COMPELLOR® MODEL 300

(Also includes MODEL 301 and MODEL 303)

OPERATING GUIDE
&
SERVICE MANUAL

APHEX
SYSTEMS

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1.0 INTRODUCTION

Multipurpose processor...

The Aphex COMPELLOR® is a multipurpose audio processor designed to give nearly inaudible control of short- and long-term average program dynamic range. In contrast to the Aphex DOMINATOR™, which is a true "Peak Limiter", the COMPELLOR maintains a well-controlled "average" audio level. One way to describe this is that the program floor is "lifted", so quiet signals become more audible, while excessively loud signals are reduced in level. The COMPELLOR provides simple adjustments to set the extent of control.

The COMPELLOR is perfectly compatible with the DOMINATOR, and the two are often used together when both the average and the precise peak audio levels need to be tightly controlled, such as in broadcasting.

In the COMPELLOR, the functions of compression, leveling, and limiting are interwoven with an intelligent control system to maintain all functions simultaneously. The various dynamic attributes of an audio signal are managed using program-dependent processing to minimize the audibility of the COMPELLOR doing its job. This means the "squeezing" or "pumping" effects commonly attributed to signal compressors are absent with the COMPELLOR, even when a large amount of control is used. The main attribute of the COMPELLOR, then, is that it is "invisible" in the audio system - you will not detect its presence.

Three Models available...

The COMPELLOR is available in several different models to suit a wide range of audio systems. The Model 300 version is a stereo unit designed especially for stereo applications like broadcasting or recording. This model can also be used for a single-channel system, but is not designed to be used as two independent processors. The Model 301 is a single-channel unit which is more economical in monaural signal applications. Two Model 301's can easily be linked for stereo operation using a simple patch cord, making this model especially useful in studios. The Model 303 COMPELLOR is a single channel unit similar to the Model 301, containing a built-in, fully-adjustable Aphex AURAL EXCITER® circuit. This model is especially useful for P. A. work and speech processing.

Typical applications for the COMPELLOR are:

- Radio, Cable, and TV Broadcasting
- Paging Systems
- P. A. Systems
- Tape Duplication
- Announcer Control
- SCA Programming
- Back- and Foreground Music Systems
- Satellite Up-Link
- Stage Monitors
- Live Recording
- Studio Vocal and Instrument Tracking
- Analog and Digital Disk Mastering

About this manual...

In the following sections, you will find information on Operational Characteristics, Installation, Front Panel Controls, Applications, Circuit Description, Test Procedures, and Circuit Modifications. Technicians and other interested users will find complete schematics and parts lists included at the back of the manual. The text and illustrations apply to all COMPELLOR models, except for features that are unique to a specific model. In those instances, a separate note or section outlines the selected feature.

2.0 OPERATIONAL CHARACTERISTICS

The COMPELLOR is a unique combination of Compressor, Leveler, and Peak Limiter. All COMPELLOR models (300, 301, 303) have three detector circuits that feed a single gain control device per channel in a very simple, high-quality audio path of extraordinary transparency, as shown in the block diagrams in Fig. 2-1, Fig. 2-2 (next page), and Fig. 2-3 (page 2-7).

The compression and leveling sidechains are "intelligent," being program-controlled and interactive. The result is a very simple, easy-to-use device that is free of the sonic pumping, breathing, noise build-up, popping and hole punching.

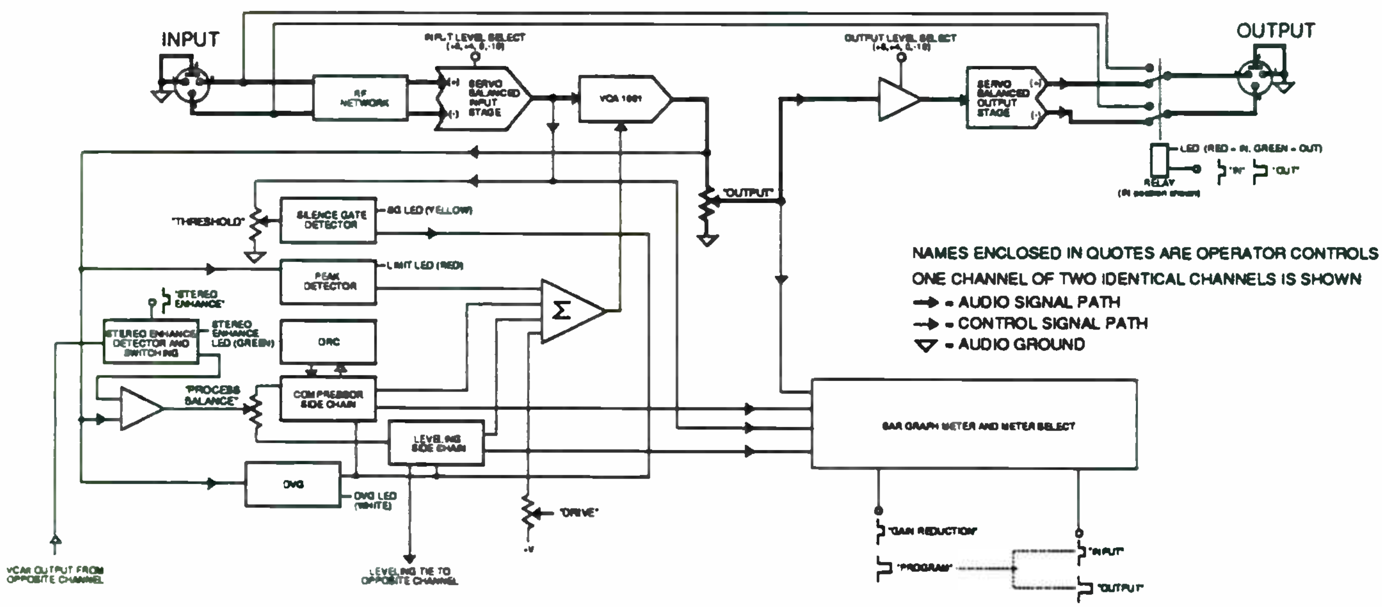


Fig. 2-1. Block Diagram of COMPELLOR Model 300 circuits. Only one channel is shown.

These functions are designed to work together, using feedback techniques (reading the output of the VCA) for extremely low distortion and accurate operation. The leveler provides a "platform" based on long-term average levels. In the Model 300, the two Leveling Sidechains are linked together so that the channel with the highest amount of leveling determines the amount of leveling in the other channel. This maintains a stable stereo platform for long-term imbalances.

The compressor, working from this "platform," has to do less gain reduction, and can more easily handle short-term level changes. A PROCESS BALANCE control varies the ratio of compression to leveling. The high-speed (1 µs) limiter catches any dynamic overshoots and ensures peak protection. The limiter also allows the compressor action to remain slow enough to maintain natural transient qualities in the audio.

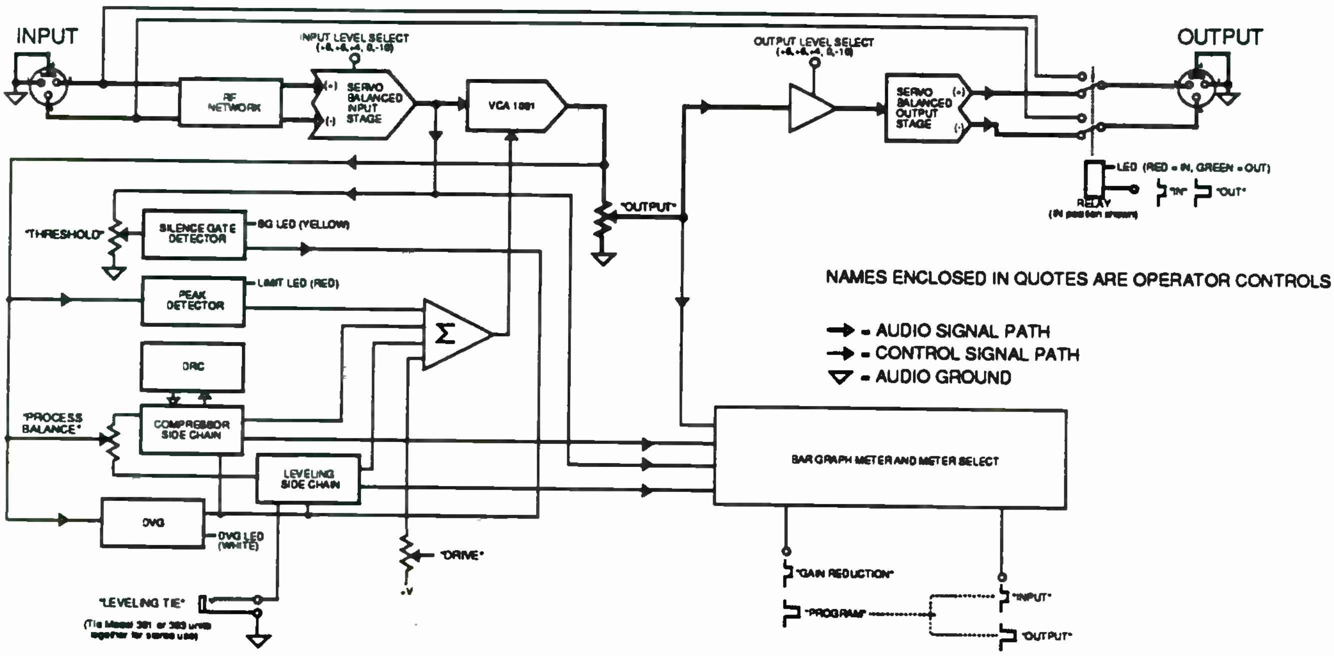


Fig. 2-2. Block diagram of COMPELLOR Model 301 circuits.

To illustrate the co-functioning of the three systems, imagine a sudden 20 dB increase in signal level above 0 VU. The limiter will catch the peak and hold it, if necessary, until the compressor reduces the level. If the increase is maintained, the leveler will then further reduce gain, freeing the compressor. Even with the best and most modern of conventional gain control devices, one can only imagine the quantity of controls necessary to handle severe and complex dynamic changes while avoiding sonic degradation. If a proper setting could be be found, it would be optimized for only one audio texture and level, necessitating constant control changes to maintain audio quality. The COMPELLOR's control circuits have the *intelligence* to analyze the incoming audio and make all the control changes *automatically* on a real-time basis, resulting in inaudible, continually-optimized dynamic range control.

2.1 Control Circuits

The COMPELLOR's compression level detector is influenced not only by the RMS level of the audio, but also by program dynamics and wave complexity, so audio quality is greatly enhanced over simple RMS or average responding processors. Transient sounds are preserved, pumping and breathing eliminated, etc.

The level detector has a "soft knee" compression characteristic, with the ratio varying from 1.1 to 1 at onset of compression and gently increasing to 8 to 1 at 20 dB of pure compression. The attack and release times are automatically varied from 5 to 50 ms for attack and 200 to 1000 ms for release.

The leveling process provides a slow and smooth control over the program level platform. It has a fairly steep ratio (20 to 1) with variable attack and release times to simulate the way the ear perceives loudness over long periods. The attack and release times vary from preset values of 2.5 s and 5 s, respectively. The circuit's most useful purpose is to maintain a consistent compression depth, and therefore sonic quality, regardless of long-term program input level.

The peak limiter has a fixed threshold 12 dB above nominal 0 VU with an attack time of 1 µs and release time of 10 ms. The 12 dB ceiling was carefully chosen to allow maximum cooperation between the sidechains, providing natural-sounding peak characteristics while maintaining a strong average level. This ensures maximum drive level to following devices without fear of clipping, overmodulation, or tape saturation.

The COMPELLOR control circuits also include a proprietary Dynamic Verification Gate™ (DVG), a Dynamic Recovery Computer™ (DRC), a Silence Gate, an INPUT Control, transformerless I/O Circuits, and an custom class A VCA for processing control. The Model 303 also adds an AURAL EXCITER circuit to the standard COMPELLOR circuitry (see Fig. 2-3).

2.1.1 Dynamic Verification Gate (DVG)

The DVG monitors short-term and long-term average levels, compares them, and impedes gain changes when program dynamics might be sacrificed for arbitrary gain reduction. The DVG also prevents gain release during short-term program pauses which otherwise would cause "pumping"or "breathing" effects. Vocal material is especially benefited by this feature, sounding natural even when extremely compressed. DVG action is indicated by a front panel LED.

2.1.2 Dynamic Recovery Computer (DRC)

The DRC allows very rapid recovery from gain reduction under certain complex wave conditions. Signals that are high in peak amplitude but low in relative power cause an increase in the compression release rate. Unrequired gain reduction is thus inhibited, preventing loss of transient wavefronts, holes, etc. This contributes towards a natural, open sound, even during heavy compression.

2.1.3 Silence Gate

The Silence Gate is another important part of the COMPELLOR's natural sound. Whenever the input falls below the selected threshold, the Silence Gate "freezes" the COMPELLOR, inhibiting release of the gain reduction. This eliminates noise swells and allows normal fade-outs. When the program resumes, attack is improved on the next signal because gain reduction does not now have to go full range.

This is NOT a "noise gate" which mutes all audio. Such action would actually cause greater problems, for noise modulation is much more noticeable than the noise itself. The Silence Gate simply holds everything constant - no signal, no change. The Silence Gate will hold gain reduction release indefinitely - for several hours, if necessary. The threshold is set by a front panel knob, labelled Silence Gate THRESHOLD, and is variable between 0 and -40 dBv.

2.1.4 DRIVE Control

The last circuit controlling the VCA is the DRIVE control. Turning the front panel knob counterclockwise attenuates the VCA, thus reducing processing. Turning the control clockwise opens up the VCA, sending more signal to the output and the detectors, providing more processing.

2.1.5 I/O Circuits

The input and output circuits are transformerless. Unique, special circuits were developed for use in the COMPELLOR, to allow it to be interfaced with a wide range of audio systems. The COMPELLOR can be driven from balanced or unbalanced sources, as if it had a bridging input transformer. The common mode rejection is excellent and RFI filtering is employed.

The nominal operating level (0 VU) of the Model 300 input circuits can be set by internal jumpers for -10, 0, +4, or +8 dBm levels. Models 301 and 303 use rotary switches for input level set, and also provide an additional setting at +6 dBm. Since the COMPELLOR operates at a constant internal level, the input metering automatically follows.

The output circuit is a unique active type which can be used like a transformer winding. If one of the outputs is grounded, full voltage swing is transferred to the opposite side of the balanced output. Gain and drive are thus preserved for unbalanced loads. Like the input circuit, the Model 300 outputs can be tailored to -10, 0, +4, or +8 dBm operating levels. Models 301 and 303 use rotary switches for output level set, and also provide an additional setting at +6 dBm. The input and output levels may be set differently so that the COMPELLOR may be used as a level translator. The maximum output level is +27 dBm balanced and +21 dBm unbalanced.

CAUTION...

If you use the COMPELLOR to change levels or balanced/unbalanced status, be aware that the IN/OUT switch is a ***hardwire bypass***. Engaging this switch during one of these listed applications will cause level or ground mismatch, resulting in system overload, distortion, and hum.

2.1.6 VCA Circuit

The VCA itself is the Aphex 1001 Voltage Controlled Attenuator. This device is the world's finest monolithic Class A audio control device. Its integrated construction enables absolute matching between the transistors, resulting in almost perfect tracking in thermal and gain characteristics.

Its geometry provides near theoretical noise performance and high speed. It can attenuate an audio signal 100 dB in 1/50,000,000 of a second with less than 0.005% distortion. It is operated in a dual differential configuration, so all common mode noise and distortion are internally cancelled out. Its transparency approaches the engineer's dream - a straight wire with gain (in this case, attenuation).

2.1.7 AURAL EXCITER

Since its introduction in 1975, the Aphex AURAL EXCITER has rapidly become a standard in the recording and broadcast industries. It has been used for thousands of albums, movies, broadcast productions, commercials and concerts. AURAL EXCITERS are on the air on the top AM, FM, and TV stations throughout the USA and the rest of the world. They also can be found in countless applications involving sound reinforcement, paging & PA systems, tape duplication and background music systems. In short, the AURAL EXCITER can benefit ***any*** audio application.

Whatever the final usage, the AURAL EXCITER will provide:

- Increased presence and clarity - program material will sound bright and real again.

- Increased intelligibility - vocal articulation will be much clearer and easier to hear and understand.

- Greater perceived loudness - will be added without any extra power.

- Reduced listener fatigue - Aural Excitement results in increased penetration at lower SPL and distortion levels.

- No decoding needed - Aural Excitement is a single-ended process. Once encoded into the material it stays, even through succeeding processes and generations of tape copies.

- Perceived enhancement - will provide even greater enhancement on poor-quality reproduction systems or poor listening environments.

- Enhanced imaging (when used in stereo or mono surround channels) - the sound seems to "open up," giving greater separation and detail and making speaker placement less critical, while still being totally mono-compatible.

By now you may be wondering how the AURAL EXCITER provides these sound benefits, and why it is necessary in the first place.

The answer is that the audio recording and reproduction process is far from perfect, even under the best of conditions. Every step of the way, from the original microphone, through countless tape and electronic stages, to the final amplifier and loudspeaker, the original sound changes. What's lost is ***presence*** and ***realism***! The sound just doesn't sound real and live any longer.

The parts that disappear are the harmonics, the tiny fragile parts of the audio that give a sound its character and definition among other sounds. Other types of processors, such as equalizers, expanders, reverb and delay cannot restore this realism because they only work on what's left of the original signal, often increasing noise and distortion in the process. Equalizers, in particular, are most commonly compared to the AURAL EXCITER, due to the apparent "boost" in mid and high frequency. However, equalization is a static, fixed process, while the AURAL EXCITER is dynamic, constantly changing with the program. Also, no equalizer can boost what is no longer there.

The AURAL EXCITER actually ***re-creates*** the missing harmonics relative to the strength of the fundamental sound. Even if the upper harmonics of a sound are no longer present, it is possible to create new ones. They are then added back in the form of a very small cue signal that creates a ***psychoacoustic*** difference in the ***subconscious*** part of the listener's brain. Because of this, the enhancement signal can be very small, and add virtually no power to the audio signal. It is easily recorded and reproduced, even by low-quality systems, and is not affected by normal acoustic problems. Together, these factors make the AURAL EXCITER a powerful tool in ***any*** audio application.

2.1.7.1 Psychoacoustics

The term psychoacoustics is the latest buzzword in the audio field. It refers to our psychological interpretation of what we hear, as opposed to the mechanics of hearing.

With the exception of the Fletcher-Munson compensation for non-linearity in our hearing, modern audio and electronic processing methods tend to ignore the entire receiving portion of what must be considered a two-part system. In the meantime, science is providing us with an increasingly better picture of how our aural processes function.

It is helpful to remember that all sound perceived appears only by courtesy of the brain. Taking into account some of the known peculiarities of psychoacoustics allows us at Aphex to provide some interesting improvements in electronic sound processing.

This is a fairly new field, with much yet to be discovered, but we do know that most of the factors that affect our interpretation of what we hear are incredibly small, such as the minute cues that let us tell left from right in a stereo image. There are also minute cues which our subconscious mind interprets as "presence" or "realness." It is these missing cues that the Aphex AURAL EXCITER re-creates and adds back to the main signal to change the way we PERCEIVE what we all hear.

The Aphex enhancement signal involves frequency-dependent phase shift and amplitude-dependent harmonic generation. The phase shift, or delay, which is too short to be perceived as an echo or reverb, is perceived as an increase in impulse or transient duration, which makes the signal seem louder. The phase-shifted signal also "beats" slightly against the main signal, simulating what happens to sound in a normal ambient situation, but without causing phase cancellation, or "phasing." The harmonics generated are derived from the main signal and are, therefore, musically related. The natural harmonics or overtones are the most likely to be lost. The louder the fundamental produced by an instrument or voice, the greater the overtones. The Aphex AURAL EXCITER generates harmonics in the same manner. The harmonic structure of each sound or instrument is thus strengthened, allowing it to stand out from other sounds. The increased harmonic structure also creates the illusion of a much fuller, brighter top end to your sound. You will swear there is at least 10 dB of treble boost, but a spectrum analyzer would show an increase of 1 or 2 dB.

2.1.7.2 How It Works

Aphex engineers have determined that it is possible to "encode" electronically-processed sound with supplementary directional information that will tend to widen the perceived image and increase presence. This information is generated by the Aphex AURAL EXCITER and is mixed with the main signal as a low-level "subcarrier." The brain, acting as a "de-coder," compares the main signal to the sub-carrier as a differential function. The result is a perception of increased spatiality and presence.

As can be seen in the block diagram, (Fig. 2-3), the main audio signal passes to the AURAL EXCITER unchanged. The processing is done in an outside loop called a *sidechain*. This sidechain taps off the main signal, and sends the

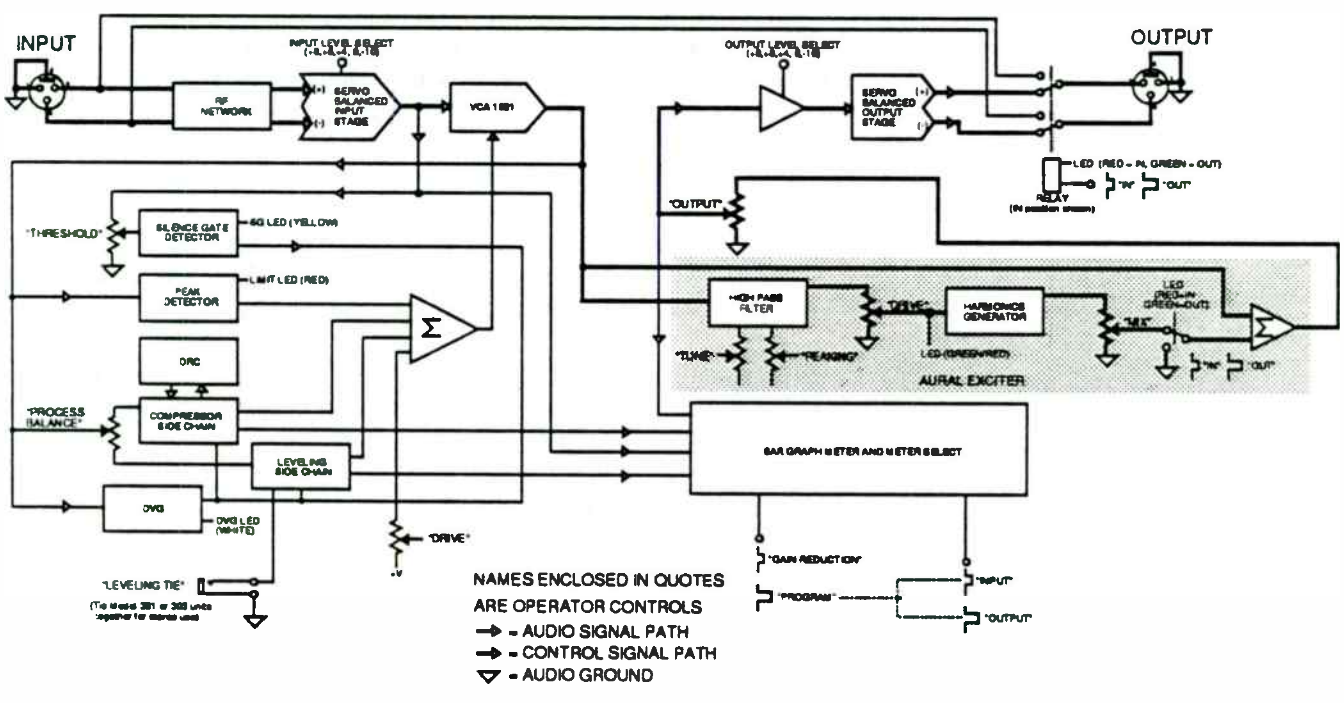


Fig. 2-3. Block diagram of COMPELLOR Model 303 circuits.

audio through a tuneable *high pass filter*. The shape of this filter is also variable, via the PEAKING control, from a fairly gentle slope to a steeper one with a slight peak. The filter removes unneeded low frequency material and creates the necessary frequency-dependent phase shift.

The filter output is then fed to the next stage, the harmonics generator, via the DRIVE control. This is where the musically-related harmonics are generated and mixed with high-passed information. This complex material then goes through the MIX pot, where a small portion (typically 20 dB below) is added to the main signal. Although this amount of information is so small, it shouldn't even be heard, you will perceive a significant increase in mid- and high-frequency energy.

2.2 Typical Applications

The COMPELLOR is a useful tool for virtually *any* audio system. It's hard even to imagine a situation where the sound system could not benefit from a more controlled dynamic range with total peak protection.

There has been so much attention brought to the newest increases in dynamic range with the onset of digital technology that some of us may have lost sight of the difference between *maximum* dynamic range and *usable* dynamic range.

In the typical live sound application, for example, there is in reality a very small difference between the maximum level available from the sound system (or the threshold of pain), and the ambient noise level in a club, concert hall or the like. The 80 or 90 dB of dynamic range so sought after is completely useless in such instances. It is also useless if it cannot be transferred from a compact disc to a cassette. Without a COMPELLOR in the audio chain, you have to decide between losing quiet signals into the noise or having distortion from overload on loud sounds.

Your ear actually *prefers* listening to reduced dynamic range material, as long as open, transient qualities are maintained. The COMPELLOR is designed to accomplish these goals, while remaining quite invisible in the process.

The following typical applications are brief examples of how any one of the COMPELLOR models (300, 301, 303) can be used to improve sound quality within your own audio discipline.

2.2.1 Broadcast Pre-Processing

Most other processors have a "sweet spot" in which they work best, usually with minimum amounts of gain reduction. The COMPELLOR will drive the audio consistently into that spot, making a station practically "jock proof." By taking the burden of heavy gain reduction off following devices (especially limiters) the devices can do what they do best, with minimum negative effect on the audio quality.

For example, the COMPELLOR can be set to feed a steady average input level with controlled dynamics into a multiband processor or clipper. This unit can then be adjusted to work only on the extreme peaks without fear of overload. The result is equal or greater loudness but with a much cleaner, more natural sound.

2.2.2 STL/Phone Line Driver

Maintaining consistent drive levels while controlling peaks (without overshoot and ringing) is just another way of describing the COMPELLOR. Full modulation of the STL can be sustained without concern for overload. Audio level can be kept well above the noise floor of phone lines or STL without the possibility of "crashing" anything following the COMPELLOR.

2.2.3 Carting/Tape Duplication

Varying audio levels from cart to cart is an all too typical problem. With the COMPELLOR, levels can be easily maintained while recording to assure maximum signal-to-noise performance without tape saturation. The COMPELLOR is especially useful in assembling tapes from several sources with varying levels onto a single tape.

Tape copies can actually come out *better* than the original. With the dynamics better controlled, the result will be much more even, permitting hotter tape levels with reduced tape noise, even if the master levels vary considerably. Duplicators transferring Compact Disks or other digital media to tape will find the COMPELLOR the only device that can squeeze digital to tape with no perceivable loss of quality.

2.2.4 Microphone Processing

The human voice is one of the most difficult sounds to record and transmit. The waveform can be highly asymmetrical with extreme peaks. Also, most people do not know how to use a microphone properly, causing widely varying levels.

The COMPELLOR will make the voice and microphone much easier to deal with. Now you can attain the "perfect mic technique" of the experienced professional, who varies the distance to the microphone as the voice level changes, to insure a constant output.

For interview and audience participation situations, the COMPELLOR will make your job almost effortless. Radio and television engineers will get the desired consistency from one announcer to another. Production studio engineers will find overdubs are easier to record by paying more attention to program content than to the meters. The recorded voice will be denser, carrying more information, though it will be completely free from any "processed" sound.

2.2.5 Paging and PA Systems

Being able to control dynamics of live sound is most critical because there is no way to "fix it in the mix." The COMPELLOR will give everyone "perfect mic technique," ensuring consistent levels whether they are talking loudly or timidly. Background vocals stay in the back, lead vocals stay loud and clear. The average level of the signal will be maintained above the ambient noises without fear of crashing the system. Vocal articulation will be greatly improved by the increased density. The sound system will be completely protected from clipping or other distortions. Imagine actually being able to *hear* an airport or hotel paging system.

Live performances will seem more "live," with increased presence and detail. Differences between performers will be smoothed out, and the mixer will have a much easier job, being allowed to concentrate on mixing, instead of having to keep his eyes glued to the output meters all the time. The sound system can be safely operate at higher levels.

The COMPELLOR's low impedance, servo-balanced output stages will effortlessly drive even the longest lines out to distant amplifier racks. For stereo programs, you can specify the (stereo) Model 300 or link two (mono) Model 301's via a common 1/4" patch cord through the LEVELING TIE jacks on the rear panel.

2.2.6 Stage Monitors

The COMPELLOR will provide maximum consistent level just below the feedback level for the performer. The performer can move around more freely without resulting in drastic level changes. The monitor system can be operated at a higher levels without fear of clipping or distortion.

2.2.7 Film Dubbing

Film dubbing has its own share of unusual problems, with audio coming from a multitude of sources, and being restricted by the dynamic capabilities of the optical film track.

If you are a dubbing mixer, the COMPELLOR will make your life much easier, by allowing you to consistently match levels from take to take for a tight level control onto the final track. It will let you concentrate on mixing instead of watching levels, since instantaneous peaks are now controlled and "valve clashes" are practically eliminated.

2.2.8 Recording

The COMPELLOR is probably the only compressor/leveler that is so transparent it can be used directly on master audio tracks. Try using the COMPELLOR on vocals, back-up groups, string sections, horns and special effects. The COMPELLOR will effortlessly control the varying audio levels for an increase in "punch" and definition. The result will be greater separation of instrumental sounds from each other, and cleaner and "tighter" sounding tracks overall.

Since headroom is much less of a problem with the COMPELLOR, consistently "hotter" tracks can be put on the tape, resulting in improved signal-to-noise, as well as improved listenability. The COMPELLOR will not reduce high frequencies or increase sibilance, thereby reducing the need for equalization and de-essing.

2.2.9 Mixing

As a mixer, you will find the COMPELLOR frees you to be creative and eliminates the typical "mix fixation" on output meters. With this unit in the output chain, you know that variations in board output level will never be heard on the mixdown tape.

2.3 Using the COMPELLOR with the DOMINATOR and AURAL EXCITER

For the ultimate in total dynamics and loudness control, the COMPELLOR may be used to feed the Aphex DOMINATOR, a multi-band peak processor. While the COMPELLOR works to control average levels, the DOMINATOR operates only on peak signals, allowing the user complete manipulation of peak-to-average-ratios and, therefore, *loudness*. While the COMPELLOR provides peak limiting on a safety basis for protection, the DOMINATOR is designed to actively limit the signal on a full-time basis, with the same level of transparency as the COMPELLOR. This is achieved by limiting low, mid and high bands *separately*, instead of together, eliminating interaction (the usual dull, "squashed" sound associated with limiting).

NOTE...

It is extremely important for audio professionals to be aware of pre-emphasis in transmission and recording systems. The American standard is 75 µs, which provides 17 dB of boost at 15 kHz. Because the COMPELLOR is a wide-band device, it is inappropiate for use as a pre-emphasis limiter. The multi-band design of the DOMINATOR allows for audio signals with pre-emphasis so that modulation can be increased up to 17 dB without overload.

For further enhancement, specify the Model 303, which includes an internal AURAL EXCITER, or alternately install an Aphex AURAL EXCITER Type III (Model 250) after the COMPELLOR (Models 300 or 301). As mentioned earilier, the AURAL EXCITER is a psychoacoustics enhancer that restores intelligibility, presence and brightness to any audio signal, without the gross level changes and unrealistic sound of equalization. The AURAL EXCITER will also create a bright, clean high end where none exists, something no equalizer can do.

When used together, the average level can be set as high as desired, while cleanly and safely maintaining an absolute peak ceiling. The limiting is so positive that the DOMINATOR can be set 1 dB below the crash point without worry. The sound system or tape can now be run at *undreamed of* levels, with total freedom from overdriving, clipping, or tape saturation. A small P.A. system can now be as loud as a big one, because headroom, clarity, power usage and signal-to-noise ratios have been optimized and controlled by the COMPELLOR/AURAL EXCITER/DOMINATOR combination.

2.4 Specifications

INPUT SPECIFICATIONS (All models)

Type:	Transformerless, RF-filtered, true instrumentation, differential servo balanced
Impedance:	50 kΩ balanced
Nominal Operating Level:	User Selectable Model 300, 0 VU = -10, 0, +4 or +8 dBm Model 301, 0 VU = -10, 0, +4, +6, or +8 dBm Model 303, 0 VU = -10, 0, +4, +6, or +8 dBm
Maximum Input Level:	+27 dBm
CMRR:	Greater than 40 dB

SIDECHAIN SPECIFICATIONS (All Models)

Compression

Attack Time:	5 to 50 ms
Release Time:	200 ms to 1 s, program dependent
Ratio:	1:1 to 8:1
Threshold:	30 db below nominal level (0 VU with DRIVE full clockwise)

Leveling

Attack Time:	2.5 s
Release Time:	5 s, program dependent
Rate:	0.5-5 dB/s
Threshold:	30 db below nominal level (0 VU with DRIVE full clockwise)

Peak Limiter

Attack Time:	1 µs
Release Time:	10 ms
Threshold:	12 dB above nominal level (0 VU)
Voltage Controlled Attenuator:	Aphex VCA1001

OUTPUT SPECIFICATIONS (All Models)

Type:	Electronically balanced, transformerless - may be operated balanced or single-ended at a full output
Impedance:	20 Ω balanced, 10 Ω unbalanced
Maximum Output Level:	+27 dBm balanced or +21 dBm unbalanced
Bandwidth:	+1 dB, 5 Hz to 65 kHz
Hum and noise:	At unity gain and +4 dB operating level, 76 dBm
Noise (ref.to max output):	-99 dBm
Dynamic THD:	0.1 % (20 dB compression, 1 kHz, and +4 dB operating level)

AURAL EXCITER (Model 303 only)

Controls:	DRIVE, TUNE, PEAKING, MIX
Tuning Range:	1 kHz to 6 kHz
Frequency Range:	10 Hz to 50 kHz, +0, -0.5 dB
THD:	0.02 % (20 Hz to 20 kHz, max. input/output)

OTHER SPECIFICATIONS (All Models)

Size:	1.75" H x 19" W x 9" D
Shipping Weight:	11 lbs
Power Requirements:	90-250 VAC, 50-60 HZ, 20 W
AC Input:	IEC standard receptacle with fuse, voltage selector and RF filter

The Aphex COMPELLOR is covered by U.S. Patent Number 4,578,648.
The Aphex AURAL EXCITER is covered by U.S. Patent Number 4,150,253.
Additional patents are pending. Foreign patents are granted and pending.

Aphex Systems is constantly striving to maintain the highest professional standards. As a result of these efforts, modifications may be made from time to time to existing products without prior notice. Specifications and appearance may differ from those listed or shown. COMPELLOR and AURAL EXCITER are registered trademarks of Aphex Systems, Ltd.

2.5 Warranty and Service Information

Aphex Systems, Ltd. warrants parts and labor for the COMPELLOR for a period of one year from the date of purchase. If it becomes necessary to return a unit for repair, repack it in the original carton and packing material, if possible. If a warranty repair, enclose a copy of proof of purchase and send package to:

APHEX SYSTEMS, LTD.
11068 Randall Street
Sun Valley, CA 91352

PH: (818) 767-2929 • FAX: (818) 767-2641

3.0 INSTALLATION

To install the Aphex COMPELLOR for use with your system, follow the procedures described in the following sections.

CAUTION...

Thoroughly read Section 3.6 before you apply power to the unit. An incorrect line voltage setting can damage the unit.

3.1 Unpacking

Your COMPELLOR was carefully packed at the factory, and the container was designed to protect the unit from rough handling. Nevertheless, we recommend careful examination of the shipping carton and its contents for any sign of physical damage which could have occurred in transit. If damage is evident, do not destroy the container or packing material. Immediately notify the carrier of a possible claim for damage. Shipping claims must be made by the consignee.

3.2 Audio I/O (Input/Output) Level Set

The COMPELLOR's nominal operating levels can be set for other levels between -10 to +8 dBm. Through an internal adjustment, you can optimize the COMPELLOR's signal-to-noise performance and headroom. This adjustment will also enable the COMPELLOR's meters to match the system in which it is being used.

NOTE...

All COMPELLOR models are normally shipped from the factory with each input and output level set at +4 dB. Do not set the COMPELLOR's nominal operating level too high, or there will not be enough input level to generate Gain Reduction. To determine if the unit is properly set, send a 0 VU tone to the COMPELLOR and verify that the Program Input Meter indicates 0 VU.

You can set the Model 300's input/output levels for other operating levels by moving jumpers located on each Audio Processing Board. Refer to the CIRCUIT MODIFICATIONS section for a detailed procedure.

If you have a Model 301 or 303, you can set the input/output levels for other operating levels by adjusting rotary switches, designated as Input Level Set and Output Level Set. To access these switches by removing the top cover of the COMPELLOR, as shown in Fig. 3-1 on the next page.

If necessary, you can set the input and output levels separately to use the COMPELLOR for level interface. For example, you can set the Input Level Set to -10 and the Output Level Set to +4 to interface a CD or tape player to a +4 dBm system.

CAUTION...

Do not switch the IN/OUT switch to OUT when using the COMPELLOR in a level match application. In the OUT position, a hardwire bypass will connect the interfacing sources together with predictable damaging results.

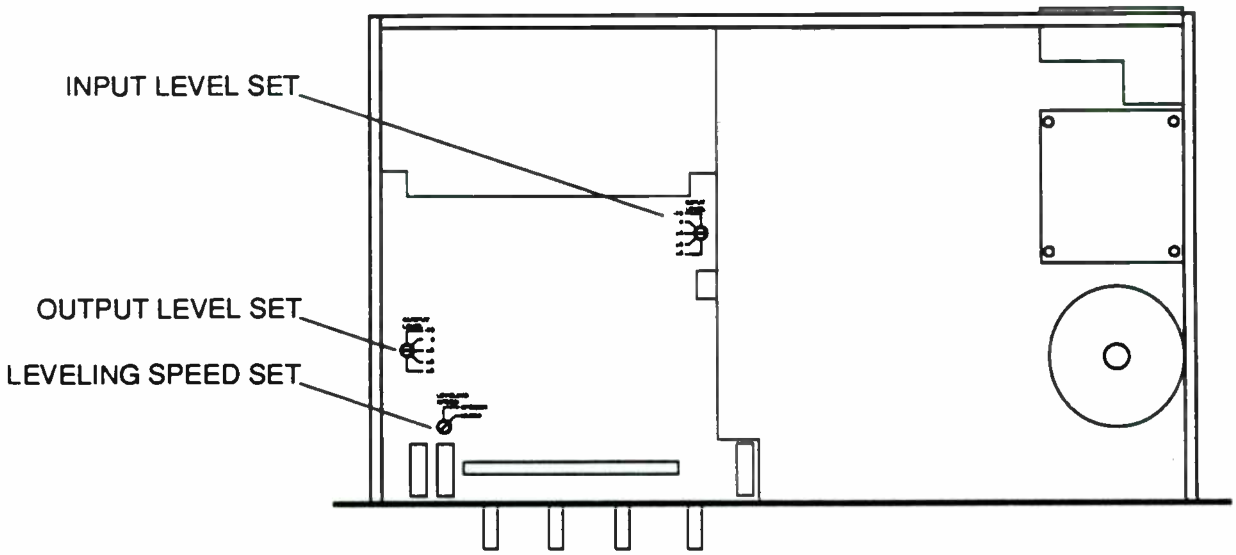


Fig. 3-1. Simplified top view showing location of INPUT LEVEL SET, OUTPUT LEVEL SET, and LEVELING SPEED SET on the Audio Processing Board, common to both COMPELLOR Model 301 and 303 units.

3.3 Leveling Speed Set

The leveling release time of the COMPELLOR can be set to accommodate a specific program like music or speech.

At the factory, the Model 300 is configured primarily for music, which requires maximum control of dynamics with minimum effect on the audio program. If your primary application is speech, you can modify the Model 300 for a faster leveling speed by changing a resistor on each Audio Processing Board. Refer to the CIRCUIT MODIFICATIONS section for a detailed procedure.

At the factory, Model 301 and 303 units are shipped with the Leveling Speed Set in the MUSIC position. With this setting, the COMPELLOR will use a longer release time to control general and music programs. If you want to increase the leveling speed for dialogue or other intermittent applications, remove the top cover, locate the Audio Processing Board, and turn the Leveling Speed Select to the SPEECH position (see Fig. 3-1).

3.4 Audio I/O Connections

All COMPELLOR models use standard XLR type 3-pin connectors (on the rear panel) for system interface of audio input(s) and output(s), as shown in Fig 3-2 . Equal polarity is maintained from input to output, so that you may elect to use either pin 2 or pin 3 as high to match your balanced system. Also be sure to use proper shielding techniques (i.e. lifting the shield wire to the input connection and connecting the shield wire to the output connection).

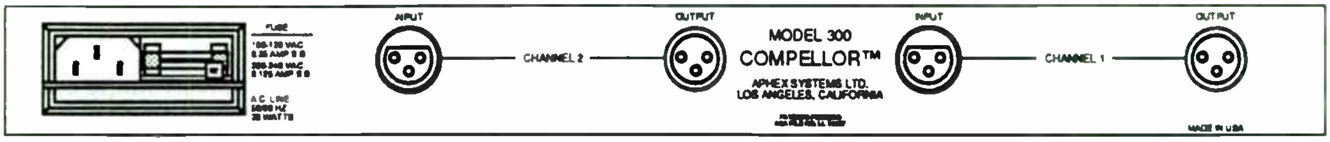


Fig. 3-2. COMPELLOR Model 300 back panel. Models 301 and 303 have only one pair of XLR connectors.

3.5 I/O Connection Considerations

Prior to installing the COMPELLOR into your system, take note of the following considerations for I/O impedance matching and system wiring.

3.5.1 Impedances

The COMPELLOR features a high input impedance (50 kΩ balanced, 25 kΩ unbalanced), allowing it to be easily driven by any other piece of audio equipment, including consumer gear. However, a piece of equipment designed to work into a 600 Ω load may show unusually low output meter readings, even though the unit is driving the COMPELLOR properly. Or the unit may considerably overdrive the COMPELLOR 's input while still indicating 0 VU.

In either case, you will observe a large disparity between indicated drive levels, with the COMPELLOR 's meter reading a much higher level than the output meter of the driving unit. If this occurs, install a 600 Ω resistor across pins 2 and 3 on each COMPELLOR input, to lower input impedance to 600 Ω.

The output impedance of the COMPELLOR is very low (20 Ω balanced, 10 Ω unbalanced), allowing it to easily drive almost any load. However, there are some types of inputs, especially transformer types, that are designed to see a 600 Ω source impedance. An indication of this mismatch would be a non-linear frequency response, emphasizing the low frequencies.

In this case, install two 300 Ω, 1/4 watt, 1% resistors (at each output) in a series bridge with pins 2 and 3 to create a 600 Ω source impedance, as shown Fig. 3-3.

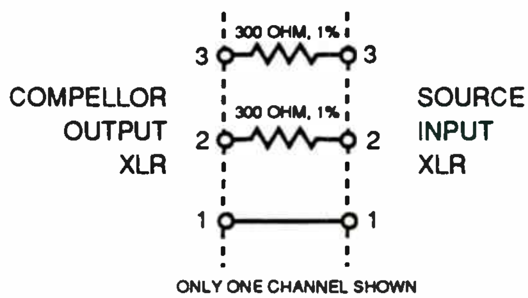


Fig. 3-3. Circuit for creating a 600Ω source impedance at a COMPELLOR's output (one channel shown).

3.5.2 Balanced vs. Unbalanced Use

Although of balanced configuration, the inputs may be driven single ended (unbalanced) on either pin 2 or 3, tying the unused pin to pin 1 ground. We recommended using pin 3 to maintain phase matching with the outputs, since pin 3 is generally designated as high in the unbalanced mode.

3.6 AC Line Connection

AC line power is supplied to the unit via an integral receptacle/fuse holder on the rear panel which meets all of the international safety certification requirements and also doubles as a radio frequency line filter.

Verify that the unit is configured to match your AC line voltage by inspecting the voltage programming tag located with the fuse holder, as shown in Fig. 3-4. If you need to change the voltage setting, follow the procedure outlined in the following two sub-sections.

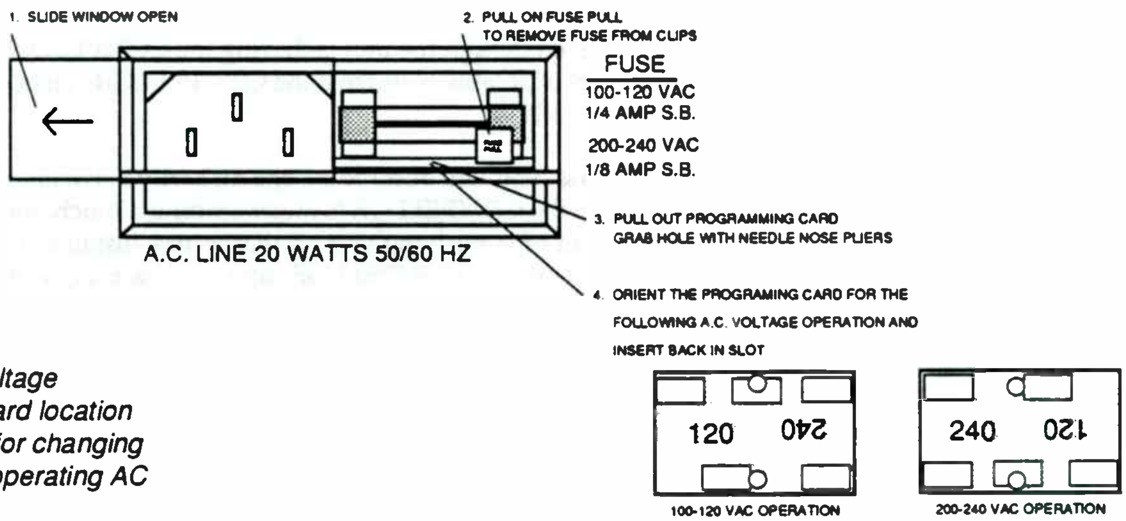


Fig. 3-4. AC voltage programming card location and procedure for changing COMPELLOR operating AC voltage.

In the event of damage, or if you require a power connector other than the one molded onto the cord, be sure to observe the following wiring conventions during replacement:

USA Wiring Code	IEC/CONTINENTAL Wiring Code
BLACK = HOT or LIVE	BROWN = HOT or LIVE
WHITE = NEUTRAL	BLUE = NEUTRAL
GREEN = GROUND	YELLOW/GREEN = EARTH

3.6.1 AC Voltage Selection

As shipped, the COMPELLOR is set for 120 VAC operation, but you can change your unit to match any standard AC line voltage. Simply reprogram the voltage programming card in the fuse holder in the following way:

1. Remove the power cord from the chassis receptacle.
2. Slide the clear plastic cover to the left to uncover the fuse compartment.
3. Remove the fuse by prying out the "fuse pull" lever.
4. Pull out the small printed circuit programming tag.

The tag has four voltages printed on it, labelled 100/220 on one side and 120/240 on the other side (see Fig. 3-4). Orient the tag so the required voltage is readable on the top left side of the tag, and re-insert the tag in the fuse holder. You should now be able to read your correct line voltage through the window of the fuse holder.

3.6.2 Fuse Selection

After reprogramming the AC line voltage, be sure one of the following rated fuses is inserted into the fuse holder before you apply power to the unit:

0.25 A Slo-Blo for 100-120 ACV operation
0.125 A Slo-Blo for 220-240 ACV operation

3.7 Installing the COMPELLOR in an Equipment Rack

The COMPELLOR occupies one standard rack unit of space (1-3/4") at a width of 19" and a depth of 8.5". Allow at least an additional 3" of depth for connectors and at least 1/2" of air space around the unit for cooling. Mount the unit in the desired space by using the cushioned rack screws provided with the package.

3.8 Applying Power and Initial Checkout

After you have completed all the above instructions, apply power to the unit by depressing the POWER switch (located on the front panel). If none of the indicator LED's light, check fuse and power cord installation before you proceed with the remaining tests.

Rotate DRIVE fully clockwise and set remaining rotary knobs at 12 o'clock. Send a test signal to each channel input, and verify that the signal is passing through the unit by auditioning or measuring the signal at each output.

Once you have successfully completed this section, proceed to the next section for an explanation of the Front Panel Controls and Meters.

4.0 FRONT PANEL CONTROLS

The front panel layout of the Aphex COMPELLOR Model 300 provides two sets of controls for the stereo channels, as shown in Fig. 4-1.

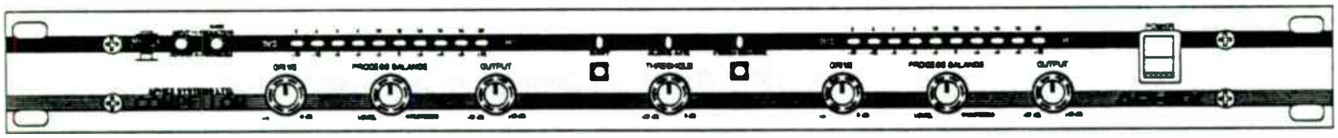


Fig. 4-1. Front panel layout of Model 300.

Each channel contains three rotary controls (located left to right), for setting DRIVE, PROCESS BALANCE, and OUTPUT parameters. Another rotary control, designated as (Silence Gate) THRESHOLD, is common to both channels. The front panel also contains five in/out pushbutton switches (located left to right), for selection of METER PROGRAM IN/OUT, METER GAIN REDUCTION, (System) IN/OUT, STEREO ENHANCE, and POWER.

Fig. 4-2. Front panel layout of Model 301.

The COMPELLOR Model 301 is a single-channel unit with the same controls (except the STEREO ENHANCE Switch), as shown in Fig. 4-2.

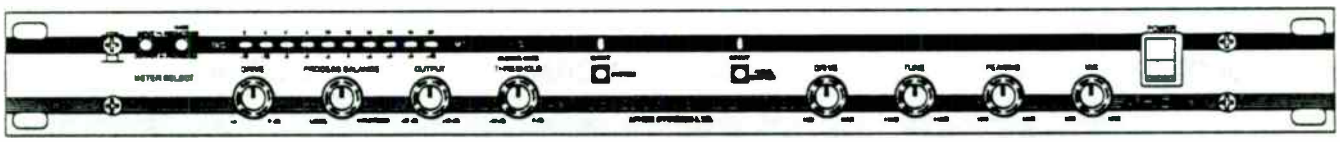


Fig. 4-3. Front panel layout of Model 303.

The COMPELLOR Model 303 is a single channel unit that also includes the AURAL EXCITER, as shown in Fig. 4-3. This model contains the same controls and switches found on the Model 301, with the addition of an IN/OUT pushbutton switch for selecting the AURAL EXCITER as well four rotary controls for setting DRIVE, TUNE, PEAKING, and MIX parameters.

The following sections contain details on the function and use of each control and switch. As a suggestion, periodically refer to the block diagrams, shown earlier in OPERATIONAL CHARACTERISTICS (section 2.0), as you become familiar with the controls and switches described below. When you have completed this section, move on to OPERATION for details on some example settings.

4.1 COMPELLOR Controls

The following controls are common to all COMPELLORs except where noted.

4.1.1 METER SELECT Switches and Bargragh

The COMPELLOR has a unique multi-function, bi-color bargraph meter that can be switched to monitor input and output levels of the program, as well as show the amount of gain reduction, as shown in Fig. 4-4.

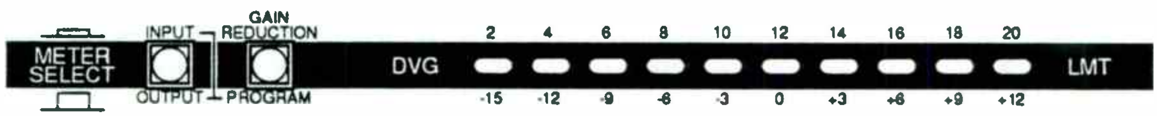


Fig. 4-4. Close-up of COMPELLOR front panel showing METER SELECT and bargraph meter layout.

In the PROGRAM mode, the last LED of the red bar indicates average level (VU) and the last LED of the green bar above it shows peak level. Program dynamics and density can be seen at a glance, as shown in Fig. 4-5. The left METER SELECT Switch provides selection of either Input or Output Program levels, whenever the right METER SELECT Switch is in the PROGRAM mode. Use the lower scale (3 dB division per LED) to read the meter's PROGRAM indicators.

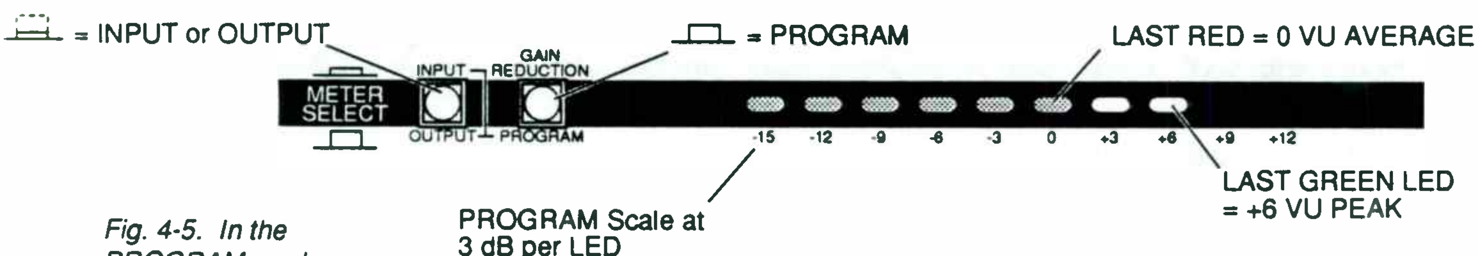


Fig. 4-5. In the PROGRAM mode, use the lower scale to read Peak and Average levels.

In the GAIN REDUCTION mode (right METER SELECT Switch is pressed), the meter shows the total amount of gain reduction as a green bar. A single red dot indicates the amount of leveling. The green bar portion above the red dot indicates the amount of compression. Use the upper scale (2 dB division per LED) to read the meter's GAIN REDUCTION indicators. For example, if 16 dB of total gain reduction is indicated and the red dot is at 10 dB, 6 dB of compression above 10 dB of leveling is indicated, as shown in Fig. 4-6.

A white "DVG" LED (see Fig. 4-4), located at the left side of each meter, flashes to show DVG action whenever the computer control circuits have anticipated and prevented a "pumping" occurrence. A red "LMT" LED (see Fig. 4-4) located at the right side of each meter flashes whenever the limiter is operating.

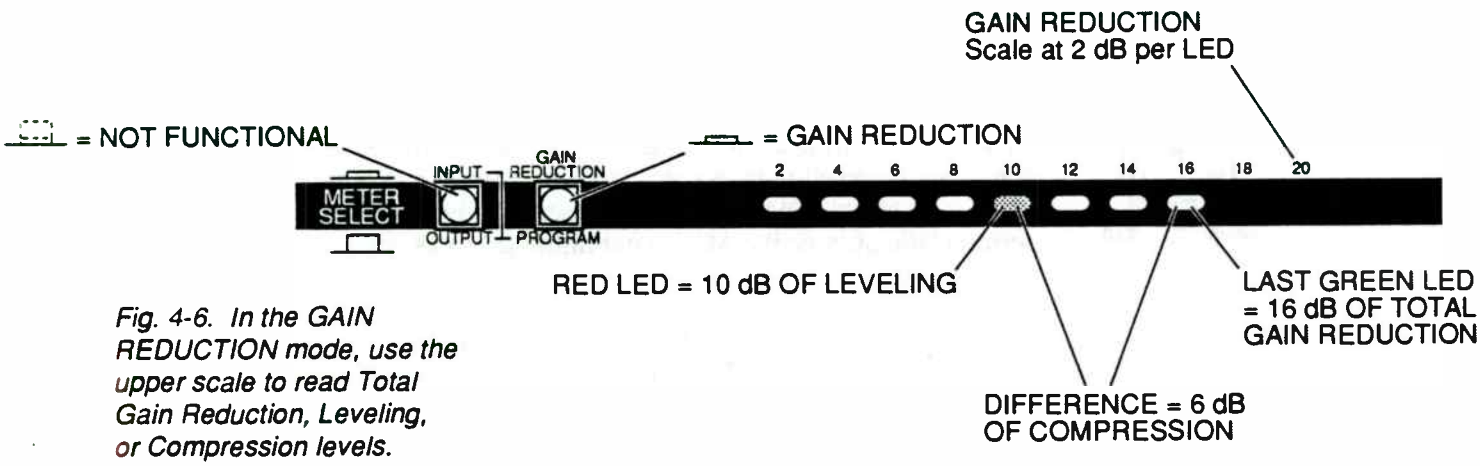


Fig. 4-6. In the GAIN REDUCTION mode, use the upper scale to read Total Gain Reduction, Leveling, or Compression levels.

NOTE... For more examples on how to read the COMPELLOR's meters, be sure to read the OPERATION section.

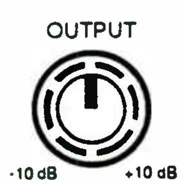
4.1.2 DRIVE Control

The DRIVE Control sets the total amount of gain reduction by controlling the amount of signal sent to the detector circuits. Turning this control clockwise provides more gain reduction.

4.1.3 PROCESS BALANCE Control

The PROCESS BALANCE Control divides the audio between the compression and the leveling sidechains, thereby controlling the ratio of leveling to compression. At the full counter-clockwise position full leveling occurs, while full compression occurs at the full clockwise position. A center position provides an even mix of the compression and leveling.

In normal operation, a mix of the two is desired, so that there is always some leveling available to absorb long-term program level changes. This will insure a consistent amount of compression regardless of program level. Unlike conventional devices with a fixed threshold that increase or decrease compression as program varies, the COMPELLOR will not change the sound quality.



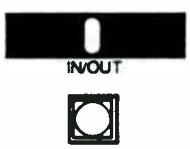
4.1.4 OUTPUT Control

The OUTPUT Control provides a ± 10 dB variation in the final signal level from the COMPELLOR. This control is used to set unity gain throughout, once all the gain reduction settings are made. This control may also be used to raise or lower the output level for other needs, as desired.

4.1.5 (Silence Gate) THRESHOLD Control

The Silence Gate is NOT a "noise gate" that mutes the audio. Instead, it senses that the audio has dropped below your pre-determined level and directs the COMPELLOR to "freeze," preventing any release of gain reduction. This action eliminates noise build-up common to other compressors or AGC devices which occurs during pauses in program. The Silence Gate also permits fade-outs, so the AGC is not fighting you as you try to lower the output level.

The (Silence Gate) THRESHOLD Control lets you set the Silence Gate Threshold from 0 to -40 dB, relative to your operating level (0 VU). Since it inhibits any action by the COMPELLOR, it should never come on during normal program material. The proper threshold level will be somewhere between normal program and your noise floor. It should activate (after about 1 second delay) when audio stops or gets part way into a fade. Silence Gate action will be indicated by the yellow LED above the THRESHOLD knob.



4.1.6 IN/OUT Switch

The IN/OUT Switch provides a hardwire bypass for system in/out comparison. An accompanying LED indicates green for OUT and red for IN.

CAUTION...

Since this switch is a *hardwire* bypass, any action being performed by the COMPELLLOR will be eliminated, including gain reduction, balanced to unbalanced and/or level translation. If you are converting a -10 dB single-ended source to a +4 dB balanced input and you select OUT, don't be surprised to hear gross distortion and hum!

4.1.7 STEREO ENHANCE Switch (Model 300 only)

When you select STEREO ENHANCE (green LED), an internal circuit measures the amount of stereo information (L-R) present at the inputs and generates an additional control signal that is sent equally to both VCA's. As the amount of stereo information increases, the output level from each VCA also increases slightly and, importantly, equally. The result is an increased *stereo* impression without any effect on monaural information.

4.2 AURAL EXCITER Controls

The following controls apply only to COMPELLOR Model 303.

4.2.1 DRIVE Control

The DRIVE Control sets the proper input level to the AURAL EXCITER enhancement-generating circuitry. A tri-color LED, located directly above the control, provides a visual indication of the amount DRIVE level. With a proper setting, the LED should indicate mostly green/yellow with program and occasionally flash red on peaks. Too much green (or no color) means the circuit is being underdriven and thereby causing minimal effect generation. Too much red means the circuit is being overdriven, perhaps causing distortion (but is not damaging).

4.2.2 *TUNE Control*

The TUNE Control allows you to adjust the range of the enhancement effect from the top end (like cymbals) down into the voice and lower instrument range. This control slides the corner frequency of the sidechain highpass filter from 1 kHz (counter-clockwise position) to 7 kHz (clockwise position). All frequencies from that point *on up* will be enhanced. You will need to experiment with this control setting across different types of audio programs to find appropriate settings. The TUNE control interacts with the DRIVE level, so be sure you verify correct DRIVE after setting the TUNE control. Try starting at 12 o'clock position for an initial setting.

4.2.3 *PEAKING Control*

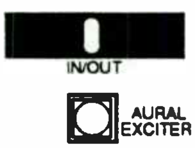
The PEAKING Control varies the shape of the high pass filter. This allows you to emphasize a narrow or wide band of material. You might want to focus on a particular voice or instrument by setting peaking to maximum, and tuning in on it, or conversely, softly blanket a whole orchestra with peaking set at minimum.

4.2.4 *Mix Control*

The MIX Control varies the amount of enhancement mixed back in with your program, from none to maximum. Your setting will depend on the effect you wish, from just a touch of naturalness for a fine sound system to grinding out maximum intelligibility in a terrible paging/PA system.

NOTE...

It's very common to over use this control at first. Remember, the goal is to sound clean and natural, not blistering!



4.2.5 *AURAL EXCITER In/Out Switch*

The AURAL EXCITER IN/OUT Switch is used to switch the enhancement instantly in or out of the Model 303 process loop. You can use this switch for A/B comparison of your settings to dry program material. The adjacent LED indicates AC power ON as well as effect OUT (green), and effect IN (red). This switch has no effect on COMPELLOR action.

5.0 OPERATION

The COMPELLOR is ideal for any application requiring automatic and completely transparent, dynamic range control. Other gain control devices either degrade audio quality or need constant adjustment, which prohibits their use for many applications. The COMPELLOR has no audible effect other than level control. You simply determine how "tight" (a relationship between the highest and lowest levels) you want the dynamic range to be, and the COMPELLOR does the rest. It will automatically control its operating parameters in response to varying program material. To operate the COMPELLOR, follow the listed steps in the Initial Settings section. If you have purchased a Model 303, also read the section on AURAL EXCITER Initial Settings at the end of this chapter.

5.1 COMPELLOR Initial Settings (All Models)

After the COMPELLOR has been properly installed, perform the following steps to familiarize yourself with its operation.

1. Send a 0 VU tone to the COMPELLOR. Set the METER SELECT switches to PROGRAM and INPUT. Adjust the COMPELLOR controls to match the initial settings shown in Fig. 5-1. You should observe a 0 VU indication on the meter. If not, refer to INSTALLATION (Section 3.0) for details.

NOTE...

On the Model 300, leave the STEREO ENHANCE Switch in the OUT position (no LED indication). When the STEREO ENHANCE Switch is OUT, the Model 300 still functions as a stereo device. If you need independent channel action, refer to CIRCUIT MODIFICATIONS (Section 8.0) for details. If you have a Model 303, make sure the AURAL EXCITER is in the OUT position.

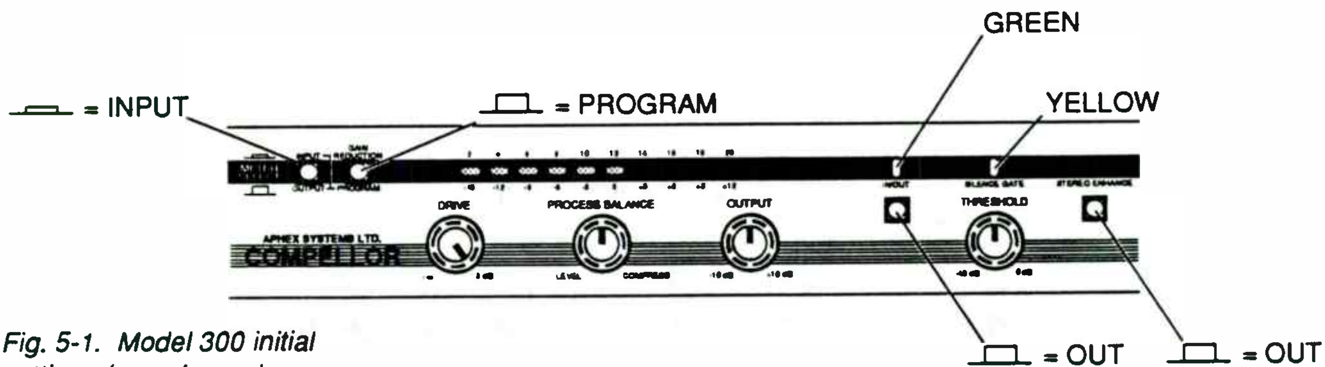


Fig. 5-1. Model 300 initial settings (one channel shown). DRIVE is initially set at full clockwise position.

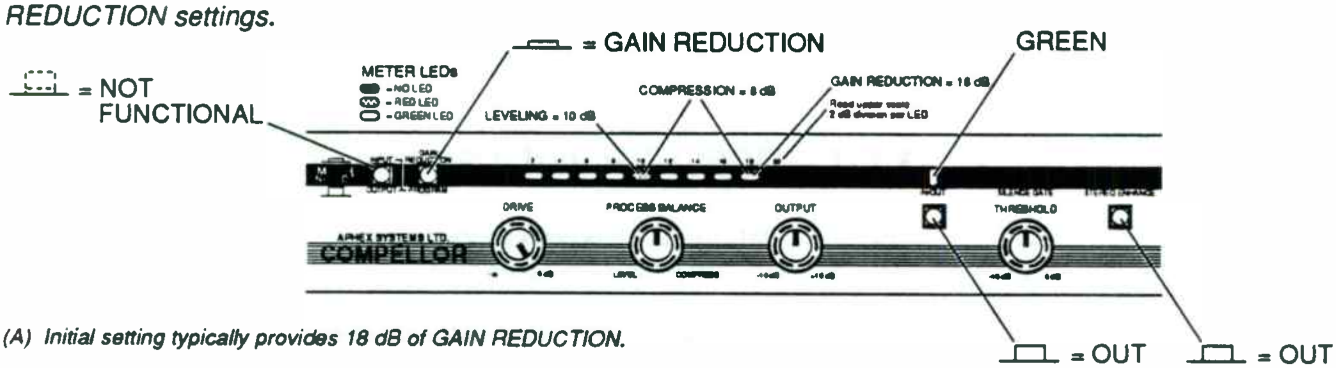
2. Select GAIN REDUCTION on the METER SELECT Switches, as shown in Fig. 5-2. Read the meter and adjust the DRIVE and PROCESS BALANCE Controls until you achieve the desired amount of GAIN REDUCTION. With audio program, adjusting these controls will determine how much the lowest-level signal will be raised.

NOTE...

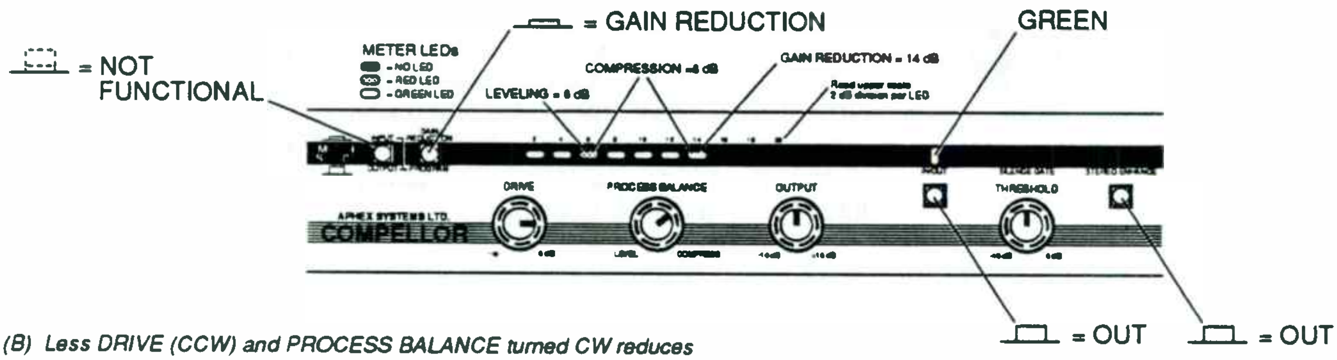
If you see unequal levels with a tone signal, the COMPELLOR may need its nominal operating levels changed or require installation of termination resistors. Refer to INSTALLATION (Section 3.0) for details.

3. Select PROGRAM and OUTPUT on the METER SELECT Switches, as shown in Fig. 5-3 . Adjust the OUTPUT Control until you see a 0 VU reading on the meter.

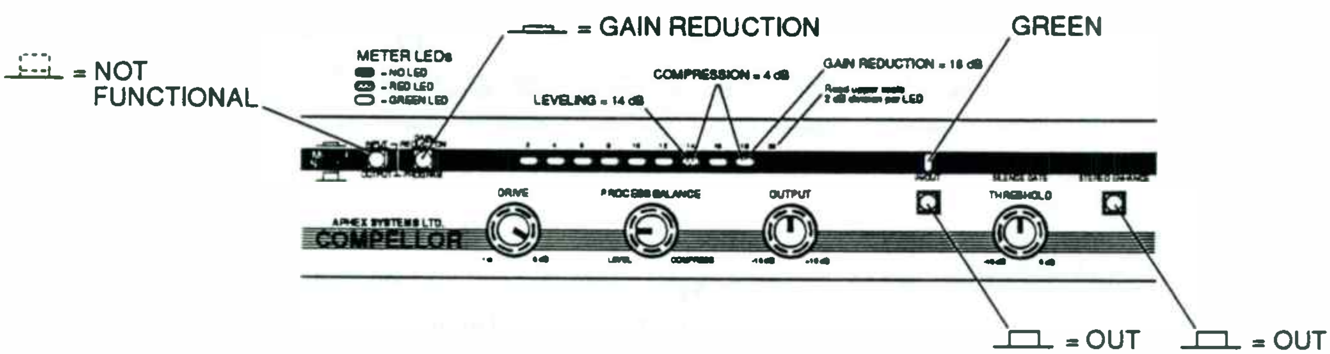
Fig. 5-2. Three examples (A, B, & C) of GAIN REDUCTION settings.



(A) Initial setting typically provides 18 dB of GAIN REDUCTION.



(B) Less DRIVE (CCW) and PROCESS BALANCE turned CW reduces GAIN REDUCTION but increases Compression.



(C) PROCESS BALANCE turned CCW reduces Compression.

For most applications, the initial DRIVE setting (full CW) provides about 18 dB of total Gain Reduction, of which 8 to 10 dB is compression. Don't be afraid - the COMPELLOR is so transparent in its action that you can use undreamed of amounts of Gain Reduction without affecting program quality. The leveling action cannot be heard at all, so you can easily use 10 dB of leveling to handle broad program level changes.

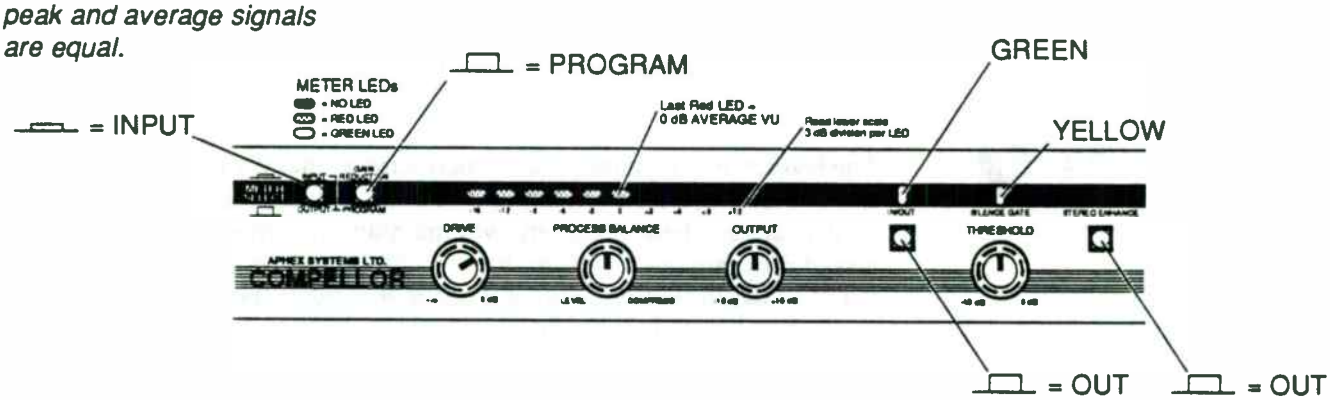
NOTE...

If the DRIVE Control is at 0 dB (full CW), and more gain reduction is needed, either increase the input level to the COMPELLOR or readjust the Input Level switch inside the COMPELLOR to a lower setting.

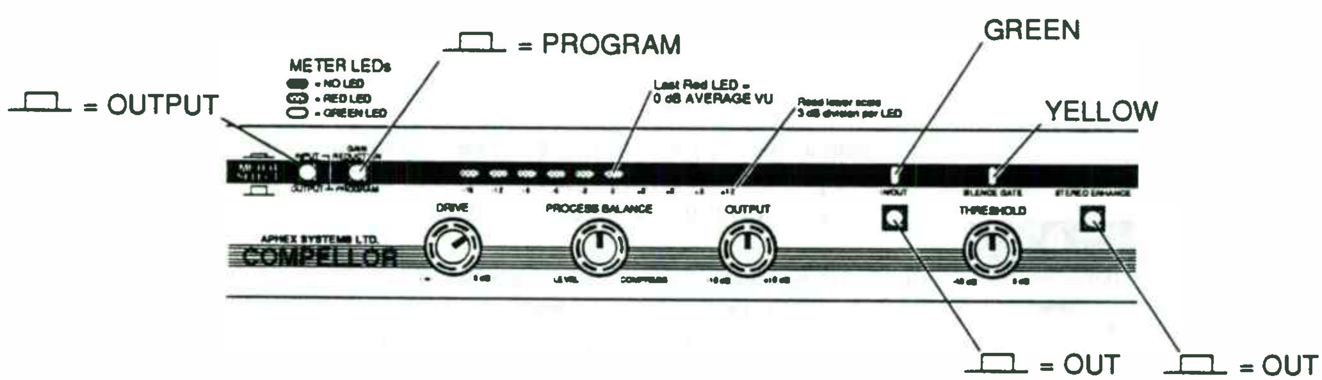
As you turn the PROCESS BALANCE Control clockwise, Compression increases and the sound becomes "tighter". In fact, even with more than 20 dB of pure compression, the audio signal will not sound "squashed".

When properly adjusted, the COMPELLOR exhibits unity gain at 0 VU. With audio programs, lower input levels will be increased and higher input levels will be decreased. The output of the COMPELLOR will "hang around" 0 VU; how closely depends upon DRIVE and PROCESS BALANCE settings.

Fig. 5-3. PROGRAM level examples for INPUT (A) and OUTPUT (B). With tone, peak and average signals are equal.



(A) In this example, the Meter Select switches are set to INPUT and PROGRAM, with the meter displaying 0 VU. This reading is achieved when the COMPELLOR's nominal operating level is set to match a system's operating level. In this mode, the DRIVE Control has no effect on the meter display.



(B) In this example, the Meter Select switches are set to OUTPUT and PROGRAM, with the meter displaying 0 VU. The COMPELLOR's output is a function of DRIVE and PROCESS BALANCE settings, with 0 VU representing the nominal operating level (typically +4 dB).

4. Using audio program, set the Silence Gate THRESHOLD, so that the Silence Gate comes on (yellow LED) after the lowest audio levels (including fade-outs), yet still above the input noise floor.

NOTE...

Be sure to verify that the Silence Gate does not come on during normal program, as this will inhibit proper action of the COMPELLOR.

An initial setting for the Silence Gate THRESHOLD is -20 dB (12 o'clock position). The Silence Gate LED should come on about 1 second after audio stops, or is partly into a fade-out. A little experimentation will easily give you the right adjustment area.

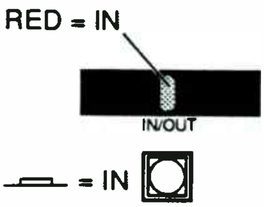


Fig. 5-4. COMPELLOR is "on-line".

5. After you are satisfied with the settings in steps 2 through 4, press the IN/OUT Switch to indicate IN (Red LED) so that the COMPELLOR is on-line, as shown in Fig. 5-4.

6. Readjust the COMPELLOR Controls to achieve the desired "tightness" and output level as necessary. Experiment with the PROCESS BALANCE Control turned more towards LEVEL than COMPRESS.

   If the leveler is used without any compression at all (full CCW), there is the possibility of some "breathing" or "swelling" with large level changes, due to the very slow attack and release. Also, the Leveling Speed switch may be set to suit either speech or music programs (see INSTALLATION Section 3.3).

NOTE...

   The leveler, having a fixed ratio, maintains a "platform" for the compressor, by holding a constant amount of a compression regardless of input level changes. This "platform" will maintain the same "sound," regardless of program level. As you turn the PROCESS BALANCE knob (CCW) toward leveling, you will notice that the instantaneous dynamic range becomes less controlled.

7. You easily can compare the sound of the audio signal with and without the COMPELLOR. When you press the IN/OUT Switch to the OUT position, a *hardwire bypass* will be inserted into the audio path.

   As you reinstate the COMPELLOR circuits, do not expect to hear any difference! The operation of the COMPELLOR simply cannot be heard. If you want to hear what it is doing, simply raise or lower the input to the COMPELLOR a few dB, and notice the absence of change or coloration at the output. Remember, the Compellor is not an effects box. There are plenty of other devices around that fit that description. If you can hear it working, it's not a COMPELLOR.

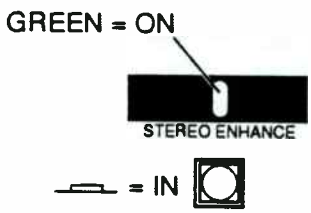


Fig. 5-5. Model 300 STEREO ENHANCE is ON.

8. On the Model 300, engage the STEREO ENHANCE Switch (Green LED), as shown in Fig. 5-5, to provide a subtle, widening effect on the stereo image that is fully mono-compatible. This special feature is not a function of an audio-matrix, stereo synthesizer system, or phase manipulation. For more information, refer to FRONT PANEL CONTROLS (Section 4.1.7).

5.2 Linking COMPELLORS (Model 301 and 303) for Stereo Operation

You can tie a Model 301 or 303 for stereo operation through the use of the LEVELING TIE jack on the rear panel on each COMPELLOR, as shown in Fig. 5-6.

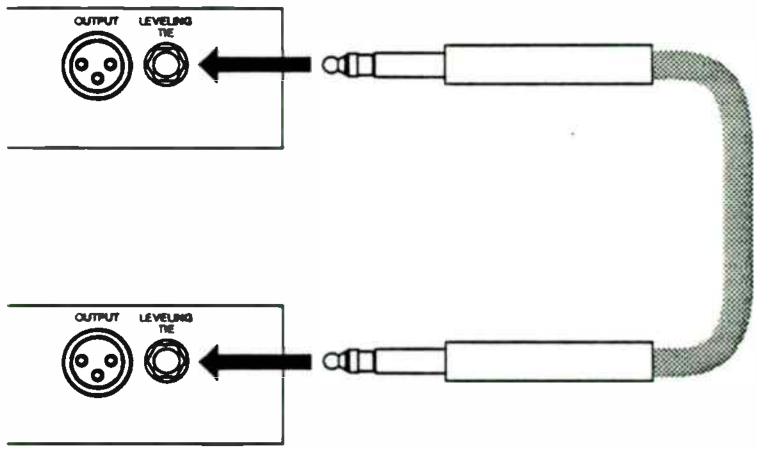


Fig. 5-6. Connecting two COMPELLORs (Model 301 or 303) through the rear panel LEVELING TIES for Stereo Operation.

Plug a 1/4" guitar cord or a standard 1/4" R-T-S patch cord into the two jacks to cross-link the control voltages. The connection between the two channels provides tracking and prevents the loss of stereo imaging. Up to six Model 301's or 303's (in any combination) can be "mult-ed" together for multitrack operation.

NOTE...

Whichever unit is set for the most GAIN REDUCTION will force its action onto all units connected through the LEVELING TIES.

5.3 AURAL EXCITER Initial Settings (Model 303 Only)

After you have set the COMPELLOR Controls, set the AURAL EXCITER Controls to the initial settings shown in Fig. 5-7 (next page).

1. With the AURAL EXCITER IN/OUT Switch initially in the OUT position, adjust the DRIVE Control so that the tri-color LED flashes green to mostly yellow. On typical program material occasional flashes of red on peaks are acceptable.

2. Set the MIX Control at minimum (full CCW), and press the AURAL EXCITER IN/OUT Switch to IN.

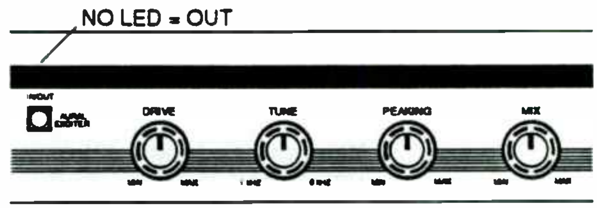


Fig. 5-7. Model 303 initial settings for AURAL EXCITER.

3. Slowly increase the MIX Control (CW), until you begin to hear the extra edges and minute cues missing from the original signal. (See OPERATIONAL CHARACTERISTICS of AURAL EXCITER, Section 2.1.7)

4. Vary the nature of the enhancement signal by adjusting the TUNE Control to include more or less of the audio spectrum. Because this action varies the amount of the signal being processed, you may have to adjust the DRIVE level accordingly. Once you have the TUNE Control set to a desired area, you can readjust the DRIVE for the correct level and the MIX for a pleasant sound.

5. Use the PEAKING Control to adjust the width of enhancement. Minimum peaking produces wide enhancement, while maximum peaking creates narrow enhancement. For example, use maximum PEAKING to pick a particular voice or instrument out of the total mix, or set the PEAKING Control at a minimum to apply a flatter, more even effect. As with most of the controls of the AURAL EXCITER, there is no right or wrong setting. The proper adjustment is a matter of personal taste.

6.0 CIRCUIT DESCRIPTION

The circuits that make up the Aphex COMPELLOR Model 300 are grouped onto several boards, including: two Audio Processing Boards, two Display Control Boards, and a Power Supply Board for AC to DC voltage conversion via the separate AC line transformer. The Model 301, being a mono unit, has one less set of Audio and Display Control boards. The Model 303 has the same number of boards as the Model 301, and also includes an Exciter board.

The following text is divided into two main sections: COMPELLOR Circuit Description and AURAL EXICTER Circuit Description. The COMPELLOR section applies to all models, while the AURAL EXCITER section describes additional circuits found only in the Model 303.

6.1 COMPELLOR Circuit Description

Block diagrams of the Model 300 and Model 301 COMPELLOR (shown in Fig. 6-1 and Fig. 6-2) disclose the circuit elements and connections in a simplified form. The COMPELLOR/AURAL EXCITER Model 303 block diagram can be found in Section 6.2. Refer to these diagrams, as well as the circuit schematics (located at the end of the manual), during the discussion of the COMPELLOR circuits. For the sake of brevity, only channel 1 components are mentioned in the following discussions.

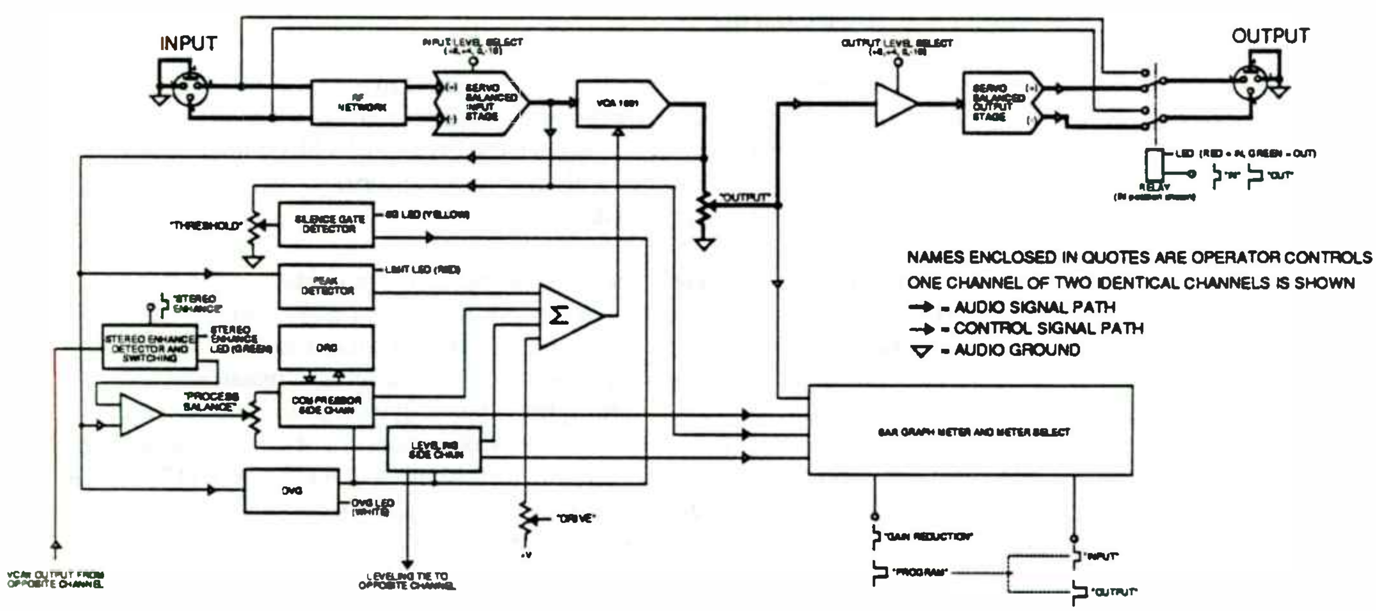


Fig. 6-1. Block diagram of COMPELLOR Model 300 circuits (one channel shown).

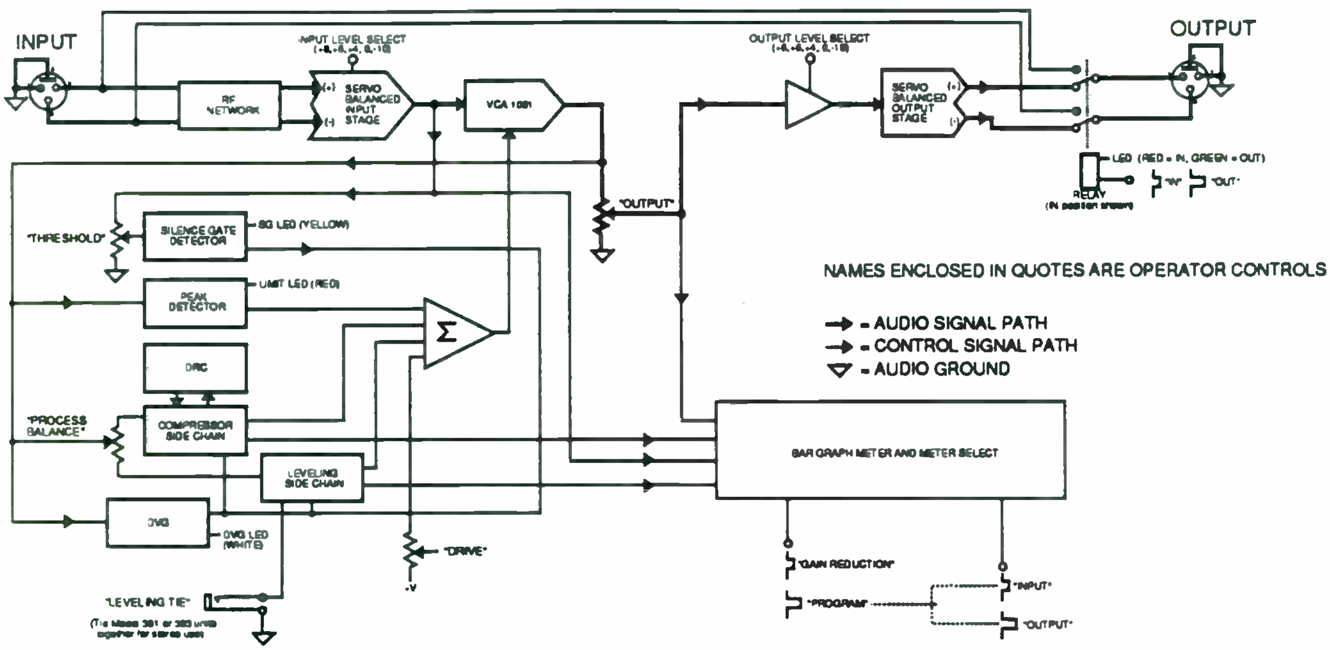


Fig. 6-2. Block diagram of COMPELLOR Model 301 circuits.

6.1.1 Input Circuits

A specialized instrumentation amplifier is used to provide true differential gain, optimum overload characteristics, differential VCA drive, and high common-mode rejection over a wide bandwidth. RFI filtering is provided using a ferrite core technique, with additional filtering as an inherent characteristic of the input stage circuit.

Refer to the Audio I/O schematic. The input circuit centers around U101A&B, and U102A. U101 A&B are much like a traditional instrumentation amplifier. In this application, the output is utilized to drive the VCA circuit. Input gain normalizing is selected by changing a resistor in the feedback circuit, thus determining the operating gain of the input stage.
A very unique arrangement is incorporated in this input circuit using U102A as a common mode error cancellation amplifier. Via R115 and R113, U102A responds only to the signal which is not equal and out of phase between the outputs of U101A&B. U102A is operated with high gain.

At the input to U101A&B, note resistors R103, R104, R105, and R106 forming a bridge. This bridge sums the input signal with the common mode error signal from U102A. Effectively, any common mode input signal will thus be canceled out, eliminating it from appearing at the differential output of the input circuit. Capacitors C103 and C104 act as DC blockers, in case the input source might contain some DC offset. C105, C106, and C110 produce a phase-correcting effect, which guarantees stability of the system at high frequencies. Also C105 and C106 for part of a low pass filter at the input which rejects RFI frequencies. Primary RFI filtering is obtained through the ferrite RF transformer core input choke, in conjunction with bypass capacitors C101 and C102.

It is important to observe that this input circuit maintains high-speed and near ideal characteristics because of its perfect symmetry, with both polarities passing through identical paths. Each path operates with optimized noise and headroom parameters.

Due to the error correcting "servo" type of feedback employed through U102A, the input can be driven unbalanced with equal gain and differential drive to the VCAtt being the result. In other words, the input stage automatically adjusts its own input sensing to accept either balanced differential, or unbalanced inputs, and produces the same net gain. This is directly analogous to using an electromagnetic transformer input stage, but without the drawbacks of audio degradation caused by transformers.

6.1.2 VCA Stage

The COMPELLOR incorporates the Aphex VCA1001 VCAtt (Voltage Controlled Attenuator, U104) as the heart of the gain management Bystem. Differential audio drive to U104 is taken directly from the input Stage Ul0lA&B. U104 is operated in a differential mode to maintain maximum dynamic range, minimum distortion, and minimum control feedthrough.

A net gain is realized by virtue of the summing amplifier U105A which receives the differential output of the VCA1001 and converts this signal to an unbalanced audio output. Thus, the stage is operated as a voltage controlled amplifier (VCA), with a potential gain control range in excess of 90 dB. The gain distribution through the input stage and VCA circuit affords sufficient peak headroom to assure no clipping will occur, even at maximum drive and gain reduction.

Pin 9 of U104 receives the DC gain control voltage. Two voltages are resistively summed at pin 8. R135 injects control voltage from the peak limiter driver, U108A. R134 injects the composite control voltage for leveling and compression from summing amplifier U105B. Resistive summing at pin 8 is used to maintain the fastest possible response with minimum delay for the peak limiter system.

6.1.3 Output Circuits

The COMPELLOR output stage is a highly-refined balanced differential line driver, having transformer output characteristics in terms of amplitude regulation to the load. This is unlike the more common differential drivers, which provide only half the voltage output when operated unbalanced to ground.

The COMPELLOR output stage provides full output swing to an unbalanced load when the user grounds the unused pin (usually Pin 2 of the output connector) to maintain phase integrity.

Normally, this method would short out the negative polarity output driver,but the COMPELLOR output stage incorporates a cross-coupled bridge type circuit, which senses lack of drive at either output pin and shifts gain to the alternative output driver, while removing gain from the shorted driver. This maintains normal system gain and output to any type of load, be it a balanced line or unbalanced line.

This technique also eliminates heavy ground currents that normally occur when the output driver is shorted to ground. This unique circuit simulates desirable characteristics of a transformer coupled output stage, while eliminating undesirable distortions and bandwidth limitations of transformers.

Output level normalizing is accomplished by the user through changing a gain determining resistor. This sets the 0 VU output level at +8, +4, +6, 0 or 10 dBm as desired. U106A&B form a single-ended to balanced buffer/driver stage having programmable gain. This stage receives audio directly from the VCA circuit through the level pot RV302. U107A&B form a cross-balanced bridge amplifier, differentially driven, with a differential output and essentially unity gain. Output drive capability is boosted by current boost transistors Q104, 105, 106 and 107. Careful attention to the feedback stability has produced an exceptionally transparent output circuit.

A point of interest that should be noted is that the COMPELLOR audio path from input to output is completely differential, except at the VCA output node. At this point, it is converted to a single-ended path to provide convenient sidechain drive and output level adjustment. The significance of this is that the differential audio path is less susceptible to noise, has less distortion and greater slew rate than a totally unbalanced audio path would exhibit. This, together with the fact that the 1001 VCAtt is an extraordinarily transparent gain control element, gives the COMPELLOR an extremely clean audio path which is subjectively unnoticeable in even the most sophisticated, high-caliber audio recording or reproducing systems.

6.1.4 The Peak Limiter

The COMPELLOR Peak Limiter circuit is driven directly by the VCA output node. R136 and R137 set the peak amplitude threshold at which limiting takes place. U102B is a unity gain buffer which drives the pulse generator pair, Q101 and Q102. Q101 is operated common-base, and when the emitter is driven positive by the Vbe of the transistor, about 0.65 volts, then Q101 pulls collector current through R128.

This action produces a pulse on the base of Q103, the pulse amplifier/current pump. Q102 is operated common emitter, so when U102B drives its base *negative* by the Vbe of the transistor, which is the same as for Q101, about 0.65 volts; collector current is pulled also through R138. This produces a pulse on the base of Q103.

Q103 is operated as a common emitter switch tied to the negative supply rail. When it is turned on by a pulse either generated by Q101 or Q102, it passes charging current through R140 to storage capacitor C115. R140 serves to limit the maximum charge rate, thus peak current, through Q103 to a safe value, while maintaining sufficiently fast attack to provide near instantaneous limiting required for catching high frequency audio peaks and transients.

R142 allows C115 to discharge between charge pulses, and its value sets the release time of the limiter.

U108B is a voltage follower/buffer to transfer the control voltage developed across C115 to the VCA control port.

U108A serves as a threshold detector and monostable trigger to flash the "LIMIT" LED whenever there is significant peak limiting happening. When the control voltage exceeds the reference voltage at the junction of R147 and R148, U108A switches state to an output high, which swings approximately to the positive supply rail. D101 couples this positive pulse to the front panel "LIMIT" LED. While C114 is charging to a stable condition, U108 remains high, due to the positive feedback of C114. When C114 reaches a full charge, U108 reverts back to an output *low*, and the LED extinguishes. The one-shot type LED drive is necessary, since most peak limiting is of too short a duration to permit visible display.

6.1.5 Leveling Sidechain

The leveling technique in the COMPELLOR uses an unusual concept in both level detection and control voltage generation. U201, with associated components, forms a full-wave rectifier and is driven from the PROCESS BALANCE pot. Drive is therefore increased or decreased, depending on the option of the user and how he programs the leveling/compression balance.

A positive-sense absolute value representation of the audio signal is placed at the positive port of comparator U202A for the rectifier U102A. A reference voltage of approximately 0.65 volts is placed on the negative port of the comparator by current limiter R213, and diode-connected transistor Q203.

U202A produces a pulse train, which transitions whenever the absolute value signal passes through the reference threshold of 0.65 volts. Thus, the pulse train duty cycle and pulse rate contain complex information about the power level of the audio wave. Since the output of U202A swings to both supply rails, the negative swing is blocked, as needed by the remaining circuitry.

R214 and R216 form an attenuator which provides the desired pulse amplitude at the source of FET Q202. Q202 is operated as a switch, passing or blocking the pulses to R222 and pin 1 of the channel interconnect DIP socket. R222, along with C205, form a slow integrator which converts the comparator pulse train to a DC voltage. U204 buffers the integrator, and feeds the derived control voltage to the VCA control port summing stage, U105B.

Q202 is part of a gating system which freezes the control voltages as commanded either by the DVG and Silence Gate bussed by "or-ing" diodes D204, D205 and isolation diode D203. When either gate bus goes negative, the gate of Q202 is forced negative, thus opening the source-drain channel and isolating R222. Since R222 both charges and discharges C205, the voltage which has been developed on C205 will "hold" until Q202 once again "closes." The leveling integrator will then begin to follow the power level contained in the pulse train from U202A.

6.1.6 Compression Sidechain

Several features in the compressor are proprietary, and are included in the DRC Module shown in the schematic. Basically, however, the compressor sidechain receives drive from the PROCESS BALANCE pot, and therefore the drive will vary, depending on the user's settings. The DRC Module contains the heart of the level detector and circuits that control the uniqueness of the COMPELLOR.

Q201 is a switch that is part of the gating structure in the COMPELLOR. C203 is a portion of the control voltage generating circuit, where it acts as an integrating element and follow-and-hold element. When Q201 is "on," C203 is connected in the circuit, and follows the compression level detector output from the DRC Module. Buffer U204A passes the control voltage to the VCA control voltage to the VCA control port summer U105B.

The gate of Q201 is connected to the DRC and Silence Gate busses by isolation diode D201, and "or-ing" diodes D204 and D205. If either bus goes negative, Q201 turns "off," isolating C203, and causing the control voltage that had been developed across it to "hold." This effectively freezes the gain instruction from the compression sidechain to the VCA. When Q201 again turns "on," the compression sidechain instantly normalizes to its new operating conditions.

U201B and associated components support the DRC and compression level detecting system.

6.1.7 Dynamic Verification Gate (DVG)

The Dynamic Verification Gate, or "DVG," provides drive signals to the follow-and-hold portions of the leveling and compression sidechains. A sample of processed audio is taken from the output of the VCA, and converted to a differential signal at the DVG Module, pins 3 and 4. The module contains proprietary circuits that drive comparator U202B. Pulses thus produced are passed to the gating bus by D205. D209 couples the pulses to the DVG LED on the front panel.

6.1.8 Silence Gate Circuit

A sample of audio is taken from the input amplifier through R116 and passed to the THRESHOLD control, RV304. RV304 is a reverse taper potentiometer, so that greater audio drive is obtained in the counter-clockwise direction of adjustment. This audio is sent to U304B and associated components, which form a half-wave gain storage. The gain is about 60 dB in this stage, in order to obtain sufficient sensitivity to detect levels to 40 dB below operating level of the input stage.

Half-wave rectified audio pulses are fed through D315 into a storage filter consisting of C307, R337 and the two LED's, LD316 and LD317. Resistor R366 sets the attack time of the threshold detector by limiting charging current to C307. This time constant is made short to permit fast recognition of audio presence by the detector.

LD315 and R339 provide a voltage reference on one LED drop, about 1.7 volts to the comparator, U304A. LD316 and LD317 form a voltage limiter, to keep the storage capacitor from acquiring an excessive charge. When audio falls below the point that produces a voltage on C307 of one LED drop, the comparator U304 goes low, or negative, at the output. This condition represents silence detection, and the negative comparator signal is passed to the gating bus in the process sidechains.

Diodes LD316 and LD317 cause the charge on the filter capacitor C307 to limit, thus allowing repeatable, consistent timing of silence detection, regardless of the character or level of the audio program.

6.1.9 Stereo Enhance Circuit (Model 300 only)

Refer to the Channel "B" board schematic. Amplifiers U408A&B serve as the A and B channel sidechain drivers, respectively. For this discussion, consider the channel A driver, U408A. Channel A VCAtt output is fed to U408A through input resistor, R432. The gain of this stage sets the operating threshold of the sidechains relative to the program level at the VCAtt output.

The driver output is split to two paths, one to the leveler and one to the compression sidechain. R425, R426 and RV403 form a bridge which adjusts the relative drive to the two sidechains.

In the stereo enhance mode, a small portion of the alternate channel's audio is added out of phase to the audio at each driver stage. The Stereo Enhance switch injects or interrupts the alternate channel audio feeds.

6.2 AURAL EXCITER Circuit Description

AURAL EXCITER processing is introduced between the COMPELLOR VCA output and the output level control, as shown in Fig. 6-3. Thus, ideal conditions for processing are maintained with minimum signal path complexity for highest performance.

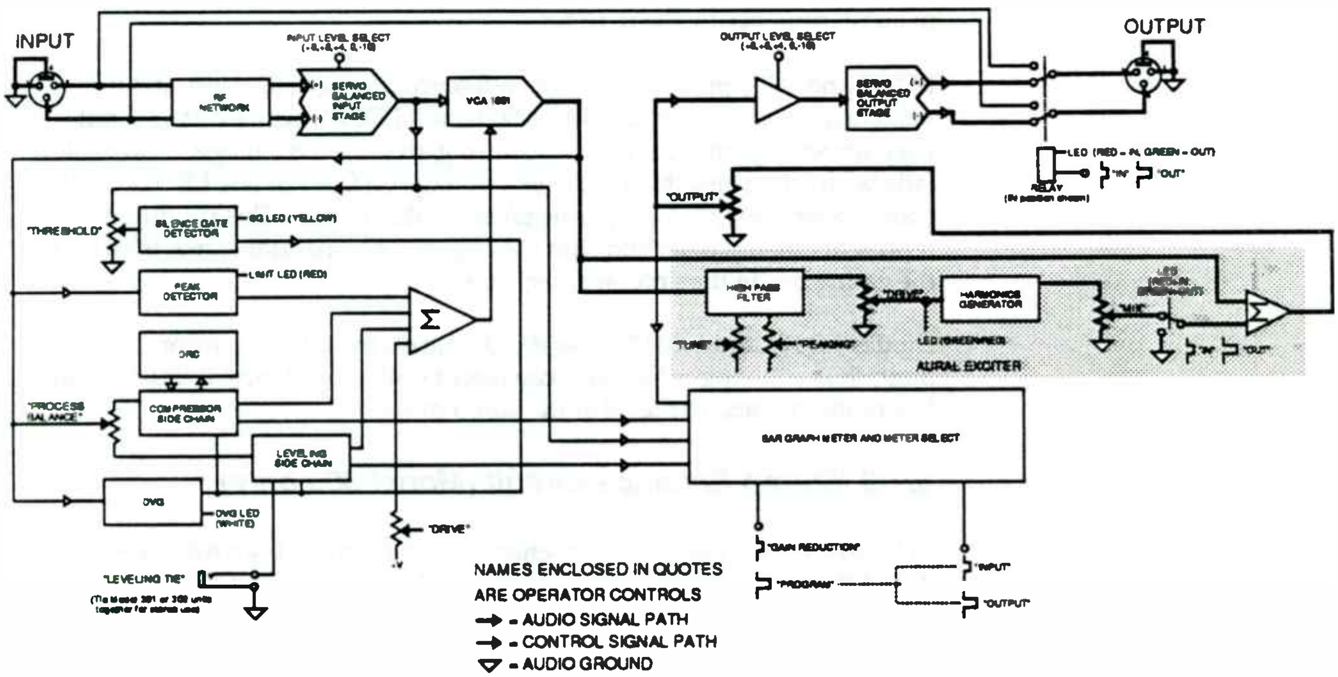


Fig. 6-3. Block diagram of COMPELLOR Model 303 circuits.

6.2.1 Filter Circuit

AURAL EXCITER processing begins at pin 3 of H401, where audio from the COMPELLOR 1001 VCAtt is passed to an adjustable second order high-pass filter consisting of U402B, U403B, and associated components. This filter determines the lower frequency limit of AURAL EXCITER enhancement. Dual potentiometer VR402 tunes the cutoff frequency from approximately 1.2 kHz to 6 kHz. The filter damping (or "Peaking") is adjusted by VR403, which effectively tunes the "Q" of the circuit between about 0.7 and 1.1, thus contouring the cutoff response between a gradual slope and a slightly peaked but sharper cutoff. The gain of the filter is set at unity.

6.2.2 Harmonics Generator

This circuit comprises U402A, U404, and associated components. VR401 sets the "Drive" level to the harmonics generator, while U402A services as an inverting gain stage. U4O4, the MAX 1502 integrated circuit (Aphex proprietary chip), constitutes the harmonics processor. Output from the MAX 1502 at pin 11 is AC coupled to VR404, the "MIX" control.

The harmonics processor operates on the principal of generating even order harmonics, mostly second order, musically and dynamically correlated to the audio input signal. The percentage of harmonics is dependent on the drive level and transient quality of the audio. Greater harmonics energy is created for brief transients than for sustained sounds. Since the harmonics generator is fed audio from the high pass filter, the frequency range and intensity of harmonics will depend on drive level and filter tuning.

6.2.3 Processing Return (MIX)

Output from the MIX control containing the harmonically processed signal is buffered by U403A and passed to the EXCITER "In/Out" switch S401. U401B serves as a mixing stage to add the harmonics signal from S401 via R402 to the original audio from pin 3 of H402 via R401. Mixed audio is returned to the COMPELLOR output level control via pin 1 of H401.

6.2.4 Display

The three-color "Drive Level" front panel LED is driven by a circuit comprised of U401A, and U405A,B,C, and D. U401A and U405A form a full wave rectifier, receiving a signal from drive buffer U402A. The full wave signal thus represents the drive level to the harmonics processor. This full wave signal is filtered and level detected by a window comparator, using U405B,C, and D. The comparator outputs are combined to drive the bi-color LED in a manner which produces green for low levels, yellow (red and green segments on) for nominal levels, and red for excessive levels.

7.0 TEST PROCEDURES

The following tests are not comprehensive, but they can be used for a quick field test of COMPELLOR operation. The tests apply to all models, except the AURAL EXCITER Test, which is performed only on the Model 303.

NOTE... If you are checking the performance of the COMPELLOR circuits on the Model 303, make sure the AURAL EXCITER is OUT.

To properly implement the tests, refer to Fig. 7.1 and Fig. 7.2 for the proper test set-up and a special test fixture for peak limiter testing.

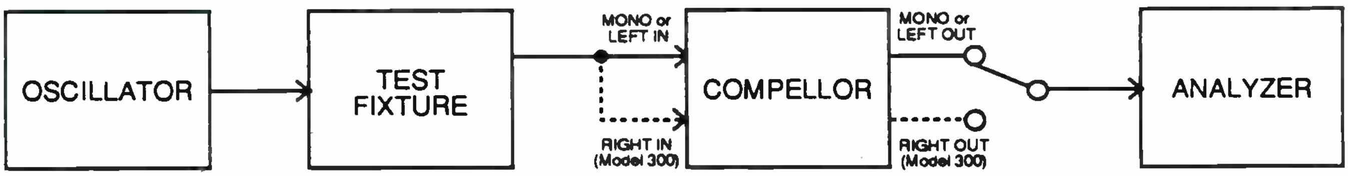


Fig. 7-1. Block diagram of test set-up.

The listed test procedures require the use of the following test equipment:

1. Audio Analyzer (Sound Technology 1710 or equivalent)
2. Spectrum Analyzer (Tektronix 5LAN or equivalent)
3. Sweep Function Generator (B&K 3025 or equivalent)
4. Multimeter (Fluke 77 or equivalent)
5. Oscilloscope (minimum 10 MHz bandwidth)

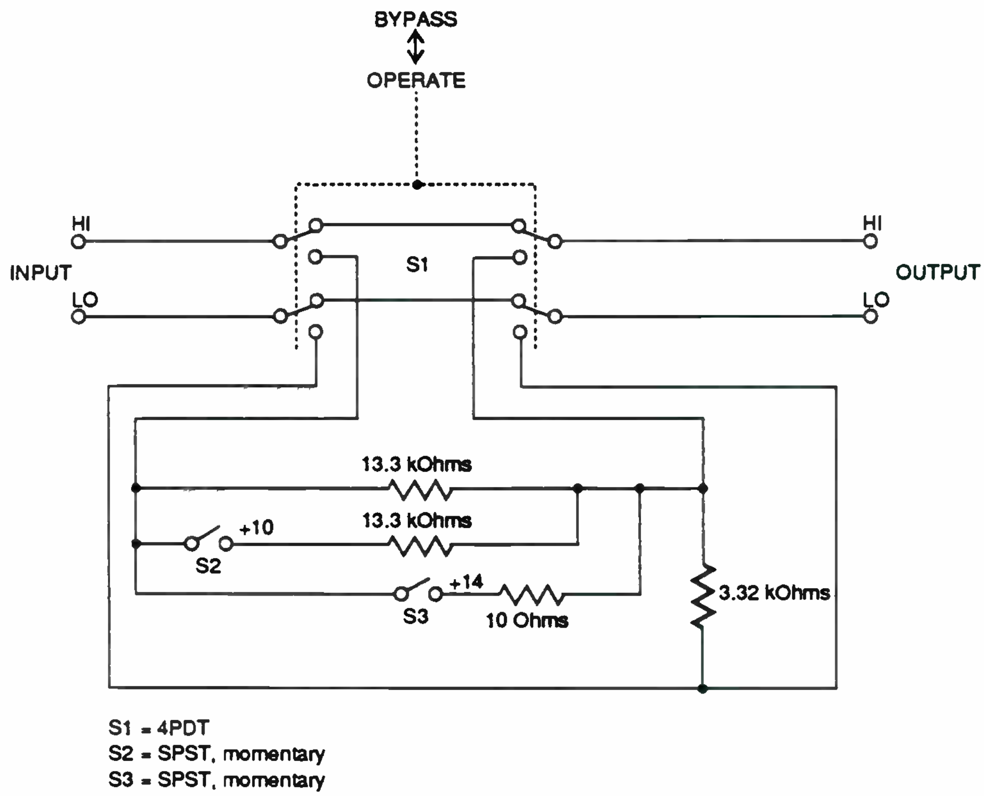


Fig. 7-2. Suggested test circuit used in the Peak Limiter test.

7.1 COMPELLOR Compression Test

7.1.1 Initial Set-up

1. Set Silence Gate THRESHOLD to full CCW position.
2. Turn all other knobs to full CW positions.
3. Set COMPELLOR IN/OUT switch to IN.
4. On Model 300, verify STEREO ENHANCE is "OFF."
5. Choose a test oscillator frequency equal to 400 Hz.
6. Select GAIN REDUCTION on METER SELECT switches.
7. Make sure I/O is normalized to +4 dBm.
8. On Model 303, verify AURAL EXCITER is OUT.

7.1.2 Test Procedure (All Models)

Step	Operation	Indications
1.	Oscillator output = +6 dBm.	A. Full scale green LED's B. Output level =+17.4 dBm ±1dB
2.	Drop oscillator 10 dB to -4 dBm.	A. 6 green LED's lit B. Output level = +14 dBm ±1dB
3.	Drop oscillator 10 dB to -14 dBm.	A. 3 green LED's lit B. Output level = +9 dBm ±1dB
4.	For Model 300, set STEREO ENHANCE to ON.	A. Output level increases 0.4 dB. B. Both channels increase same amount ± 0.25 dB .

7.2 COMPELLOR Leveling Test

7.2.1 Initial Set-up

1. Set Silence Gate THRESHOLD and PROCESS BALANCE to full CCW position.
2. Set DRIVE to 3 o'clock position. On Model 300, set Left DRIVE to 3 o'clock position and Right DRIVE to full CCW position.
3. Turn all other knobs to full CW positions.
4. On Model 300, verify STEREO ENHANCE is "OFF."
5. Set COMPELLOR IN/OUT switch to IN.
6. Choose a test oscillator frequency equal to 400 Hz.
7. Select GAIN REDUCTION on METER SELECT switches.
8. Make sure I/O is normalized to +4 dBm.
9. On Model 303, verify AURAL EXCITER is OUT.

7.2.2 Test Procedure for Model 300 only

Step	Operation	Indications
1.	Oscillator level = - 7 dBm.	A. Approximately 2 LED's lit B. Left Output = +13 dBm within 1dB C. Right Output = 0
2.	Turn Right INPUT CW until Left Output drops 0.1 to 0.2 dB.	A. Right and Left Outputs at +13 dBm B. Channels match within 1 dB
3.	Increase oscillator to 0 dBm.	Right and Left Outputs settle to +13 dBm and match within 1 dB.
4.	Increase oscillator to +10 dBm.	Right and Left Outputs settle to +13 dBm within 1 dB.
5.	Suddenly drop the oscillator level by 20 dBm.	Right and Left Output levels recover to +9 dBm and track within 1 dB - Worst case divergence does not exceed $\pm$ 0.5 dB at any Input level.
6.	Set OUTPUT Levels exactly equal, repeat steps 4 & 5.	Difference during recovery should be negligible ($\pm$ 0.5 dB).

7.2.3 Test Procedure for Model 301 and 303

Step	Operation	Indications
1.	Oscillator level = -7 dBm.	A. Approximately 2 LED's lit B. Output = +13 dBm within 1dB
2.	Increase oscillator to 0 dBm.	Output settles to +13 dBm.
3.	Increase oscillator to +10 dBm.	Output settles to +13 dBm.
4.	Suddenly drop the oscillator level by 20 dB .	Output levels recover to +9 dBm.

7.3 COMPELLOR Peak Limit Test

7.3.1 Initial Set-up

1. Set PROCESS BALANCE to full CCW position (leveling mode).
2. Set INPUT and OUTPUT to full CCW positions.
3. On Model 300, verify STEREO ENHANCE is "OFF."
4. Leave all other controls at their present positions.
5. Feed inputs through the special test fixture, as shown in Fig. 7-2.
6. Set oscillator to 400 Hz and +10 dBm level.
7. Verify I/O is normalized at +4 dBm.
8. Set IN/OUT switch to OUT.
9. On Model 303, verify AURAL EXCITER is OUT.

7.3.2 Test Procedure for Model 300

Step	Operation	Indications
1.	Turn Right INPUT to full CCW position.	
2.	Press the "+10" button on the test fixture.	The LEDs indicate gainreduction, but peak LED will not flash.
3.	Release the "+10" button and let gain reduction recover. When gain is recovered, press the "+14" button on the fixture.	The LEDs indicate gain reduction and the peak LED will flash once or twice briefly.
4.	Turn the Left INPUT to full CCW position, and turn the Right INPUT to 12 o'clock position.	
5.	Repeat steps 2 & 3 for the Right channel.	

7.3.3 Test Procedure for Model 301 and 303

Step	Operation	Indications
1.	Press the "+10" button on the test fixture.	The LEDs indicate gain reduction, but peak LED will not flash.
2.	Release the "+10" button and let gain reduction recover. When gain is recovered, press the "+14" button on the fixture.	The LEDs indicate gain reduction and the peak LED will flash once or twice briefly.

7.4 AURAL EXCITER Tests (Model 303 Only)

NOTE... Disconnect P401 from the AURAL EXCITER board at H401 to enable insertion of test signals. The normal power supply via H402 is still retained for the following tests, which are conducted with the power on.

7.4.1 Filter Test

This test should be done using a tracking generator and spectrum analyzer. Inject a -10 dBm signal from the tracking generator to pin 3 of H401 and monitor the filter output at the DRIVE control clockwise end. Set the analyzer to sweep at 1 kHz/div. Verify the gain is unity above the cutoff frequency, and that the cutoff frequency tunes with the TUNE control. Observe that the shape set by the PEAKING control holds through the tune range. Verify that PEAKING is adjustable from at least 2 dB down to zero.

7.4.2 Harmonics Processor Test

Apply a -10 dBm, 5 kHz tone to pin 3 of H401. Set TUNE full counterclockwise. Set PEAKING and DRIVE full clockwise. Check the signal at the clockwise end of the MIX pot with an oscilloscope. You should see a waveform similar to Fig. 7-3.

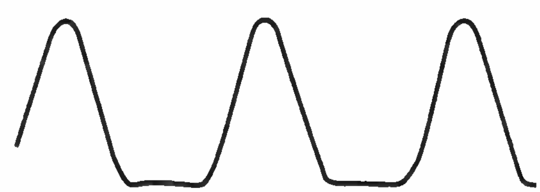


Fig. 7-3. Waveform shape appearing at clockwise terminal of MIX pot.

Reduce DRIVE to minimum. The waveform should smoothly resume a nearly sinusodial shape and diminish in amplitude as DRIVE is reduced.

7.4.3 Mix Return Test

Retain the setup used in the Harmonics Processor Test and return DRIVE to full clockwise. Monitor the output of pin 1 of H401 with the oscilloscope. Turn MIX full clockwise. Check that the IN/OUT switch functions by observing the output as it changes shape and amplitude.

With the IN/OUT Switch IN, verify that the waveform is similar in shape to Fig. 7-3. Reduce the MIX Control to zero and observe that the waveform falls in amplitude and loses the non-sinusodial shape in proportion to mix level. Check that the signal at pin 1 of H401 is equal to pin 3 when MIX is at zero.

7.4.4 Drive Indicator Calibration

With the same initial setup used in the Harmonics Processor Test, readjust the oscillator level until each of the three colors appears on the DRIVE LED. Make note of the oscillator level at each color threshold. The oscillator output levels should follow the following table within ± 2 dB.

GREEN	-44 dBm
YELLOW	-30 dBm
RED	-20 dBm

8.0 CIRCUIT MODIFICATIONS

This section contains several circuit modifications that have been implemented in the field for custom applications. Modifications include:

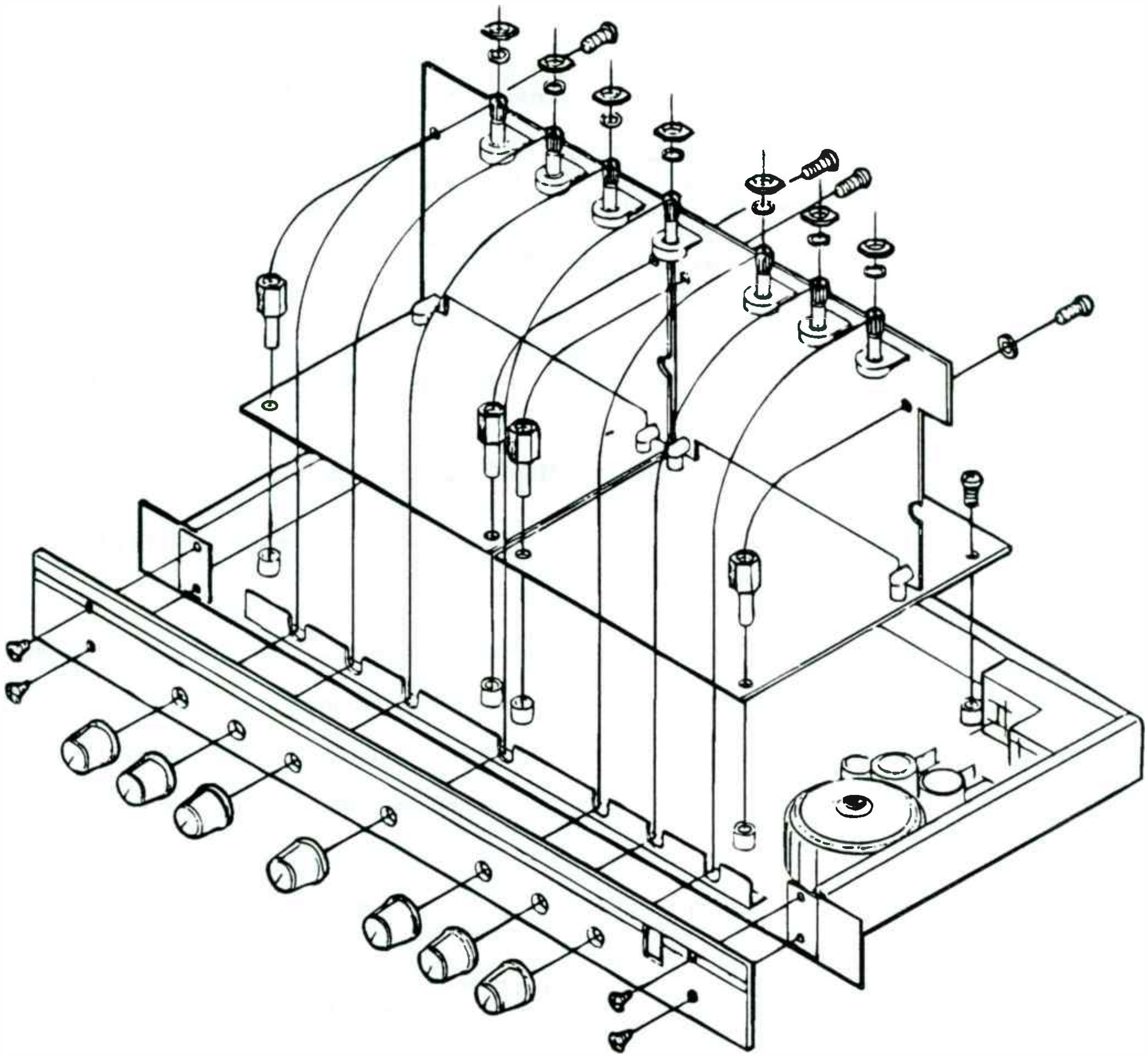
- Changing the Model 300's Operating Levels
- Increasing the Model 300's Leveling Speed
- Unlinking the Model 300 for 2-channel Operation
- Modifying the COMPELLOR (all models) for Input Grounding
- Defeating the COMPELLOR (all models) Peak Limiter

Take a moment to read through each section to evaluate whether any one or more modifications are applicable to your own installation. With a little planning, all work can be completed during a single disassembly session.

8.1 Changing the Model 300's Operating Levels

Although the Model 300 is set at the factory for +4 dBm operating level, you can set the COMPELLOR for three other reference levels (-10, 0, or +8 dBm) with the following procedure:

1. Remove the cover, knobs, and faceplate, as shown in Fig. 8-1 (next page).
2. Loosen pot shaft nuts on the Display Boards.
3. Remove the (2) 8-32 Phillips screws on the front of the board(s).
4. Remove the 16-pin jumper and disconnect the red molex power harness.
5. Move the Display Control Boards to an upright position.
6. Locate the INPUT LEVEL level set dip on each Audio Processing Board, as shown in Fig. 8-2 (on page 8-3).
7. Using a tweezer or other appropriate instrument, pull out the jumper from the dip socket, and insert it into a desired level setting. Be sure to observe the legends on side of socket.
8. Locate the OUPUT LEVEL level set on Audio Processing Board (see Fig. 8-2), and repeat the process used in step 7 above.
9. Replace all board assemblies, install lower mounting screws.
10. Lower the top boards, carefully inserting the pot shaft into the support bracket with nuts and washers on the outside.
11. Making sure the bushings are fully seated in the bracket, carefully tighten the pot nuts. Applying too much torque will break a pot!
12. Replace the upper 8-32 mounting screws (with plastic washers).
13. Reconnect the power harness to the Audio Boards.
14. Insert the DIP jumper firmly into the Display Boards.



1 - With the power off, remove the top cover and front panel knobs. Some early models used collet-type knobs, while current models use push-on knobs.
2 - Unplug power cable(s) from the lower Audio Boards (red molex connectors).
3 - On the Model 300, unplug the short DIP jumper (located between the top boards).
4 - Loosen and remove the potentiometer mounting nuts. Next, remove the faceplate.
5 - Remove the Phillips screws that secure the top Display board(s) to the lower Audio board(s). Then tilt the Display Board(s) upright.
6 - Remove 1/4" standoffs located at the front of the Audio board(s).
7 - Remove the remaining Phillips screws located at the back of the Audio board(s).
8 - Lift each assembly from the chassis.

Fig. 8-1. Model 300 disassembly drawing and instructions for removing circuit boards from the unit. If you own a Model 301 or 303 COMPELLOR, use the same procedure, but note that there is one less set of Audio and Display boards. The Model 303 also contains an additional AURAL EXCITER board.

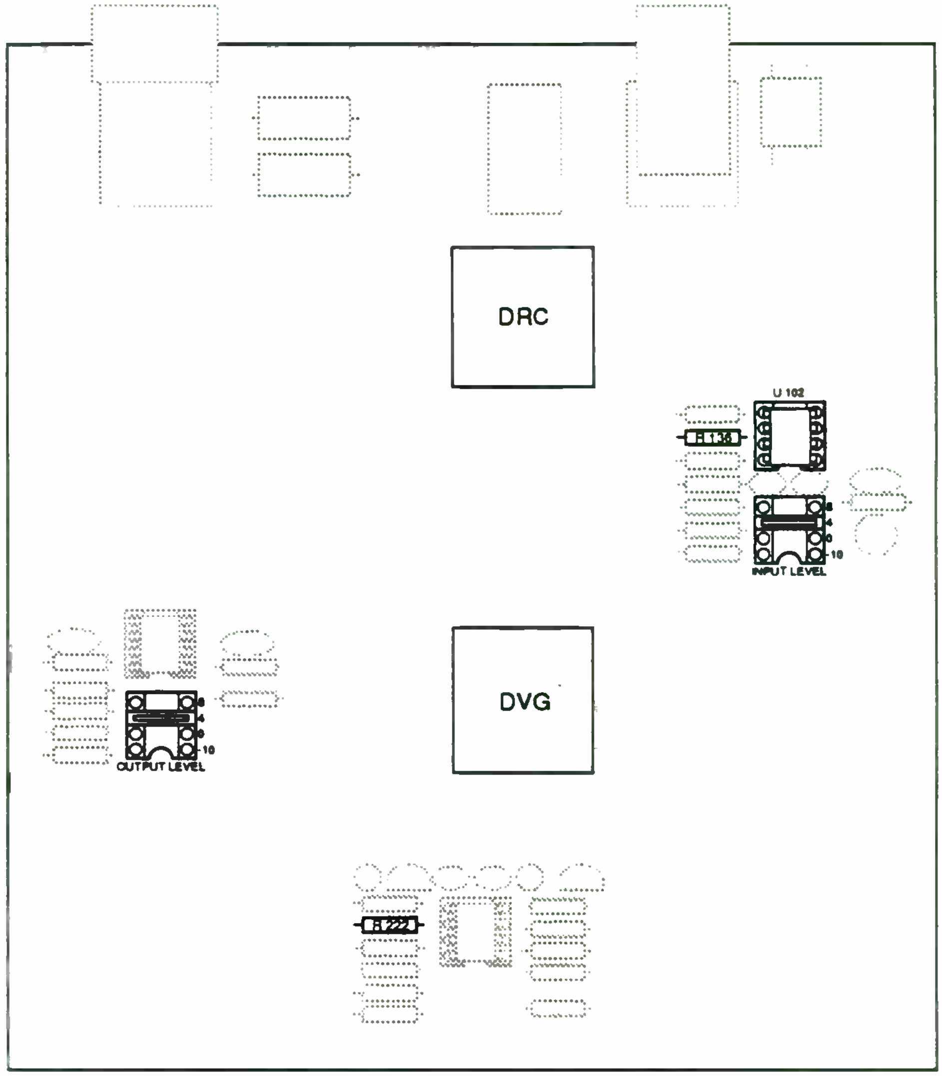


Fig. 8-2. Simplified view of Model 300 Audio Board (parts side) showing relative locations of several key components discussed in this chapter.

15. Replace the faceplate, knobs, cover, and turn on power. As a suggestion, write down on a label the date and the new Operating Level. Post it on the COMPELLOR's front or back panel to inform all users of your modification.

8.2 Increasing the Model 300's Leveling Speed

The Model 300 COMPELLOR, as currently configured, is designed for maximum control of dynamics with minimum effect on audio program.

In cases where the majority of program material is Speech, you may wish to increase the leveling speed to better control the dynamics of the program material.

This modification is accomplished by changing R222 on the Audio Boards from a 5.6 MΩ to a 2.7 MΩ resistor, as listed in the following instructions:

1. With power off, remove the cover, knobs, and faceplate, as shown in Fig. 8-1 (page 8-2).
2. Loosen pot shaft nuts on the Display Control Boards.
3. Remove the (2) 8-32 Phillips screws on the front of the boards.
4. Remove the 16-pin jumper and disconnect the red molex power harness.
5. Remove the boards to an upright position.
6. Remove the (4) 8-32 Phillips screws securing the Audio Processing Boards to the chassis.
7. Remove the Audio Boards.
8. Replace R222 (5.6 MΩ) on the Audio Boards with a 2.7 MΩ,1 % film resistor (see Fig. 8-2 on page 8-3).
9. Replace all board assemblies and install lower mounting screws.
10. Lower the top boards, carefully inserting the pot shaft into the support bracket, with nuts and washers on the outside.
11. Making sure the bushings are fully seated in the bracket, carefully tighten the pot nuts! Too much torque will break the pots.
12. Replace the upper 8-32 mounting screws (with plastic washers).
13. Reconnect the power harness to the Audio Boards.
14. Insert the DIP jumper firmly into the Display Boards.
15. Replace the faceplate, knobs, cover, and turn on power. As a suggestion, write down on a label the date and the new Leveling Speed setting. Post it on the COMPELLOR's front or back panel to inform all users of your modification.

8.3 Unlinking the Model 300 for 2-Channel Operation

As shipped from the factory, the Model 300 COMPELLOR is configured as a STEREO product. The stereo channels are linked electronically in two ways:

1. The leveling circuits are tied together to preserve stereo imaging.
2. The Silence Gate Circuit is common and operates on both channels simultaneously.

Although either channel can be used singly, the need occasionally develops for two separate channels, each unaffected by the other. The following simple modification will unlink the COMPELLOR's sidechains, providing two separate channels.

CAUTION...

Due to the unlinking, the Silence Gate will function on the B (right) channel only. Be sure to take this into account when sending audio to each channel.

Unlinking Procedure:

1. With power off, remove the cover, knobs, and faceplate, as shown in Fig. 8-1 (on page 8-2).

2. Remove the 16-pin DIP jumper that connects the upper Display Boards of channels A and B.

3. Using a razor blade or X-Acto knife, carefully separate and cut conductors 9, 10, and 16, as shown in Fig. 8-3.

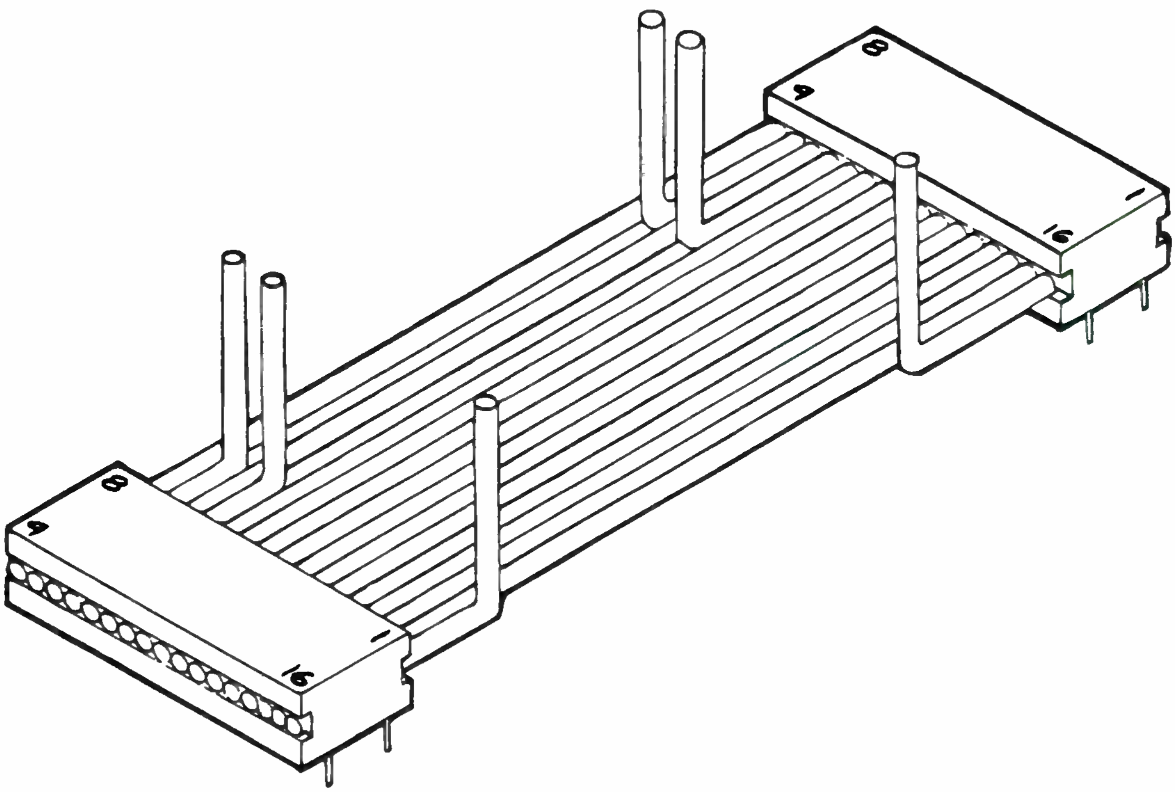


Fig. 8-3. An illusration showing how the cut DIP jumper wires should look once the modification is complete.

4. Re-insert the jumper (pin 16 towards the rear).

5. Loosen the pot shaft nuts on channel B Display Board (right hand side as viewed from the front).

6. Remove the two 8-32 Phillips screws on the front of the board.

7. Raise the board to an upright position. Solder a small jumper wire from the rear pad of R446 (2 kΩ) to the positive (Ground) pad of C409 (100 µF, 25V), as shown in Fig. 8-4.

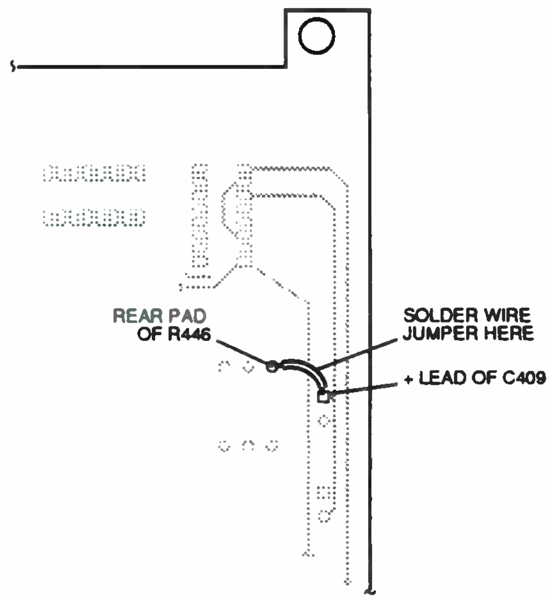


Fig. 8-4. Partial simplified view of the channel B Display Board (circuit trace side). Solder an insulated jumper wire from the R446 (rear) pad to the C409 (+) pad.

8. Lower the board back into place.

9. Replace the two 8-32 screws.

10. Tighten the pot shaft nuts carefully! Too much torque will break the pots.

11. Check that the DIP jumper is firmly seated on both ends.

12. Replace the faceplate, knobs, cover, and turn on power. As a suggestion, write down on a label the date and "2-Channel." Post it on the COMPELLOR's front or back panel to inform all users of your modification.

8.4 Modifying the COMPELLOR (All Models) for Input Grounding

In order to avoid ground loops, the input stage of COMPELLOR is floated. However, under certain situations you may want to tie the audio ground to the chassis. Perform the following steps to modify the input grounding:

1. With power off, remove the top cover.

2. Locate R101 on the upper right-side of the (lower) Audio Board(s). This board is acccessible without removing the (top) Display Board.

3. Solder one end of an insulated buss wire to R101, as shown in Fig. 8-5.

4. Connect the other end of the buss wire to the nearest Phillips screw that holds the Audio Board to the chassis.

5. Replace the cover and restore power. As a suggestion, write down on a label the date, and that Audio Ground is tied to the chassis. Post it on the COMPELLOR's front or back panel to inform users of your modification.

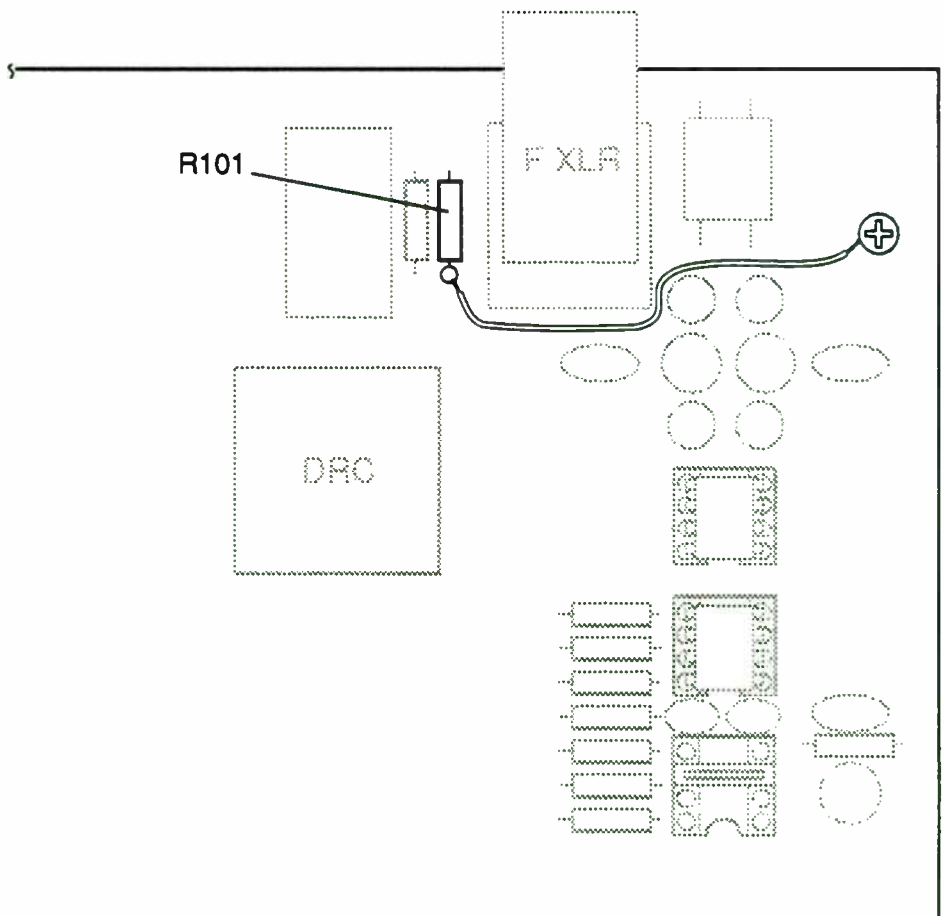


Fig. 8-5. Partial simplified view of Audio Board (component side). Solder one end of an insulated buss wire to R101 pad and connect other end to the nearest Phillips screw (that holds board to chassis).

8.5 Defeating the COMPELLOR (All Models) Peak Limiter

When the COMPELLOR is used with the PROCESS BALANCE Control mostly or completely set toward leveling, there are times when peak limiting occurs more often because the compression circuit no longer manages short-term dynamics. In some applications, such as speech processing, the peak limiting may produce an audible crack or slight click. You can verify this action by noting if the sound occurs at the same time as the "LMT" LED flashes. Disabling the peak limiter circuit will prevent this occurrence.

The following procedure non-destructively disables the peak limiter so it may be restored at a later time:

1. With power off, remove the top cover.

2. Locate the integrated circuit designated U102 (see Fig. 8-2 on page 8-3) on the right-hand side of the (lower) Audio Board(s). This board is accessible without removing the (top) Display Board.

3. Carefully remove U102 from its socket. Bend out pins 6 and 7 so they will not contact the socket when replaced, as shown in Fig. 8-6.

4. Insert the integrated circuit back into the socket, making sure that pins 1 to 5 are properly seated.

5. Replace the cover and restore power. As a suggestion, write down on a label the date and that the Peak Limiter is defeated. Post it on the COMPELLOR's front or back panel to inform all users of your modification.

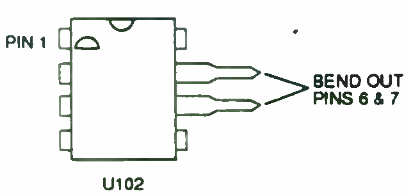


Fig. 8-6. An illustration showing what pins 6 & 7 should look like once the modification has been completed.

9.0 PARTS LIST

COMPELLOR Model 300 Parts

Sub-Assemblies and Assorted Parts

QUANT	DESCRIPTION	STOCK #
1	CORCOM POWER FILTER	42-013
1	7 PIN MOLEX BLOCK	43-059
7	MOLEX CONTACTS	49-016
1	US POWER CORD	54-013
1	GROUND LUG	60-028
1	8-32 X 5/8" PANHD PHILLIPS	60-040
1	STANDOFF TOROID	62-041
1	POLY BAG (LITERATURE)	9 X 1266-036
1	POLY BAG (UNIT)	12 X 2466-052
1	POLY ZIP BAG (MOUNTING SCREWS)	66-090
1	"GROUND LUG" STICKER	66-110
1	CHASSIS COVER	66-
1	CHASSIS	66-
1	PANEL, FRONT	69-
4	6-32 X 3/8" BLK OVL PHL SCRW	60-033
4	4-40 X 1/4" BLK PN PHL SLF TAP	60-042
1	SHIPPING CARTON	66-
1	SET SHIPPING FOAM	66-
1	OWNERS MANUAL	
2	AUDIO PCB ASSEMBLY	68-031SA
1	CONTROL A PCB ASSEMBLY	68-032SA
1	CONTROL B PCB ASSEMBLY	68-033SA
1	POWER SUPPLY ASSEMBLY	68-030SA
1	CABLE ASSEMBLY 7 PIN	
1	CABLE ASSEMBLY 7 PIN	
1	CABLE ASSEMBLY 6 PIN	
1	CABLE ASSEMBLY 16 PIN DIP	
2	CABLE ASSEMBLY 16 PIN DIP	

Audio PCB Assembly - Resistors

PART #	VALUE	DESCRIPTION	STOCK #
R101	100K	1/4 W 1% MTL FILM	92-1003
R102	100K	1/4 W 1% MTL FILM	92-1003
R103	20K0	1/4 W 1% MTL FILM	92-2002
R104	20K0	1/4 W 1% MTL FILM	92-2002
R105	13K3	1/4 W 1% MTL FILM	92-1332
R106	13K3	1/4 W 1% MTL FILM	92-1332
R107	10K0	1/4 W 1% MTL FILM	92-1002
R108	10K0	1/4 W 1% MTL FILM	92-1002
R109	2K87	1/4 W 1% MTL FILM	92-2871
R110	13K3	1/4 W 1% MTL FILM	92-1332
R111	34K0	1/4 W 1% MTL FILM	92-3402
R114	10K0	1/4 W 1% MTL FILM	92-1002
R115	10K0	1/4 W 1% MTL FILM	92-1002
R116	150R	1/4 W 1% MTL FILM	92-1500
R117	21R5	1/4 W 1% MTL FILM	92-0215
R118	21R5	1/4 W 1% MTL FILM	92-0215
R119	332K	1/4 W 1% MTL FILM	92-3323
R126	100K	1/4 W 1% MTL FILM	92-1003
R127	4K99	1/4 W 1% MTL FILM	92-4991
R128	4K99	1/4 W 1% MTL FILM	92-4991
R129	39K2	1/4 W 1% MTL FILM	92-3922
R130	21R5	1/4 W 1% MTL FILM	92-0215
R131	39K2	1/4 W 1% MTL FILM	92-3922
R132	150R	1/4 W 1% MTL FILM	92-1500
R133	20K0	1/4 W 1% MTL FILM	92-2002
R134	825R	1/4 W 1% MTL FILM	92-8250
R135	1K00	1/4 W 1% MTL FILM	92-1001
R136	34K0	1/4 W 1% MTL FILM	92-3402
R137	10K0	1/4 W 1% MTL FILM	92-1002
R138	2K74	1/4 W 1% MTL FILM	92-2741
R139	2K74	1/4 W 1% MTL FILM	92-2741
R140	4K75	1/4 W 1% MTL FILM	92-4751
R141	1K00	1/4 W 1% MTL FILM	92-1001
R142	1M00	1/4 W 1% MTL FILM	92-1004
R143	150R	1/4 W 1% MTL FILM	92-1500
R144	1K00	1/4 W 1% MTL FILM	92-1001
R145	1K00	1/4 W 1% MTL FILM	92-1001
R146	1M00	1/4 W 1% MTL FILM	92-1004
R147	10K0	1/4 W 1% MTL FILM	92-1002
R148	150R	1/4 W 1% MTL FILM	92-1500
R149	47K5	1/4 W 1% MTL FILM	92-4752
R150	10K0	1/4 W 1% MTL FILM	92-1002
R151	10K0	1/4 W 1% MTL FILM	92-1002
R152	1K00	1/4 W 1% MTL FILM	92-1001
R153	20K0	1/4 W 1% MTL FILM	92-2002
R155	9K31	1/4 W 1% MTL FILM	92-9311
R156	4K99	1/4 W 1% MTL FILM	92-4991
R157	2K87	1/4 W 1% MTL FILM	92-2871
R158	10K0	1/4 W 1% MTL FILM	92-1002
R160	10K0	1/4 W 1% MTL FILM	92-1002
R161	10K0	1/4 W 1% MTL FILM	92-1002
R162	10K0	1/4 W 1% MTL FILM	92-1002
R163	10K0	1/4 W 1% MTL FILM	92-1002
R164	10K0	1/4 W 1% MTL FILM	92-1002
R165	100K	1/4 W 1% MTL FILM	92-1003
R166	2K74	1/4 W 1% MTL FILM	92-2741
R167	2K74	1/4 W 1% MTL FILM	92-2741
R168	10R0	1/4 W 1% MTL FILM	92-0100
R169	10R0	1/4 W 1% MTL FILM	92-0100
R170	10R0	1/4 W 1% MTL FILM	92-0100
R171	10K0	1/4 W 1% MTL FILM	92-1002
R172	10R0	1/4 W 1% MTL FILM	92-0100
R173	10K0	1/4 W 1% MTL FILM	92-1002
R174	10K0	1/4 W 1% MTL FILM	92-1002
R175	10K0	1/4 W 1% MTL FILM	92-1002
R176	10K0	1/4 W 1% MTL FILM	92-1002
R177	100K	1/4 W 1% MTL FILM	92-1003
R178	2K74	1/4 W 1% MTL FILM	92-2741
R179	2K74	1/4 W 1% MTL FILM	92-2741
R180	10R0	1/4 W 1% MTL FILM	92-0100
R181	10R0	1/4 W 1% MTL FILM	92-0100
R182	10R0	1/4 W 1% MTL FILM	92-0100
R183	10K0	1/4 W 1% MTL FILM	92-1002
R184	10R0	1/4 W 1% MTL FILM	92-0100
R202	10K0	1/4 W 1% MTL FILM	92-1002
R203	10K0	1/4 W 1% MTL FILM	92-1002
R204	15K0	1/4 W 1% MTL FILM	92-1502
R205	56R0	1/4 W 5% CRBN FILM	90-156
R206	1M00	1/4 W 1% MTL FILM	92-1004
R207	33K2	1/4 W 1% MTL FILM	92-3322

COMPELLOR Model 300 Parts

PART #	VALUE	DESCRIPTION	STOCK #
R208	1K00	1/4 W 1% MTL FILM	92-1001
R209	10K0	1/4 W 1% MTL FILM	92-1002
R210	10K0	1/4 W 1% MTL FILM	92-1002
R211	10K0	1/4 W 1% MTL FILM	92-1002
R212	1K00	1/4 W 1% MTL FILM	92-1001
R213	10K0	1/4 W 1% MTL FILM	92-1002
R214	10K0	1/4 W 1% MTL FILM	92-1002
R215	1M00	1/4 W 1% MTL FILM	92-1004
R216	10K0	1/4 W 1% MTL FILM	92-1002
R217	2K00	1/4 W 1% MTL FILM	92-2001
R218	2K00	1/4 W 1% MTL FILM	92-2001
R219	1K18	1/4 W 1% MTL FILM	92-1181
R220	2K00	1/4 W 1% MTL FILM	92-2001
R221	750R	1/4 W 1% MTL FILM	92-7500
R222	5M60	1/4 W 5% CRBN FILM	90-656
R223	1K00	1/4 W 1% MTL FILM	92-1001
R224	10K0	1/4 W 1% MTL FILM	92-1002
R225	100K	1/4 W 1% MTL FILM	92-1003
R226	10K0	1/4 W 1% MTL FILM	92-1002
R227	10K0	1/4 W 1% MTL FILM	92-1002
R228	1K00	1/4 W 1% MTL FILM	92-1001
R229	1K00	1/4 W 1% MTL FILM	92-1001

Audio PCB Assembly - Variable Resistors

PART #	VALUE	DESCRIPTION	STOCK #
VR101	1K	10 TURN	22-019
VR102	100R	10 TURN	22-018

Audio PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C101	150pF	MICA DIP RADIAL	85-015
C102	150pF	MICA DIP RADIAL	85-015
C103	22µF	25V EL RADIAL	82-003
C104	22µF	25V EL RADIAL	82-003
C105	20pF	MICA DIP RADIAL	85-003
C106	20pF	MICA DIP RADIAL	85-003
C107	20pF	MICA DIP RADIAL	85-003
C108	20pF	MICA DIP RADIAL	85-003
C109	100µF	35V EL RADIAL	82-014
C110	20pF	MICA DIP RADIAL	85-003
C111	5pF	MICA DIP RADIAL	85-017
C112	5pF	MICA DIP RADIAL	85-017
C113	.001µF	POLY RADIAL	84-001
C114	.01µF	POLY RADIAL	84-012
C115	.01µF	POLY RADIAL	84-012
C116	20pF	MICA DIP RADIAL	85-003
C117	20pF	MICA DIP RADIAL	85-003
C118	100µF	35V EL RADIAL	82-014
C119	100µF	35V EL RADIAL	82-014
C120	10pF	MICA DIP RADIAL	85-001
C121	10pF	MICA DIP RADIAL	85-001
C122	20pF	MICA DIP RADIAL	85-003
C123	20pF	MICA DIP RADIAL	85-003
C124	20pF	MICA DIP RADIAL	85-003

PART #	VALUE	DESCRIPTION	STOCK #
C125	20pF	MICA DIP RADIAL	85-003
C126	22µF	25V EL RADIAL	82-003
C127	22µF	25V EL RADIAL	82-003
C128	22µF	25V EL RADIAL	82-003
C129	22µF	25V EL RADIAL	82-003
C130	100µF	35V EL RADIAL	82-014
C131	100µF	35V EL RADIAL	82-014
C132	100µF	35V EL RADIAL	82-014
C133	100µF	35V EL RADIAL	82-014
C134	330µF	35V EL AXIAL	82-016
C135	330µF	35V EL AXIAL	82-016
C136	100µF	35V EL RADIAL	82-014
C137	100µF	35V EL RADIAL	82-014
C138	.1µF	50V MONO RADIAL	88-001
C139	.1µF	50V MONO RADIAL	88-001
C140	.1µF	50V MONO RADIAL	88-001
C141	.1µF	50V MONO RADIAL	88-001
C144	.1µF	50V MONO RADIAL	88-001
C145	.1µF	50V MONO RADIAL	88-001
C201	1µF	35V TANT RADIAL	83-001
C202	47pF	MICA DIP RADIAL	85-005
C203	1µF	35V TANT RADIAL	83-001
C204	47pF	MICA DIP RADIAL	85-005
C205	1µF	35V TANT RADIAL	83-001
C206	4.7µF	63V EL RADIAL	82-006
C207	10pF	MICA DIP RADIAL	85-001
C208	47pF	MICA DIP RADIAL	85-009
C209	.33µF	35V TANT RADIAL	83-012
C210	.15µF	POLY	84-020
C211	.1µF	50V MONO RADIAL	88-001
C212	.1µF	50V MONO RADIAL	88-001
C213	.1µF	50V MONO RADIAL	88-001
C214	.1µF	50V MONO RADIAL	88-001
C215	.1µF	50V MONO RADIAL	88-001
C216	.1µF	50V MONO RADIAL	88-001
C217	100µF	35V EL RADIAL	82-014
C218	100µF	35V EL RADIAL	82-014

Audio PCB Assembly - Semiconductors

PART #	DESCRIPTION	STOCK #
U101	LF353NDUAL OPAMP	32-007
U102	LF353NDUAL OPAMP	32-007
U104	VCA1001 APHEX VCA	33-052
U105	NE5532N DUAL OPAMP LOW NOISE	32-028
U106	LF353N DUAL OPAMP	32-007
U107	LF353N DUAL OPAMP	32-007
U108	LF353N DUAL OPAMP	32-007
U201	LF353N DUAL OPAMP	32-007
U202	LF353N DUAL OPAMP	32-007
U203	LF353N DUAL OPAMP	32-007
U204	LF353N DUAL OPAMP	32-007
Q101	2N3906 PNP SS	31-011
Q102	2N3906 PNP SS	31-011
Q103	2N3904 NPN SS	31-015
Q104	2SD600 NPN POWER	31-020

COMPELLOR Model 300 Parts

PART #	DESCRIPTION	STOCK #
Q105	2SB631 PNP POWER	31-021
Q106	2SD600 NPN POWER	31-020
Q107	2SB631 PNP POWER	31-021
Q201	J113 N CHANNEL JFET	31-010
Q202	J113 N CHANNEL JFET	31-010
Q203	2N3906 PNP SS	31-011
D101	1N914B LOW SIGNAL DIODE	30-002
D102	1N914B LOW SIGNAL DIODE	30-002
D103	1N914B LOW SIGNAL DIODE	30-002
D104	1N914B LOW SIGNAL DIODE	30-002
D105	1N914B LOW SIGNAL DIODE	30-002
D106	1N914B LOW SIGNAL DIODE	30-002
D107	1N914B LOW SIGNAL DIODE	30-002
D108	1N914B LOW SIGNAL DIODE	30-002
D109	1N914B LOW SIGNAL DIODE	30-002
D110	1N4003 POWER DIODE	30-009
D111	1N914B LOW SIGNAL DIODE	30-002
D112	1N914B LOW SIGNAL DIODE	30-002
D113	1N914B LOW SIGNAL DIODE	30-002
D201	1N914B LOW SIGNAL DIODE	30-002
D202	1N914B LOW SIGNAL DIODE	30-002
D204	1N914B LOW SIGNAL DIODE	30-002
D205	1N914B LOW SIGNAL DIODE	30-002
D206	1N914B LOW SIGNAL DIODE	30-002
D207	1N914B LOW SIGNAL DIODE	30-002
D208	1N914B LOW SIGNAL DIODE	30-002
D209	1N914B LOW SIGNAL DIODE	30-002

Audio PCB Assembly - Miscellaneous

PART #	DESCRIPTION	STOCK #
J101	XLR FEMALE PCB MOUNT RT ANGLE	43-074
J102	XLR MALE PCB MOUNT RT ANGLE	43-073
K101	RELAY DPDT 5VDC SEALED	73-006
H101	16 PIN MACHINE SOCKET	43-078
H102	7 PIN LOCKING HEADER	43-062
H103	8 PIN MACHINE SOCKET	43-077
H104	8 PIN MACHINE SOCKET	43-077
DRC	DRC MODULE	68-034SA
DVG	DVG MODULE	68-035SA
CHOKE	RF CHOKE	72-003

Audio PCB Assembly - Hardware

QUANT.	DESCRIPTION	STOCK #
10	8 PIN IC SOCKET	43-003
1	18 PIN IC SOCKET	43-008
6	TEST POINT	67-046
2	PJ-1 JUMPER	49-003
2	M-F HINGED STANDOFF	62-035
6	8-32 X 1/4" PANHD PHIIPS SIMS	60-035
8	4-40 X 1/4" PANHD PHILPS SEL TP	60-047
20	BIVAR SPACER .25"	62-029
16	BIVAR SPACER .1"	62-040
8	BIVAR SPACER DIODE	62-048
1	AUDIO PCB	68-031B

Control A PCB Assembly - Resistors

PART #	VALUE	DESCRIPTION	STOCK #
R301	1K00	1/4 W 1% MTL FILM	92-1001
R302	20K0	1/4 W 1% MTL FILM	92-2002
R303	1K00	1/4 W 1% MTL FILM	92-1001
R304	5K62	1/4 W 1% MTL FILM	92-5621
R305	33K2	1/4 W 1% MTL FILM	92-3322
R306	10K0	1/4 W 1% MTL FILM	92-1002
R307	10K0	1/4 W 1% MTL FILM	92-1002
R308	100K	1/4 W 1% MTL FILM	92-1003
R309	100K	1/4 W 1% MTL FILM	92-1003
R310	1K00	1/4 W 1% MTL FILM	92-1001
R311	3K65	1/4 W 1% MTL FILM	92-3651
R312	10K0	1/4 W 1% MTL FILM	92-1002
R313	100K	1/4 W 1% MTL FILM	92-1003
R314	1K00	1/4 W 1% MTL FILM	92-1001
R315	3K65	1/4 W 1% MTL FILM	92-3651
R316	10K0	1/4 W 1% MTL FILM	92-1002
R317	100K	1/4 W 1% MTL FILM	92-1003
R318	1K00	1/4 W 1% MTL FILM	92-1001
R319	10K0	1/4 W 1% MTL FILM	92-1002
R320	825R	1/4 W 1% MTL FILM	92-8250
R321	4K99	1/4 W 1% MTL FILM	92-4991
R322	10K0	1/4 W 1% MTL FILM	92-1002
R323	20K0	1/4 W 1% MTL FILM	92-2002
R324	825R	1/4 W 1% MTL FILM	92-8250
R326	5K62	1/4 W 1% MTL FILM	92-5621
R327	1K00	1/4 W 1% MTL FILM	92-1001
R328	1K00	1/4 W 1% MTL FILM	92-1001
R329	10K0	1/4 W 1% MTL FILM	92-1002
R330	100K	1/4 W 1% MTL FILM	92-1003
R331	100K	1/4 W 1% MTL FILM	92-1003
R332	20K0	1/4 W 1% MTL FILM	92-2002

Control A PCB Assembly - Varbl. Resistors

PART #	VALUE	DESCRIPTION	STOCK #
VR301	B-10K	10K LIN POT	23-038
VR302	15A-10K	10K AUDIO POT	23-037
VR303	B-3K	3K LIN POT	23-036

Control A PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C301	20pF	MICA DIP RADIAL	85-003
C302	1μF 35V	TANT RADIAL	83-001
C303	1μF 35V	TANT RADIAL	83-001
C304	20pF	MICA DIP RADIAL	85-003

COMPELLOR Model 300 Parts

PART #	VALUE	DESCRIPTION	STOCK #
C305	20pF	MICA DIP RADIAL	85-003
C306	22µF	25V EL RADIAL	82-003
C307	100µF	35V EL RADIAL	82-014
C308	100µF	35V EL RADIAL	82-014
C309	100µF	35V EL RADIAL	82-014
C310	100µF	35V EL RADIAL	82-014
C311	.1µF 50V	MONO RADIAL	88-001
C312	.1µF 50V	MONO RADIAL	88-001
C313	.1µF 50V	MONO RADIAL	88-001
C314	.1µF 50V	MONO RADIAL	88-001
C315	1µF 35V	TANT RADIAL	83-001

Control A PCB Assembly - Semiconductors

PART #	DESCRIPTION	STOCK #
U301	LF353N DUAL OPAMP	32-007
U302	LF353N DUAL OPAMP	32-007
U303	LF353N DUAL OPAMP	32-007
U304	LM3914 DISPLAY DRIVER	33-023
U305	LM3914 DISPLAY DRIVER	33-023
U306	LM3915 DISPLAY DRIVER	33-035
U307	LM3915 DISPLAY DRIVER	33-035
Q301	2N3906 PNP SS	31-011
Q302	2N3906 PNP SS	31-011
Q303	2N3906 PNP SS	31-011
Q304	2N3906 PNP SS	31-011
Q305	2N3906 PNP SS	31-011
Q306	2N3906 PNP SS	31-011
Q307	2N3906 PNP SS	31-011
Q308	2N3906 PNP SS	31-011
Q309	2N3906 PNP SS	31-011
Q310	2N3906 PNP SS	31-011
Q311	J113 N CHANNEL JFET	31-010
Q312	J113 N CHANNEL JFET	31-010
Q313	2N3904 NPN SS	31-015
Q314	2N3904 NPN SS	31-015
D301	1N5221B ZENER DIODE 2.4V	30-011
D302	1N5221B ZENER DIODE 2.4V	30-011
D303	1N5221B ZENER DIODE 2.4V	30-011
D304	1N5221B ZENER DIODE 2.4V	30-011
D305	1N5221B ZENER DIODE 2.4V	30-011
D306	1N5221B ZENER DIODE 2.4V	30-011
D307	1N5221B ZENER DIODE 2.4V	30-011
D308	1N5221B ZENER DIODE 2.4V	30-011
D309	1N5221B ZENER DIODE 2.4V	30-011
D310	1N5221B ZENER DIODE 2.4V	30-011
D311	1N914B LOW SIGNAL DIODE	30-002
D312	1N914B LOW SIGNAL DIODE	30-002
LD301	T-1 3/4 BICOLOR LED	27-011
LD302	T-1 3/4 BICOLOR LED	27-011
LD303	T-1 3/4 BICOLOR LED	27-011
LD304	T-1 3/4 BICOLOR LED	27-011
LD305	T-1 3/4 BICOLOR LED	27-011
LD306	T-1 3/4 BICOLOR LED	27-011
LD307	T-1 3/4 BICOLOR LED	27-011
LD308	T-1 3/4 BICOLOR LED	27-011
LD309	T-1 3/4 BICOLOR LED	27-011
LD310	T-1 3/4 BICOLOR LED	27-011
LD311	T-1 3/4 RED LED	27-018
LD312	T-1 3/4 YELLOW LED	27-020

Control A PCB Assembly - Miscellaneous

PART #	DESCRIPTION	STOCK #
SW301	4PDT PUSHBUTTON	20-017
H301	16 PIN MACHINE SOCKET	43-078
H302	16 PIN MACHINE SOCKET	43-078

Control A PCB Assembly - Hardware

QUANT.	DESCRIPTION	STOCK #
3	8 PIN IC SOCKET	43-003
4	16 PIN IC SOCKET	43-008
1	33 PIN STRIP RT ANGLE HEADER	43-072
1	33 PIN STRIP SOCKET	43-067
2	ECG BLACK BUTTON	11-009
3	SELCO BLACK KNOB	12-004
3	SELCO BLACK CAP WHITE LINE	14-003
2	8-32 KEP NUT	63-021
3	BIVAR SPACER .25"	62-029
7	BIVAR SPACER .1"	62-040
6	TEST POINT	67-046
1	CONTROL A PCB	68-032A
1	LED PCB 68-032L	
1	INSPECTION STICKER	

Control B PCB Assembly - Resistors

PART #	VALUE	DESCRIPTION	STOCK #
R401	1K00	1/4 W 1% MTL FILM	92-1001
R402	20K0	1/4 W 1% MTL FILM	92-2002
R403	1K00	1/4 W 1% MTL FILM	92-1001
R404	5K62	1/4 W 1% MTL FILM	92-5621
R405	33K2	1/4 W 1% MTL FILM	92-3322
R406	10K0	1/4 W 1% MTL FILM	92-1002
R407	10K0	1/4 W 1% MTL FILM	92-1002
R408	100K	1/4 W 1% MTL FILM	92-1003
R409	100K	1/4 W 1% MTL FILM	92-1003
R410	1K00	1/4 W 1% MTL FILM	92-1001
R411	3K65	1/4 W 1% MTL FILM	92-3651
R412	10K0	1/4 W 1% MTL FILM	92-1002
R413	100K	1/4 W 1% MTL FILM	92-1003
R414	1K00	1/4 W 1% MTL FILM	92-1001
R415	3K65	1/4 W 1% MTL FILM	92-3651
R416	10K0	1/4 W 1% MTL FILM	92-1002
R417	100K	1/4 W 1% MTL FILM	92-1003
R418	1K00	1/4 W 1% MTL FILM	92-1001
R419	10K0	1/4 W 1% MTL FILM	92-1002
R420	825R	1/4 W 1% MTL FILM	92-8250
R421	10K0	1/4 W 1% MTL FILM	92-1002
R422	47K5	1/4 W 1% MTL FILM	92-4752
R423	20K0	1/4 W 1% MTL FILM	92-2002

COMPELLOR Model 300 Parts

PART #	VALUE	DESCRIPTION	STOCK #
R424	825R	1/4 W 1% MTL FILM	92-8250
R425	5K62	1/4 W 1% MTL FILM	92-5621
R426	5K62	1/4 W 1% MTL FILM	92-5621
R427	1K00	1/4 W 1% MTL FILM	92-1001
R428	1K00	1/4 W 1% MTL FILM	92-1001
R429	10K0	1/4 W 1% MTL FILM	92-1002
R430	33K2	1/4 W 1% MTL FILM	92-3322
R431	3K65	1/4 W 1% MTL FILM	92-3651
R432	8K25	1/4 W 1% MTL FILM	92-8251
R433	57K6	1/4 W 1% MTL FILM	92-5762
R434	8K25	1/4 W 1% MTL FILM	92-8251
R435	57K6	1/4 W 1% MTL FILM	92-5762
R436	33K2	1/4 W 1% MTL FILM	92-3322
R437	3K65	1/4 W 1% MTL FILM	92-3651
R438	150R	1/4 W 1% MTL FILM	92-1500
R439	100K	1/4 W 1% MTL FILM	92-1003
R440	100R	1/4 W 1% MTL FILM	92-1000
R441	100K	1/4 W 1% MTL FILM	92-1003
R442	1K00	1/4 W 1% MTL FILM	92-1001
R443	2M2	1/4 W 5% MTL FILM	90-622
R444	10K0	1/4 W 1% MTL FILM	92-1002
R445	1K00	1/4 W 1% MTL FILM	92-1001
R446	2K00	1/4 W 1% MTL FILM	92-2001
R447	2K00	1/4 W 1% MTL FILM	92-2001
R448	100R	1/4 W 1% MTL FILM	92-1000
R449	150R	1/4 W 1% MTL FILM	92-1500
R450	56R	1/4 W 5% MTL FILM	90-056
R451	150R	1/4 W 1% MTL FILM	92-1500

Control B PCB Assembly - Varbl. Resistors

PART #	VALUE	DESCRIPTION	STOCK #
VR401	B-10K	10K LIN POT	23-038
VR402	15A-10K	10K AUDIO POT	23-037
VR403	B-3K	3K LIN POT	23-036
VR404	15C-10K	10K REV AUDIO POT	23-035

Control B PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C401	20pF	MICA DIP RADIAL	85-003
C402	1µF 35V	TANT RADIAL	83-001
C403	1µF 35V	TANT RADIAL	83-001
C404	20pF	MICA DIP RADIAL	85-003
C405	20pF	MICA DIP RADIAL	85-003
C406	22µF	25V EL RADIAL	82-003
C407	100µF	35V EL RADIAL	82-014
C408	100µF	35V EL RADIAL	82-014
C409	100µF	35V EL RADIAL	82-014
C410	100µF	35V EL RADIAL	82-014
C411	.1µF	50V MONO RADIAL	88-001
C412	.1µF	50V MONO RADIAL	88-001
C413	.1µF	50V MONO RADIAL	88-001
C414	.1µF	50V MONO RADIAL	88-001
C415	.1µF	50V MONO RADIAL	88-001
C416	10pF	MICA DIP RADIAL	85-001
C417	100µF	35V EL RADIAL	82-014
C418	10pF	MICA DIP RADIAL	85-001
C419	100µF	35V EL RADIAL	82-014
C420	22µF	25V EL RADIAL	82-003
C421	1µF	35V TANT RADIAL	83-001
C422	10pF	MICA DIP RADIAL	85-001
C423	1µF	35V TANT RADIAL	83-001

Control B PCB Assembly - Semiconductors

PART #	DESCRIPTION	STOCK #
U401	LF353N DUAL OPAMP	32-007
U402	LF353N DUAL OPAMP	32-007
U403	LF353N DUAL OPAMP	32-007
U404	LM3914 DISPLAY DRIVER	33-023
U405	LM3914 DISPLAY DRIVER	33-023
U406	LM3915 DISPLAY DRIVER	33-035
U407	LM3915 DISPLAY DRIVER	33-035
U408	LF353N DUAL OPAMP	32-007
U409	LF353N DUAL OPAMP	32-007
Q401	2N3906 PNP SS	31-011
Q402	2N3906 PNP SS	31-011
Q403	2N3906 PNP SS	31-011
Q404	2N3906 PNP SS	31-011
Q405	2N3906 PNP SS	31-011
Q406	2N3906 PNP SS	31-011
Q407	2N3906 PNP SS	31-011
Q408	2N3906 PNP SS	31-011
Q409	2N3906 PNP SS	31-011
Q410	2N3906 PNP SS	31-011
Q411	J113 N CHANNEL JFET	31-010
Q412	J113 N CHANNEL JFET	31-010
Q413	2N3904 NPN SS	31-015
Q414	2N3904 NPN SS	31-0154
D401	1N5221B ZENER DIODE 2.4V	30-011
D402	1N5221B ZENER DIODE 2.4V	30-011
D403	1N5221B ZENER DIODE 2.4V	30-011
D404	1N5221B ZENER DIODE 2.4V	30-011
D405	1N5221B ZENER DIODE 2.4V	30-011
D406	1N5221B ZENER DIODE 2.4V	30-011
D407	1N5221B ZENER DIODE 2.4V	30-011
D408	1N5221B ZENER DIODE 2.4V	30-011
D409	1N5221B ZENER DIODE 2.4V	30-011
D410	1N5221B ZENER DIODE 2.4V	30-011
D411	1N914B LOW SIGNAL DIODE	30-002
D412	1N914B LOW SIGNAL DIODE	30-002
D413	1N914B LOW SIGNAL DIODE	30-002
D414	1N914B LOW SIGNAL DIODE	30-002
D415	1N914B LOW SIGNAL DIODE	30-002
D416	1N914B LOW SIGNAL DIODE	30-002
LD401	T-1 3/4 BICOLOR LED	27-011
LD402	T-1 3/4 BICOLOR LED	27-011
LD403	T-1 3/4 BICOLOR LED	27-011
LD404	T-1 3/4 BICOLOR LED	27-011
LD405	T-1 3/4 BICOLOR LED	27-011
LD406	T-1 3/4 BICOLOR LED	27-011

COMPELLOR Model 300 Parts

PART #	DESCRIPTION	STOCK #
LD407	T-1 3/4 BICOLOR LED	27-011
LD408	T-1 3/4 BICOLOR LED	27-011
LD409	T-1 3/4 BICOLOR LED	27-011
LD410	T-1 3/4 BICOLOR LED	27-011
LD411	T-1 3/4 RED LED	27-018
LD412	T-1 3/4 YELLOW LED	27-020
LD413	T-1 3/4 BICOLOR LED	27-011
LD414	T-1 3/4 GREEN LED	27-019
LD415	T-1 3/4 YELLOW LED	27-020
LD416	T-1 GREEN LED	27-017
LD417	T-1 GREEN LED	27-017
LD418	T-1 GREEN LED	27-017

Control B PCB Assembly - Miscellaneous

PART #	DESCRIPTION	STOCK #
SW401	4PDT PUSHBUTTON	20-017
SW402	4PDT PUSHBUTTON	20-017
H401	16 PIN MACHINE SOCKET	43-078
H402	16 PIN MACHINE SOCKET	43-078
H403	6 PIN RT ANGLE LOCK HEADER	43-061

Control B PCB Assembly - Hardware

QUANT.	DESCRIPTION	STOCK #
3	8 PIN IC SOCKET	43-003
4	16 PIN IC SOCKET	43-008
1	33 PIN STRIP RT ANGLE HEADER	43-072
1	33 PIN STRIP SOCKET	43-067
1	4 PIN STRIP RT ANGLE HEADER	43-072
1	4 PIN STRIP SOCKET	43-067
2	ECG BLACK BUTTON	11-009
4	SELCO BLACK KNOB	12-004
4	SELCO BLACK CAP WHITE LINE	14-003
1	RF SHIELD	66-047
1	4-40 X 1/4 BLACK PAN PHILLIPS	60-016
2	8-32 KEP NUT	63-021
6	BIVAR SPACER .25"	62-029
12	BIVAR SPACER .1"	62-040
6	TEST POINT	67-046
1	CONTROL B PCB	68-033A
1	LED PCB	68-041
1	INSPECTION STICKER	

Power Supply PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C1	2200µF	35V EL RADIAL	82-040
C2	2200µF	35V EL RADIAL	82-040
C3	2200µF	35V EL RADIAL	82-040
C4	1µF	35V TANT RADIAL	83-001
C5	1µF	35V TANT RADIAL	83-001
C6	1µF	35V TANT RADIAL	83-001
C7	1µF	35V TANT RADIAL	83-001
C8	1µF	35V TANT RADIAL	83-001
C9	1µF	35V TANT RADIAL	83-001

Power Supply PCB - Semiconductors

PART #	DESCRIPTION	STOCK #
BR1	BR81D BRIDGE RECTIFIER	30-004
BR2	BR81D BRIDGE RECTIFIER	30-004
D1	1N4003 POWER DIODE	30-009
D2	1N4003 POWER DIODE	30-009
D3	1N4003 POWER DIODE	30-009
D4	1N4003 POWER DIODE	30-009
D5	1N4003 POWER DIODE	30-009
D6	1N4003 POWER DIODE	30-009
D7	1N4003 POWER DIODE	30-009
D8	1N4003 POWER DIODE	30-009
D9	1N4003 POWER DIODE	30-009
D10	1N4003 POWER DIODE	30-009
D11	1N4003 POWER DIODE	30-009
D12	1N4003 POWER DIODE	30-009
REG1	7815 REGULATOR +15V	36-009
REG2	7815 REGULATOR +15V	36-009
REG3	7915 REGULATOR -15V	36-010
REG4	7915 REGULATOR -15V	36-010
REG5	7805 REGULATOR +5V	36-012
REG6	7805 REGULATOR +5V	36-012

Power Supply PCB - Miscellaneous

QUANT.	DESCRIPTION	STOCK #
3	7 PIN LOCKING HEADER	43-062
2	6 PIN LOCKING HEADER	43-066
4	8-32 X 1/4" PAN PHIL SIMS	60-035
6	BIVAR SPACER .1"	62-040
6	HEATSINK CLIP	65-003
1	POWER SUPPLY PCB	68-030B

COMPELLOR Model 301 Parts

Sub-Assemblies and Assorted Parts

QUANT	DESCRIPTION	STOCK #
1	CORCOM POWER FILTER	42-013
1	7 PIN MOLEX BLOCK	43-059
7	MOLEX CONTACTS	49-016
1	US POWER CORD	54-013
1	GROUND LUG	60-028
1	8-32 X 5/8" PANHD PHILLIPS	60-040
1	STANDOFF TOROID	62-041
1	POLY BAG (LITERATURE)	9 X 1266-036
1	POLY BAG (UNIT)	12 X 2466-052
1	POLY ZIP BAG (MOUNTING SCREWS)	66-090
1	"GROUND LUG" STICKER	66-110
1	CHASSIS COVER	66-
1	CHASSIS	66-
1	PANEL, FRONT	69-
4	6-32 X 3/8" BLK OVL PHL SCRW	60-033
4	4-40 X 1/4" BLK PN PHL SLF TAP	60-042
1	SHIPPING CARTON	66-
1	SET SHIPPING FOAM	66-
1	OWNERS MANUAL	
1	AUDIO PCB ASSEMBLY	68-047SA
1	CONTROL PCB ASSEMBLY	68-045SA
1	POWER SUPPLY ASSEMBLY	68-030SA
1	CABLE ASSEMBLY 7 PIN	
1	CABLE ASSEMBLY 6 PIN	
1	CABLE ASSEMBLY 16 PIN DIP	

Audio PCB Assembly - Resistors

PART #	VALUE	DESCRIPTION	STOCK #
R100	2K87	1/4 W 1% MTL FILM	92-2871
R101	100K	1/4 W 1% MTL FILM	92-1003
R102	100K	1/4 W 1% MTL FILM	92-1003
R103	20K0	1/4 W 1% MTL FILM	92-2002
R104	20K0	1/4 W 1% MTL FILM	92-2002
R105	13K3	1/4 W 1% MTL FILM	92-1332
R106	13K3	1/4 W 1% MTL FILM	92-1332
R107	10K0	1/4 W 1% MTL FILM	92-1002
R108	10K0	1/4 W 1% MTL FILM	92-1002
R110	13K3	1/4 W 1% MTL FILM	92-1332
R111	34K0	1/4 W 1% MTL FILM	92-3402
R112	76K8	1/4 W 1% MTL FILM	92-7682
R114	10K0	1/4 W 1% MTL FILM	92-1002
R115	10K0	1/4 W 1% MTL FILM	92-1002
R116	150R	1/4 W 1% MTL FILM	92-1500
R117	21R5	1/4 W 1% MTL FILM	92-0215
R118	21R5	1/4 W 1% MTL FILM	92-0215
R119	332K	1/4 W 1% MTL FILM	92-3323
R120	100K	1/4 W 1% MTL FILM	92-1003
R127	4K99	1/4 W 1% MTL FILM	92-4991
R128	4K99	1/4 W 1% MTL FILM	92-4991
R129	39K2	1/4 W 1% MTL FILM	92-3922
R130	21R5	1/4 W 1% MTL FILM	92-0215
R131	39K2	1/4 W 1% MTL FILM	92-3922
R132	150R	1/4 W 1% MTL FILM	92-1500
R133	20K0	1/4 W 1% MTL FILM	92-2002

PART #	VALUE	DESCRIPTION	STOCK #
R134	825R	1/4 W 1% MTL FILM	92-8250
R135	1K00	1/4 W 1% MTL FILM	92-1001
R136	34K0	1/4 W 1% MTL FILM	92-3402
R137	10K0	1/4 W 1% MTL FILM	92-1002
R138	2K74	1/4 W 1% MTL FILM	92-2741
R139	2K74	1/4 W 1% MTL FILM	92-2741
R140	4K75	1/4 W 1% MTL FILM	92-4751
R141	1K00	1/4 W 1% MTL FILM	92-1001
R142	1M00	1/4 W 1% MTL FILM	92-1004
R143	150R	1/4 W 1% MTL FILM	92-1500
R144	1K00	1/4 W 1% MTL FILM	92-1001
R145	1K00	1/4 W 1% MTL FILM	92-1001
R146	1M00	1/4 W 1% MTL FILM	92-1004
R147	10K0	1/4 W 1% MTL FILM	92-1002
R148	150R	1/4 W 1% MTL FILM	92-1500
R149	47K5	1/4 W 1% MTL FILM	92-4752
R150	10K0	1/4 W 1% MTL FILM	92-1002
R151	10K0	1/4 W 1% MTL FILM	92-1002
R152	1K00	1/4 W 1% MTL FILM	92-1001
R153	20K0	1/4 W 1% MTL FILM	92-2002
R155	9K31	1/4 W 1% MTL FILM	92-9311
R156	4K99	1/4 W 1% MTL FILM	92-4991
R157	3K74	1/4 W 1% MTL FILM	92-3741
R158	2K87	1/4 W 1% MTL FILM	92-2871
R159	10K0	1/4 W 1% MTL FILM	92-1002
R160	10K0	1/4 W 1% MTL FILM	92-1002
R161	10K0	1/4 W 1% MTL FILM	92-1002
R162	10K0	1/4 W 1% MTL FILM	92-1002
R163	10K0	1/4 W 1% MTL FILM	92-1002
R164	10K0	1/4 W 1% MTL FILM	92-1002
R165	100K	1/4 W 1% MTL FILM	92-1003
R166	2K74	1/4 W 1% MTL FILM	92-2741
R167	2K74	1/4 W 1% MTL FILM	92-2741
R168	10R0	1/4 W 1% MTL FILM	92-0100
R169	10R0	1/4 W 1% MTL FILM	92-0100
R170	10R0	1/4 W 1% MTL FILM	92-0100
R171	10K0	1/4 W 1% MTL FILM	92-1002
R172	10R0	1/4 W 1% MTL FILM	92-0100
R173	10K0	1/4 W 1% MTL FILM	92-1002
R174	9K76	1/4 W 1% MTL FILM	92-9761
R175	10K0	1/4 W 1% MTL FILM	92-1002
R176	10K0	1/4 W 1% MTL FILM	92-1002
R177	100K	1/4 W 1% MTL FILM	92-1003
R178	2K74	1/4 W 1% MTL FILM	92-2741
R179	2K74	1/4 W 1% MTL FILM	92-2741
R180	10R0	1/4 W 1% MTL FILM	92-0100
R181	10R0	1/4 W 1% MTL FILM	92-0100
R182	10R0	1/4 W 1% MTL FILM	92-0100
R183	10K0	1/4 W 1% MTL FILM	92-1002
R184	10R0	1/4 W 1% MTL FILM	92-0100
R185	1K00	1/4 W 1% MTL FILM	92-1001
R186	150R	1/4 W 1% MTL FILM	92-1500
R202	10K0	1/4 W 1% MTL FILM	92-1002
R203	10K0	1/4 W 1% MTL FILM	92-1002
R204	15K0	1/4 W 1% MTL FILM	92-1502
R205	56R0	1/4 W 5% CRBN FILM	90-156
R206	1M00	1/4 W 1% MTL FILM	92-1004

COMPELLOR Model 301 Parts

PART #	VALUE	DESCRIPTION	STOCK #
R207	33K2	1/4 W 1% MTL FILM	92-3322
R208	1K00	1/4 W 1% MTL FILM	92-1001
R209	10K0	1/4 W 1% MTL FILM	92-1002
R210	10K0	1/4 W 1% MTL FILM	92-1002
R211	10K0	1/4 W 1% MTL FILM	92-1002
R212	1K00	1/4 W 1% MTL FILM	92-1001
R213	10K0	1/4 W 1% MTL FILM	92-1002
R214	10K0	1/4 W 1% MTL FILM	92-1002
R215	1M00	1/4 W 1% MTL FILM	92-1004
R216	10K0	1/4 W 1% MTL FILM	92-1002
R217	2K00	1/4 W 1% MTL FILM	92-2001
R218	2K00	1/4 W 1% MTL FILM	92-2001
R219	1K18	1/4 W 1% MTL FILM	92-1181
R220	2K00	1/4 W 1% MTL FILM	92-2001
R221	750R	1/4 W 5% CRBN FILM	90-275
R222	5M60	1/4 W 5% CRBN FILM	90-656
R223	1K00	1/4 W 1% MTL FILM	92-1001
R224	10K0	1/4 W 1% MTL FILM	92-1002
R225	100K	1/4 W 1% MTL FILM	92-1003
R226	10K0	1/4 W 1% MTL FILM	92-1002
R227	10K0	1/4 W 1% MTL FILM	92-1002
R228	1K00	1/4 W 1% MTL FILM	92-1001
R229	1K00	1/4 W 1% MTL FILM	92-1001
R230	1M21	1/4 W 1% MTL FILM	92-1214

Audio PCB Assembly - Variable Resistors

PART #	VALUE	DESCRIPTION	STOCK #
VR101	1K	10 TURN	22-019
VR102	1K	PIHER LAY DOWN	22-011
VR103	100R	10 TURN	22-018

Audio PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C101	150pF	MICA DIP RADIAL	85-015
C102	150pF	MICA DIP RADIAL	85-015
C103	22µF	25V EL RADIAL	82-003
C104	22µF	25V EL RADIAL	82-003
C105	20pF	MICA DIP RADIAL	85-003
C106	20pF	MICA DIP RADIAL	85-003
C107	20pF	MICA DIP RADIAL	85-003
C108	20pF	MICA DIP RADIAL	85-003
C109	100µF	35V EL RADIAL	82-014
C110	20pF	MICA DIP RADIAL	85-003
C111	5pF	MICA DIP RADIAL	85-017
C112	5pF	MICA DIP RADIAL	85-017
C113	.001µF	POLY RADIAL	84-001
C114	.01µF	POLY RADIAL	84-012
C115	.01µF	POLY RADIAL	84-012
C116	20pF	MICA DIP RADIAL	85-003
C117	20pF	MICA DIP RADIAL	85-003
C118	100µF	35V EL RADIAL	82-014
C119	100µF	35V EL RADIAL	82-014

PART #	VALUE	DESCRIPTION	STOCK #
C120	10pF	MICA DIP RADIAL	85-001
C121	10pF	MICA DIP RADIAL	85-001
C122	20pF	MICA DIP RADIAL	85-003
C123	20pF	MICA DIP RADIAL	85-003
C124	20pF	MICA DIP RADIAL	85-003
C125	20pF	MICA DIP RADIAL	85-003
C126	22µF	25V EL RADIAL	82-003
C127	22µF	25V EL RADIAL	82-003
C128	22µF	25V EL RADIAL	82-003
C129	22µF	25V EL RADIAL	82-003
C130	100µF	35V EL RADIAL	82-014
C131	100µF	35V EL RADIAL	82-014
C132	100µF	35V EL RADIAL	82-014
C133	100µF	35V EL RADIAL	82-014
C134	330µF	25V EL RADIAL	82-017
C135	330µF	25V EL RADIAL	82-017
C136	100µF	35V EL RADIAL	82-014
C137	100µF	35V EL RADIAL	82-014
C138	.1µF	50V MONO RADIAL	88-001
C139	.1µF	50V MONO RADIAL	88-001
C140	.1µF 50V	MONO RADIAL	88-001
C141	.1µF 50V	MONO RADIAL	88-001
C144	.1µF 50V	MONO RADIAL	88-001
C145	.1µF 50V	MONO RADIAL	88-001
C201	1µF	35V TANT RADIAL	83-001
C202	47pF	MICA DIP RADIAL	85-005
C203	1µF	35V TANT RADIAL	83-001
C204	47pF	MICA DIP RADIAL	85-005
C205	1µF	35V TANT RADIAL	83-001
C206	4.7µF	63V EL RADIAL	82-006
C207	10pF	MICA DIP RADIAL	85-001
C208	47pF	MICA DIP RADIAL	85-005
C209	.33µF	35V TANT RADIAL	83-009
C210	.15µF	POLY	84-020
C211	.1µF	50V MONO RADIAL	88-001
C212	.1µF	50V MONO RADIAL	88-001
C213	.1µF	50V MONO RADIAL	88-001
C214	.1µF	50V MONO RADIAL	88-001
C215	.1µF	50V MONO RADIAL	88-001
C216	.1µF	50V MONO RADIAL	88-001
C217	100µF	35V EL RADIAL	82-014
C218	100µF	35V EL RADIAL	82-014

Audio PCB Assembly - Semiconductors

PART #	DESCRIPTION	STOCK #
U101	LF353NDUAL OPAMP	32-007
U102	LF353NDUAL OPAMP	32-007
U104	VCA1001 APHEX VCA	33-052
U105	NE5532N DUAL OPAMP LOW NOISE	32-028
U106	LF353N DUAL OPAMP	32-007
U107	LF353N DUAL OPAMP	32-007
U108	LF353N DUAL OPAMP	32-007
U201	LF353N DUAL OPAMP	32-007
U202	LF353N DUAL OPAMP	32-007
U203	LF353N DUAL OPAMP	32-007

COMPELLOR Model 301 Parts

PART #	DESCRIPTION	STOCK #
U204	LF353N DUAL OPAMP	32-007
Q101	2N3906 PNP SS	31-011
Q102	2N3906 PNP SS	31-011
Q103	2N3904 NPN SS	31-015
Q104	2SD600 NPN POWER	31-020
Q105	2SB631 PNP POWER	31-021
Q106	2SD600 NPN POWER	31-020
Q107	2SB631 PNP POWER	31-021
Q201	J113 N CHANNEL JFET	31-010
Q202	J113 N CHANNEL JFET	31-010
Q203	2N3906 PNP SS	31-011
D101	1N914B LOW SIGNAL DIODE	30-002
D102	1N914B LOW SIGNAL DIODE	30-002
D103	1N914B LOW SIGNAL DIODE	30-002
D104	1N914B LOW SIGNAL DIODE	30-002
D105	1N914B LOW SIGNAL DIODE	30-002
D106	1N914B LOW SIGNAL DIODE	30-002
D107	1N914B LOW SIGNAL DIODE	30-002
D108	1N914B LOW SIGNAL DIODE	30-002
D109	1N914B LOW SIGNAL DIODE	30-002
D110	1N4003 POWER DIODE	30-009
D111	1N914B LOW SIGNAL DIODE	30-002
D112	1N914B LOW SIGNAL DIODE	30-002
D113	1N914B LOW SIGNAL DIODE	30-002
D201	1N914B LOW SIGNAL DIODE	30-002
D202	1N914B LOW SIGNAL DIODE	30-002
D204	1N914B LOW SIGNAL DIODE	30-002
D205	1N914B LOW SIGNAL DIODE	30-002
D206	1N914B LOW SIGNAL DIODE	30-002
D207	1N914B LOW SIGNAL DIODE	30-002
D208	1N914B LOW SIGNAL DIODE	30-002
D209	1N914B LOW SIGNAL DIODE	30-002

Audio PCB Assembly - Miscellaneous

PART #	DESCRIPTION	STOCK #
J101	F-XLR PCB MOUNT RIGHT ANGLE	43-074
J102	M-XLR PCB MOUNT RIGHT ANGLE	43-073
J103	1/4" PHN JCK PC MNT RIGHT ANGLE	43-071
K101	RELAY DPDT 5VDC SEALED	73-006
H101	16 PIN MACHINE SOCKET	43-078
H102	7 PIN LOCKING HEADER	43-062
SW101	5 PSTN PC MOUNT ROTARY SWITCH	21-008
SW102	5 PSTN PC MOUNT ROTARY SWITCH	21-008
SW103	2 PSTN PC MOUNT ROTARY SWITCH	21-009
DRC	DRC MODULE	68-034SA
DVG	DVG MODULE	68-035SA
CHOKE	RF CHOKE	72-003

Audio PCB Assembly - Hardware

QUANT.	DESCRIPTION	STOCK #
10	8 PIN IC SOCKET	43-003
1	18 PIN IC SOCKET	43-008
6	TEST POINT	67-046
2	M-F HINGED STANDOFF	62-035
6	8-32 X 1/4" PANHD PHLPS SIMS	60-035
10	4-40 X 1/4" PANHD PHLPS SELF TAP	60-047
21	BIVAR SPACER .25"	62-029
16	BIVAR SPACER .1"	62-040
8	BIVAR SPACER DIODE	62-048
1	AUDIO PCB	68-047B

Control PCB Assembly - Resistors

PART #	VALUE	DESCRIPTION	STOCK #
R301	1K00	1/4 W 1% MTL FILM	92-1001
R302	3K65	1/4 W 1% MTL FILM	92-3651
R303	10K0	1/4 W 1% MTL FILM	92-1002
R304	100K	1/4 W 1% MTL FILM	92-1003
R305	1K00	1/4 W 1% MTL FILM	92-1001
R306	3K65	1/4 W 1% MTL FILM	92-3651
R307	10K0	1/4 W 1% MTL FILM	92-1002
R308	100K	1/4 W 1% MTL FILM	92-1003
R309	20K0	1/4 W 1% MTL FILM	92-2002
R310	20K0	1/4 W 1% MTL FILM	92-2002
R311	1K00	1/4 W 1% MTL FILM	92-1001
R312	5K62	1/4 W 1% MTL FILM	92-5621
R313	33K2	1/4 W 1% MTL FILM	92-3322
R314	10K0	1/4 W 1% MTL FILM	92-1002
R315	10K0	1/4 W 1% MTL FILM	92-1002
R316	100K	1/4 W 1% MTL FILM	92-1003
R317	100K	1/4 W 1% MTL FILM	92-1003
R318	825R	1/4 W 1% MTL FILM	92-8250
R319	10K0	1/4 W 1% MTL FILM	92-1002
R320	4K75	1/4 W 1% MTL FILM	92-4751
R321	825R	1/4 W 1% MTL FILM	92-8250
R322	10K0	1/4 W 1% MTL FILM	92-1002
R323	1K00	1/4 W 1% MTL FILM	92-1001
R324	20K0	1/4 W 1% MTL FILM	92-2002
R325	100K	1/4 W 1% MTL FILM	92-1003
R326	100K	1/4 W 1% MTL FILM	92-1003
R327	10K0	1/4 W 1% MTL FILM	92-1002
R328	33K2	1/4 W 1% MTL FILM	92-3322
R329	3K65	1/4 W 1% MTL FILM	92-3651
R330	8K25	1/4 W 1% MTL FILM	92-8251
R331	57K6	1/4 W 1% MTL FILM	92-5762
R332	100R	1/4 W 1% MTL FILM	92-1000
R333	100K	1/4 W 1% MTL FILM	92-1003
R334	100K	1/4 W 1% MTL FILM	92-1003
R335	100R	1/4 W 1% MTL FILM	92-1000
R336	1K00	1/4 W 1% MTL FILM	92-1001
R337	2M2	1/4 W 5% MTL FILM	90-622
R338	1K00	1/4 W 1% MTL FILM	92-1001
R339	10K0	1/4 W 1% MTL FILM	92-1002
R340	1K00	1/4 W 1% MTL FILM	92-1001
R341	150R	1/4 W 1% MTL FILM	92-1500

COMPELLOR Model 301 Parts

PART #	VALUE	DESCRIPTION	STOCK #
R342	560R	1/4 W 5% MTL FILM	90-256
R343	150R	1/4 W 1% MTL FILM	92-1500
R344	1K00	1/4 W 1% MTL FILM	92-1001
R345	2K00	1/4 W 1% MTL FILM	90-2001
R346	1K00	1/4 W 1% MTL FILM	92-1001
R347	5K62	1/4 W 1% MTL FILM	92-5621
R348	5K62	1/4 W 1% MTL FILM	92-5621

Control PCB Assembly -Variable Resistors

PART #	VALUE	DESCRIPTION	STOCK #
VR301	B-10K	10K LIN POT	23-038
VR302	B-3K	3K LIN POT	23-036
VR303	15A-10K	10K LOG POT	23-037
VR304	15C-10K	10K REV LOG POT	23-035

Control PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C301	20pF	MICA DIP RADIAL	85-003
C302	20pF	MICA DIP RADIAL	85-003
C303	20pF	MICA DIP RADIAL	85-003
C304	100µF	35V EL RADIAL	82-014
C305	100µF	35V EL RADIAL	82-014
C306	10pF	MICA DIP RADIAL	85-001
C307	1µF	35V TANT RADIAL	83-001
C308	1µF	35V TANT RADIAL	83-001
C309	1µF	35V TANT RADIAL	83-001
C310	.1µF	50V MONO RADIAL	88-001
C311	.1µF	50V MONO RADIAL	88-001
C312	.1µF	50V MONO RADIAL	88-001
C313	.1µF	50V MONO RADIAL	88-001
C314	.1µF	50V MONO RADIAL	88-001
C315	.1µF	50V MONO RADIAL	88-001
C316	.1µF	50V MONO RADIAL	88-001
C317	100µF	35V EL RADIAL	82-014
C318	100µF	35V EL RADIAL	82-014
C319	100µF	35V EL RADIAL	82-014
C320	22µF	25V EL RADIAL	82-003
C321	22µF	25V EL RADIAL	82-003

Control PCB Assembly - Semiconductors

PART #	DESCRIPTION	STOCK #
U301	LF353N DUAL OPAMP	32-007
U302	LF353N DUAL OPAMP	32-007
U303	LF353N DUAL OPAMP	32-007
U304	LF353N DUAL OPAMP	32-007
U305	LM3915 DISPLAY DRIVER	33-035
U306	LM3915 DISPLAY DRIVER	33-035
U307	LM3914 DISPLAY DRIVER	33-023
U308	LM3914 DISPLAY DRIVER	33-023
Q301	2N3906 PNP SS	31-011
Q302	2N3906 PNP SS	31-011
Q303	2N3906 PNP SS	31-011

PART #	DESCRIPTION	STOCK #
Q304	2N3906 PNP SS	31-011
Q305	2N3906 PNP SS	31-011
Q306	2N3906 PNP SS	31-011
Q307	2N3906 PNP SS	31-011
Q308	2N3906 PNP SS	31-011
Q309	2N3906 PNP SS	31-011
Q310	2N3906 PNP SS	31-011
Q311	2N3904 NPN SS	31-015
Q312	2N3904 NPN SS	31-015
Q313	J113 N CHANNEL JFET	31-010
Q314	J113 N CHANNEL JFET	31-010
D301	1N5221B ZENER DIODE 2.4V	30-011
D302	1N5221B ZENER DIODE 2.4V	30-011
D303	1N5221B ZENER DIODE 2.4V	30-011
D304	1N5221B ZENER DIODE 2.4V	30-011
D305	1N5221B ZENER DIODE 2.4V	30-011
D306	1N5221B ZENER DIODE 2.4V	30-011
D307	1N5221B ZENER DIODE 2.4V	30-011
D308	1N5221B ZENER DIODE 2.4V	30-011
D309	1N5221B ZENER DIODE 2.4V	30-011
D310	1N5221B ZENER DIODE 2.4V	30-011
D311	1N914B LOW SIGNAL DIODE	30-002
D312	1N914B LOW SIGNAL DIODE	30-002
D313	1N914B LOW SIGNAL DIODE	30-002
D314	1N914B LOW SIGNAL DIODE	30-002
D315	1N914B LOW SIGNAL DIODE	30-002
D316	1N914B LOW SIGNAL DIODE	30-002
LD301	T-1 3/4 BICOLOR LED	27-011
LD302	T-1 3/4 BICOLOR LED	27-011
LD303	T-1 3/4 BICOLOR LED	27-011
LD304	T-1 3/4 BICOLOR LED	27-011
LD305	T-1 3/4 BICOLOR LED	27-011
LD306	T-1 3/4 BICOLOR LED	27-011
LD307	T-1 3/4 BICOLOR LED	27-011
LD308	T-1 3/4 BICOLOR LED	27-011
LD309	T-1 3/4 BICOLOR LED	27-011
LD310	T-1 3/4 BICOLOR LED	27-011
LD311	T-1 3/4 YELLOW LED	27-020
LD312	T-1 3/4 RED LED	27-018
LD313	T-1 3/4 YELLOW LED	27-020
LD314	T-1 3/4 BICOLOR LED	27-011
LD315	T-1 GREEN LED	27-017
LD316	T-1 GREEN LED	27-017
LD317	T-1 GREEN LED	27-017

Control PCB Assembly - Miscellaneous

PART #	DESCRIPTION	STOCK #
SW301	4PDT PUSHBUTTON	20-017
SW302	4PDT PUSHBUTTON	20-017
SW303	4PDT PUSHBUTTON	20-017
H301	16 PIN MACHINE SOCKET	43-078
H304	6 PIN RT ANGLE LOCK HEADER	43-061

COMPELLOR Model 301 Parts

Control PCB Assembly - Hardware

QUANT.	DESCRIPTION	STOCK #
4	8 PIN IC SOCKET	43-003
4	18 PIN IC SOCKET	43-008
1	36 PIN STRIP RT ANGLE HEADER	43-072
1	36 PIN STRIP SOCKET	43-067
3	ECG BLACK BUTTON	11-009
4	SELCO BLACK KNOB	12-004
4	SELCO BLACK CAP WHITE LINE	14-003
2	8-32 KEP NUT	63-021
4	BIVAR SPACER .25"	62-029
13	BIVAR SPACER .1"	62-040
7	TEST POINT	67-046
1	CONTROL PCB	68-045C
1	LED PCB 68-046	
1	INSPECTION STICKER	

Power Supply PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C1	2200µF	35V EL RADIAL	82-040
C2	2200µF	35V EL RADIAL	82-040
C3	2200µF	35V EL RADIAL	82-040
C4	1µF	35V TANT RADIAL	83-001
C5	1µF	35V TANT RADIAL	83-001
C6	1µF	35V TANT RADIAL	83-001
C7	1µF	35V TANT RADIAL	83-001
C8	1µF	35V TANT RADIAL	83-001
C9	1µF	35V TANT RADIAL	83-001

Power Supply PCB - Semiconductors

PART #	DESCRIPTION	STOCK #
BR1	BR81D BRIDGE RECTIFIER	30-004
BR2	BR81D BRIDGE RECTIFIER	30-004
D1	1N4003 POWER DIODE	30-009
D2	1N4003 POWER DIODE	30-009
D3	1N4003 POWER DIODE	30-009
D4	1N4003 POWER DIODE	30-009
D5	1N4003 POWER DIODE	30-009
D6	1N4003 POWER DIODE	30-009
D7	1N4003 POWER DIODE	30-009
D8	1N4003 POWER DIODE	30-009
D9	1N4003 POWER DIODE	30-009
D10	1N4003 POWER DIODE	30-009
D11	1N4003 POWER DIODE	30-009
D12	1N4003 POWER DIODE	30-009
REG1	7815 REGULATOR +15V	36-009
REG2	7815 REGULATOR +15V	36-009
REG3	7915 REGULATOR -15V	36-010
REG4	7915 REGULATOR -15V	36-010
REG5	7805 REGULATOR +5V	36-012
REG6	7805 REGULATOR +5V	36-012

Power Supply PCB - Miscellaneous

QUANT.	DESCRIPTION	STOCK #
3	7 PIN LOCKING HEADER	43-062
2	6 PIN LOCKING HEADER	43-066
4	8-32 X 1/4" PAN PHIL SIMS	60-035
6	BIVAR SPACER .1"	62-040
6	HEATSINK CLIP	65-003
1	POWER SUPPLY PCB	68-030B

COMPELLOR Model 303 Parts

Sub-Assemblies and Assorted Parts

QUANT	DESCRIPTION	STOCK #
1	CORCOM POWER FILTER	42-013
1	7 PIN MOLEX BLOCK	43-059
7	MOLEX CONTACTS	49-016
1	US POWER CORD	54-013
1	GROUND LUG	60-028
1	8-32 X 5/8" PANHD PHILLIPS	60-040
1	STANDOFF TOROID	62-041
1	POLY BAG (LITERATURE)	9 X 1266-036
1	POLY BAG (UNIT)	12 X 2466-052
1	POLY ZIP BAG (MOUNTING SCREWS)	66-090
1	"GROUND LUG" STICKER	66-110
1	CHASSIS COVER	66-
1	CHASSIS	66-
1	PANEL, FRONT	69-
4	6-32 X 3/8" BLK OVL PHL SCRW	60-033
4	4-40 X 1/4" BLK PN PHL SLF TAP	60-042
1	SHIPPING CARTON	66-
1	SET SHIPPING FOAM	66-
1	OWNERS MANUAL	
1	AUDIO PCB ASSEMBLY	68-047SA
1	CONTROL PCB ASSEMBLY	68-045SA
1	EXCITER PCB ASSEMBLY	68-113CSA
1	POWER SUPPLY ASSEMBLY	68-030SA
1	CABLE ASSEMBLY 7 PIN	
1	CABLE ASSEMBLY 7 PIN	
1	CABLE ASSEMBLY 6 PIN	
1	CABLE ASSEMBLY 3 PIN	
1	CABLE ASSEMBLY 16 PIN DIP	

Audio PCB Assembly - All Parts

(Same as Model 301 Parts, refer to pages 9 - 7 through 9 - 9)

Control PCB Assembly - All Parts

(Same as Model 301 Parts, refer to pages 9 - 9 through 9 - 11)

EXCITER PCB Assembly - Resistors

PART #	VALUE	DESCRIPTION	STOCK #
R401	100K	1/4 W 1% MTL FILM	92-1003
R402	100K	1/4 W 1% MTL FILM	92-1003
R403	10K0	1/4 W 1% MTL FILM	92-1002
R404	10K0	1/4 W 1% MTL FILM	92-1002
R405	150R	1/4 W 1% MTL FILM	92-1500
R406	2K00	1/4 W 1% MTL FILM	92-2001
R407	10K0	1/4 W 1% MTL FILM	92-1002
R408	1K00	1/4 W 1% MTL FILM	92-1001
R409	1K00	1/4 W 1% MTL FILM	92-1001
R410	560R	1/4 W 5% MTL FILM	90-256
R411	3K32	1/4 W 1% MTL FILM	92-3321
R412	100K	1/4 W 1% MTL FILM	92-1003
R413	39K2	1/4 W 1% MTL FILM	92-3922
R414	68K1	1/4 W 1% MTL FILM	92-6812
R415	22K1	1/4 W 1% MTL FILM	92-2212
R416	1M00	1/4 W 1% MTL FILM	92-1004
R417	249K	1/4 W 1% MTL FILM	92-2493
R418	1K00	1/4 W 1% MTL FILM	92-1001
R419	33K2	1/4 W 1% MTL FILM	92-3322
R420	10K0	1/4 W 1% MTL FILM	92-1002
R421	499R	1/4 W 1% MTL FILM	92-4990
R422	100K	1/4 W 1% MTL FILM	92-1003
R423	200K	1/4 W 1% MTL FILM	92-2003
R424	100K	1/4 W 1% MTL FILM	92-1003
R425	100K	1/4 W 1% MTL FILM	92-1003
R426	76K8	1/4 W 1% MTL FILM	92-7682
R427	2K49	1/4 W 1% MTL FILM	92-2491
R428	499K	1/4 W 1% MTL FILM	92-4993
R429	2K49	1/4 W 1% MTL FILM	92-2491
R430	1M00	1/4 W 1% MTL FILM	92-1004
R431	2K49	1/4 W 1% MTL FILM	92-2491
R432	33K2	1/4 W 1% MTL FILM	92-3322
R433	5K10	1/4 W 1% MTL FILM	92-5101
R434	1K82	1/4 W 1% MTL FILM	92-1821
R435	560R	1/4 W 5% MTL FILM	92-256
R436	1K00	1/4 W 1% MTL FILM	92-1001
R437	1K00	1/4 W 1% MTL FILM	92-1001
R438	1K00	1/4 W 1% MTL FILM	92-1001

EXCITER PCB Assembly - Vrble. Resistors

PART #	VALUE	DESCRIPTION	STOCK #
VR401	10A-10K	10K LOG POT	23-023
VR402	10C-50K	DUAL 50K/10K	23-043
	10C-10K	REV LOG POT	
VR403	B-10K	10K LIN POT	23-038
VR404	10A-10K	10K LOG POT	23-023

EXCITER PCB Assembly - Capacitors

PART #	VALUE	DESCRIPTION	STOCK #
C401	20pF	MICA DIP RADIAL	85-003
C402	22µF	25V EL RADIAL	82-003
C403	.0047µF	POLY	84-007
C404	.0047µF	POLY	84-007
C405	20pF	MICA DIP RADIAL	85-003
C406	22µF	25V EL RADIAL	82-003
C407	22µF	25V EL RADIAL	82-003
C408	22µF	25V EL RADIAL	82-003
C409	1µF	35V TANT RADIAL	83-001
C410	22µF	25V EL RADIAL	82-003
C411	.1µF	50V MONO RADIAL	88-001
C412	20pF	MICA DIP RADIAL	85-003
C413	22µF	25V EL RADIAL	82-003
C414	22µF	25V EL RADIAL	82-003
C415	20pF	MICA DIP RADIAL	85-003
C416	100µF	35V EL RADIAL	82-014
C417	100µF	35V EL RADIAL	82-014
C418	.1µF	50V MONO RADIAL	88-001
C419	.1µF	50V MONO RADIAL	88-001

COMPELLOR Model 303 Parts

PART #	VALUE	DESCRIPTION	STOCK #
C420	.1µF	50V MONO RADIAL	88-001
C421	.1µF	50V MONO RADIAL	88-001
C422	22µF	25V EL RADIAL	82-003
C423	.1µF	50V MONO RADIAL	88-001
C424	.1µF	50V MONO RADIAL	88-001
C425	100µF	35V EL RADIAL	82-014
C426	100µF	35V EL RADIAL	82-014

EXCITER PCB Assembly - Semiconductors

PART #	DESCRIPTION	STOCK #
U401	LF353N DUAL OPAMP	32-007
U402	LF353N DUAL OPAMP	32-007
U403	LF353N DUAL OPAMP	32-007
U404	MAX1502 AURAL EXCITER	33-051
U405	LM324N QUAD OPAMP	32-003
D401	1N914B LOW SIGNAL DIODE	30-002
D402	1N914B LOW SIGNAL DIODE	30-002
D403	1N914B LOW SIGNAL DIODE	30-002
D404	1N914B LOW SIGNAL DIODE	30-002
D405	1N914B LOW SIGNAL DIODE	30-002
D406	1N914B LOW SIGNAL DIODE	30-002
D407	1N914B LOW SIGNAL DIODE	30-002
D408	1N914B LOW SIGNAL DIODE	30-002
D409	1N914B LOW SIGNAL DIODE	30-002
LD401	T-1 3/4 BICOLOR LED	27-011
LD402	T-1 3/4 BICOLOR LED	27-011

EXCITER PCB Assembly - Miscellaneous

PART #	DESCRIPTION	STOCK #
SW401	4PDT PUSHBUTTON	20-017
H401	3 PIN RT ANGLE LOCK HEADER	43-094
H402	7 PIN RT ANGLE LOCK HEADER	43-062
H403	5 PIN RT ANGLE HEADER	43-072

EXCITER PCB Assembly - Hardware

QUANT.	DESCRIPTION	STOCK #
3	8 PIN IC SOCKET	43-003
1	14 PIN IC SOCKET	43-004
1	16 PIN IC SOCKET	43-007
1	ECG BLACK BUTTON	11-009
4	SELCO BLACK KNOB	12-004
4	SELCO BLACK CAP WHITE LINE	14-003
2	8-32 X 3/8" PANHEAD PHILLIPS SIMS	60-028
2	8-32 X 5/8" M/F STANDOFF	62-041
4	BIVAR SPACER .25"	62-029
4	BIVAR SPACER .1"	62-040
1	EXCITER PCB	68-113C
1	LED PCB	68-115A
1	INSPECTION STICKER	

Power Supply PCB Assembly - Capacitors

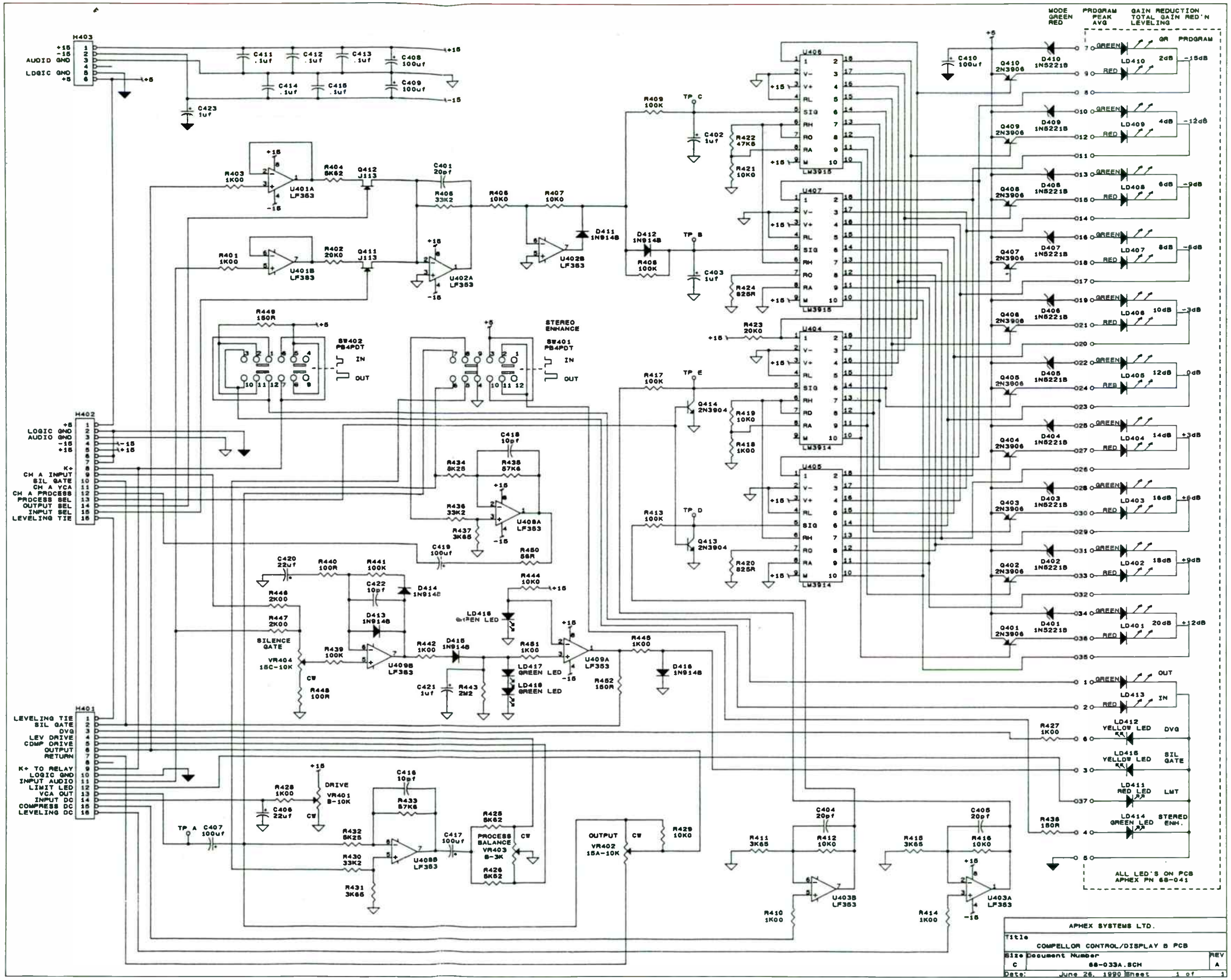
PART #	VALUE	DESCRIPTION	STOCK #
C1	2200µF	35V EL RADIAL	82-040
C2	2200µF	35V EL RADIAL	82-040
C3	2200µF	35V EL RADIAL	82-040
C4	1µF	35V TANT RADIAL	83-001
C5	1µF	35V TANT RADIAL	83-001
C6	1µF	35V TANT RADIAL	83-001
C7	1µF	35V TANT RADIAL	83-001
C8	1µF	35V TANT RADIAL	83-001
C9	1µF	35V TANT RADIAL	83-001

Power Supply PCB - Semiconductors

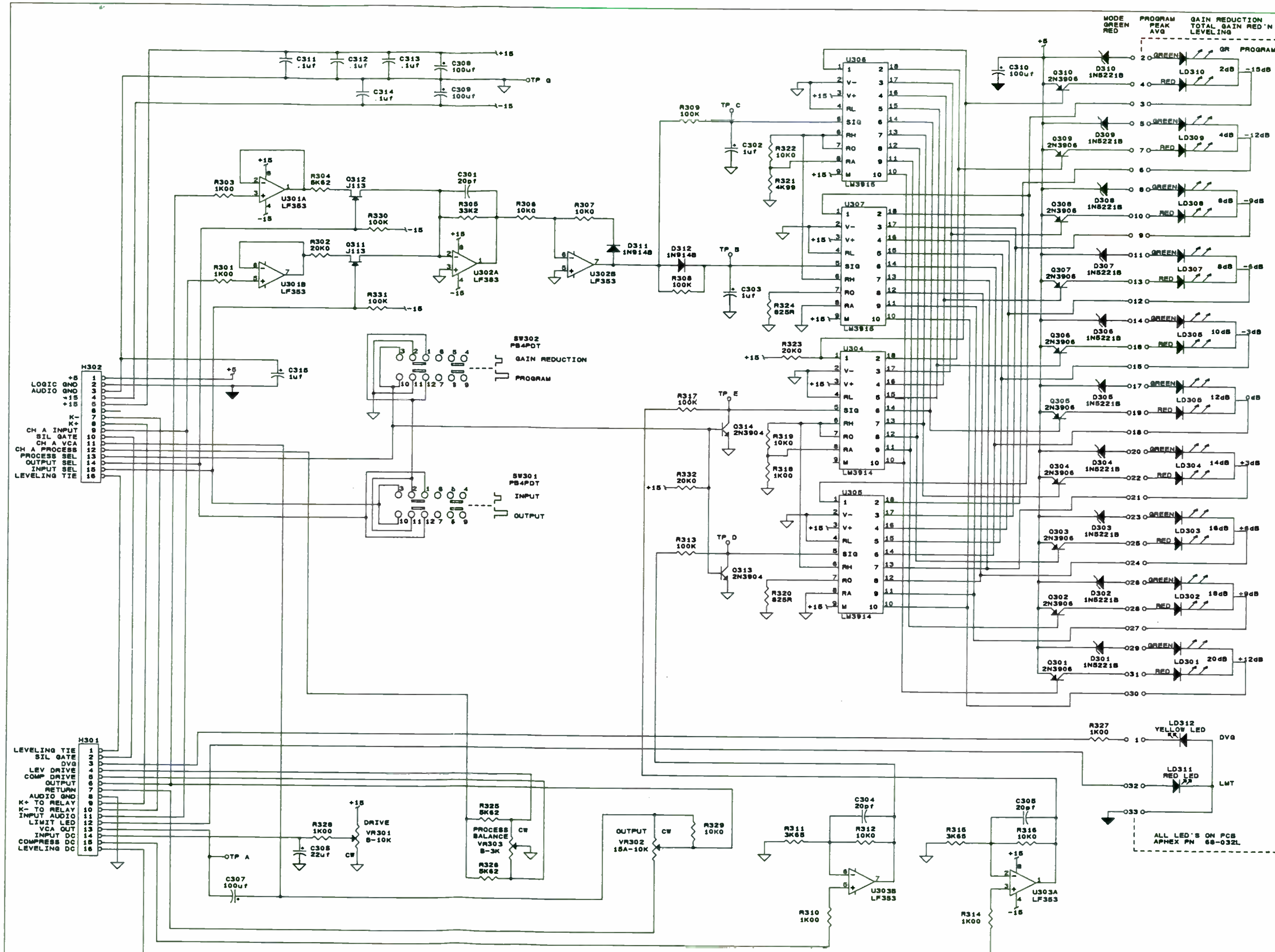
PART #	DESCRIPTION	STOCK #
BR1	BR81D BRIDGE RECTIFIER	30-004
BR2	BR81D BRIDGE RECTIFIER	30-004
D1	1N4003 POWER DIODE	30-009
D2	1N4003 POWER DIODE	30-009
D3	1N4003 POWER DIODE	30-009
D4	1N4003 POWER DIODE	30-009
D5	1N4003 POWER DIODE	30-009
D6	1N4003 POWER DIODE	30-009
D7	1N4003 POWER DIODE	30-009
D8	1N4003 POWER DIODE	30-009
D9	1N4003 POWER DIODE	30-009
D10	1N4003 POWER DIODE	30-009
D11	1N4003 POWER DIODE	30-009
D12	1N4003 POWER DIODE	30-009
REG1	7815 REGULATOR +15V	36-009
REG2	7815 REGULATOR +15V	36-009
REG3	7915 REGULATOR -15V	36-010
REG4	7915 REGULATOR -15V	36-010
REG5	7805 REGULATOR +5V	36-012
REG6	7805 REGULATOR +5V	36-012

Power Supply PCB - Miscellaneous

QUANT.	DESCRIPTION	STOCK #
3	7 PIN LOCKING HEADER	43-062
2	6 PIN LOCKING HEADER	43-066
4	8-32 X 1/4" PAN PHIL SIMS	60-035
6	BIVAR SPACER .1"	62-040
6	HEATSINK CLIP	65-003
1	POWER SUPPLY PCB	68-030B



H403
+15
-15
AUDIO GND
LOGIC GND
+5
H402
LOGIC GND
AUDIO GND
-15
+15
K+
CH A INPUT
SIL GATE
CH A VCA
CH A PROCESS
PROCESS SEL
OUTPUT SEL
INPUT SEL
LEVELING TIE
H401
LEVELING TIE
SIL GATE
DVG
LEV DRIVE
COMP DRIVE
OUTPUT
RETURN
K+ TO RELAY
LOGIC GND
INPUT AUDIO
LIMIT LED
VCA OUT
INPUT DC
COMPRESS DC
LEVELING DC
STEREO ENHANCE
SW401 PB4PDT
SW402 PB4PDT
IN
OUT
SILENCE GATE
DRIVE
PROCESS BALANCE
OUTPUT
MODE GREEN RED
PROGRAM PEAK AVG
GAIN REDUCTION TOTAL GAIN RED'N LEVELING
GR PROGRAM
ALL LED'S ON PCB
APHEX PN 68-041
APHEX SYSTEMS LTD.
Title
COMPELLOR CONTROL/DISPLAY B PCB
Size C
Document Number 68-033A.SCH
REV A
Date: June 26, 1990
Sheet 1 of 1

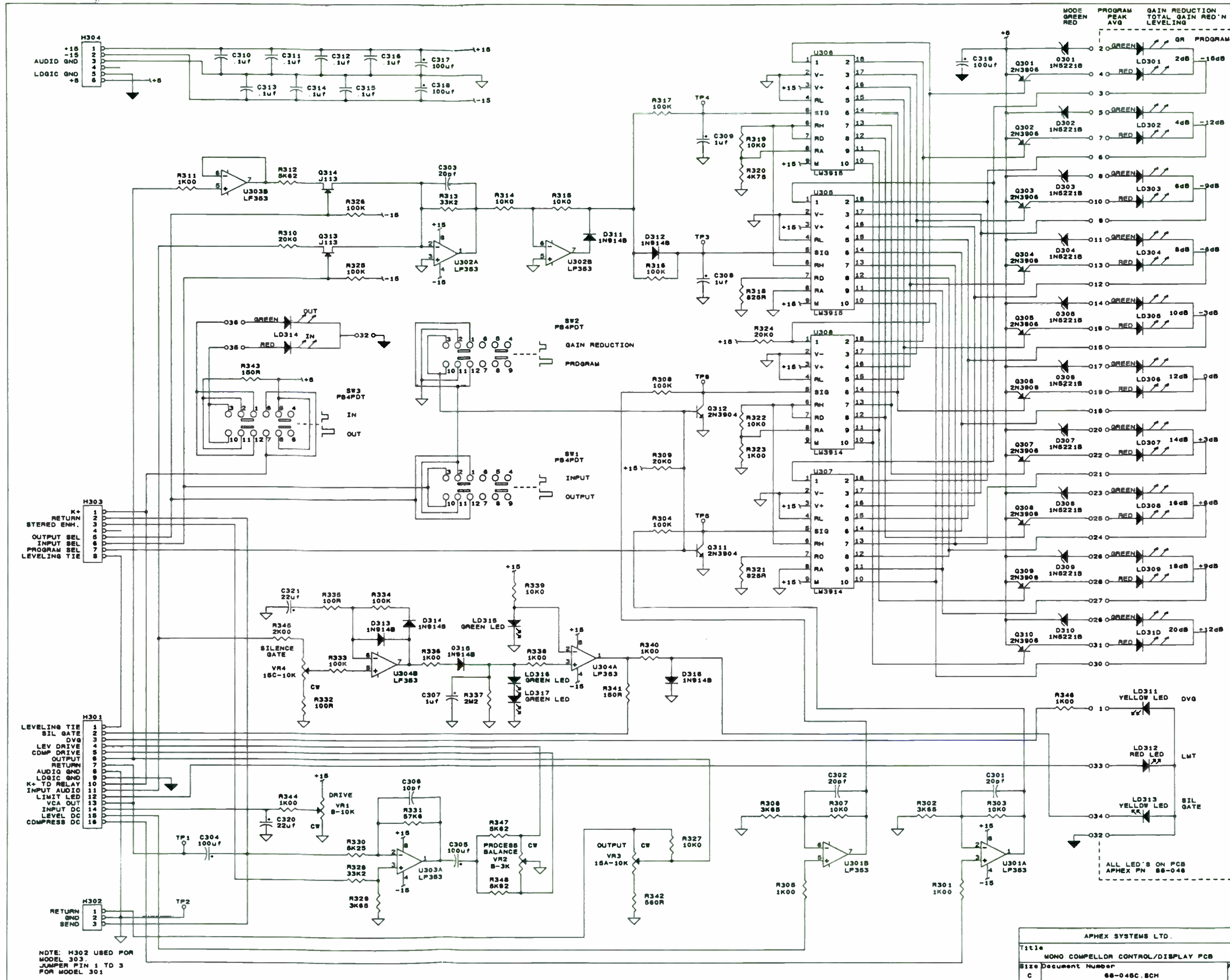


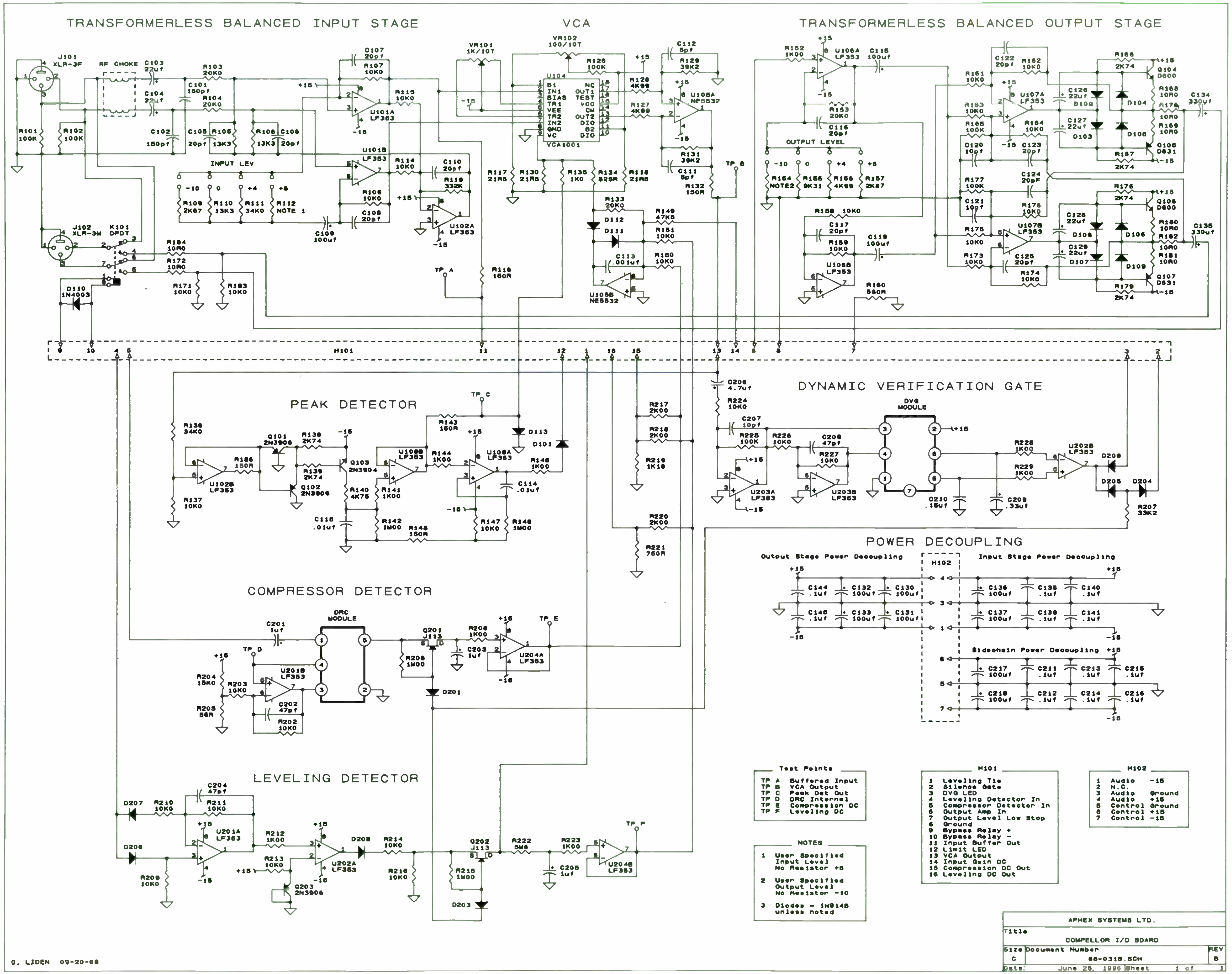
APHEX SYSTEMS LTD.

Title: COMPELLOR CONTROL/DISPLAY A PCB

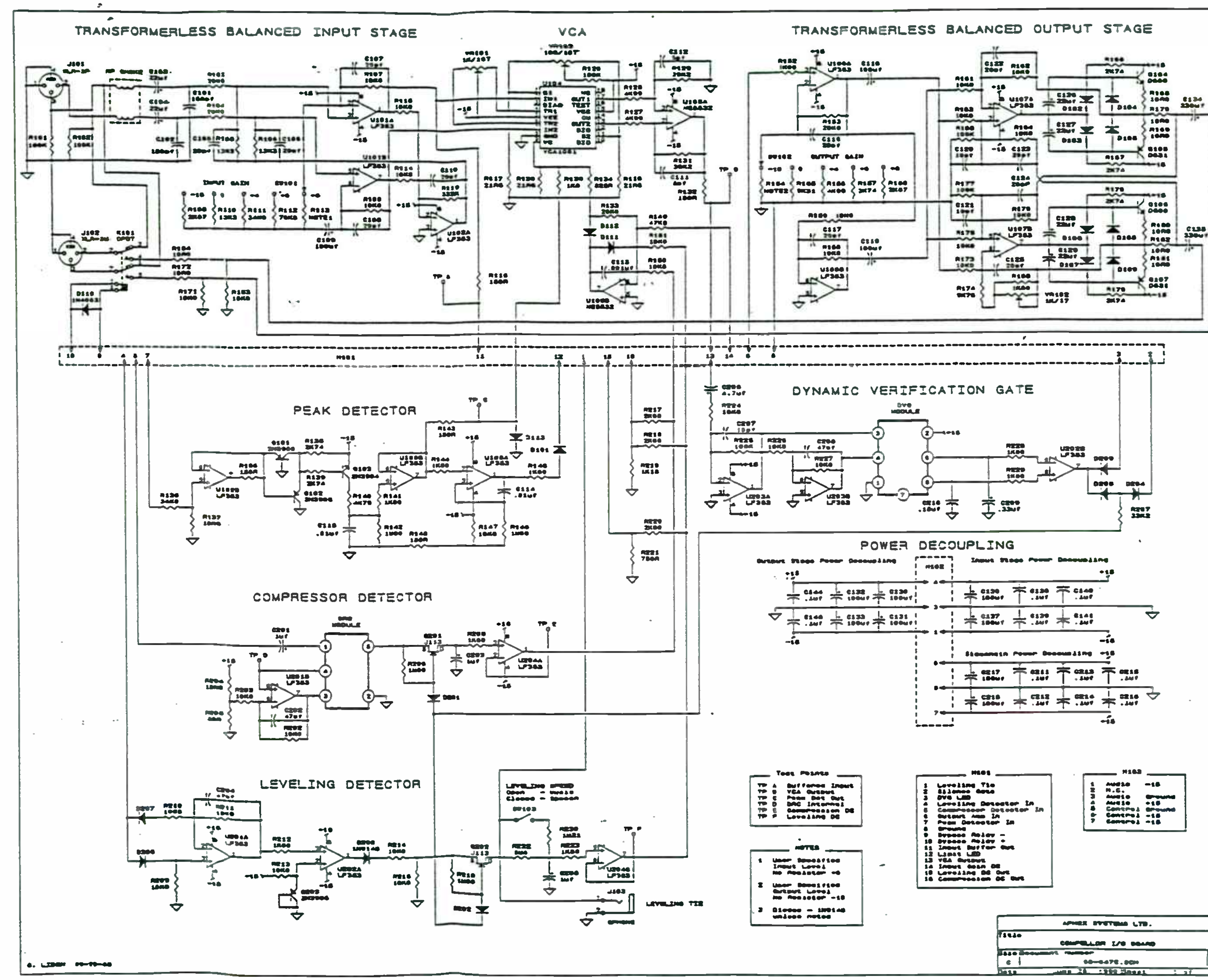
Size	Document Number	REV
C	68-032A.SCH	A

Date: June 27, 1990 Sheet 1 of 1


NOTE: H302 USED FOR MODEL 303. JUMPER PIN 1 TO 3 FOR MODEL 301
ALL LED'S ON PCB APHEX PN 66-046
APHEX SYSTEMS LTD.
Title
MONO COMPELLOR CONTROL/DISPLAY PCB
Size C
Document Number 66-045C.SCH
REV
Date: June 9, 1990 Sheet 1 of 1



TRANSFORMERLESS BALANCED INPUT STAGE
VCA
TRANSFORMERLESS BALANCED OUTPUT STAGE
PEAK DETECTOR
DYNAMIC VERIFICATION GATE
POWER DECOUPLING
Output Stage Power Decoupling
Input Stage Power Decoupling
Sidechain Power Decoupling
COMPRESSOR DETECTOR
LEVELING DETECTOR
Test Points
TP A Buffered Input
TP B VCA Output
TP C Peak Det Out
TP D DRC Internal
TP E Compression DC
TP F Leveling DC
NOTES
1 User Specified Input Level No Resistor +5
2 User Specified Output Level No Resistor -10
3 Diodes - 1N914B unless noted
H101
1 Leveling Tie
2 Silence Gate
3 DVG LED
4 Leveling Detector In
5 Compressor Detector In
6 Output Amp In
7 Output Level Low Stop
8 Ground
9 Bypass Relay +
10 Bypass Relay -
11 Input Buffer Out
12 Limit LED
13 VCA Output
14 Input Gain DC
15 Compression DC Out
16 Leveling DC Out
H102
1 Audio -15
2 N.C.
3 Audio Ground
4 Audio +15
5 Control Ground
6 Control +15
7 Control -15
APHEX SYSTEMS LTD.
Title
COMPELLOR I/O BOARD
Size C
Document Number 88-031B.SCH
REV B
Date: June 26, 1990 Sheet 1 of 1
G. LIDEN 09-20-88


TRANSFORMERLESS BALANCED INPUT STAGE
VCA
TRANSFORMERLESS BALANCED OUTPUT STAGE
PEAK DETECTOR
DYNAMIC VERIFICATION GATE
POWER DECOUPLING
COMPRESSOR DETECTOR
LEVELING DETECTOR
APHEX SYSTEMS LTD.
Title
COMPELLOR I/O BOARD