +10v., both sawtooth and pulse
- Power Consumption: +15v. @17mA.; -15v. @25mA.

DUAL SAWTOOTH/PULSE VCO



The AR-324 is a multi-function module providing control voltage signal sources and signal processors. The two low-frequency oscillators have independent manual frequency control, and are syncable. The LAG circuit is a 60b-per-octave low-pass filter, with a variable, very low cut-off frequency. The LAG is used to limit the rate of change of a control signal, like the portamento circuit in the AR-313 Keyboard Control, or to "round off" the edges of a low frequency pulse to produce a usable envelope.

- LFO's: Frequency range: 0.3Hz to 30Hz
- Output Waveforms: Sawtooth: 0v.-+10v.; Square: 0v.-+10v.; Triangle: -5v.-+5v.
- Sync Input: positive-going edge req., 2v. min. to 10v. max.
- Sync Input Impedance: 47K ohms
- LAG: Gain: 1.0
- Lag Time: variable, 1ms. to 1 sec.
- Input Impedance: 1K ohms at min. Lag; 1M ohms at max. Lag
- Input Level: $\pm 10v$, max.
- INVERTER: Gain: variable, 0 to -1.0
- Input Level: $\pm 10v$, max.
- Input Impedance: 50K min.
- Output Impedance: 1K ohms, all outputs
- Controls: LFO-1 frequency; LFO-2 frequency; LAG time; INVERTER gain
- Connectors: LFO-1: Sync In, Sawtooth Out, Square Out, Triangle Out; LFO-2: same as LFO-1; LAG In, LAG Out; INVERTER In, INVERTER Out
- Power Consumption: +15v. D.C. @48mA.; -15v. D.C. @20mA.

DUAL LFO, LAG, and INVERTER

VOLTAGE-CONTROLLED LP FILTER

The AR-314 is a basic 12dB-per-octave low pass filter with voltage controllable cut-off frequency and variable resonance (Q). This filter modifies the harmonic content, or spectrum, of an incoming signal by damping all frequency components of the waveform above a certain cut-off point. The resonance control boosts the amplitude of the frequency, or harmonic of the incoming wave, closest to the cut-off frequency, by a variable amount according to the manual setting. The control input varies the cut-off frequency at 1 octave per volt of input signal: positive voltage will raise the cut-off and negative voltage will lower it.

- Frequency Response: 16Hz to 16KHz
 Q (Gain at Cut-off Freq.): 0.5 to 50
 Maximum Signal Level: $\pm 10v$, peak
 Signal-to-Noise Ratio: 70db min.
 Control Input: $\pm 10v$, 0v-1v, octave
 Signal Input Impedance: 50K ohms min.
 Control Input Impedance: 50K ohms min.
 Output Impedance: 1K ohms
- Controls: Initial Freq., Resonance (Q), Signal
 1 Input Attenuator Control 1 Input
 Attenuator
- Connectors: 4 Signal Inputs
 4 Control Inputs
 2 Outputs
- Power Consumption: $\pm 15v$, D.C. @20mA,
 $-15v$, D.C. @20mA,



MULTIMODE VC FILTER

The AR-327 is a voltage controlled, state variable filter with simultaneous HIGHPASS, LOWPASS, BANDPASS, and switch-selectable NOTCH or PEAK outputs. It also features extremely high, voltage-controllable Q without filter oscillation: exclusive dynamic Q limiting prevents overloading even at full signal input levels and High Q setting. Q voltage control input varies the amount of resonance, resonant frequency is determined by the cut-off setting or freq. control input. The various filter outputs may be mixed to achieve complex timbres and waveforms. These functions are also similar to studio equalization, and may be used for stereo system equalization. Phasing sounds may be achieved by sweeping the cut-off freq. while using the NOTCH out.

- Frequency Response: 16Hz -25KHz
 Signal-to-Noise Ratio: 70db
 Distortion: less than 0.05% typically
 Q (Gain at Cut-Off Freq.): 0.5 to 512
 Signal Levels: $\pm 10v$, peak



- Input Impedance: 50K ohms
 Output Impedance: 1K ohms, all outputs
 Controls: Initial (Cut-Off) freq., Resonance
 Audio 1 Input Attenuator
 Freq. Control 1 Input Attenuator
 NOTCH/PEAK switch select
- Connectors: 3 Audio Signal Inputs
 3 Freq. Control Inputs
 2 Q Control Inputs
 1 NOTCH or PEAK output
 1 LOWPASS output
 1 HIGHPASS output
 1 BAND PASS output
- Power Consumption: $\pm 15v$, D.C. @15mA,
 $-15v$, D.C. @17mA.

AR-329 PHASE FLANGE

Note: 3-pin audio connectors "Left" and "Right" are no longer used for the rightmost row of audio jacks. Instead, they are now designated as follows: Left, Left 2, and Right and Right 2 (from left to right). All other connectors: their left side is NEG. (negative of ground) and their right side is PHASED (only right side).

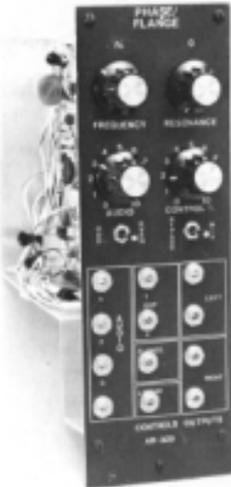
PHASE/FLANGE

The AR-329 is a voltage controlled phaser. Usually people think of phasing as a special effect - swooshing, jet sounds, etc. Very few people have had a chance to use a phaser that isn't controlled by an internal oscillator, so fail to discover that a phaser can be a uniquely effective timbral modifier. The AR-329 has a manual center frequency control to set the initial center frequency of its 4-to-5 peak frequency response curve, and a manual center resonance control which can bring this very stable device to the brink of self-oscillation (ringing) on the smallest input signal. Two input attenuators, one for ALL 4 audio signal inputs, and one for the first exponential control input complete the control complement.

The control input sensitivities available make this an extraordinarily flexible unit. The first 2 control inputs are exponentially sensitive, one fixed 1v/oct., and the second aresaturable. These are used for the standard phasing effect where a sine or triangle is applied to control frequency. With the keyboard control voltage applied the AR-329 becomes a voltage-controlled formant filter producing four or five formant peaks whose relationship is fixed. Used this way, the 329 is a unique timbral modification. The linear input is primarily designed to be used with envelope follower outputs, and moves the phase frequency as the amplitude of the followed signal changes. The flange input has a reciprocal sensitivity whose response simulates the response of a swept flanger, which slows the swoosh up to infinity at an ever increasing rate. The EVEN mode has four formant peaks and produces a "fat" sound rich in high and low harmonics. The ODD mode has 5 formant peaks, and produces a thinner, reedy sound.

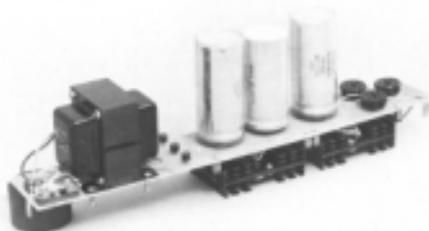
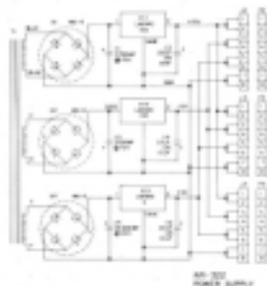
- Input Impedance: 50K ohms
 Output Impedance: 1K ohms
 Power Consumption: $\pm 15v$, D.C. @12mA,
 $-15v$, D.C. @11mA.

See Figure 4, page 12.



POWER SUPPLY

No, this is not a New Jersey oil refinery. The AR-322 has enough muscle, though, to drive approximately 50 series 300 modules, providing +15 volts, -15 volts, and +5 volts, at 1 Amp each. It is well-regulated to insure stability and tuning accuracy of your synthesizer.



STEREO REVERB & OUTPUT

The AR-322 incorporates all of the functions of the AR-328 Output and Power, and then adds several features to produce a module of significantly increased musical prowess.

Each of the two input signals which can be accommodated is split, fed to an attenuator for level control, then to a pan pot for placement of the dry, unreverberated signal anywhere in the stereo field, and fed to the reverb network: a pot at the beginning of the reverb network allows continuous panning from input 1 only to the reverberation device to input 2 only. A second dial concentric pot gives independent control of the reverb level on each output channel. Two independent CASCADE REVERBERATION DEVICES by D.C. Electronics give more spaciousness and realism than the signal delay devices found on many synthesizers. These reverbs are spring-type delay lines, but sound significantly better than other springs we've heard.

Input Impedances: 50K nominal
Output Impedance: 230 ohms minimum
Input Signal Level: 20v. p-p. (for optimum S/N)

Signal-to-Noise Ratio: better than +60db
Controls: 2 Input Attenuators (1 ea. channel)
2 pan pots (1 ea. channel)
1 Reverb source pan pot
1 Dual concentric Reverb Level pot.

Power Consumption: +15v. D.C. @39mA.;
-15v. D.C. @27mA.

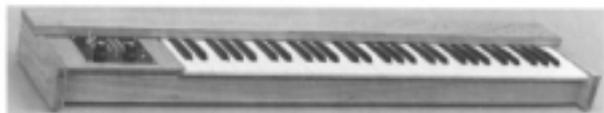


OUTPUT & POWER

The AR-322 handles the basic output and power interface requirements of any Aris system. It receives two input signals from the synthesizer and produces output signals appropriate for use with standard stereo system equipment or musical instrument amplifiers. (P.C.A. phono jacks) These outputs will also drive high-impedance (60+ ohms) speakers directly. A stereo headphone (1/4" phono) jack is also provided. D.C. voltages of +10v. and -10v. are provided via the front panel jacks, as are two 4-jack multiples. Two input level controls and Power on-off switch are included.



KEYBOARD GROUP



The Keyboard Group consists of three elements: the AR-311 Five Octave Keyboard, AR-313 Keyboard Electronics, and AR-320 Keyboard Cabinet.

The Keyboard is still the most frequently used synthesizer controller, offering immediate, precise control of any v.a. parameter.

Outputs:

Voice — this is the main control voltage output, providing a D.C. voltage proportional to the lowest key being held down. With the Tuning Control at center position, the lowest key (C) provides 0v. out, the next key (C#) 1/12v., so that 1 octave = 1 volt. (6 jacks)

Aux. Voice — provides the necessary output for 2-voice operation: a D.C. voltage proportional to the interval between the lowest and highest keys being held down. When added to the Voice output at the Vaux control input of a VCO, when another VCO receives only the Voice output, the VCO's will track whatever interval of keys is played. (2 jacks)

Gate — provides +10v. whenever a key is depressed.

Trigger — provides a +10v., 1ms. pulse whenever a key is depressed.

Controls:

Tuning — adds or subtracts voltage from the main Voice output (has no effect at or near its center position). This may be used as a "stretchband" control, making notes sharp or flat. Range: 1.5 volts

Portamento — causes a glide, or lag time, between notes by slewing the voltage from one level to the next according to the amount set by the control pot. The portamento Mode switch selects Normal (responsive) or Linear response — in the former, about the same amount of time is required to glide over small intervals as large intervals; in Linear, the glide takes longer for long intervals and is a more uniform glide. The On-Off switch allows the player to select or remove Portamento at any time. (Portamento Lag time: 0 to 0.5 sec.)

Trimming:

The Keyboard electronics contain two trims: **Voice** and **Aux. Voice**. These set the respective output intervals to 1 volt/octave precisely. They should not normally be needed, but if necessary can be adjusted in five simple steps.

Output Impedances:

Gate and Trigger — 1K ohms; Voice and Aux. Voice — 50 ohms

Power Consumption: +15v. D.C. @10mA.;
-15v. D.C. @10mA.

On Synthesizer Controllers

The single major leap that the synthesizer makes from the old (basic?) electronic music studio is voltage control — voltage controlled oscillators, filters, amplifiers, pulse-width modulators, shapers, and so on. Voltage control means that any voltage signal can vary any v.a. parameter: pitch, drive, loudness; synthesizers usually don't care much where the voltage comes from: a computer, a keyboard, a simple potentiometer, or any transducer — microphone, electroencephalograph electrode — anything — as long as the voltage's amplitude is within the synthesizer's range (1/12 volt for a semi-tone change at V.C.O. for example) less than ±15v.

The keyboard is the most common type of controller because it offers precise, and readily accessible stepped voltages and timing signals. The sample, track and hold circuit found in the AR-3180 is another common and relatively inexpensive controller. Most frequently heard producing pseudo-random voltages, this module can also be used to create arbitrarily long repeating patterns by sampling periodic waveforms, and these patterns can be made shorter and quite stable by feeding back a bit of the SYN output to the SYN clock oscillator, or by using the sync feature on the SYN clock and the oscillator producing the sampled signal.

Sequencers are another extremely useful controller for producing pitch/rhythm patterns. These are usually one of two types: the shorter, (8 event to 16 event) analog type which use potentiometers as "memory," and the longer (24 to 256 event) digital memory type.

Aris is presently developing an integrated synthesizer controller built around a 4-voice for 8-voiced digital keyboard and including two types of sequencing, a programmable rhythmic pattern synthesizer and pre-patch storage.

CABINETS

All Aris cabinets are now made of highgrade, finely laminated 3/4" plywood. Kits are shipped with all parts cut and drilled; assembled cabinets are finished with polyurethane varnish. All cabinets include aluminum supports for module mounting, and 22-gauge edge connectors for p.c. boards, allowing custom hand-welding or "normalised" patch connections to be made.

AR-310 — holds 11 Aris 300 series modules plus power supply. Weight: 25 lbs.

AR-330 — holds 14 Aris 300 series modules plus power supply, keyboard and keyboard electronics. Weight: 50 lbs.

AR-340 — holds 7 Aris 300 series modules and power supply. Weight: 14 lbs.

AR-320 — holds the entire keyboard and keyboard electronics.

All cabinets are pictured with the Sample Systems on the next two pages.

BASIC PATCH SYSTEM I

AR-340; AR-322; AR-316; AR-332; AR-314; AR-326; AR-312; AR-311; 313, 320 (Keyboard Group)



SAMPLE SYSTEMS

The four sample systems shown here are intended not as definitive, "What-you-ought-to-buy" systems, but as four different, viable instruments — from a mini or entry-level system on up to a moderate size instrument of great versatility. Aris is fully committed to the modular concept because a musician/composer knows what kind of instrument will best meet his creative/expressive needs, and a fully modular system allows optimum fulfillment of a diverse spectrum of musical needs and desires.



SYSTEM II

AR-310; AR-322; AR-317 (2); AR-312 (2); AR-316; AR-318; AR-323; AR-324; AR-326; AR-327;
AR-315; Keyboard group



SYSTEM III

AR-300; AR-322; AR-312; AR-317; AR-332; AR-327; AR-316; AR-316; AR-318; AR-323;
AR-324; AR-328; AR-329; AR-331; AR-314; AR-311, 313 Keyboard



SYSTEM IV

AR-310; AR-322; AR-340; AR-312 (2); AR-314; AR-316 (2); AR-316; AR-317 (2); AR-318;
AR-323; AR-324; AR-327 (2); AR-328; AR-329; AR-331; AR-332; Keyboard Group

- ATTENUATE** – reduce amplitude or signal level
- AUDIO SIGNAL** – within the frequency range of human hearing (approx. 16Hz - 16000)
- CONTROL VOLTAGE** – any signal used as a control input (generally, but not necessarily, sub-audio)
- dB/OCTAVE** – change in signal level (decibel) per octave (frequency)
- D.C.** – Direct Current, or a voltage with no periodic, fluctuating component.
- ENVELOPE** – contour of an event, or note, in terms of changing amplitude or harmonic structure for the duration of the event.
- ENVELOPE FOLLOWER** – device which produces a D.C. voltage directly proportional to the amplitude contour of an input signal.
- FORMANT** – a characteristic resonance in an instrument or voice, regardless of frequency.
- FREQUENCY** – cycles-per-second (rate of fluctuation)
- GATE** – signal used to 'gate' – that is, to hold ON or OPEN a circuit (circuit is OFF or CLOSED when gate is not present). A duration signal.
- HARMONIC** – frequency component of a signal that is above the fundamental, or lowest frequency. Usually a signal contains several harmonics, in a particular order, or series.
- IMPEDANCE** – electrical resistance, measured in OHMS
- Hz** – Hertz, equal to cycles-per-second (frequency)
- K** – Kilo, or one thousand (as in 1K ohms, or 1800K)
- MULTIPLE** – a set of connectors shorted together, so that a signal going in to one connector will appear as an output at all other connectors of the multiple
- POLARITY** – positive or negative nature of a voltage or signal. A signal that is inverted changes to the opposite polarity.
- PULSE WIDTH** – percentage of peak voltage, or 'on' time, in the duty cycle of a pulse wave
- RESONANCE** – an exaggerated or sympathetic frequency (every acoustic instrument has resonances in its material, be it wood, brass, or strings; a synthesizer filter can be made to resonate at a specific frequency chosen as center or cut-off)
- SAMPLE** – to look at the voltage state of a signal at any particular instant with the appropriate (sampling) circuit.
- SLEW** – to slow the rate of change of a signal (equivalent to LAG and PORTAMENTO)
- SPECTRUM** – as in frequency spectrum; usually denoted the harmonic content of a signal
- TIMBRE** – aural texture of a sound; brass instruments have a 'bright' timbre, wind instruments a 'mellow' timbre. Relates directly to waveform and harmonic spectrum in synthesis.
- TRACK** – to follow and reiterate a signal without altering it
- TRIGGER** – a short, nearly instantaneous signal or spike, rising from 0s to some positive voltage and returning to 0s. An initiation signal.

AR-331 PRE AMP/ENVELOPE FOLLOWER

FIGURE 1a

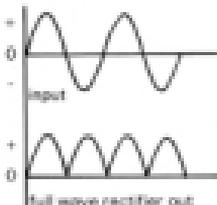
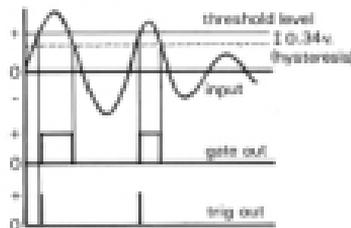
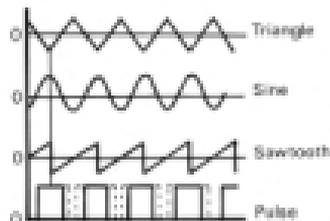


FIGURE 1b



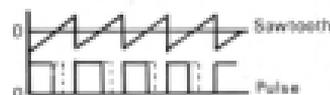
AR-317 OSCILLATOR

FIGURE 2



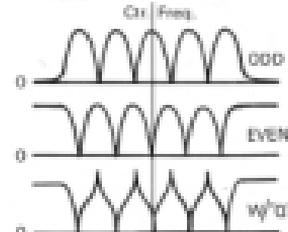
AR-332 DUAL OSCILLATOR

FIGURE 3



AR-328 PHASE FLANGE

FIGURE 4



ORDERING INFORMATION

Credit MasterCard orders accepted
 Credit is extended only to accredited educational institutions
 (terms - Net 30 days)

C.O.D. C.O.D. orders must be accompanied by a minimum 50% deposit

International Orders From Canada, send U.S. funds
 Outside U.S. and Canada, send International Money Order

Delivery Time Assembled System: 6 weeks delivery
 Kits: Usually sent in two or three shipments, 1 or 2 weeks apart. Consult factory for special delivery requirements

Discount Quantity Discount:
 Orders over \$1000. - take 5% off total price
 Orders over \$2000. - take 10% off total price

Order Form Please send this form if you wish to retain price list

Number	Description	Kit price	Wired price	Weight	Quantity	Kit or Wired
AR-210	Basic Cabinet (11 module space)	\$ 82.00	\$155.00	20 lbs.		
AR-230	Integral Cabinet (14 module & Kit)	\$350.00	50 lbs.		
AR-240	Mini-cabinet (7 module space)	\$ 69.00	\$ 75.00	14 lbs.		
AR-211	Five Octave Keyboard	\$119.00		10 lbs.		
AR-213	Keyboard/Interface Electronics	\$ 62.00	\$276.00	3 lbs.		
AR-220	Keyboard Cabinet	\$ 52.00		14 lbs.		
AR-212	ADSR Envelope Generator	\$ 67.00	\$110.00	3 lbs.		
AR-214	Lowpass Voltage Controlled Filter	\$111.00	\$184.00	3 lbs.		
AR-215	Balanced Modulator	\$ 66.00	\$121.00	3 lbs.		
AR-216	Voltage Controlled Amplifier	\$ 68.00	\$121.00	3 lbs.		
AR-217	Four Waveform V. C. Oscillator	\$129.00	\$182.00	3 lbs.		
AR-218	Sample & Hold, Noise, V. C. Clock Module	\$ 71.00	\$121.00	3 lbs.		
AR-221	Pre-Amp & Envelope Follower	\$149.00	\$275.00	3 lbs.		
AR-221	Hex Attenuator	\$ 46.00	\$ 70.00	3 lbs.		
AR-222	Power Supply	\$ 60.00	\$132.00	9 lbs.		
AR-223	Dual Mixer	\$ 71.00	\$121.00	3 lbs.		
AR-224	Dual Low Frequency Oscillator	\$ 71.00	\$121.00	3 lbs.		
AR-226	Power & Output	\$ 67.00	\$ 99.00	3 lbs.		
AR-227	Multi-mode V. C. Filter	\$159.00	\$249.00	3 lbs.		
AR-228	Stereo Reverb and Output	\$159.00	\$235.00	4 lbs.		
AR-229	Phase/Flange Module	\$155.00	\$235.00	3 lbs.		
GE-101	Pitch & Envelope Follower	\$249.00	7 lbs.		
AR-232	Dual Smooth/Pulse V. C. Oscillator	\$179.00	\$299.00	4 lbs.		

User's Manual \$ 5.00
 Documentation (5/6) \$ 5.00

All prices F.O.B. Salem, Ma.

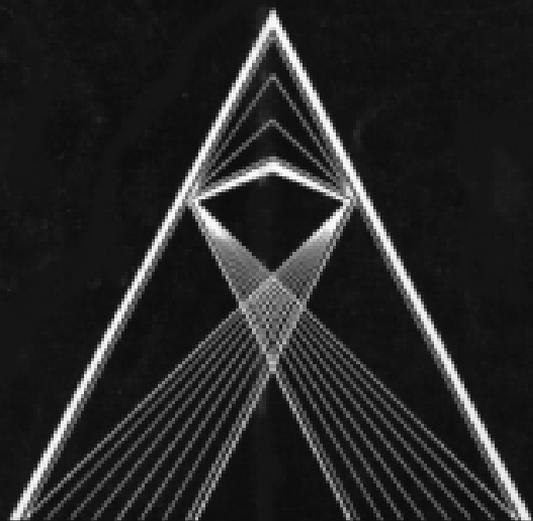
Not Available in kit form.

Include allowance for UPS shipping, or contact us for details.

NAME _____ PHONE _____ TOTAL _____

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