

APHEX II

A NEW GENERATION OF AURAL EXCITEMENT

FROM
APHEX SYSTEMS, LTD.
—THE ORIGINATORS OF
AURAL EXCITEMENT

APHEX DRIVE

This controls the amount of drive to the Aphex side chain. It should be set so the red/green level indicator is green, flashing red on signal peaks. The effect is level dependent and sufficient drive is necessary for proper harmonic generation.

TUNING

Sets the corner frequency of the high pass network between 700 Hz and 7KHz. Initial setting should be 12 o'clock. A lower setting is suggested for bandwidth limited mediums. A most effective setting may also depend on the program material (e.g. voice overs, a setting tuned to maximize intelligibility on voices.

DAMPING

Adjusts the damping ratio of the side chain filter network giving somewhat of an equalizing effect. CCW produces a flatter, more even response, while CW will result in a brighter, peakier sound. The overall effect will be somewhat interactive with the tuning control. A 12 o'clock setting is suggested for initial set up.

TIMBRE

The most subtle yet useful control. Timbre varies the spectral quality of the generated harmonics. Pure even (CCW) are warm, round and musical. Pure odd (CW) are sharper and will greatly enhance the percussive edges of the signal. Settings will depend greatly on

the harmonic structure of the particular tracks being processed and how prominent the tracks are within the mix. This control will be finally set more by "feel" than by listening.

LIMITER

Because the generated harmonics are level dependent, high signal peaks may cause "splashiness". To prevent this, the Limiter is used on the side chain only. The level at which the Limited is engaged is set by Threshold. T-Release sets the release time of the Limiter from fast CCW to slower CW. If the Limiter is used only to prevent "splash" T-Release should be set at approximately 11 o'clock. Lengthening the release will cause the Limiter to act more like a compressor,

allowing greater amounts of side chain to be added back into the output. This will concentrate the brightness effect but may tend to diminish overall transparency.

MIX

Sets the amount of Aphex side chain output added back into the total output. CCW is pure source, moving clockwise adds more effect. At the full CW position there is a clickstop which eliminates source so that the output is only the side chain. The latter position would be used for external mixing (e.g.-echo sends/returns).

LIMIT L.E.D.

Shows onset of Limiting action.

LEVEL

Attenuates the level of the total output from unity gain (cal position) to -20dB.

DRIVE LEVEL

(green/red) L.E.D. Shows drive level to Aphex side chain.

PEAK L.E.D.

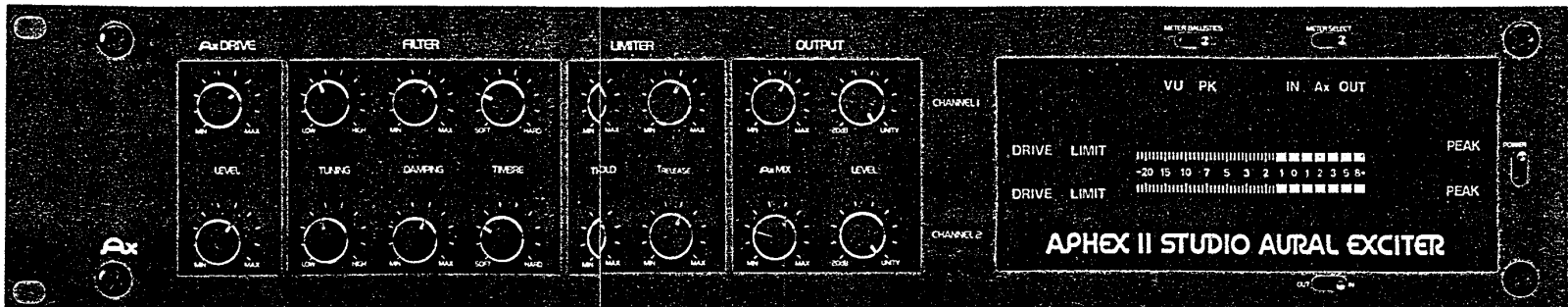
Lights when output is 2dB below clipping level.

IN-OUT SWITCH

Disables side chain for instant comparison between processed and unprocessed signal.

ON-OFF SWITCH

AC power to unit.



ALL NEW DESIGN
COMPLETE CONTROL OF ENHANCEMENT PARAMETERS
FLEXIBILITY TO COMPLEMENT ANY PROGRAM MATERIAL
MOST ADVANCED ELECTRONIC COMPONENTRY
FAST, ACCURATE ELECTRONIC METERING
EASILY INTERFACED WITH ANY SYSTEM

The Aphex Aural Exciter has become a standard in the music industry and has been used for years on thousands of albums, movies, broadcast productions, commercials and concerts. The Aural Exciter is now accepted as a unique method to achieve clarity, definition and dimensionality in reproduction of sound. The program material literally "opens up", possessing more detail and intelligibility, as well as greater apparent frequency and dynamic range. The sound quality is less subject to degradation through the various generations and transmissions from production to final consumer.

The Aphex Aural Exciter achieves these effects by creating a signal composed of frequency dependent phase shift, amplitude dependent harmonics, and mixing this signal with the original.

In any natural acoustic environment a listener will hear the primary signal as well as slightly delayed, low level reflections. The phase shifted signal, when mixed back into the original signal, provides a simulation of these reflections, thus generating more natural ambient information. Because the phase shift creates time delays too short to be perceived as an echo or reverb, it is perceived as an increase in the impulse

duration. Tests have shown that listeners presented with two signals of equal amplitude and different duration will perceive the signal with longer duration as louder.

The Fletcher-Munson curves show that a listener with normal hearing is most sensitive to changes in the 3 to 5 KHz range. This range is critical for directio perception and intelligibility. Since the Aural Exciter is especially effective in that frequency range, the increase in detail and presence, due to the Aural Exciter, is most dramatic.

The only way a listener can differentiate between instruments is through overtones. The louder the fundamental the greater the amount of these overtones. The Aural Exciter generates harmonics in the same manner. The harmonic structure of each instrument is thus strengthened, allowing it to stand out from the other instruments.

An equalizer can only cut or boost a particular section of the audio spectrum. Therefore, if an equalizer is used to brighten the high end, all the noise and distortion will increase also. The high end of the input to the Aural Exciter can be rolled off and the Aural Exciter will

generate a brighter, cleaner, more natural high end.

Another important difference between the Aural Exciter and other processing equipment is, the Aural Exciter will not induce listener fatigue the way large amounts of equalization or other processing will.

In summary, the total effect of the Aural Exciter is directed towards a sound closer to the original acoustic event.

STUDIO USE

Aphex processing gives the best results and the greatest flexibility in mixdown applications, but can also be used in tracking and mastering.

It is best used in a foldback configuration similar to echo or other external effects, where channel sends can be individually mixed. If separate monitor, echo or cue sends are not available, the mix or stereo busses can be used with reduced flexibility in a "blanketing" effect. It sounds best if the Aural Exciter pan follows the original track pan. This is easiest if two post-fader sends are used to Aural Exciter channels A and B.

The send levels must be high enough for proper harmonic generation. The return faders should then be set 10 to 20 dB below the main signal according to the desired effect. The effect is addictive, and discretion is advised so that the unit is not overused.

SOUND ENFORCEMENT

The Aural Exciter can be used with most public address systems in the same manner as studio equipment. If separate echo or monitor sends are not available, the unit can be connected in series between the mixer and power amp. In this situation, the Aural Exciter mix would be introduced into the chain in the mix pot.

Aphex processing is especially useful in reverberant halls or halls that have "dead spots". It will spread the sound more evenly without adding any level to the total mix. The unit's ability to bring voices and instruments out makes it especially useful for monitor mixing, without increasing feedback.

FILM AND VIDEO USE

The Aural Exciter has been used on many videotape and motion picture productions to enhance the sound-track by recapturing the live feeling

often lost or impaired in location. It is unique in its ability to sharpen dialogue, making voices more intelligible while retaining their natural quality. The looping process often required to complete a film or video work is greatly aided by the use of the unit as the Aural Exciter allows the engineering to tie the loop sound much more closely to the live sound. The effect is maintained in transfer from magnetic tape to optical and kept intact through duplication.

Video and film audio are both bandwidth limited and compressed. The Aphex II is especially useful in creating the perception of higher frequencies and greater dynamics, thus bringing more presence and clarity to the final product.

LEVELS

For best results, establishing correct levels is important. For that purpose, the dynamic range is internally selectable to maximize signal to noise ratio for any particular reference level. Metering reference level is selectable for 0 VU = 0, +4, +8 dBm or user definable position.

APHEX II

CIRCUIT DIAGRAMS & LAYOUTS

① SIGNAL PATH & PROCESSING CIRCUITS

Group 200	Balanced Instrumentation type Input Amplifier Input Level Selection (+27, +24, +21dB or option) Calibration Trimmers - VTF Meter Input Level Feed
Group 300	Side Chain Circuit - Highpass Filter - Tuning Damping - External Sidechain Access & Reference Drive Control - Drive (Green-Red) Detector Feed Timbre Control (Odd/Even Harmonics)
Group 400	VCA Circuit - Bias Trimmer Proof Operate In/Out Circuit Remote Ax In/Out Opto Isolator
Group 500	Limit Detector Circuit Threshold Control - T-Release Control Limit LED Indication Feed
Group T-600	Output Circuits - Ax Solo/Mix Switching Ax Solo/Mix Switching & Ax Level Control Total Output Level Control and Calibration Trimmer Output Level Select (+27, +24, +21dB or option) Output Amplifier - Balanced Floating Transformer Peak LED Indication Feed - VTF Meter Ax Feed VTF Meter Output Level Feed
Group E-600	Transformerless Output Option

② METER & INDICATOR CIRCUITS

Group 700	Peak LED Indicator Circuit Limit LED Indicator Circuit
Group 800	VTF Meter (Signal Level) Meter Circuits Meter Source Select (Input/Ax/Output) Meter Calibration - VU/Peak Mode Selection
Group 900	Ax Drive LED Indicator Circuit (Green-Red) Green-Red Threshold Trimmer

③ POWER SUPPLY

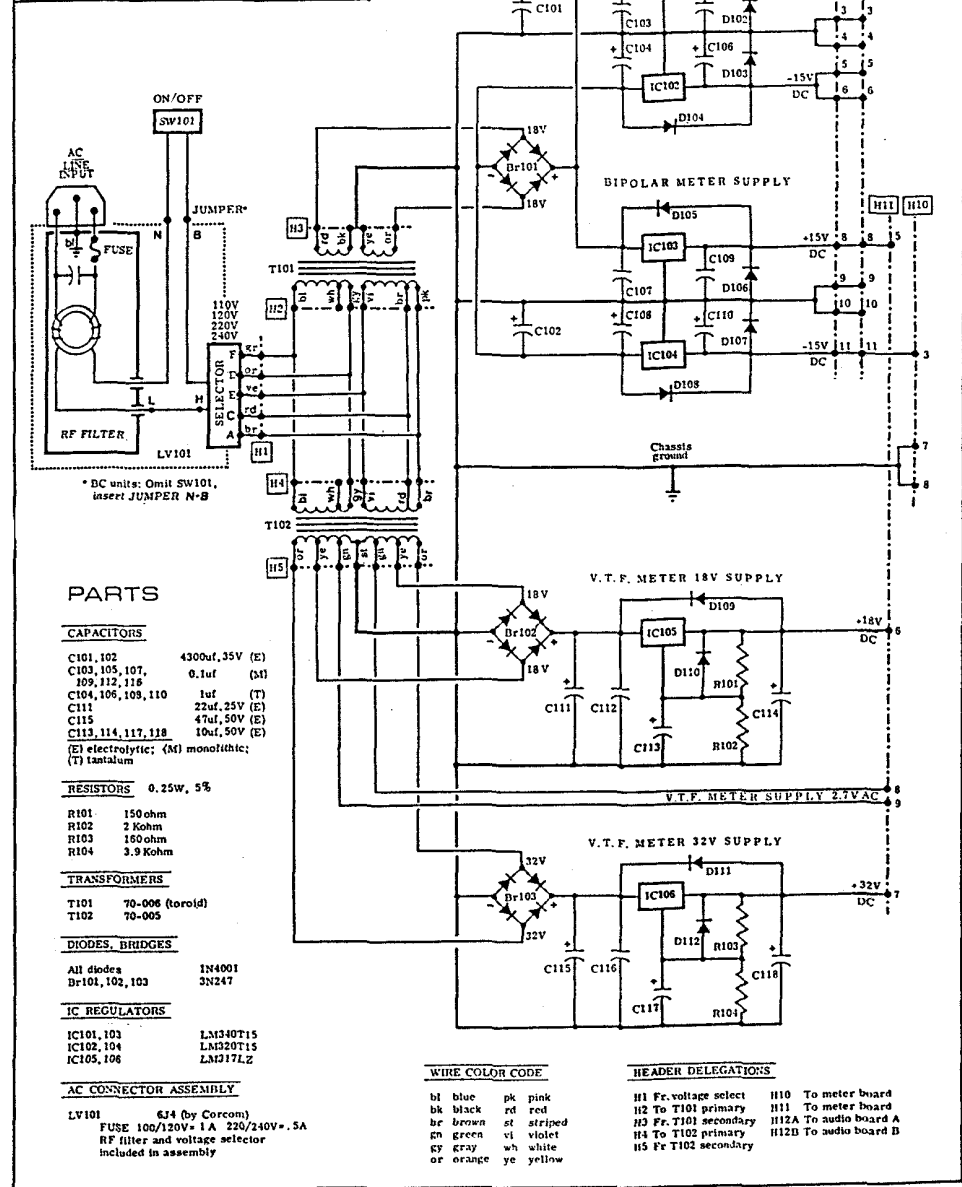
Group 100	Line Input - Fuse - RF Filter - Voltage Selector Power Transformers - Rectifiers Bipolar Audio Supply - Bipolar Meter Supply VTF Meter Supplies (+18VDC, +32VDC, +2.7VAC) Power Distribution Header Pin-number Delegation
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④ PC BOARDS & PARTS LAYOUT

Audio Board - Power Board - Meter Board

APHEX II SCHEMATIC POWER SUPPLY

SCALE: none APPROVED BY: DRAWN BY: CK
 DATE: Feb. 1982 REVISED: May 1983
 APHEX AURAL EXCITER MODEL II U.S. patents 4,150253, 4,155047 & foreign patents issued or pending
 APHEX SYSTEMS LTD DRAWING NUMBER: 81011
 Los Angeles, Ca 90046



PARTS

CAPACITORS

C101, 102	4300uf, 35V (E)
C103, 105, 107, 109, 112, 118	0.1uf (M)
C104, 106, 108, 110	1uf (T)
C111	22uf, 25V (E)
C115	47uf, 50V (E)
C113, 114, 117, 119	10uf, 50V (E)

(E) electrolytic; (M) monolithic; (T) tantalum

RESISTORS 0.25W, 5%

R101	150 ohm
R102	2 Kohm
R103	180 ohm
R104	3.9 Kohm

TRANSFORMERS

T101	70-006 (toroid)
T102	70-005

DIODES, BRIDGES

All diodes	1N4001
D101, 102, 103	3N247

IC REGULATORS

IC101, 103	LM340T15
IC102, 104	LM320T15
IC105, 106	LM317LZ

AC CONNECTOR ASSEMBLY

LV101	614 (By Corcom)
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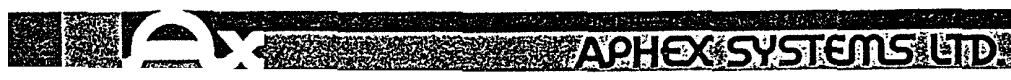
FUSE 100/120V-1A 220/240V-5A
 RF filter and voltage selector included in assembly

WIRE COLOR CODE

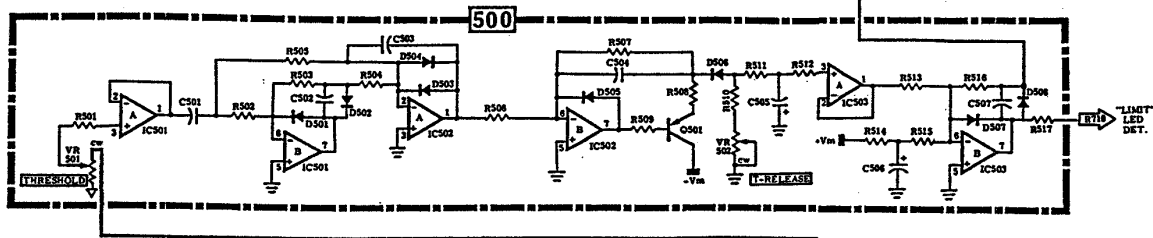
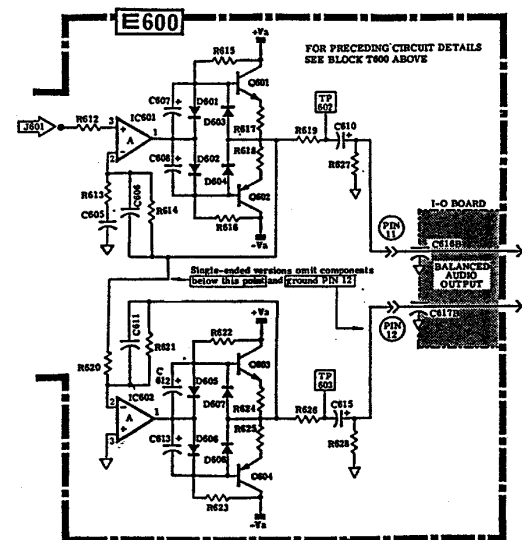
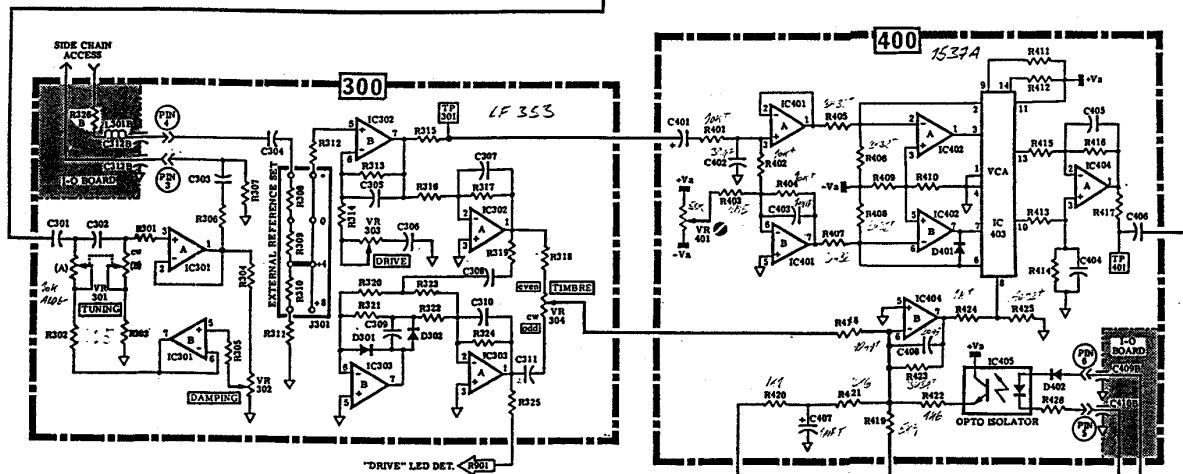
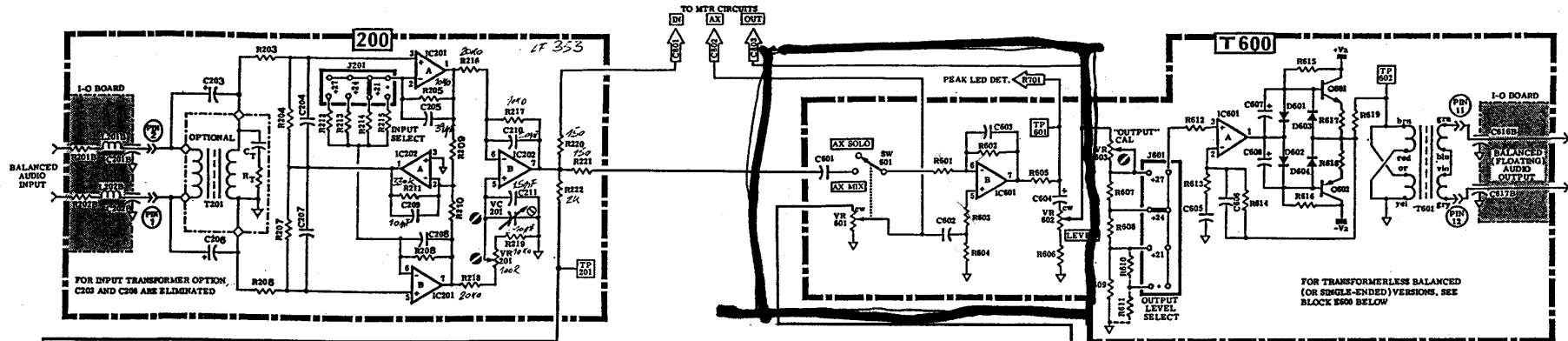
bl	blue	pk	pink
bk	black	rd	red
br	brown	st	striped
gn	green	vi	violet
gy	gray	wh	white
or	orange	ye	yellow

HEADER DELEGATIONS

H1	Fr voltage select	H10	To meter board
H2	To T101 primary	H11	To meter board
H3	Fr T101 secondary	H12A	To audio board A
H4	To T102 primary	H12B	To audio board B
H5	Fr T102 secondary		

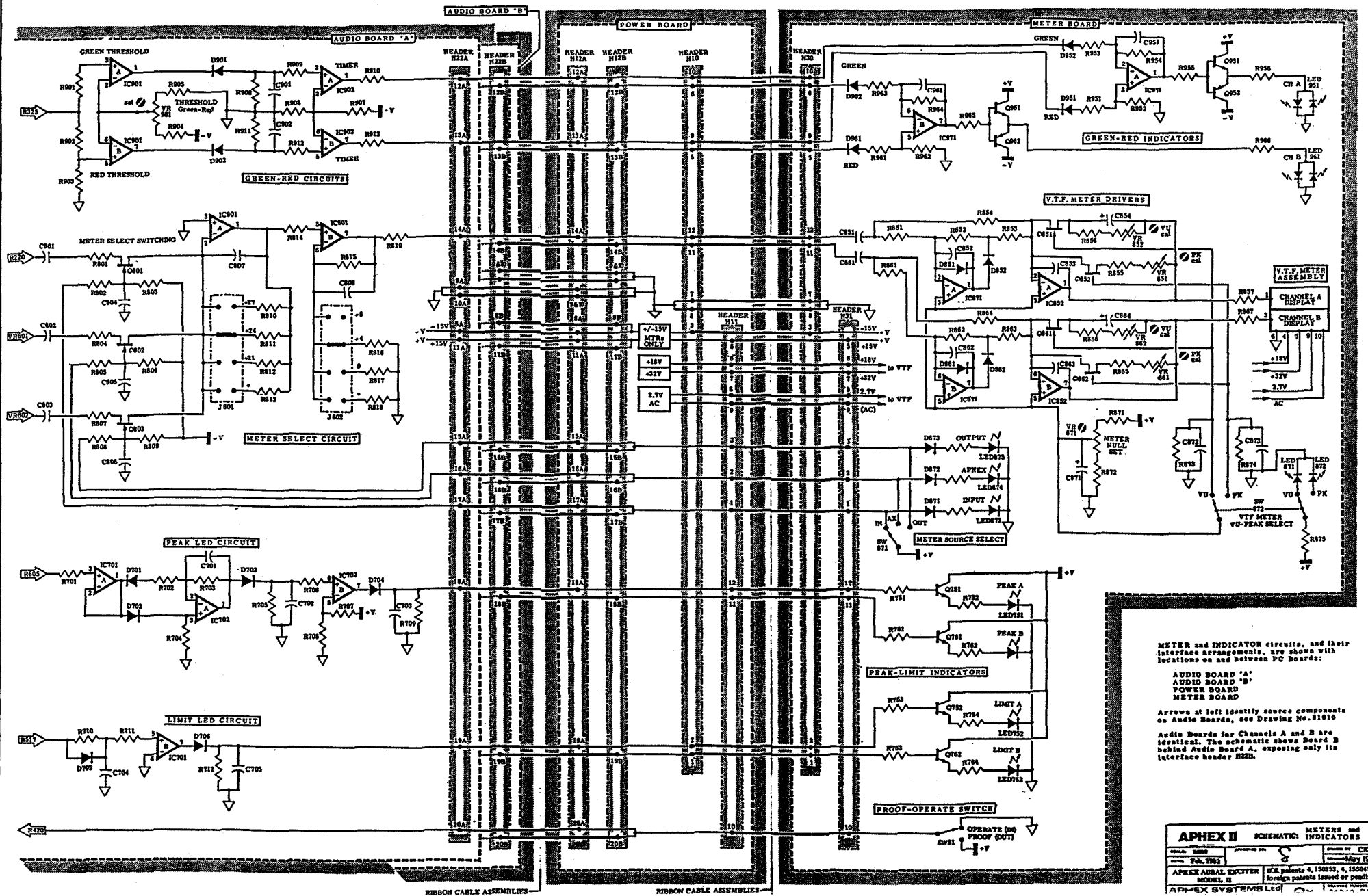


APHEX II SIGNAL PATH & PROCESSING CIRCUITS



NOTES DECOUPLING CAPS NOT SHOWN SUFFIX 'B' - BROADCAST VERSION * - USER DEFERRABLE SYMBOLS Vm - METERING SUPPLY Va - AUDIO SUPPLY TO or FROM COMPONENT NUMBER H21 H22 TP TEST POINT CHASSIS GROUND AUDIO GROUND

APHEX II		SCHEMATIC: SIGNAL PATH & PROCESSING CIRCUITS	
REV. 1086	DATE	DESIGNED BY	CK
REV. 10, 1981		DESIGNED BY	May 1983
APHEX AURAL EXCITER MODEL II		U.S. patents 4,150253, 4,155047 & foreign patents issued or pending	
APHEX SYSTEMS LTD Los Angeles, Ca 90009		81010-R2	



METER and INDICATOR circuits, and their interface arrangements, are shown with locations on and between PC Boards:

AUDIO BOARD 'A'
AUDIO BOARD 'B'
POWER BOARD
METER BOARD

Arrows at left identify source components on Audio Boards, see Drawing No. 31010

Audio Boards for Channels A and B are identical. This schematic shows Board B behind Audio Board A, exposing only its interface header H22.

APHEX II		SCHEMATIC: METERS and INDICATORS	
Model No. 1902	Rev. 1	Drawn by CK	Checked by CK
APHEX ARBAL EXCITER MODEL II	U.S. patents 4,150,333, 4,195,047 A	Foreign patents issued or pending	May 1968
APHEX SYSTEMS Ltd			

A. "Dyna-Set" Jumpers

The Aphex II Aural Exciter operates at an internal clipping level of +21 dBv. To accommodate systems operating at other levels, Dyna-Set allows the user to optimize the gain structure of the Aphex II for best signal-to-noise performance as well as selecting any 0vu reference point for metering ease. The calibration tag on the rear of the unit shows where it was set at the factory. Should the levels need to be changed, it can be done as follows:

1. J.201 Input Select - Set this jumper for the maximum level expected from your signal source. Fixed options are +21, +24 or +27 dBv (0dBv = 0.775v) other levels may be accommodated by choosing the appropriate value for position R215, and putting the selector in the *position.

2. J.601 Output Level Select - This is normally set to correlate with J201 "input level", in all units with balanced outputs. For units with single-ended transformerless outputs the jumper must be set to read 6 dB higher than the actual intended output level. For example, to set +21 dBv output level, the jumper will be set at the +27 position.

In cases where the desired max output is lower than the preselected values, (i.e. +10 dBv), R609 can be removed and replaced by a pair of resistors in positions R610 and 611 to pad the output (and attendant noise) to the appropriate level.

3. "Meter Refs" J.801 and J802 correlate internal clipping and VU settings to the user's system. Set J801 to match J301. Set J802 to match user's choice of VU reference. R818 may be chosen to match a non-standard reference. Standard settable references are 0, +4, and +8 dBv = 0VU.

In semi-pro or consumer applications where 0VU = -10dBv and clipping + 10dBv, use the 0VU = 0dBv position since the meter sensing point occurs before the signal level is padded and sent to the putput.

4. "External Ref" J301 sets the sidechain input headroom to minimize noisegain at a given operating level. The '0' position allows about 20 dB of headroom above your selected 0VU level (see sec. 3, "meter ref").

In situations using already processed material, the headroom (and noise) can be lowered by moving the jumper to the +4 or +8 positions, giving 16 or 12 dB of headroom, respectively. Conversely, the * position can be used for increased headroom, if necessary.

B. Calibrating the Aphex II

Once the Dyna-Set jumpers have been set, minimal calibration adjusts will fine trim the entire unit.

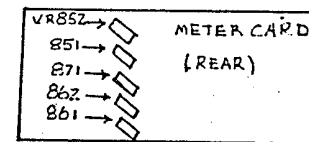
1. Unity Gain and Meter Calibration

- a. Make sure test equipment input is loaded with the same impedance as the circuit in which unit is to be used (600 or correct bridging impedance).

- b. Set-Up:

Meter Ballistics: "VU"
 Meter Select: "Out"
 In/Out (Proof/Operate): "Out" or "Proof"
 Output Level: "Cal" (Max. cw)
 Ax Mix: Anyplace but "solo"
 All Other Controls: Does not matter

Meter Trimmer Locations: See Figure —



PROCEDURE:

1. With no signal, adjust Meter 0 Null Adj. Trimmer VR871 for no display. This is a "0 centering" type of adjust.
2. Apply signal to CH.B at chosen 0 VU

Procedure, con't

3. Adjust Output Cal trim VR603 for exactly unity gain. (This is why the correct load is essential. There is sufficient reserve gain to bring the unit into cal with a 600 load if used.)
4. Adjust CH B cal VR861 so meter barely reads "0".
5. Switch Meter Ballistics selector to "PK" and adjust CH B PK cal VR862 as in step 4.
6. Repeat steps 2 - 5 for CH A, using VR851 and VR852 for VU and PK respectively.

2. Red/Green "Drive" Led Calibration

Note: Since this circuit is calibrated to internal levels, it will not usually need recalibration unless an IC in this circuit or a power supply regulator is replaced. Even then, change will be non-critical ($\pm .5\text{dB}$).

Set-Up: "Drive" : Min. (Full ccw)
 "Tuning": Min. " "
 "Damping": Min. " "

Procedure:

1. Insert signal at about 0VU into input. $>2\text{kHz}$
2. Place probe at test point TP301.
3. Adjust "Drive" (VR303) for +6dBv at this point.
 Note: This is a measured value ref 0 dBv = 0.775 volts, not +6VU
4. Adjust Red/Green Threshold trimmer VR901 so that Drive LED just goes from green to red.
5. Reduce signal about 12dB. LED should go from green to off at approximately this setting (o 12 to 13dB "window" between off and red is correct.

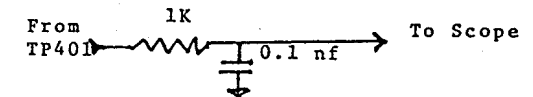
3. D.C. Offset trim on VCA:

(Harmonics and Limiting function, section #400)

SET-UP: In/Out (Proof/Operate) switch: "Out" (Proof)
 all Filter Controls: Full ccw (min)

EQUIPMENT: Shielded Probe
 Noise (low pass) filter
 Scope - 10Mv sensitivity min.

NOTE: An appropriate noise filter can be made with a fixture which puts this filter in line with the probe at the scope input:



PROCEDURE:

1. Place probe at TP401 (VCA output).
2. With scope on 10mv/division scale D.C. with no signal adjust vertical center of scope so trace is centered.
3. Switch "IN/OUT" switch to "In" (OPERATE) and adjust VR401 so that trace centers at same location as previously noted.
4. Repeat until no difference is seen between IN and OUT conditions. $\pm 1\text{Mv}$ adjust is easily achieved. VR401 will only affect circuit output when circuit is in "IN" (OPERATE) mode.

Once unit is burned in, D.C. drift is not normally a problem. Readjustment usually becomes necessary only if a power supply regulator or 1C401, 402, or 403 is replaced.
