DOMINATOR II
PRECISION MULTIBAND
PEAK LIMITER

PRELIMINARY

OPERATING GUIDE

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WARNING

TO REDUCE THE RISKS OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE

Dominator II

Errata And Modifications To The Operating Guide

Due to circuit changes, several parts of the manual are now irrelevant or inaccurate. Please Note the following changes.

1. Section 3.0, Basic Setup, paragraph (5.) should read thusly:

   5) Feed speech or music program at normal level; adjust **INPUT** control to generate at least 6 to 8dB of limiting. Do not use a steady tone for this purpose but a 1KHz tone burst with 30msec on and 300msec off may be used.

2. Section 5.8.2, ALT Generator:

   The circuit revision defeats the tone detector function and places a direct connection from collector to emitter of Q3. Therefore, any discussion of the tone detect circuit is irrevelant. All discussion including Q3 should be taken to assume Q3 is always conducting. The Dominator II no longer recognizes test tones.

3. The parts list should be updated to reflect several new values.

   Main Audio PCB:
   R317(L,M,H) was 10K0 is now 4K99
   R417(L,M,H) was 10K0 is now 4K99
   D301(L,M,H) was 1N914B diode is now 5.6meg resistor
   D401(L,M,H) was 1N914B diode is now 5.6meg resistor

   Aux Control PCB:
   C6 was 0.001UF is now 0.01UF
   R32 was 4K99 is now 100K

DOMINATOR II

PRECISION MULTIBAND PEAK LIMITER

1.0 INTRODUCTION

After its introduction in 1985, the Studio Dominator became the world standard for peak limiting because of its transparency and effectiveness. However, unwilling to rest on its already established reputation, **Aphex Systems, Ltd.** has continued to develop new techniques. The result is the **Dominator II.**

As a direct descendant of the original, the **Dominator II** has the same primary functions and applications. Its many performance improvements lie in the areas of dynamic range, distortion, flexibility, and ease of setup.

Although those familiar with the Studio Dominator already know much of the information in this manual, Aphex recommends that these people as well as those new to Aphex Dominators read this manual.

The Dominator II is a stereo multiband peak limiter with absolute zero overshoot. Once the **PEAK CEILING** is set, there is no higher amplitude in the output. Awareness of headroom limitations and the price of exceeding those limitations, important for any audio application, is critical for most, especially digital. The Dominator II allows users to work confidently, creatively, and quickly by freeing them from the fear of "crashing".

Achieving this **brick wall** result while retaining complete fidelity is the art and science of the Dominator II. Because of its exceptional function and performance, it has applications in a great many audio fields, including:

- **BROADCASTING-PRODUCTION, AND TRANSMISSION FOR AM, FM, AND TV**
- **RECORDING**
- **SAMPLING**
- **MIXING**
- **MASTERING-CD, FILM, AND ANALOG DISK**
- **SOUND REINFORCEMENT**
- **SATELLITE AND STL UPLINK**
- **LOCATION RECORDING**
- **VIDEO POST-PRODUCTION**
- **TAPE DUPLICATION**
- **TELECONFERENCING**

1.1 DYNAMIC RANGE CONTROL

Essential to a full understanding of the operation and application of the Dominator II is a knowledge of the definitions and applications for each type of gain control: leveling, compression, limiting, and clipping.

1.1.1 Leveling

Leveling has high compression ratios with slow attack and release times. Because of its very slow time constants, leveling has no effect on short term changes in average levels or on transient peaks. Therefore, it is used to maintain a constant output level without affecting the short term dynamics by adjusting for long term changes in the input signal. Typically, the threshold is set low so that low level signals will be brought up.

1.1.2 Compression

Compression has low ratios with faster attack and release times. A compressor forces a wide dynamic range into a smaller range. The size of the resulting dynamic range depends on the level of the threshold, the height of the ratio used, and the speed of the attack and release. The higher the ratio and the faster the time constants, the greater the effect on the short term dynamics (the actual quality and fidelity of the sound); these effects are often used creatively. Normally, since one of the desired results of compression is to bring up low level signals, the threshold is set low.

1.1.3 Limiting

Limiting has high compression ratios (usually defined as greater than 8:1), fast attack and, depending on the particular application and desired sound, slow or fast release times. Since it is normally used to keep high levels down, the threshold is set high. Inasmuch as the ratios are high, as the input is driven further into limiting, the dynamic range of the output becomes 'tighter', an effect that may or may not be desirable. If the attack times are set to control only the average level, and allow for peaks above the threshold to pass, the limiter is considered a **program limiter**. When the speed of the attack times is increased to control peaks, the limiter is considered a **peak limiter**.

1.1.4 Clipping

Regardless of a limiter's attack time, there is a finite amount of time before the detector circuits cause the gain circuits to reduce

the output below threshold. Also, extremely fast gain modulation introduces unwanted audible effects. Therefore, clipping with its infinite ratios and instantaneous attack and release, functions as an absolute **brick wall.** To control the peaks, clipping literally shaves off the peaks of the wave above threshold without changing the amplitude of the remainder of the wave. Done properly, clipping is inaudible and, under certain circumstances, actually enhances the audio. Done improperly, however, clipping produces very audible, obnoxious effects.

2.0 FUNCTIONAL DESCRIPTION

Traditionally, peak limiters have been designed with fast attack times: the faster the attack time, the lower the amount of overshoot above threshold. The drawback to these fast attack times, however, is that the limiter is triggered off each transient, even extremely short ones. The sonic result is hole punching and overall lower density (peak to average ratio). On the other hand, while slower attack times result in better sonic performance, the overshoots cause distortion, or the overall level must be reduced to accommodate the overshoots. The Dominator II overcomes both drawbacks by combining limiters with fairly slow attack times and clipping, in an interactive, self-adjusting manner.

The Dominator II has been designed as a unity gain device with an adjustable threshold. Since there is zero overshoot over threshold, users have only to set the **PEAK CEILING** to the level at which peaks must stop (for example: 100% modulation). In other words, **set it and forget it!**

2.1 MULTIBAND VERSUS WIDEBAND PROCESSING

A significant problem with **wideband** processing is **"spectral gain intermodulation"** which occurs when one part of the spectrum controls the level of another part. A typical situation is a vocalist being 'sucked down' whenever the kick drum hits.

Since most energy is contained in the lower frequencies, they tend to control the level of the entire spectrum. When lower frequencies are above the limit threshold, higher frequencies are attenuated, causing the output to be dull.

Multiband processing solves these problems by splitting the audio into two or more frequency bands, and processing each band separately. However, more bands often result in many more parameters to control, including a method of summing the bands together again. While this creates user flexibility, it also requires different settings for almost every different source.

Since the Dominator II uses **program dependent, intelligent circuits** that reduce the number of controls, users have the flexibility to shape the sound while quickly and easily achieving consistent, effective limiting.

2.2 ALT (AUTOMATIC LIMIT THRESHOLD)

[Reference: Fig. 2.1 ALT BLOCK DIAGRAM, Page 2-4]. A multiband processor splits the audio into separate bands, limits each band individually, and then sums the bands together again. Even though each band's peak output is predictable, summing the bands together produces an unpredictable peak output.

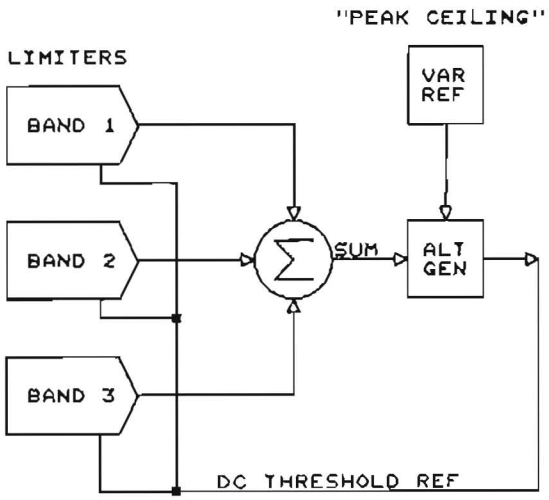
One conventional approach to making the summed output predictable is to use a wideband limiter after the summing. Unfortunately, this introduces all the drawbacks of wideband limiting identified above.

Another approach is to use a clipper on the summed output, but this causes too much clipping distortion if the summed output is too high. To avoid this distortion, the limiters' thresholds are set very far below the clipper threshold. The drawback to this approach is a loss of loudness and, because of the lower thresholds, a much greater amount of processing.

Instead of either of these approaches, the Dominator II uses a patented method to produce a predictable peak output while maintaining maximum loudness without audible distortion: **the Automatic Limit Threshold (ALT).** With this method, the outputs of the three bands are summed and sent to the ALT detector circuit. If the sum exceeds a reference value, the ALT reduces the thresholds of the individual limiters. When the summed output falls below the reference value, the limit thresholds return to their original setting.

The ALT circuit has a self-adjusting finite attack time. The amount of time it takes to lower the thresholds of the limiters is the length of time the limiters' overshoot may be in the clipper. The reference value of the ALT in relation to the clipper determines the depth of clipping. The **DENSITY** control sets both parameters. When it is set higher, the ALT reference gets closer to clipping and the attack time is slower, producing more clipping. When DENSITY is set lower, the opposite occurs. The **0 RCH** position for the DENSITY control emulates the standard parameters of the original Studio Dominator, Model 700; this is recommended for general use.

It is important to know that because there is only one ALT circuit controlling both channels equally, this method provides global stereo balance and imaging by ensuring that both channels always limit at the same threshold. Since this does cause an interaction if the Dominator II is used as two independent channels, Aphex does not recommend such a practice.



ALT BLOCK DIAGRAM

FIGURE 2.1

2.3 EQUALIZATION

As indicated above, wideband limiting often causes **dullness**. To prevent this, a common practice is to follow the limiter with an equalizer set to boost the high frequencies. The drawback is that the equalizer adds directly to the **overshoot**.

Another practice is to attenuate the lower frequencies fed to the detector circuits. While this diminishes spectral gain intermodulation, the drawback is that when there is substantial energy in those lower frequencies, it creates unacceptable amounts of overshoot.
The Dominator II eliminates these problems by using three-band processing with **selectable crossover frequencies** between low and mid-band and between mid and high-band, with adjustable input levels to the low and high-band. Also, the crossover filters are designed so that when the EQ controls are set flat and the input is below threshold, the Dominator II will pass perfect square waves. This means that the Dominator II equals a well designed wideband limiter in below threshold audio performance, and vastly outperforms any wideband device in performing its function above threshold.

The selection of the crossover frequencies and the input level to each band helps determine the **frequency response** of the output. When the input is below the limit threshold, the EQ will give a response equal to the change in input in each band. Since the compression ratio of the limiter is essentially infinite, a change in the input level above threshold will not cause any change in the output level. The EQ provides user flexibility to shape the sound and still maintain an absolute peak ceiling.

2.4 RELEASE TIME

The **release time** allows users to adjust the **density** of the output. With faster release times, the output is consistently maintained as close as possible to maximum. Extremely fast release times result

in a very tight dynamic range, and also may cause low frequency distortion. Slower release times reduce the distortion and provide a rounder, softer sound. Very slow release times tend to make the output much lower in average amplitude, especially on transient inputs.

2.5 GAIN CONTROL CIRCUITS

An important design goal for all Aphex products has been to make a signal processor able to **do nothing** before it performs its function. That is, it must be able to pass audio as if it were nothing more than a straight wire--no noise, distortion, or color.

Essential to achieving that goal is the use of the **Aphex VCA 1001** high performance integrated gain control element. Its measured specifications are outstanding as a signal amplifier, but even more importantly, its **dynamic performance** surpasses all other devices. Others produce distortion or amplitude anomalies with complex program audio which do not appear with steady tone test measurements. Of extreme importance is that other devices also create anomalies when gain is changed rapidly. The best known anomaly is DC shift or control feedthrough whose sonic results include clicks, pops, or unintended signal fed to the control circuits. The Aphex VCA 1001 is completely free from these anomalies, even in the most demanding situations such as a peak limiter.

Each band has its own **limiter** and **detector**. The **attack time** is preset and equal for all limiters. The **release time** is adjustable and also equal for all limiters. The **threshold** is adjustable from the

front panel **Peak Ceiling** control and is also adjusted by the **ALT.**

2.6 TRACKING CONTROL

Tracking forces the limiting of each band in each channel to follow the same band in the other channel. The channel with the greatest amount of limiting will cause the same band in the other channel to have an equal amount of limiting. This control maintains a stable stereo image. Without the tracking control, increased stereo loudness can be achieved but with potentially inaccurate or "smeared" stereo imaging, depending on the amount of limiting. For light limiting, non-tracking may be preferred in many cases.

2.7 DENSITY

The **DENSITY** control is one of the most important improvements incorporated into the Dominator II. As indicated in section 2.2 ALT, the DENSITY control adjusts the parameters of the ALT circuit. In effect, this allows users to determine the **RELATIVE CREST HEIGHT (RCH)** of the audio output signal. With a higher RCH setting, the below-threshold peak levels increase, producing greater power in the waveform as well as greater relative loudness.

By setting the ALT reference level and attack time, this control essentially adjusts the average **depth** of clipping, and the relative **duration** of clipping allowed. High clipping depth and duration create greater loudness, but may generate high distortion. Low clipping depth and duration reduce clip distortion, transferring more work to the limiters. Reduced loudness and 'punch' is traded for low distortion.

For those interested in the technical aspects, when the DENSITY control is in the 12 o'clock position, the limiter thresholds are **3dB** below the clipper threshold. Fully clockwise, the limiter thresholds are at the **same** level. Fully counterclockwise, the limiter thresholds are **6dB** below the clipper.

2.8 PEAK CEILING CONTROL

Many audio applications require that the **peak output** be trimmed to be as high as possible. To fulfill that requirement, the Dominator II was designed with two controls for the output ceiling. The **COARSE** control switches the ceiling, in 2dB steps, from +2 to +24dBu (peak). The **FINE** control adjusts the ceiling +1 to -1dB from the COARSE setting, in 0.2dB steps.

There is a third control, **RANGE**, which adjusts the internal gain structure by adding 10dB at the input, and subtracting 10dB at the output. These three controls give users the ability to trim the peak output to within 0.2dB over a 34dB range.

The **PEAK CEILING** controls set the **threshold** of clipping (the maximum peak output). If the input level remains below threshold, adjusting the PEAK CEILING controls does not affect output levels.

2.9 INPUT AND OUTPUT CIRCUITS, BYPASS RELAY

For maximum audio performance, the Dominator II has **servo-balanced transformerless** audio I/O circuits. With these, perfect interfacing with any system, balanced or unbalanced, high or low impedance, is extremely simple.

The input stage and AC power input receptacle include radio frequency filtering to reject interference from transmitters and allow the Dominator II to be used in typical broadcast racks.

The servo balanced input stage has a selectable 600 ohm termination resistor for systems which need to be loaded. When **Bypass** mode is selected, the resistor is lifted to prevent line loading disturbance. For systems that don't require a load resistance, users simply do not select the termination; unterminated, the input impedance is 19.5K-ohm.

The servo-balanced output stage properly drives any load of 600 ohms or greater. The output impedance of 65 ohms can drive long capacitive lines effectively, terminated or unterminated. The especially unique characteristic of the servo-balanced output stage is its ability to drive balanced and unbalanced output lines without difficulty. For unbalanced output, the unused output pin (2 or 3) is GROUNDED to pin 1. This causes the output stage to shift all drive automatically to the hot pin only, and adjust gain to provide full output level (no 6dB loss as with other circuits).

A high quality audio **relay** provides a true hard-wired bypass function. **Bypass** connects the output connector directly to the input connector and lifts the input termination resistor, if it was selected. The limiter input stage is still connected to the input connector; thus, the limiter remains active for instant insertion in line. The Bypass function can be initiated in one of three ways: powering down or power failure; front panel **Process Off/On** switch; or remote control (rear panel jack). This configuration provides a fail-safe

characteristic for critical systems where the audio signal must be bypassed through the Dominator II if the AC line or internal power supply fails.

2.10 MODEL 723 PRE AND DE-EMPHASIS

Pre-emphasis is an equalization curve expressed as a time value based on the ratio of a resistor and capacitor. The higher the value, the greater the equalization. This has been used as a noise reduction technique for broadcast and transmission links.

Primarily, there are two world standards: **50** and **75 microseconds**. Starting flat at approximately 1KHz, 50 microsecond pre-emphasis increases almost 12dB at 15KHz; 75 microsecond pre-emphasis increases over 17dB at 15KHz.

The Dominator II Model 723 has pre-emphasis (either 50 or 75 microsec) added after the input circuit and before the limiters. It also has a complementary de-emphasis circuit (which may be switched out of circuit) after the final limiter and before the output stage.

When the de-emphasis circuit is in circuit, the audio output of the Model 723 is flat if the input is below threshold. As the input increases above threshold, the output takes the shape of the de-emphasis curve.

3.0 BASIC SETUP

This procedure makes the Dominator II a **unity gain device** with nominal operating parameters and peak output at the proper level. Refer to Section 2.0 FUNCTIONAL DESCRIPTION and Section 4.0 APPLICATIONS for information on using EQ, RELEASE TIME, and DENSITY controls as well as other setup recommendations.

1. Set the **RANGE** switch as needed. Switch to **-10** if the input is **low level** (-10dBV, -7.8dBm), or to **0** if the input it **high level** (0 to +8dBm).

2. Set **INPUT and EQ** controls to **0** detent position, LF XOVER at 100Hz and HF XOVER at 1.7KHz, TRACKING in OFF position.

3. Set **RELEASE TIME AND DENSITY** controls fully clockwise.

4. Set **PEAK CEILING** control to a level below the estimated maximum peak input level to the following device, e.g., recorder, transmitter, etc.

5. Feed tone or program at normal level; adjust **INPUT** control to generate at least 6 to 8dB of limiting.

6. Raise **PEAK CEILING** control while observing peak indicators on the input of the following device, e.g., modulation monitors, peak meters, overload indicators, etc. If no peak indicators are available, listen to the audio for distortion.

NOTE

Be sure that there is limiting as the PEAK CEILING control is increased; adjust INPUT control as necessary.

7. Once the **PEAK CEILING** has been established, return **INPUT**, **DENSITY**, and **RELEASE TIME** to center detent. Switch TRACKING to ON.

4.0 APPLICATIONS

4.1 RECORDING

Both analog and digital recording media suffer from excess or insufficient record level. If the level is too low, an analog track will be noisy; a digital track will lack resolution and sound grainy. If the level is too hot, an analog track will sound compressed or pinched, while a digital track will sound harsh and badly distorted. Since these problems cannot be properly "fixed in the mix" it is necessary to take measures that ensure good recording during tracking.

Riding faders during recording is not always the best approach to getting correct record levels. The recordist may not always know the performance, and artists seldom play at exactly the same levels as in rehearsals. Especially when multiple tracks are being recorded in a hectic situation, artists and engineers cannot be expected to keep all levels optimized. All too often, the results are some bad tracks.

When the Dominator II is set up according to Section 3.0 Basic Setup and used during recording, a hot track can be made consistently and the recording engineer will be freed from worries about overload. A digital track can then utilize the maximum resolution available without ever crashing. An analog track will sound clean and more quiet. This applies to mixdown as well as to multitrack masters. A hot two track master can be generated using the full dynamic range of the medium without overload distortion.

NOTE

Finding the absolute peak input crashpoint of a particular recorder may be difficult because of the absence of any peak indicators. In that event, program should be recorded at various peak input levels and monitored for distortion. Once the peak input level has been established, it should be noted for later use in setting up the Dominator II.

Even if peak indicators are provided, they may not indicate the true crashpoint. It may be wise to verify the actual maximum peak input as if there were no peak indicators.

4.1.1 Digital Recording and Sampling

While overload characteristics of analog tape may be a desirable effect for certain types of program, overload characteristics of digital should be avoided under all circumstances.

The obvious and most often used method to avoid this effect is to run the input level sufficiently low to prevent any peaks from causing overload. The difficulty with this method is that digital loses one bit of resolution for every 6dB drop in level. And, as resolution decreases, the negative sonic characteristics of digital become more prominent (grunge, inaccurate high frequencies, and loss of 'air'). No amount of processing will increase the resolution---in fact, the reverse! Digital signal processing, including digital to digital conversions, actually further decreases resolution! The Dominator II, used simply as a protection device, will guarantee maximum benefit of the digital medium.

4.1.2 Stereo Recording

Stable imaging is often a high priority for stereo recording, and critical for binaural recording. The Dominator II should be set up according to Section 3.0 Basic Setup. Also, it is important to make sure that TRACKING is switched to ON.

4.2 MIXING

When assembling a mix, it is important to keep the highest peak levels of the elements within a fairly close range. This will allow for a hotter master later on, without the necessity for a large amount of limiting at the mastering stage.

Using the Dominator II on each individual element will also give users the flexibility to adjust the unit differently for different elements. This is an appropriate place to try various settings of crossovers, EQ levels, DENSITY and RELEASE times.

Multitrack mixing often requires layering of the various tracks to achieve depth and allow the more important tracks to maintain prominence. The level range (window) for each track may be maintained by riding faders or using some form of gain reduction.

If it is desirable to have a tight "window" for the average level, the Dominator II may be used as a PROGRAM LIMITER. In this case, average levels must be driven further into limiting. That is accomplished by turning up the INPUT control, by driving the input to the Dominator II to a higher level, or by lowering the PEAK CEILING. The amount of limiting on the display should be at least 6 to 8dB.

One application of this type of effect is for voice-overs in which the voice must "ride" over the music or effects bed at a consistent level. The tightness of the window is determined by the speed of the release time. The faster the release time, the tighter the window. The slower the release time, the more open the window.

NOTE

Beware of radical settings. If the release time is too fast, there may be an increase in audible distortion caused by the limiters following the low frequency waveforms. Even if there is no increase in distortion, the tightness may become unnatural.

4.3 MASTERING: CD, VINYL, FILM, TAPE DUPLICATION

As in recording, the main goal in mastering is to achieve a clean, hot transfer without overload distortion and without coloration. Many applications, however, require that the master be as loud as possible.

Loudness is defined in several different ways. Here, loudness is defined as how high the average level (Vu or RMS) is in relation to the peak level in terms of amplitude and duration. The higher the average level and the longer it stays at that high level, the louder it will seem to be.

If the goal is to achieve a maximally loud master, the Dominator II should be set up initially according to Section 3.0, followed by a loudness tuning procedure, as follows:

1. Make sure that there is 2 to 6dB of limiting by turning up the INPUT control or increasing the input level to the Dominator II. The first 6dB of limiting increases the loudness. A greater amount of limiting will turn the Dominator II into a PROGRAM LIMITER, and begin affecting the apparent dynamics.

2. Turn up the DENSITY control. This will increase the output level into the clipper which will increase average level. Because the amount of clipping will be increased, it is necessary to stop when any distortion becomes audible.

3. Speed up the RELEASE time. This will allow the average level to stay at a higher level for a longer time. If only 2 or 3dB of limiting is used, then the RELEASE time may be used at full fast. If greater amounts of limiting are used, slower release times must be used to avoid distortion.

4.4 SOUND REINFORCEMENT

Brick wall peak limiting may not be as apparently critical for sound reinforcement because of the forgiving nature of some amplifiers and speakers to short term "spikes". The problem is that a conventional limiter must be set well below the peak input of the amplifier to reduce the height and duration of the over-threshold spike. That will then introduce all the problems of conventional limiters explained in Section 1.0 Introduction.

One of the most important advantages of using the Dominator II for sound reinforcement is that all the available power may be applied without fear of overload. If the Dominator II gives an increase in average level of only 3dB (it usually can achieve greater loudness), it effectively has doubled the power amplification. In effect, the Dominator II turns a 10,000 watt system into a 20,000 watt system that is completely overload protected!

4.4.1 Processor Speaker Systems

To avoid some of the problems of conventional limiters, some crossover manufacturers use limiters in each band. Typically, these limiters have fast attack which causes an entire band to "duck" when a spike goes over threshold in that band. Other manufacturers provide sliding crossover frequencies and limiters to allow maximum level in each band, an approach that causes different equalization characteristics as the program changes its peak to average characteristics. Using the Dominator II in front of these systems ensures against these negative effects by establishing a maximum peak level into the downstream processors.

4.4.2 Reverberant Rooms

A common problem sound designers face is the necessity to limit lower frequencies to below the level of excitation of the reverberant field. The problem with conventional limiters is that the entire spectrum will be limited to the same point which causes dullness and loss of intelligibility. The multiband design of the Dominator II eliminates this problem. The LF crossover should be set at 210Hz. Other settings should follow Section 3.0.

4.4.3 Input Limiting and Mixing

As in recording tracks and multitrack mixing, the Dominator II may provide protection, equalization, greater loudness, and layering (program limiting). See Section 4.1 and 4.2 for suggested settings.

4.5 BROADCASTING

4.5.1 Production

A major goal in preparing audio for broadcast is to have the same sound off air as in the studio. When production staff lacks understanding of broadcast requirements, this goal is often unachievable.

One problem is that a studio environment allows for a much wider dynamic range than a typical living room. While broadcasters recognize this problem and employ compressors to reduce the dynamic range, the compressors make decisions that should have been made in the studio. The result is a changed sound.

Another problem is that production staff are concerned only with average levels. The result is that various elements will have much higher peak values than other elements which causes the broadcast limiters to clamp down harder on those peaks, and often cause "hole punching".

Still another problem is caused by pre-emphasis. As explained in Section 2.10, 75 microsecond pre-emphasis boosts 15KHz over 17dB relative to 1KHz. Many producers want their material to be brighter and brighter, especially as they get older and older. The

additional high frequency content in the program combined with the pre-emphasis greatly overworks the broadcast limiters. The results are most apparent on sibilance which becomes very "spitty" and smeared while transient material such as applause becomes "crackly".

The problem of too wide dynamic range may be handled by fader moves or use of an intelligent compressor such as the Compellor. If layering of the elements is critical, the Dominator II may be used as described in Section 4.2.

The problem of varying peak outputs can be handled simply and effectively by setting the Dominator II according to Section 3.0 so that the PEAK CEILING is set at the maximum input to the recorder. This allows the mixers to continue working with Vu meters without worrying about peaks. It also allows an overall hotter mix which sails through the broadcast limiters relatively untouched.

The third problem, too much high frequency, may be handled by simply reducing the high frequency content in the program. However, because that solution is often unacceptable, there is a need to control the high frequency content automatically. The Dominator II, Model 723, has additional circuitry which has the appropriate pre-emphasis in the input, and complementary de-emphasis in the output. This results in flat response under limiting, and a peak output shaped to the pre-emphasis above limiting.

Use of the Model 723 in the studio causes less loudness and less brightness because of the greater amount of high frequencies that the Dominator II must control. The off air sound, however, will be very close to the studio sound.

4.5.2 AM, FM, TV, Cable Transmission

The object of broadcasting should be the transmission of the program material without any changes. Reality, however, is much different. The necessity to handle different program levels automatically, as well as the much more sonically destructive requirement to be loud do indeed cause changes to the audio. The Dominator II was designed to achieve greater loudness while retaining the original sound quality.

AM broadcasting is bandwidth limited. AM processors are quite aggressive because many of the audible artifacts are out of band. The Dominator II in front of these processors will give them less to do and in this way help them work both better and more predictably. The Dominator II should be set to achieve loudness according to Section 4.3. The DENSITY control may be used more aggressively since the artifacts will be out of band.

FM broadcasting is more sensitive to processing because of its wider bandwidth. Most commercial stations demand loudness which requires greater amounts of processing. Typically, there are slow gain riders followed by faster compressors (very often multiband), followed by pre-emphasized limiters, followed by a stereo generator, followed by a composite clipper. It isn't surprising that listeners cannot listen for very long periods of time!

If there is a pre-emphasized limiter in the broadcast chain, the Model 720 should be used directly in front of it. The Dominator II should be set up for maximum loudness with tolerable distortion as described in Section 4.3. This will allow the final limiter to work less and more predictably. The Dominator II is particularly useful

in between a multiband compressor and the final limiter, since the multiband compressor typically generates a tremendous number of peak overshoots.

The Model 723 may be used as a final limiter. For this application, the stereo generator must contain the required 15KHz lowpass filters. Aphex highly recommends bypassing the pre-emphasis circuit in the stereo generator, allowing the Model 723 to provide all pre-emphasis. In this case, the Model 723 has its de-emphasis turned OFF. However, if the stereo generator pre-emphasis cannot be defeated, the Model 723 must then have its de-emphasis turned ON.

The Dominator II will give an FM station greater fidelity, punch, and the feeling of dynamics while maintaining competitive loudness.

NOTE

See the Appendix for information on using the Dominator II with the Compellor, Aural Exciter, and the Optimod.

Since TV audio in most of the world is FM, the problems for TV audio are the same as for FM radio. The additional TV audio problems stem from a much wider dynamic range and the fact that most of the program is dialog. Because people are more sensitive to distortion on dialog than on music, processing must be of higher quality, and must not be aggressive.

The Dominator II Model 723 with the de-emphasis circuit engaged should be used in front of a TV stereo generator because the generator has its own pre-emphasis.

If a stereo generator has its own processing, the Model 720 should be used; in this case, all processing in the generator should be bypassed except for the pre-emphasis limiter. Both Models should be set up according to Section 3.0 in order to retain a maximum of fidelity.

Cable TV presents essentially the same circumstances as broadcast TV when the cable operator must de-modulate signals from various sources and modulate again for distribution. Also, a cable operator often must add local spots to a source, spots that may have very different levels than the source.

Aphex recommends using both the Compellor and the Dominator II (typically Model 723) on each channel to provide channel-to-channel level consistency while maintaining the highest quality. For this use, the Dominator II should be set up according to Section 3.0.

4.6 SATELLITE UPLINKS AND STLs

Satellite uplinks and STLs both suffer from limited dynamic range, and most use pre-emphasis to reduce high frequency noise. To maximize signal-to-noise, and protect from overload, many people use conventional limiters.

As indicated in Section 1.0 Introduction, these limiters have severe sonic drawbacks. In addition to sonic degradation, they do not provide protection from peak overloading because of pre-emphasis. Further, even if these limiters are 'brick wall' they **must be set 17dB below maximum peak input** to the uplink. This then causes

the high noise floor to become even more apparent, especially when downstream processors bring up the low level signals.

The Dominator II Model 723 is the perfect solution. It maximizes the signal-to-noise ratio and at the same time provides overload protection. It is particularly effective for mobile recording trucks which transmit back to the station or to a satellite. For this type of application, the Dominator II should be set up according to Section 3.0.

5.0 TECHNICAL DESCRIPTION

The **Dominator II** is a stereo processor with two identical channels. The circuit description refers to the left channel, but by substituting the equivalent reference designators all information applies also to the right channel.

5.1 I/O FUNCTIONAL DESCRIPTION

5.1.1 Servo Balanced Input Stage

[Reference: Fig. 68-172-1.sch.] The input stage consists of U101A&B. RN101, a precision resistor network, forms a bridge around U101B to receive the input signal. VR102 serves as a fine bridge balance trim to allow peaking the common mode rejection. U101A serves as a current to the voltage converter to produce the output voltage.

When the input stage is not overloaded, there is no signal voltage at any opamp input node. This assures maximum input stage linearity and maximum common mode breakdown voltage. U101B establishes a servo loop to maintain this condition. U101B, pin 5, is grounded to the input jack ground, pin 1. This point, the only point where the chassis is connected to the power ground system, becomes the zero volt signal reference to reduce the possibility of ground loop hum. Signal input on XLR, pin 2, feeds the RN101 bridge, causing U101B to produce an output signal on pin 7. Signal input on XLR, pin 3, feeds forward directly to U101A, causing an output signal at pin 1. Because RN101 bridges the current summing node of U101A, the output signal from U101B injects a complementary current into the output summing node. In this way,

the input stage preserves perfect symmetry of input sensitivity.

If the input signal is unbalanced, pin 1 **or** pin 2 may be hot with no effect on gain. To prevent possible noise pickup, however, it is desirable to ground the undriven pin although it may be left open without negative effect.

The variable feedback resistance of VR501A establishes input gain. The variable trimmer VR101 compensates for resistance and linearity tolerances of the potentiometer. This allows precise gain matching of the two channels, and the establishment of precision unity gain throughput.

The input lines are passed through an RFI (radio frequency interference) filter consisting of R101, R102, L101 through L104, and C101 through C104. This filter, a modified butterworth fourth order lowpass filter, has a cutoff frequency of approximately 380 KHz. Virtually no phase shift is introduced within the audio range.

C105 through C108 block any offsets that arrive at the input. Sonic perfection is enhanced by the 'composite' capacitor approach--using a high grade mylar capacitor to bridge a high quality non polar electrolytic. This eliminates any problems of dielectric absorption or dissipation in the electrolytic.

5.1.2 Servo Balanced Output Stage

[Reference: Fig. 68-172-6.sch.] The output stage consists of U103A&B and U104A&B. U103A&B form a cross-coupled differential amplifier with the peculiar ability to sense if one of the outputs is shorted to ground. With no outputs shorted, the cross-coupling

establishes a 50 percent gain reduction of both polarity amplifiers. If one output is shorted, the lack of cross-coupling to the other stage provides a doubling of gain in the unshorted stage. Doubling causes the active output to double in level, which provides correct gain and level to equal the balanced mode. Also, the doubling of cross-coupled feedback to the shorted stage produces a precise differential gain null, and removes the output current dumped to ground from the shorted stage.

Either output may be shorted; the circuit will behave identically in a symmetrical manner. VR105 functions to null the common mode output gain.

U104A&B function as a DC servo to eliminate any DC offsets at the outputs of U103A&B. To eliminate any squarewave tilt, the low frequency corner of this servo is less than 0.1Hz. Output coupling capacitors are thereby eliminated, which improves the sonic clarity of the **Dominator II.**

5.1.3 Relay Bypass

[Reference: Fig. 68-172-1.sch.] K101 is a 3-pole relay with two functions. First, it provides a direct path from the input XLR to the output XLR when de-energized. Second, it opens the connection of the selectable input terminating resistor when de-energized. This scheme allows a transparent bypass with no loading, while allowing a loaded or unloaded insertion in the line.

5.2 LEVEL TRANSLATOR

[Reference: Fig. 68-172-2.sch.] This circuit optimizes limiter signal to noise ratio (SNR) for low or high line levels. The RANGE switch dictates the state of this circuit. In the O position, the SNR is optimized for HIGH line level such as O, +4, or +8dBm. In the -10 position, SNR is optimized for -10dBV operating level.

The circuit inserts a switched gain stage (U509A) after the input stage but before limiting, and inserts a switched gain stage (U510A) after the limiter summing stage. These gain stages are orchestrated to add 10dB of gain ahead of limiting, and equally cut gain after limiting in the -10 RANGE position.

Several incidental circuits on the schematic deserve mention:

- .U511A serves as a phase inverter to obtain the necessary differential drive to the servo balanced output stage.
- .Q506 is a constant current source for the LED indicator string which includes all the switch position indicators **except** PROCESS IN/OUT.
- .Q504 is a logic inverter for the RANGE function.
- .Q503 temperature compensates the Release control function.
- .SW504 couples the left and right limiter control voltages.

5.3 BAND SPLITTER

[Reference: Fig. 68-172-3.sch.] R108 receives signal from the level translator circuit. U501A, U502A, and U503A comprise a modified state variable crossover. SW502 and SW503 switch low and high crossover frequencies, respectively. VR502A and VR503A, the LF EQ AND HF EQ controls respectively, provide ±5dB gain adjustment for low and high band outputs. The mid-band output is

maintained at unity gain. U504A and U505A serve as inverting buffers to re-establish correct phase and load the EQ controls for correct taper shaping.

VR103 and VR104 trim flat response for center detent EQ positions precisely. The three band outputs are fed to three limiters, described in the following paragraphs.

5.4 BAND LIMITERS

[Reference: Fig. 68-172-4.sch.] The circuit shown is one of three identical limiters in each channel. The heart of the limiter is a voltage controlled amplifier composed of U303, the VCA, and support stages U301B and U304B. VR301 and VR302 are the coarse and fine control feedthrough null trims, respectively. VR303 is the DC offset trim. U304A is a phase flipper circuit which establishes the polarity of peak detection. (The phase flipper is controlled by a phase bus originating on the Aux. control card.) Q301 serves as a switch to short out the signal at pin 3 of U304A. If Q301 is open, U304A acts as a non-inverting unity gain stage. If Q301 is closed, U304A acts as an inverting unity gain stage.

A detector composed of U302A&B controls limiter gain reduction. U302A compares the peak amplitude of the audio signal from U304A to a DC reference voltage known as **ALT**. If the audio peak is greater than the ALT reference, the U302A output swings negative; otherwise, it remains positive. D301 simply provides a stabilizing negative feedback path when the comparator is idle, and limits the positive swing to about +0.6VDC.

When the comparator output is negative, C304 charges to a negative voltage through R317 and D302. The rate of charge (attack time) is regulated by the value of R317. U302B, a high impedance voltage follower, drives the VCA control point. As the voltage on C304 goes negative, the VCA begins attenuating. Within 5 milliseconds, the VCA gain is attenuated enough to bring down the peak output level below the ALT reference level, at which time the comparator output snaps positive again. The voltage, developed more slowly on C304, discharges through a constant current source consisting of Q302 and R319. The rate of discharge (release time) is determined by the programmed current through the current source which, in turn, is programmed by a voltage from the RELEASE TIME control.

When there is no limiting, the Q302 current source tends to draw C304 to a positive voltage. But the clamp circuit of U301A prevents the voltage on C304 from going more positive than zero volts by absorbing all the current source output under that condition.

5.5 BAND SUMMING

[Reference: Fig. 68-172-5.sch.] The three limiter outputs arrive at U506A, an inverting three input summing amplifier. The summed output at pin 1 feeds through header H503 to the clipper circuit located on the clipper Aux. board. The summed signal also feeds a full wave rectifier composed of U507A and U508A. The output of the rectifier combines through D104 with the identical signal from the right channel, and is fed to the ALT circuit located on the Aux. control board via header H502.

5.6 PROGRAMMABLE CLIPPER BOARD

[Reference: Fig. 68-179.sch.] The summed limiter signal arrives through header H503. Ula is a buffer stage with unity gain. Input resistors Rl and R2 form a divider, clamped by the clipper circuit made up of transistor array QAl. The clipped signal returns to H503 and is passed on to the Level Translator circuit previously described in section 5.2 of this manual.

The clipper circuit is a dual differential op-amp configuration that uses a simple high speed topology in a bipolar current clamping mode. Clipping occurs when the audio signal at the junction of Rl and R2 exceeds the bias voltage established by the clip ref. signal on H502, pin 5, a method that produces perfectly square clipping over a wide range of amplitudes. The clip ref. voltage, derived directly from the output ceiling control, follows a specific relationship to the limiter thresholds. In this way, clipping is coordinated correctly with the ALT system.

U2A&B serve as clip ref. buffers.

5.7 PRE/DE-EMPHASIS CIRCUIT

[Reference: Fig. 68-180-1.sch and 68-180-2.sch.] This board adds pre/de-emphasis circuits to the programmable clipper circuit described in 5.6 above. U3A&B form a precision pre-emphasis circuit imposed on the path from the input stage to the level translator stage on the main board.

U5A&B form a precision de-emphasis circuit imposed between the limiter summing stage and the level translator stage of the maim board. De-emphasis is selectable or defeatable by SW1.

5.8 AUX. CONTROL BOARD

[Reference: Fig. 68-177-1.sch and 68-177-2.sch.]

5.8.1 Peak Ceiling Reference Generator

The peak ceiling reference generator is composed of the circuit involving U1D. The peak ceiling switch selects one of twelve resistor pairs which set the DC output level on pin 14. These twelve steps represent the coarse limit threshold settings. Fine adjustment is made by a potentiometer, located on the main board between pins 3 and 4 of H101, that provides an offset gain of ±1dB. The peak ceiling ref. feeds the peak clipper through H101 as well as the ALT generator.

5.8.2 ALT Generator

The circuits of U1C and U2 form the ALT generator. U2 is a comparator which receives two signals: the peak ceiling reference voltage at the (+) input, and the full wave summed limiter output signal at the (-) input. When the peak signal is below the reference level, the output voltage rises to +15VDC. When the peak signal exceeds the reference signal, the output voltage is zero. A pulse train with constant rise time but variable pulse width is thus established out of the comparator.

C6 and R30 form a differentiator which converts the said pulse train into a constant pulse width, variable interval pulse train that causes Q2 to switch on and off accordingly. D6, keeping the differentiator centered, provides a symmetrical current path to offset the loading effect of the Q2 base current.

The charge on C5, the final ALT reference voltage buffered by U1C, is developed according to the description below.

Q2 is a chopper that modulates the discharge path of C5 by means of the pulse train developed by C6 and R30. Charging of C5 occurs between discharge pulses. The charge path reflects back through R31 and one section of the Density control. If Q3 is conducting, the Density control sets the initial ALT voltage as 50 to 100 percent of the Peak Ceiling reference. If Q3 is non-conducting, the Density control has no effect, and the initial ALT voltage is equal to the Peak Ceiling reference.

A program detector composed of U3A&B, and U1B determines if the audio signal passing through the **Dominator II** is a test tone or a program audio by looking at the peak factor. If the signal is a test tone, Q3 switches off, allowing the ALT reference to rise to the Peak Ceiling reference. If the signal is not a test tone, Q3 conducts, returning the ALT reference voltage to the Density control setting. This circuit allows correct setup of the Dominator II in a system that uses test tones.

5.8.3 Phase Detector

U5B receives audio signals from the two input stages, and acts as a summing stage. D1 and D2 provide threshold bias for D3 and D4, which form a peak differencer with C3, C4, R45, and R46. U5A acts as a comparator with hysteresis. The output of U5A operates Q1 which, in turn, provides a zero or -15VDC output to the Phase bus used by the band limiters. In this way, the peak asymmetry causes the Phase bus to switch levels according to the polarity with the greater peak amplitude.

5.8.4 Limiting Meter Driver

The input audio of the two channels is first full wave rectified, and then ored together. This is accomplished in an obvious manner by the circuits of U5C&D and U4C&D. U4B, a logarithmic amplifier, receives the ored signal. U4A, another logarithmic amplifier, receives the Peak Ceiling reference voltage. Since the two signals are of opposite polarity, adding their voltages is the same as subtracting their absolute values. This is performed by U3C whose output represents the exact amount of peak limiting, if any, in the **Dominator II** at any given instant. If the output is positive, there is no limiting. If the output is negative, limiting takes place in a decibel linear relationship to the magnitude of the voltage.

U3D and U1A form a peak holding circuit to capture the negative output of U3C, and drive the meter display circuit. The peak acquisition is virtually instantaneous, while the fallback time is variable by means of the current source consisting of Q1&2 of QA1. The release time bus controls the current source. Thus, the meter

display indicates the release time of the limiters, useful for getting an idea of the Release Time setting.

5.9 METER DISPLAY

[Reference: Fig. 68-176.sch.] U1 drives 10 LEDs in a series string technique to conserve power supply current. VR1 trims the full scale sensitivity.

The Peak Ceiling switch, SW1, is co-located on this board.

6.0 TEST PROCEDURES

6.1 MAIN BOARD TEST

6.1.1 Preparation

1. Turn Power to ON.
2. Test all lights.
3. Look for overheating or smoking parts.
4. Turn Terminations to OFF.
5. Set Jumpers on H501.
6. Set all trimmers to CENTERED.
7. Feed both channels: 1KHz, OdBm.
8. Set all pots to CENTER DETENT.
9. Set RANGE to zero '0'.
10. Turn all switches to RED.
11. Shift Test Jumper in OPERATE position.

6.1.2 Gain Cal

1. Measure L-CH output level.
2. Tweak VR101 for output = OdBm ±0.1dB.
3. Measure R-CH output level.
4. Tweak VR201 for output = OdBm ±0.1dB.
5. Switch RANGE to '-10'.
6. Verify that L-CH and R-CH gain is still OdB ±0.2dB.
7. Reset RANGE to '0'.
8. Turn INPUT GAIN counterclockwise (CWW) and then clockwise (CW). Verify that both channels reach approximately -15dB and +15dB output level variation.

6.1.3 CMRR Trim

1. Feed CMR TEST at 120Hz, +10dBm.
2. Measure output of CH1&2.
3. Tweak VR106 and VR206 for CMR null.
4. Reset feed to 1KHz, OdBm.

6.1.4 Crossover Test

1. Input 20-20KHz response sweep, OdBm.
2. Graph TP301L (TP401L).
3. Verify that crossovers match and are nominal.
4. Graph TP301M (TP401M).
5. Verify that crossovers match and are nominal.
6. Graph TP 301H (TP401H).
7. Verify that crossovers match and are nominal.
8. Switch X-OVERS to GREEN.
9. Repeat steps 1 through 7.

6.1.5 Shift Null

Repeat this procedure for each limiter. The sweep probe contains a 2KO resistor. The sweep source is 0 to -10V ramp. The scope should be X-Y with X from the sweep source.

1. Turn input feed to OFF.
2. Monitor TP302 with the scope.
3. Attach the sweep probe to VCA, pin 9.
4. Adjust VR301, VR302, and VR303 for OVDC offset and minimum shift.

6.1.6 EQ Calibration

1. Feed the inputs with 200 Hz squarewave, peak about 1V.
2. Observe outputs with the scope.
3. Trim VR103 and VR104 for flattest top on CH-1.
4. Trim VR203 and VR204 for flattest top on CH-2.

6.1.7 Release Pot Test

1. Measure the voltage at pin 4 of H502 with a DMM.
2. Verify that the voltages match the table below for all three positions.

Item	Position	Volts
1	Full CCW	0.8
2	Center	2.8
3	Full CW	15.0

6.1.8 Phase Flipper Test

Perform this test for each limiter.

1. Input sine at OdBm. Set frequency as needed per band (100Hz, 5KHz).
2. Use scope in dual trace mode with input wave as reference.
3. Check pin 1 of U304 with scope.
4. Exercise the PHS bus between 0 and -15VDC.
5. Observe that the waveform flips the polarity.

6.1.9 Limiter Test

Perform this test for each limiter.

1. Set release time full CW.
2. Observe TP302 (limiter output).
3. Set feed frequency as appropriate for each band.
4. Increase input level until output at TP302 goes into limiting.
5. The limiting amplitude should equal 7.5V peak.

6.2 AUX. CONTROL BOARD TEST AND ALIGNMENT

6.2.1 Preparation

1. To test, install the board on a known good main board system.
2. Verify that all controls are centered.
3. Set PEAK CEILING at +16.
4. Set RANGE to zero '0'.
5. Turn all other switches to RED.

6.2.2 Phase Detector Test

1. Feed in a positive half-wave sine at 1KHz, OdBm.
2. Observe that pin 3 of H502 rests at -15VDC with scope.
3. Reverse the polarity of the input half-wave.
4. Observe that the signal on H502, pin 3, changes to zero volts.

6.2.3 Peak Ceiling Reference Test and Calibration

1. Use a DVM to check the -15VDC voltage on the Aux. Control PCB power connector.
2. Remove the meter ground from the power connector.
3. Adjust the negative voltage regulator to obtain exactly -15.00VDC.

Item	Peak Ceiling	VDC
1	24	6.30
2	22	5.05
3	20	4.04
4	18	3.22
5	16	2.59
6	14	2.09
7	12	1.67
8	10	1.35
9	8	1.08
10	6	0.91
11	4	0.73
12	2	0.61

4. Set PEAK CEILING at +16.
5. Turn the Fine Ceiling control through full rotation.
6. Verify that the voltage on U1, pin 14, matches the table below.

Item	Position	Volts
1	CCW	2.34
2	MID	2.56
3	CW	2.84

6.2.4 Program Detector Test

1. With a music program input signal, verify that the collector of Q3 is within 0.1V of zero volts DC.
2. Feed in a 1KHz tone at OdBm.
3. Verify that the voltage on the Ql collector rises to approximately 2.56VDC.

6.2.5 ALT Generator Test

1. Check that there is no input signal.
2. Set PEAK CEILING at +16.
3. Set DENSITY to full CW.
4. Verify that the voltage on Ul, pin 8, is 2.34VDC.
5. Set DENSITY to center.
6. Verify that the voltage on Ul, pin 8, is 1.82VDC.
7. Set DENSITY to full CCW.
8. Verify that the voltage on Ul, pin 8, is 1.3.VDC.
9. Set DENSITY to full CW.
10. Feed in 1KHz, +20dBm.
11. Verify that the voltage on Ul, pin 8, moves to 2.45VDC.

6.2.6 Metering Zero Calibration and Test

1. Set PEAK CEILING at +16.
2. Set input signal at 1KHz, +13dBm.
3. Verify that all controls are centered.
4. Observe the signal on U3, pin 8, with the scope.
5. Adjust the VR so that signal peaks just touch zero volts.
6. Vary the input gain to produce more and less limiting.
7. Observe the effect of Release Time on the meter fallback time (**slow** should fall slowly, **fast** should fall quickly).

6.3 CLIPPER BOARD TEST [MODEL 720 ONLY]

6.3.1 Preparation

1. Install the board in a known good **Dominator** II chassis; disable limiters by pulling all U302s.
2. Verify that all controls are centered.
3. Set RANGE to zero ;0;.
4. Turn all switches to RED.
5. Feed in 1KHz at +24dBm.
6. Connect dual trace DC-coupled scope with channel 1 to pin 5 of Hl, and channel 2 to pin 3 of Hl. Both scope channels should be set for equal gain, and the traces overlapped and centered for ground (OV).

6.3.2 Test

1. Verify that the peak amplitude of clipping on pin 3 equals the DC level of pin 5 on H1, and that clipping is symmetrical for all settings of the PEAK CEILING control. Do **not** change the RANGE setting from zero '0'.
2. Repeat the test after changing the channel 2 scope probe from pin 3 to pin 8 of H1.

6.4 CLIPPER AND PRE/DE-EMPHASIS TEST [MODEL 723 ONLY]

6.4.1 Setup

1. Follow the instructions for Section 6.3.
2. Feed in a 150Hz-15KHz frequency sweep at -10dBm to both channels.
3. Set PEAK CEILING at +24.
4. Measure the pre-emphasized output signal at pins 2 and 9 of H1 to verify the nominal pre-emphasis curve of 50 or 75uSec. (as factory ordered).
5. Set the de-emphasis switch to ON.
6. Measure the output level at pins 3 and 8 to verify that the response is flat within ±0.25dB 20Hz to 15KHz.
7. Switch the de-emphasis to OFF.
8. Feed in 15KHz at 0dBm to both channels.
9. Connect dual trace DC-coupled scope with channel 1 to pin 5 of H1, and channel 2 to pin 3 of H1. Both scope channels should be set for equal gain and the traces overlapped and centered for ground (0V).
10. Raise the input gain until clipping is evident on pin 3 of H1.
11. Verify that the peak amplitude of clipping equals the DC level of pin 5, and clipping is symmetrical for all settings of the PEAK CEILING control. Do **not** change the RANGE setting from '0'. As necessary, adjust the input gain to regain clipping.
12. Repeat the test after changing the channel 2 scope probe from pin 3 to pin 8 of H1.

7.0 SPECIFICATIONS

AUDIO SPECS: RANGE SETTING	0dB	-10dB
NOMINAL GAIN:	0dB ±15dB	Same
OUTPUT NOISE:	-81dBu	-89dBu
THD	<.005%	Same
SMPTE IMD:	<.006%	Same
DIM.:	<.006%	Same
FREQ. RESP.:	±0.2dB 2Hz-75KHz	Same
MAX INPUT (MIL):	+27dBu	+23dBu
MAX OUTPUT (MOL):	+22dBu (RMS)*	+12dBu (RMS)*
CROSSTALK:	>70dB up to 20KHz	Same
DYNAMIC RANGE:	104dB	102dB

CONTROLS	ADJ. RANGE
INPUT GAIN	±15dB
LF EQ	±5dB
LF CROSSOVER	100Hz/210Hz
HF EQ	±5dB
HF CROSSOVER	1.7KHz/3.4KHz
RELEASE TIME	150mSec to 7Sec
DENSITY	-5 to +5 RCH
OUTPUT CEILING	-9 to +25dB (PK)**

I/O	
INPUT CIRCUITS	Servo Balanced Transformerless
OUTPUT CIRCUITS	Servo Balanced Transformerless
INPUT CONNECTORS	3-Pin XLR Female
OUTPUT CONNECTORS	3-Pin XLR Male
INPUT IMPEDANCE	19.5K OHMS Unterminated; 600 OHMS by Rear Panel Selectable Terminator (Terminator Lifts in Bypass)
OUTPUT IMPEDANCE	65 OHMS
INPUT CMRR	Better Than 60dB 20Hz to 10KHz
INPUT RF REJECTION	Better Than 40dB at 800KHz, Better Than 60dB Above 2MHz

MISCELLANEOUS	
POWER	100/120/220/240VAC 50/60Hz 30 Watts
POWER FUSE	100/120VAC = .375A (SLO) 220/240VAC = .25A (SLO)
WEIGHT	5.6 Pounds
SIZE	19" X 1.75" X 9.5"

*MOL is limited by the peak ceiling setting. The output stage is capable of +25dBu into 600 OHMS.

**dB (PK) = peak value of sinewave.

DOMINATOR II PARTS

68-172 MAIN AUDIO PCB

CAPACITORS

PART#	VALUE	DESCRIPTION	STOCK#
C101	470PF	CERAMIC	80-015
C102	470PF	CERAMIC	80-015
C103	470PF	CERAMIC	80-015
C104	470PF	CERAMIC	80-015
C105	22UF/NP	ELECTROLYTIC	89-001
C106	.01UF	FOIL 5%	84-012
C107	22UF/NP	ELECTROLYTIC	89-001
C108	.01UF	FOIL 5%	84-012
C109	100PF	MICA	85-008
C110	.0047UF	GREEN 1%	81-012
C111	.047UF	GREEN 1%	81-014
C112	100UF/35V	ELECTROLYTIC	82-014
C113	10PF	MICA	85-001
C114	.33UF	FOIL 5%	84-022
C115	10PF	MICA	85-001
C116	10PF	MICA	85-001
C117	20PF	MICA	85-003
C118	20PF	MICA	85-003
C119	10PF	MICA	85-001
C120	100UF/35V	ELECTROLYTIC	82-014
C121	.33UF	FOIL 5%	84-022
C122	20PF	MICA	85-003
C123	20PF	MICA	85-003
C124	100UF/35V	ELECTROLYTIC	82-014
C125	.33UF	FOIL 5%	84-022
C126	20PF	MICA	85-003
C127	20PF	MICA	85-003
C128	.1UF	MONO	88-001
C129	.1UF	MONO	88-001
C130	100UF/35V	ELECTROLYTIC	82-014
C131	100UF/35V	ELECTROLYTIC	82-014
C201	470PF	CERAMIC	80-015
C202	470PF	CERAMIC	80-015
C203	470PF	CERAMIC	80-015
C204	470PF	CERAMIC	80-015
C205	22UF/NP	ELECTROLYTIC	89-001
C206	.01UF	FOIL 5%	84-012
C207	22UF/NP	ELECTROLYTIC	89-001
C208	.01UF	FOIL 5%	84-012
C209	100PF	MICA	85-008
C210	.0047UF	GREEN 1%	81-012
C211	.047UF	GREEN 1%	81-014
C212	100UF/35V	ELECTROLYTIC	82-014
C213	10PF	MICA	85-001
C214	.33UF	FOIL 5%	84-022
C215	10PF	MICA	85-001

PART#	VALUE	DESCRIPTION	STOCK#
C216	10PF	MICA	85-001
C217	20PF	MICA	85-003
C218	20PF	MICA	85-003
C219	10PF	MICA	85-001
C220	100UF/35V	ELECTROLYTIC	82-014
C221	.33UF	FOIL 5%	84-022
C222	20PF	MICA	85-003
C223	20PF	MICA	85-003
C224	100UF/35V	ELECTROLYTIC	82-014
C225	.33UF	FOIL 5%	84-022
C226	20PF	MICA	85-003
C227	20PF	MICA	85-003
C228	.1UF	MONO	88-001
C229	.1UF	MONO	88-001
C230	100UF/35V	ELECTROLYTIC	82-014
C231	100UF/35V	ELECTROLYTIC	82-014
C301L	10PF	MICA	85-001
C301M	10PF	MICA	85-001
C301H	10PF	MICA	85-001
C302L	20PF	MICA	85-003
C302M	20PF	MICA	85-003
C302H	20PF	MICA	85-003
C303L	20PF	MICA	85-003
C303M	20PF	MICA	85-003
C303H	20PF	MICA	85-003
C304L	1UF	TANTALUM	83-001
C304M	1UF	TANTALUM	83-001
C304H	1UF	TANTALUM	83-001
C305L	.1UF	MONO	88-001
C305M	.1UF	MONO	88-001
C305H	.1UF	MONO	88-001
C306L	.1UF	MONO	88-001
C306M	.1UF	MONO	88-001
C306H	.1UF	MONO	88-001
C401L	10PF	MICA	85-001
C401M	10PF	MICA	85-001
C401H	10PF	MICA	85-001
C402L	20PF	MICA	85-003
C403M	20PF	MICA	85-003
C403H	20PF	MICA	85-003
C403L	20PF	MICA	85-003
C403M	20PF	MICA	85-003
C403H	20PF	MICA	85-003
C404L	1UF	TANTALUM	83-001
C404M	1UF	TANTALUM	83-001
C404H	1UF	TANTALUM	83-001
C405L	.1UF	MONO	88-001
C405M	.1UF	MONO	88-001
C405H	.1UF	MONO	88-001
C406L	.1UF	MONO	88-001
C406M	.1UF	MONO	88-001
C406H	.1UF	MONO	88-001
C501	100UF/35V	ELECTROLYTIC	82-014

INDUCTORS

PART#	VALUE	DESCRIPTION	STOCK#
L101	220UH	MOLDED	72-016
L102	1000UH	MOLDED	72-013
L103	220UH	MOLDED	72-016
L104	1000UH	MOLDED	72-013
L105	47UH	MOLDED	72-018
L106	47UH	MOLDED	72-018
L201	220UH	MOLDED	72-016
L202	1000UH	MOLDED	72-013
L203	220UH	MOLDED	72-016
L204	1000UH	MOLDED	72-013
L205	47UH	MOLDED	72-018
L206	47UH	MOLDED	72-018

RESISTORS

R101	1K00	1/4W 1% MTL FILM	92-1001
R102	1K00	1/4W 1% MTL FILM	92-1001
R103	407R	1/4W 1% MTL FILM	92-4070
R104	100R	1/4W 1% MTL FILM	92-1000
R105	4K99	1/4W 1% MTL FILM	92-4991
R106	1M00	1/4W 1% MTL FILM	92-1004
R107	604R	1/2W 1% MTL FILM	93-260
R108	10K0	1/4W 1% MTL FILM	92-1002
R109	10K0	1/4W 1% MTL FILM	92-1002
R110	10K0	1/4W 1% MTL FILM	92-1002
R111	10K0	1/4W 1% MTL FILM	92-1002
R112	4K99	1/4W 1% MTL FILM	92-4991
R113	20K0	1/4W 1% MTL FILM	92-2002
R114	23K7	1/4W 1% MTL FILM	92-2372
R115	33K2	1/4W 1% MTL FILM	92-3322
R116	33K2	1/4W 1% MTL FILM	92-3322
R117	3K74	1/4W 1% MTL FILM	92-3741
R118	13K0	1/4W 1% MTL FILM	92-1302
R119	24K3	1/4W 1% MTL FILM	92-2432
R120	3K74	1/4W 1% MTL FILM	92-3741
R121	13K0	1/4W 1% MTL FILM	92-1302
R122	24K3	1/4W 1% MTL FILM	92-2432
R123	10K0	1/4W 1% MTL FILM	92-1002
R124	10K0	1/4W 1% MTL FILM	92-1002
R125	10K0	1/4W 1% MTL FILM	92-1002
R126	10K0	1/4W 1% MTL FILM	92-1002
R127	10K0	1/4W 1% MTL FILM	92-1002
R128	10K0	1/4W 1% MTL FILM	92-1002
R129	10K0	1/4W 1% MTL FILM	92-1002
R130	4K99	1/4W 1% MTL FILM	92-4991
R131	10K0	1/4W 1% MTL FILM	92-1002
R132	4K99	1/4W 1% MTL FILM	92-4991
R133	10K0	1/4W 1% MTL FILM	92-1002
R134	6K34	1/4W 1% MTL FILM	92-6341
R135	15K0	1/4W 1% MTL FILM	92-1502

PART#	VALUE	DESCRIPTION	STOCK#
R136	30K1	1/4W 1% MTL FILM	92-3012
R137	10K0	1/4W 1% MTL FILM	92-1002
R138	10K0	1/4W 1% MTL FILM	92-1002
R139	10K0	1/4W 1% MTL FILM	92-1002
R140	10K0	1/4W 1% MTL FILM	92-1002
R141	10K0	1/4W 1% MTL FILM	92-1002
R142	56R2	1/4W 1% MTL FILM	92-562G
R143	10M	1/4W 5% CAR FILM	90-710
R144	332K	1/4W 1% MTL FILM	92-3323
R145	10K0	1/4W 1% MTL FILM	92-1002
R146	10K0	1/4W 1% MTL FILM	92-1002
R147	150R	1/4W 1% MTL FILM	92-1500
R148	20K0	1/4W 1% MTL FILM	92-2002
R149	10K0	1/4W 1% MTL FILM	92-1002
R150	10K0	1/4W 1% MTL FILM	92-1002
R151	56R2	1/4W 1% MTL FILM	92-562G
R152	10M	1/4W 5% CAR FILM	90-710
R153	332K	1/4W 1% MTL FILM	92-3323
R154	10K0	1/4W 1% MTL FILM	92-1002
R155	10K0	1/4W 1% MTL FILM	92-1002
R156	150R	1/4W 1% MTL FILM	92-1500
R157	20K0	1/4W 1% MTL FILM	92-2002
R158	499K	1/4W 1% MTL FILM	92-4993
R201	1K00	1/4W 1% MTL FILM	92-1001
R202	1K00	1/4W 1% MTL FILM	92-1001
R203	407R	1/4W 1% MTL FILM	92-4070
R204	100R	1/4W 1% MTL FILM	92-1000
R205	4K99	1/4W 1% MTL FILM	92-4991
R206	1M00	1/4W 1% MTL FILM	92-1004
R207	604R	1/2W 1% MTL FILM	93-260
R208	10K0	1/4W 1% MTL FILM	92-1002
R209	10K0	1/4W 1% MTL FILM	92-1002
R210	10K0	1/4W 1% MTL FILM	92-1002
R211	10K0	1/4W 1% MTL FILM	92-1002
R212	4K99	1/4W 1% MTL FILM	92-4991
R213	20K0	1/4W 1% MTL FILM	92-2002
R214	23K7	1/4W 1% MTL FILM	92-2372
R215	33K2	1/4W 1% MTL FILM	92-3322
R216	33K2	1/4W 1% MTL FILM	92-3322
R217	3K74	1/4W 1% MTL FILM	92-3741
R218	13K0	1/4W 1% MTL FILM	92-1302
R219	24K3	1/4W 1% MTL FILM	92-2432
R220	3K74	1/4W 1% MTL FILM	92-3741
R221	13K0	1/4W 1% MTL FILM	92-1302
R222	24K3	1/4W 1% MTL FILM	92-2432
R223	10K0	1/4W 1% MTL FILM	92-1002
R224	10K0	1/4W 1% MTL FILM	92-1002
R225	10K0	1/4W 1% MTL FILM	92-1002
R226	10K0	1/4W 1% MTL FILM	92-1002
R227	10K0	1/4W 1% MTL FILM	92-1002
R228	10K0	1/4W 1% MTL FILM	92-1002
R229	10K0	1/4W 1% MTL FILM	92-1002
R230	4K99	1/4W 1% MTL FILM	92-4991

PART#	VALUE	DESCRIPTION	STOCK#
R231	10K0	1/4W 1% MTL FILM	92-1002
R232	4K99	1/4W 1% MTL FILM	92-4991
R233	10K0	1/4W 1% MTL FILM	92-1002
R234	6K34	1/4W 1% MTL FILM	92-6341
R235	15K0	1/4W 1% MTL FILM	92-1502
R236	30K1	1/4W 1% MTL FILM	92-3012
R237	10K0	1/4W 1% MTL FILM	92-1002
R238	10K0	1/4W 1% MTL FILM	92-1002
R239	10K0	1/4W 1% MTL FILM	92-1002
R240	10K0	1/4W 1% MTL FILM	92-1002
R241	10K0	1/4W 1% MTL FILM	92-1002
R242	56R2	1/4W 1% MTL FILM	92-562G
R243	10M	1/4W 5% CAR FILM	90-710
R244	332K	1/4W 1% MTL FILM	92-3323
R245	10K0	1/4W 1% MTL FILM	92-1002
R246	10K0	1/4W 1% MTL FILM	92-1002
R247	150R	1/4W 1% MTL FILM	92-1500
R248	20K0	1/4W 1% MTL FILM	92-2002
R249	10K0	1/4W 1% MTL FILM	92-1002
R250	10K0	1/4W 1% MTL FILM	92-1002
R251	56R2	1/4W 1% MTL FILM	92-562G
R252	10M	1/4W 5% CAR FILM	90-710
R253	332K	1/4W 1% MTL FILM	92-3323
R254	10K0	1/4W 1% MTL FILM	92-1002
R255	10K0	1/4W 1% MTL FILM	92-1002
R256	150R	1/4W 1% MTL FILM	92-1500
R257	20K0	1/4W 1% MTL FILM	92-2002
R258	499K	1/4W 1% MTL FILM	92-4993
R301L	10K0	1/4W 1% MTL FILM	92-1002
R301M	10K0	1/4W 1% MTL FILM	92-1002
R301L	10K0	1/4W 1% MTL FILM	92-1002
R302H	10K0	1/4W 1% MTL FILM	92-1002
R302M	10K0	1/4W 1% MTL FILM	92-1002
R302L	10K0	1/4W 1% MTL FILM	92-1002
R303H	4K99	1/4W 1% MTL FILM	92-4991
R303M	4K99	1/4W 1% MTL FILM	92-4991
R303L	4K99	1/4W 1% MTL FILM	92-4991
R304H	4K99	1/4W 1% MTL FILM	92-4991
R304M	4K99	1/4W 1% MTL FILM	92-4991
R304L	4K99	1/4W 1% MTL FILM	92-4991
R305H	5K90	1/4W 1% MTL FILM	92-5901
R305M	5K90	1/4W 1% MTL FILM	92-5901
R305L	5K90	1/4W 1% MTL FILM	92-5901
R306H	5K90	1/4W 1% MTL FILM	92-5901
R306M	5K90	1/4W 1% MTL FILM	92-5901
R306L	5K90	1/4W 1% MTL FILM	92-5901
R307H	1M00	1/4W 1% MTL FILM	92-1004
R307M	1M00	1/4W 1% MTL FILM	92-1004
R307L	1M00	1/4W 1% MTL FILM	92-1004
R308H	1K00	1/4W 1% MTL FILM	92-1001
R308M	1K00	1/4W 1% MTL FILM	92-1001
R308L	1K00	1/4W 1% MTL FILM	92-1001
R309H	21R5	1/4W 1% MTL FILM	92-215G

PART#	VALUE	DESCRIPTION	STOCK#
R309M	21R5	1/4W 1% MTL FILM	92-215G
R309L	21R5	1/4W 1% MTL FILM	92-215G
R310H	40R2	1/4W 1% MTL FILM	92-402G
R310M	40R2	1/4W 1% MTL FILM	92-402G
R310L	40R2	1/4W 1% MTL FILM	92-402G
R311H	40R2	1/4W 1% MTL FILM	92-402G
R311M	40R2	1/4W 1% MTL FILM	92-402G
R311L	40R2	1/4W 1% MTL FILM	92-402G
R312H	200K	1/4W 1% MTL FILM	92-2003
R312M	200K	1/4W 1% MTL FILM	92-2003
R312L	200K	1/4W 1% MTL FILM	92-2003
R313H	10K0	1/4W 1% MTL FILM	92-1002
R313M	10K0	1/4W 1% MTL FILM	92-1002
R313L	10K0	1/4W 1% MTL FILM	92-1002
R314H	10K0	1/4W 1% MTL FILM	92-1002
R314M	10K0	1/4W 1% MTL FILM	92-1002
R314L	10K0	1/4W 1% MTL FILM	92-1002
R315H	10K0	1/4W 1% MTL FILM	92-1002
R315M	10K0	1/4W 1% MTL FILM	92-1002
R315L	10K0	1/4W 1% MTL FILM	92-1002
R316H	10K0	1/4W 1% MTL FILM	92-1002
R316M	10K0	1/4W 1% MTL FILM	92-1002
R316L	10K0	1/4W 1% MTL FILM	92-1002
R317H	10K0	1/4W 1% MTL FILM	92-1002
R317M	10K0	1/4W 1% MTL FILM	92-1002
R317L	10K0	1/4W 1% MTL FILM	92-1002
R318H	10K0	1/4W 1% MTL FILM	92-1002
R318M	10K0	1/4W 1% MTL FILM	92-1002
R318L	10K0	1/4W 1% MTL FILM	92-1002
R319H	1M50	1/4W 1% MTL FILM	92-1504
R319M	1M50	1/4W 1% MTL FILM	92-1504
R319L	1M50	1/4W 1% MTL FILM	92-1504
R320H	6K65	1/4W 1% MTL FILM	92-6651
R320M	6K65	1/4W 1% MTL FILM	92-6651
R320L	6K65	1/4W 1% MTL FILM	92-6651
R401H	10K0	1/4W 1% MTL FILM	92-1002
R401M	10K0	1/4W 1% MTL FILM	92-1002
R401L	10K0	1/4W 1% MTL FILM	92-1002
R402H	10K0	1/4W 1% MTL FILM	92-1002
R402M	10K0	1/4W 1% MTL FILM	92-1002
R402L	10K0	1/4W 1% MTL FILM	92-1002
R403H	4K99	1/4W 1% MTL FILM	92-4991
R403M	4K99	1/4W 1% MTL FILM	92-4991
R403L	4K99	1/4W 1% MTL FILM	92-4991
R404H	4K99	1/4W 1% MTL FILM	92-4991
R404M	4K99	1/4W 1% MTL FILM	92-4991
R404L	4K99	1/4W 1% MTL FILM	92-4991
R405H	5K90	1/4W 1% MTL FILM	92-5901
R405M	5K90	1/4W 1% MTL FILM	92-5901
R405L	5K90	1/4W 1% MTL FILM	92-5901
R406H	5K90	1/4W 1% MTL FILM	92-5901
R406M	5K90	1/4W 1% MTL FILM	92-5901
R406L	5K90	1/4W 1% MTL FILM	92-5901

PART#	VALUE	DESCRIPTION	STOCK#
R407H	1M00	1/4W 1% MTL FILM	92-1004
R407M	1M00	1/4W 1% MTL FILM	92-1004
R407L	1M00	1/4W 1% MTL FILM	92-1004
R408H	1K00	1/4W 1% MTL FILM	92-1001
R408M	1K00	1/4W 1% MTL FILM	92-1001
R408L	1K00	1/4W 1% MTL FILM	92-1001
R409H	21R5	1/4W 1% MTL FILM	92-215G
R409M	21R5	1/4W 1% MTL FILM	92-215G
R409L	21R5	1/4W 1% MTL FILM	92-215G
R410H	40R2	1/4W 1% MTL FILM	92-402G
R410M	40R2	1/4W 1% MTL FILM	92-402G
R410L	40R2	1/4W 1% MTL FILM	92-402G
R411H	40R2	1/4W 1% MTL FILM	92-402G
R411M	40R2	1/4W 1% MTL FILM	92-402G
R411L	40R2	1/4W 1% MTL FILM	92-402G
R412H	200K	1/4W 1% MTL FILM	92-2003
R412M	200K	1/4W 1% MTL FILM	92-2003
R412L	200K	1/4W 1% MTL FILM	92-2003
R413H	10K0	1/4W 1% MTL FILM	92-1002
R413M	10K0	1/4W 1% MTL FILM	92-1002
R413L	10K0	1/4W 1% MTL FILM	92-1002
R414H	10K0	1/4W 1% MTL FILM	92-1002
R414M	10K0	1/4W 1% MTL FILM	92-1002
R414L	10K0	1/4W 1% MTL FILM	92-1002
R415H	10K0	1/4W 1% MTL FILM	92-1002
R415M	10K0	1/4W 1% MTL FILM	92-1002
R415L	10K0	1/4W 1% MTL FILM	92-1002
R416H	10K0	1/4W 1% MTL FILM	92-1002
R416M	10K0	1/4W 1% MTL FILM	92-1002
R416L	10K0	1/4W 1% MTL FILM	92-1002
R417H	10K0	1/4W 1% MTL FILM	92-1002
R417M	10K0	1/4W 1% MTL FILM	92-1002
R417L	10K0	1/4W 1% MTL FILM	92-1002
R418H	10K0	1/4W 1% MTL FILM	92-1002
R418M	10K0	1/4W 1% MTL FILM	92-1002
R418L	10K0	1/4W 1% MTL FILM	92-1002
R419H	1M50	1/4W 1% MTL FILM	92-1504
R419M	1M50	1/4W 1% MTL FILM	92-1504
R419L	1M50	1/4W 1% MTL FILM	92-1504
R420H	6K65	1/4W 1% MTL FILM	92-6651
R420M	6K65	1/4W 1% MTL FILM	92-6651
R420L	6K65	1/4W 1% MTL FILM	92-6651
R501	56R2	1/4W 1% MTL FILM	92-562G
R502	10K0	1/4W 1% MTL FILM	92-1002
R503	1K00	1/4W 1% MTL FILM	92-1001
R504	1K00	1/4W 1% MTL FILM	92-1001
R505	100R	1/4W 1% MTL FILM	92-1000
R506	10K0	1/4W 1% MTL FILM	92-1002
R507	10K0	1/4W 1% MTL FILM	92-1002
R508	1K18	1/4W 1% MTL FILM	92-1181
R509	21R5	1/4W 1% MTL FILM	92-215G
R510	21R5	1/4W 1% MTL FILM	92-215G
R511	1M00	1/4W 1% MTL FILM	92-1004

PART#	VALUE	DESCRIPTION	STOCK#
R512	1M00	1/4W 1% MTL FILM	92-1004
R513	1M00	1/4W 1% MTL FILM	92-1004
R514	100K	1/4W 1% MTL FILM	92-1003
RN101	10KI8	4 RESISTOR NET	97-004-I8
RN201	10KI8	4 RESISTOR NET	97-004-I8
---------- VARIABLE RESISTORS ----------			
VR101	5K/10T	10 TURN TRIM	22-020
VR102	50K/1T	PT6KV(5)	22-033
VR103	50K/1T	PT6KV(5)	22-033
VR104	50K/1T	PT6KV(5)	22-033
VR105	10K/1T	PT6KV(5)	22-032
VR201	5K/10T	10 TURN TRIM	22-020
VR202	50K/1T	PT6KV(5)	22-033
VR203	50K/1T	PT6KV(5)	22-033
VR204	50K/1T	PT6KV(5)	22-033
VR205	10K/1T	PT6KV(5)	22-032
VR301L	1K/1T	PT6KV(5)	22-030
VR301M	1K/1T	PT6KV(5)	22-030
VR301L	1K/1T	PT6KV(5)	22-030
VR302H	100R/1T	EVN36CA00B12	22-034
VR302M	100R/1T	EVN36CA00B12	22-034
VR302L	100R/1T	EVN36CA00B12	22-034
VR303H	10K/1T	PT6KV(5)	22-032
VR303M	10K/1T	PT6KV(5)	22-032
VR303L	10K/1T	PT6KV(5)	22-032
VR401H	1K/1T	PT6KV(5)	22-030
VR401M	1K/1T	PT6KV(5)	22-030
VR401L	1K/1T	PT6KV(5)	22-030
VR402H	100R/1T	EVN36CA00B12	22-034
VR402M	100R/1T	EVN36CA00B12	22-034
VR402L	100R/1T	EVN36CA00B12	22-034
VR403H	10K/1T	PT6KV(5)	22-032
VR403M	10K/1T	PT6KV(5)	22-032
VR403L	10K/1T	PT6KV(5)	22-032
VR501	15A10KX2	DUAL 10K AUD	23-061
VR502	B10KX2	DUAL 10K LIN	23-062
VR503	B10KX2	DUAL 10K LIN	23-062
VR504	15A100KX2	DUAL 100K AUD	23-064
VR505	15A10K	10K AUD	23-063
VR506	B10KX2	DUAL 10K LIN	23-062
---------- SEMICONDUCTORS ----------			
D101	1N914B	SS DIODE	30-002
D102	1N914B	SS DIODE	30-002
D103	1N914B	SS DIODE	30-002
D104	1N914B	SS DIODE	30-002
D201	1N914B	SS DIODE	30-002
D202	1N914B	SS DIODE	30-002
D203	1N914B	SS DIODE	30-002
D204	1N914B	SS DIODE	30-002

PART#	VALUE	DESCRIPTION	STOCK#
D301L	1N914B	SS DIODE	30-002
D301M	1N914B	SS DIODE	30-002
D301H	1N914B	SS DIODE	30-002
D302L	1N914B	SS DIODE	30-002
D302M	1N914B	SS DIODE	30-002
D302H	1N914B	SS DIODE	30-002
D303L	1N914B	SS DIODE	30-002
D303M	1N914B	SS DIODE	30-002
D303H	1N914B	SS DIODE	30-002
D401L	1N914B	SS DIODE	30-002
D401M	1N914B	SS DIODE	30-002
D401H	1N914B	SS DIODE	30-002
D402L	1N914B	SS DIODE	30-002
D402M	1N914B	SS DIODE	30-002
D402H	1N914B	SS DIODE	30-002
D403L	1N914B	SS DIODE	30-002
D403M	1N914B	SS DIODE	30-002
D403H	1N914B	SS DIODE	30-002
D501	1N4003	POWER DIODE	30-009
D502	1N914B	SS DIODE	30-002
D503	1N914B	SS DIODE	30-002
LD501	LTL-1234A	RED LED	27-034
LD502	LTL-1204A	GREEN LED	27-035
LD503	LTL-1234A	RED LED	27-034
LD504	LTL-1204A	GREEN LED	27-035
LD505	LTL-1234A	RED LED	27-034
LD506	LTL-1204A	GREEN LED	27-035
LD507	LTL-1234A	RED LED	27-034
LD508	LTL-1204A	GREEN LED	27-035
LD509	LTL-1234A	RED LED	27-034
LD510	LTL-1204A	GREEN LED	27-035
Q301L	J113	N CH FET	31-010
Q301M	J113	N CH FET	31-010
Q301H	J113	N CH FET	31-010
Q302L	2N3906	PNP	31-011
Q302M	2N3906	PNP	31-011
Q302H	2N3906	PNP	31-011
Q401L	J113	N CH FET	31-010
Q401M	J113	N CH FET	31-010
Q401H	J113	N CH FET	31-010
Q402L	2N3906	PNP	31-011
Q402M	2N3906	PNP	31-011
Q402H	2N3906	PNP	31-011
Q501	2N3904	NPN	31-015
Q502	2N3906	PNP	31-011
Q503	2N3906	PNP	31-011
Q504	2N3904	NPN	31-015
Q505	2N3904	NPN	31-015
U101	NE5532	DUAL LN OPAMP	32-028
U102	CD4016	CMOS SWITCH	38-003
U103	NE5532	DUAL LN OPAMP	32-028
U104	LF353	DUAL OPAMP	32-007
U201	NE5532	DUAL LN OPAMP	32-028

PART#	VALUE	DESCRIPTION	STOCK#
U202	CD4016	CMOS SWITCH	38-003
U203	NE5532	DUAL LN OPAMP	32-028
U204	LF353	DUAL OPAMP	32-007
U301L	LF353	DUAL OPAMP	32-007
U301M	LF353	DUAL OPAMP	32-007
U301L	LF353	DUAL OPAMP	32-007
U302H	LF353	DUAL OPAMP	32-007
U302M	LF353	DUAL OPAMP	32-007
U302L	LF353	DUAL OPAMP	32-007
U303H	VCA1001	APHEX VCA	33-052
U303M	VCA1001	APHEX VCA	33-052
U303L	VCA1001	APHEX VCA	33-052
U304H	NE5532	DUAL LN OPAMP	32-028
U304M	NE5532	DUAL LN OPAMP	32-028
U304L	NE5532	DUAL LN OPAMP	32-028
U401H	LF353	DUAL OPAMP	32-007
U401M	LF353	DUAL OPAMP	32-007
U401L	LF353	DUAL OPAMP	32-007
U402H	LF353	DUAL OPAMP	32-007
U402M	LF353	DUAL OPAMP	32-007
U402L	LF353	DUAL OPAMP	32-007
U403H	VCA1001	APHEX VCA	33-052
U403M	VCA1001	APHEX VCA	33-052
U403L	VCA1001	APHEX VCA	33-052
U404H	NE5532	DUAL LN OPAMP	32-028
U404M	NE5532	DUAL LN OPAMP	32-028
U404L	NE5532	DUAL LN OPAMP	32-028
U501	NE5532	DUAL LN OPAMP	32-028
U502	NE5532	DUAL LN OPAMP	32-028
U503	NE5532	DUAL LN OPAMP	32-028
U504	NE5532	DUAL LN OPAMP	32-028
U505	NE5532	DUAL LN OPAMP	32-028
U506	NE5532	DUAL LN OPAMP	32-028
U507	LF353	DUAL OPAMP	32-007
U508	LF353	DUAL OPAMP	32-007
U509	NE5532	DUAL LN OPAMP	32-028
U510	NE5532	DUAL LN OPAMP	32-028
U511	NE5532	DUAL LN OPAMP	32-028
---------- SWITCHES AND RELAYS ----------			
K101	DS4E-M-DC12V	RELAY	73-012
K201	DS4E-M-DC12V	RELAY	73-012
SW101	2PDT	MTK 2UEE NON-SHORT	20-031
SW201	2PDT	MTK 2UEE NON-SHORT	20-031
SW501	2PDT	MTK 2UEE NON-SHORT	20-031
SW502	4PDT	MTK 4UEE NON-SHORT	20-030
SW503	4PDT	MTK 4UEE NON-SHORT	20-030
SW504	4PDT	MTK 4UEE NON-SHORT	20-030
SW505	2PDT	MTK 2UEE NON-SHORT	20-031

CONNECTORS

PART#	VALUE	DESCRIPTION	STOCK#
TP101	TP-101-20	TEST POINT	67-046
TP102	TP-101-20	TEST POINT	67-046
TP201	TP-101-20	TEST POINT	67-046
TP301L	TP-101-20	TEST POINT	67-046
TP301M	TP-101-20	TEST POINT	67-046
TP301L	TP-101-20	TEST POINT	67-046
TP302H	TP-101-20	TEST POINT	67-046
TP302M	TP-101-20	TEST POINT	67-046
TP302L	TP-101-20	TEST POINT	67-046
TP401H	TP-101-20	TEST POINT	67-046
TP401M	TP-101-20	TEST POINT	67-046
TP401L	TP-101-20	TEST POINT	67-046
TP402H	TP-101-20	TEST POINT	67-046
TP402M	TP-101-20	TEST POINT	67-046
TP402L	TP-101-20	TEST POINT	67-046
H501	M100	8 PIN SIP HEADER	43-063
H502	M100	8 PIN SIP HEADER	43-063
H503	M100	10 PIN SIP HEADER	43-063
H504	M100	3 PIN SIP HEADER	43-063
H505	22-23-2031	3 PIN MOLEX	43-093
J101	RAPC3FG	XLR-3F	43-074
J102	RAPC3MHG	XLR-3M	43-073
J201	RAPC3FG	XLR-3F	43-074
J202	RAPC3MHG	XLR-3M	43-073
J501	520250-2	RJ11 4 PIN JACK	42-020

MISCELLANEOUS

QTY	DESCRIPTION	STOCK#
35	8 PIN DIP IC SOCKET	43-003
2	14 PIN DIP IC SOCKET	43-004
6	18 PIN DIP IC SOCKET	43-008
10	BIVAR SPACER	62-050
1	PRINTED CIRCUIT BOARD	68-172A
1	TT-02 SHUNT	67-065

DOMINATOR II PARTS

68-176 DISPLAY/SWITCH PCB

CAPACITORS

PART#	VALUE	DESCRIPTION	STOCK#
C1	22UF/25V	ELECTROLYTIC	82-003
C2	22UF/25V	ELECTROLYTIC	82-003

RESISTORS

R1	150R	1/4W 1% MTL FILM	92-1500
R2	1K00	1/4W 1% MTL FILM	92-1001
R3	1K00	1/4W 1% MTL FILM	92-1001

VARIABLE RESISTORS

VR1	10K/1T	PT10H	22-014

SEMICONDUCTORS

U1	LM3914	LED BAR DRIVER	33-023
LED1	MV54164	GI LED BAR	27-038

SWITCHES

SW1	A112-03-RNCQE	C&K 12 POS ROTARY	21-011

CONNECTORS

H1		16 CONDUCTOR	54-059

MISCELLANEOUS

QTY	DESCRIPTION	STOCK#
1	18 PIN DIP IC SOCKET	43-008
1	PRINTED CIRCUIT BOARD	68-176B

DOMINATOR II PARTS

68-177 AUX CONTROL PCB

CAPACITORS

PART#	VALUE	DESCRIPTION	STOCK#
C1	.01UF	FOIL	84-012
C2	.01UF	FOIL	84-012
C3	.1UF	FOIL	84-043
C4	.1UF	FOIL	84-043
C5	.33UF	FOIL	84-022
C6	.001UF	FOIL	84-001
C7	22UF/25V	ELECTROLYTIC	82-003
C8	.1UF	FOIL	84-043
C9	.0047UF	FOIL	84-007
C10	.0047UF	FOIL	84-007
C11	.1UF	FOIL	84-043
C12	.1UF	MONO	88-001
C13	.1UF	MONO	88-001
C14	.1UF	MONO	88-001
C15	.1UF	MONO	88-001

RESISTORS

R1	249K	1/4W 1% MTL FILM	92-2493
R2	ZERO		
R3	205K	1/4W 1% MTL FILM	92-2053
R4	ZERO		
R5	165K	1/4W 1% MTL FILM	92-1653
R6	2K94	1/4W 1% MTL FILM	92-2941
R7	133K	1/4W 1% MTL FILM	92-1333
R8	3K32	1/4W 1% MTL FILM	92-3321
R9	110K	1/4W 1% MTL FILM	92-1103
R10	1K02	1/4W 1% MTL FILM	92-1021
R11	88K7	1/4W 1% MTL FILM	92-8872
R12	750R	1/4W 1% MTL FILM	92-7500
R13	71K5	1/4W 1% MTL FILM	92-7152
R14	133R	1/4W 1% MTL FILM	92-1330
R15	57K6	1/4W 1% MTL FILM	92-5762
R16	249R	1/4W 1% MTL FILM	92-2490
R17	45K3	1/4W 1% MTL FILM	92-4532
R18	976R	1/4W 1% MTL FILM	92-9760
R19	36K5	1/4W 1% MTL FILM	92-3652
R20	442R	1/4W 1% MTL FILM	92-4420
R21	29K4	1/4W 1% MTL FILM	92-2942
R22	51R1	1/4W 1% MTL FILM	92-511G
R23	23K2	1/4W 1% MTL FILM	92-2322
R24	402R	1/4W 1% MTL FILM	92-4020
R25	11K0	1/4W 1% MTL FILM	92-1102
R26	49K9	1/4W 1% MTL FILM	92-4992
R27	11K0	1/4W 1% MTL FILM	92-1102
R28	11K0	1/4W 1% MTL FILM	92-1102
R29	10K0	1/4W 1% MTL FILM	92-1002

PART#	VALUE	DESCRIPTION	STOCK#
R30	49K9	1/4W 1% MTL FILM	92-4992
R31	732K	1/4W 1% MTL FILM	92-7323
R32	4K99	1/4W 1% MTL FILM	92-4991
R33	100K	1/4W 1% MTL FILM	92-1003
R34	100K	1/4W 1% MTL FILM	92-1003
R35	100K	1/4W 1% MTL FILM	92-1003
R36	392K	1/4W 1% MTL FILM	92-3923
R37	4K99	1/4W 1% MTL FILM	92-4991
R38	10K0	1/4W 1% MTL FILM	92-1002
R39	4K99	1/4W 1% MTL FILM	92-4991
R40	10M	1/4W 5% CAR FILM	90-710
R41	4K99	1/4W 1% MTL FILM	92-4991
R42	100K	1/4W 1% MTL FILM	92-1003
R43	100K	1/4W 1% MTL FILM	92-1003
R44	100K	1/4W 1% MTL FILM	92-1003
R45	10M	1/4W 5% CAR FILM	90-710
R46	10M	1/4W 5% CAR FILM	90-710
R47	44K2	1/4W 1% MTL FILM	92-4422
R48	21R5	1/4W 1% MTL FILM	92-215G
R49	10K0	1/4W 1% MTL FILM	92-1002
R50	4K99	1/4W 1% MTL FILM	92-4991
R51	10K0	1/4W 1% MTL FILM	92-1002
R52	10K0	1/4W 1% CAR FILM	92-1002
R53	4K99	1/4W 1% MTL FILM	92-4991
R54	10K0	1/4W 1% MTL FILM	92-1002
R55	20K0	1/4W 1% MTL FILM	92-2002
R56	10K0	1/4W 1% MTL FILM	92-1002
R57	10K0	1/4W 1% MTL FILM	92-1002
R58	4K99	1/4W 1% MTL FILM	92-4991
R59	10K0	1/4W 1% MTL FILM	92-1002
R60	20K0	1/4W 1% MTL FILM	92-2002
R61	20K0	1/4W 1% MTL FILM	92-2002
R62	20K0	1/4W 1% MTL FILM	92-2002
R63	10K0	1/4W 1% MTL FILM	92-1002
R64	10K0	1/4W 1% MTL FILM	92-1002
R65	100K	1/4W 1% MTL FILM	92-1003
R66	3K57	1/4W 1% MTL FILM	92-3571
R67	30K1	1/4W 1% MTL FILM	92-3012
R68	1K00	1/4W 1% MTL FILM	92-1001
R69	499R	1/4W 1% MTL FILM	92-4990
R70	2M2	1/4W 5% CAR FILM	90-622
R71	100K	1/4W 1% MTL FILM	92-1003
R72	30K1	1/4W 1% MTL FILM	92-3012
R73	10M	1/4W 5% CAR FILM	90-710
R74	1K00	1/4W 1% MTL FILM	92-1001
---------- VARIABLE RESISTORS ----------			
VR1	10K/1T	PT10V	22-003

SEMICONDUCTORS

PART#	VALUE	DESCRIPTION	STOCK#
D1	1N914B	SS DIODE	30-002
D2	1N914B	SS DIODE	30-002
D3	1N914B	SS DIODE	30-002
D4	1N914B	SS DIODE	30-002
D5	1N914B	SS DIODE	30-002
D6	1N914B	SS DIODE	30-002
D7	1N914B	SS DIODE	30-002
D8	1N914B	SS DIODE	30-002
D9	1N914B	SS DIODE	30-002
D10	1N914B	SS DIODE	30-002
D11	1N914B	SS DIODE	30-002
D12	1N914B	SS DIODE	30-002
D13	1N914B	SS DIODE	30-002
D14	1N914B	SS DIODE	30-002
D15	1N914B	SS DIODE	30-002
D16	1N914B	SS DIODE	30-002
D17	1N914B	SS DIODE	30-002
D18	1N914B	SS DIODE	30-002
LD1	SLR-34-MG3	GREEN LED T-1	27-017
Q1	2N3906	PNP	31-011
Q2	2N3904	NPN	31-015
Q3	2N3904	NPN	31-015
Q4	2N3906	PNP	31-011
QA1	CA3086	TRANSISTOR ARRAY	33-022
U1	LF347	QUAD OPAMP	32-048
U2	LM311	COMPARATOR	33-002
U3	LF347	QUAD OPAMP	32-048
U4	MC34084	QUAD OPAMP	36-027
U5	LF347	QUAD OPAMP	32-048

CONNECTORS

H101	M100	8 PIN SIP SOCKET	43-063
H102	M100	8 PIN SIP SOCKET	43-063
H103	22-23-2031	3 PIN MOLEX RTANGL	43-094
H104	3916-0000T	3M HEADER 16 PIN	41-046

MISCELLANEOUS

QTY	DESCRIPTION	STOCK#
1	8 PIN DIP IC SOCKET	43-003
5	14 PIN DIP IC SOCKET	43-004
1	PRINTED CIRCUIT BOARD	68-177A

DOMINATOR II PARTS

68-178 POWER SUPPLY PCB

CAPACITORS

PART#	VALUE	DESCRIPTION	STOCK#
C1	2200UF/35V	SNAP-IN ELEC	82-040
C2	2200UF/35V	SNAP-IN ELEC	82-040
C3	1UF/35V	TANTALUM	83-001
C4	1UF/35V	TANTALUM	83-001
C5	22UF/25V	ELECTROLYTIC	82-003

RESISTORS

R1	121R	1/4W 1% MTL FILM	92-1210
R2	1K27	1/4W 1% MTL FILM	92-1271

VARIABLE RESISTORS

VR1	100R/1T	PT10V	22-009

SEMICONDUCTORS

BR1	RS202L	BRIDGE RECTIFIER	30-004
D1	1N4003	POWER DIODE	30-009
D2	1N4003	POWER DIODE	30-009
U1	LM7815	REGULATOR +15V	36-009
U2	LM337T	REGULATOR -ADJ	36-030

CONNECTORS

H1	22-23-2071	7 PIN MOLEX	43-062
H2	22-23-2031	3 PIN MOLEX	43-093
H3	22-23-2031	3 PIN MOLEX	43-093
H4	22-23-2031	3 PIN MOLEX	43-093

MISCELLANEOUS

QTY	DESCRIPTION	STOCK#
1	PRINTED CIRCUIT BOARD	68-178A

DOMINATOR II PARTS

68-179 CLIPPER PCB

CAPACITORS

PART#	VALUE	DESCRIPTION	STOCK#
C1	39PF	MICA	85-004
C2	20PF	MICA	85-003
C3	20PF	MICA	85-003
C4	39PF	MICA	85-004
C5	20PF	MICA	85-003
C6	20PF	MICA	85-003
C7	.1UF	MONO	88-001
C8	.1UF	MONO	88-001

RESISTORS

R1	4K99	1/4W 1% MTL FILM	92-4991
R2	4K99	1/4W 1% MTL FILM	92-4991
R3	10K0	1/4W 1% MTL FILM	92-1002
R4	10K0	1/4W 1% MTL FILM	92-1002
R5	49K9	1/4W 1% MTL FILM	92-4992
R6	2K49	1/4W 1% MTL FILM	92-2491
R7	10K0	1/4W 1% MTL FILM	92-1002
R8	10K0	1/4W 1% MTL FILM	92-1002
R9	2K49	1/4W 1% MTL FILM	92-2491
R10	49K9	1/4W 1% MTL FILM	92-4992
R11	4K99	1/4W 1% MTL FILM	92-4991
R12	4K99	1/4W 1% MTL FILM	92-4991
R13	10K0	1/4W 1% MTL FILM	92-1002
R14	10K0	1/4W 1% MTL FILM	92-1002
R15	49K9	1/4W 1% MTL FILM	92-4992
R16	2K49	1/4W 1% MTL FILM	92-2491
R17	10K0	1/4W 1% MTL FILM	92-1002
R18	10K0	1/4W 1% MTL FILM	92-1002
R19	2K49	1/4W 1% MTL FILM	92-2491
R20	49K9	1/4W 1% MTL FILM	92-4992
R21	10K0	1/4W 1% MTL FILM	92-1002
R22	10K0	1/4W 1% MTL FILM	92-1002
R23	10K0	1/4W 1% MTL FILM	92-1002

SEMICONDUCTORS

Q1	2N3906	PNP	31-011
Q2	2N3906	PNP	31-011
QA1	CA3096	TRANSISTOR ARRAY	33-026
QA2	CA3096	TRANSISTOR ARRAY	33-026
U1	LF353	DUAL OPAMP	32-007
U2	LF353	DUAL OPAMP	32-007

CONNECTORS

PART#	VALUE	DESCRIPTION	STOCK#
H1		8 PIN SIP SOCKET	43-067
H2		3 PIN MOLEX RT ANG	43-094

MISCELLANEOUS

QTY	DESCRIPTION	STOCK#
2	8 PIN DIP IC SOCKET	43-003
1	16 PIN DIP IC SOCKET	43-007
1	PRINTED CIRCUIT BOARD	68-179A

DOMINATOR II PARTS

68-180 CLIPPER + PRE/DE-EMP PCB

CAPACITORS

PART#	VALUE	DESCRIPTION	STOCK#
C1	39PF	MICA	85-004
C2	20PF	MICA	85-003
C3	20PF	MICA	85-003
C4	39PF	MICA	85-004
C5	20PF	MICA	85-003
C6	20PF	MICA	85-003
C7	.1UF	MONO	88-001
C8	.1UF	MONO	88-001
C9	100PF	MICA	85-008
C10	100PF	MICA	85-008
C11	.01UF	GREEN MYLAR 1%	81-011
C12	100PF	MICA	85-008
C13	100PF	MICA	85-008
C14	.01UF	GREEN MYLAR 1%	81-011
C15	.01UF	GREEN MYLAR 1%	81-011
C16	20PF	MICA	85-003
C17	.01UF	GREEN MYLAR 1%	81-011
C18	20PF	MICA	85-003
C19	.1UF	MONO	88-001
C20	.1UF	MONO	88-001
C21	.1UF	MONO	88-001
C22	.1UF	MONO	88-001

RESISTORS

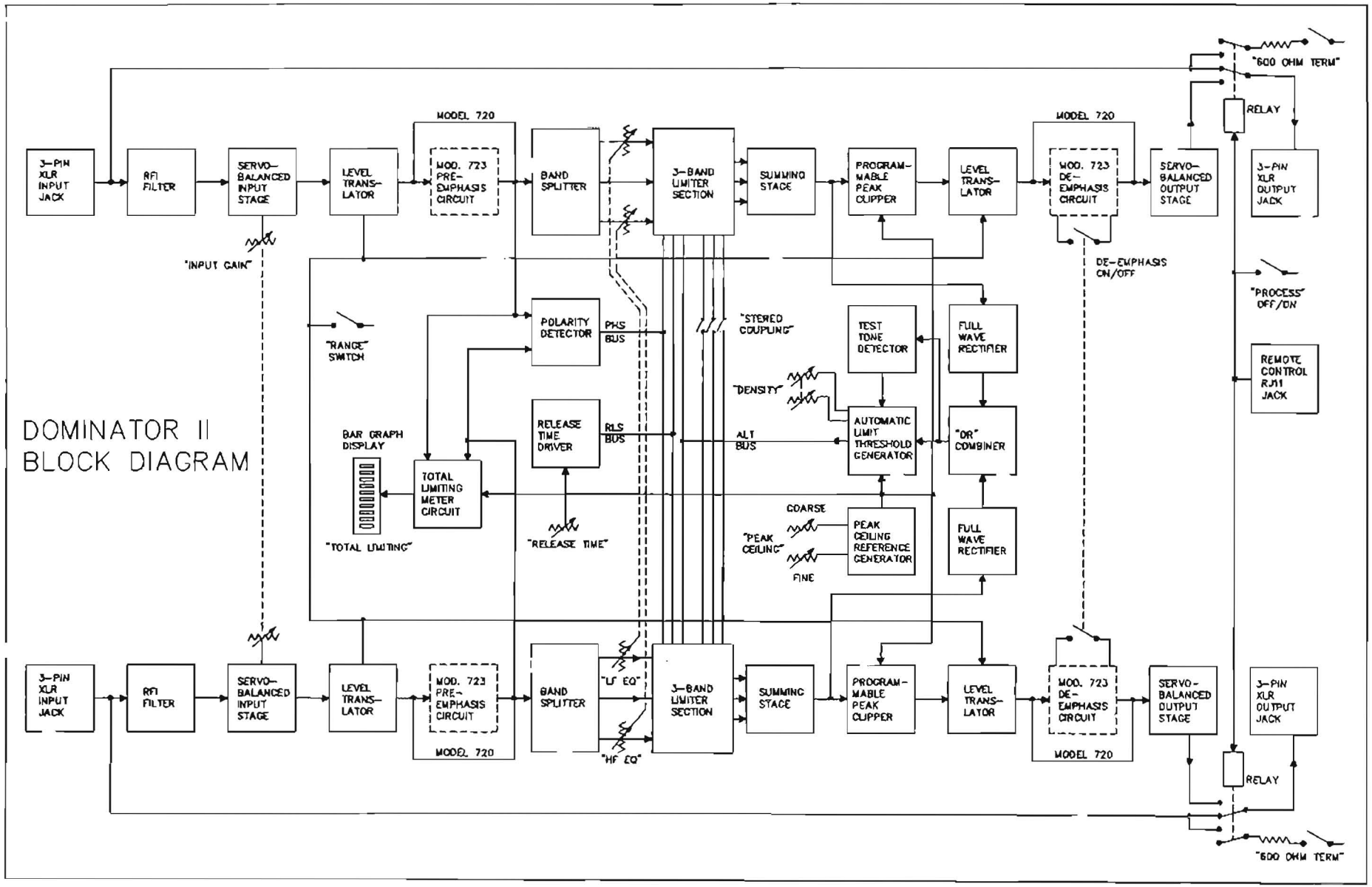
R1	4K99	1/4W 1% MTL FILM	92-4991
R2	4K99	1/4W 1% MTL FILM	92-4991
R3	10K0	1/4W 1% MTL FILM	92-1002
R4	10K0	1/4W 1% MTL FILM	92-1002
R5	49K9	1/4W 1% MTL FILM	92-4992
R6	2K49	1/4W 1% MTL FILM	92-2491
R7	10K0	1/4W 1% MTL FILM	92-1002
R8	10K0	1/4W 1% MTL FILM	92-1002
R9	2K49	1/4W 1% MTL FILM	92-2491
R10	49K9	1/4W 1% MTL FILM	92-4992
R11	4K99	1/4W 1% MTL FILM	92-4991
R12	4K99	1/4W 1% MTL FILM	92-4991
R13	10K0	1/4W 1% MTL FILM	92-1002
R14	10K0	1/4W 1% MTL FILM	92-1002
R15	49K9	1/4W 1% MTL FILM	92-4992
R16	2K49	1/4W 1% MTL FILM	92-2491
R17	10K0	1/4W 1% MTL FILM	92-1002
R18	10K0	1/4W 1% MTL FILM	92-1002
R19	2K49	1/4W 1% MTL FILM	92-2491
R20	49K9	1/4W 1% MTL FILM	92-4992
R21	10K0	1/4W 1% MTL FILM	92-1002
R22	10K0	1/4W 1% MTL FILM	92-1002

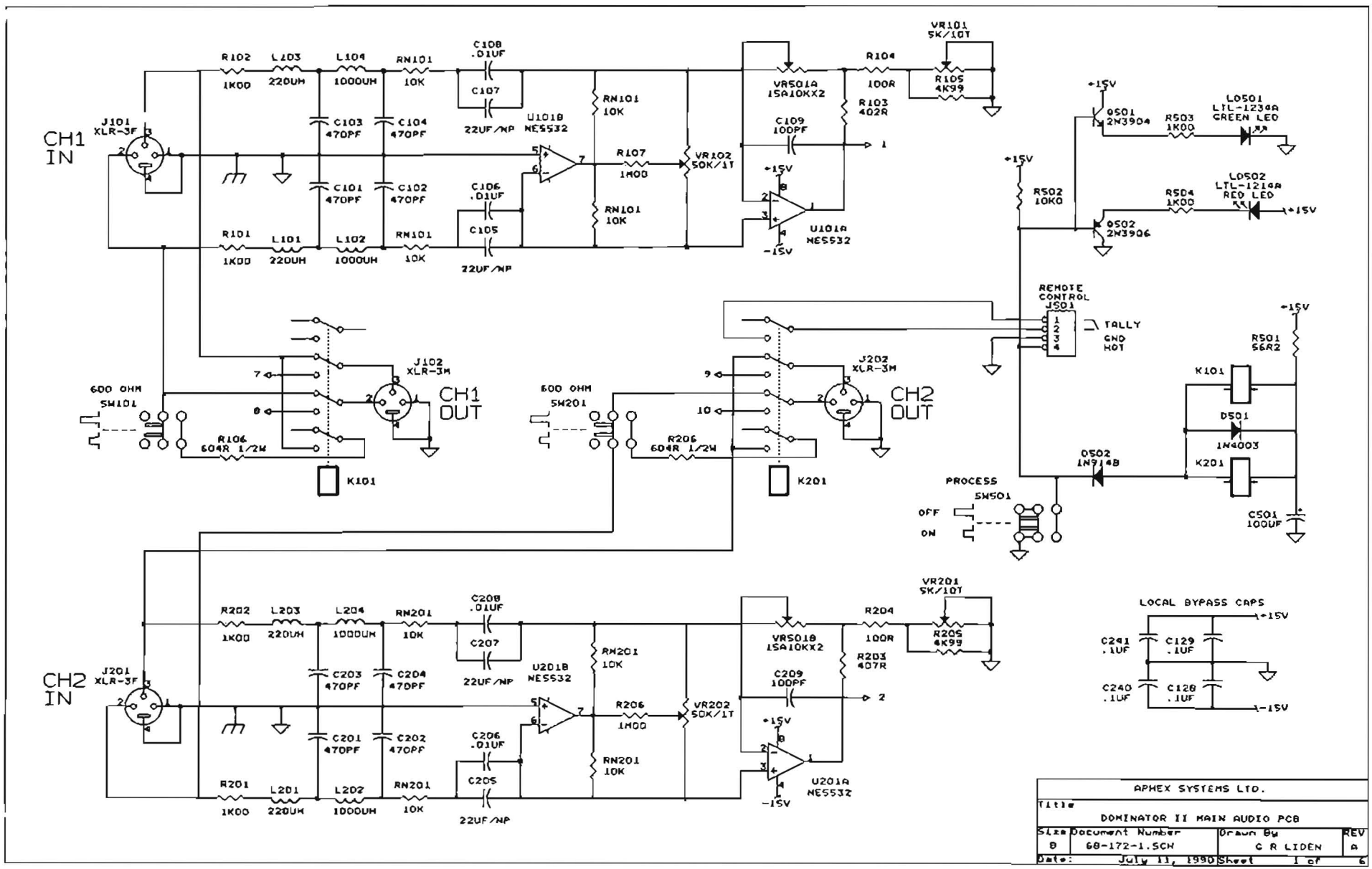
PART#	VALUE	DESCRIPTION	STOCK#
R23	10K0	1/4W 1% MTL FILM	92-1002
R24	4K99	1/4W 1% MTL FILM	92-4991
R25	4K99	1/4W 1% MTL FILM	92-4991
R26	7K50	1/4W 1% MTL FILM	92-7501
R27	249R	1/4W 1% MTL FILM	92-2490
R28	7K50	1/4W 1% MTL FILM	92-7501
R29	4K99	1/4W 1% MTL FILM	92-4991
R30	4K99	1/4W 1% MTL FILM	92-4991
R31	7K50	1/4W 1% MTL FILM	92-7501
R32	21R5	1/4W 1% MTL FILM	92-215G
R33	7K50	1/4W 1% MTL FILM	92-7501
R34	7K50	1/4W 1% MTL FILM	92-7501
R35	7K50	1/4W 1% MTL FILM	92-7501
R36	10K0	1/4W 1% MTL FILM	92-1002
R37	10K0	1/4W 1% MTL FILM	92-1002
R38	7K50	1/4W 1% MTL FILM	92-7501
R39	7K50	1/4W 1% MTL FILM	92-7501
R40	10K0	1/4W 1% MTL FILM	92-1002
R41	10K0	1/4W 1% MTL FILM	92-1002
---------- SEMICONDUCTORS ----------			
Q1	2N3906	PNP	31-011
Q2	2N3906	PNP	31-011
QA1	CA3096	TRANSISTOR ARRAY	33-026
QA2	CA3096	TRANSISTOR ARRAY	33-026
U1	LF353	DUAL OPAMP	32-007
U2	LF353	DUAL OPAMP	32-007
U3	LF353	DUAL OPAMP	32-007
U4	LF353	DUAL OPAMP	32-007
U5	LF353	DUAL OPAMP	32-007
U6	LF353	DUAL OPAMP	32-007
---------- SWITCHES ----------			
SW1	2PDT	MTK 2UEE NON-SHORT	20-031
---------- CONNECTORS ----------			
H1		8 PIN SIP SOCKET	43-067
H2		3 PIN MOLEX RT ANG	43-094
---------- MISCELLANEOUS ----------			
QTY	DESCRIPTION		STOCK#
6	8 PIN DIP IC SOCKET		43-003
1	16 PIN DIP IC SOCKET		43-007
1	PRINTED CIRCUIT BOARD		68-180A

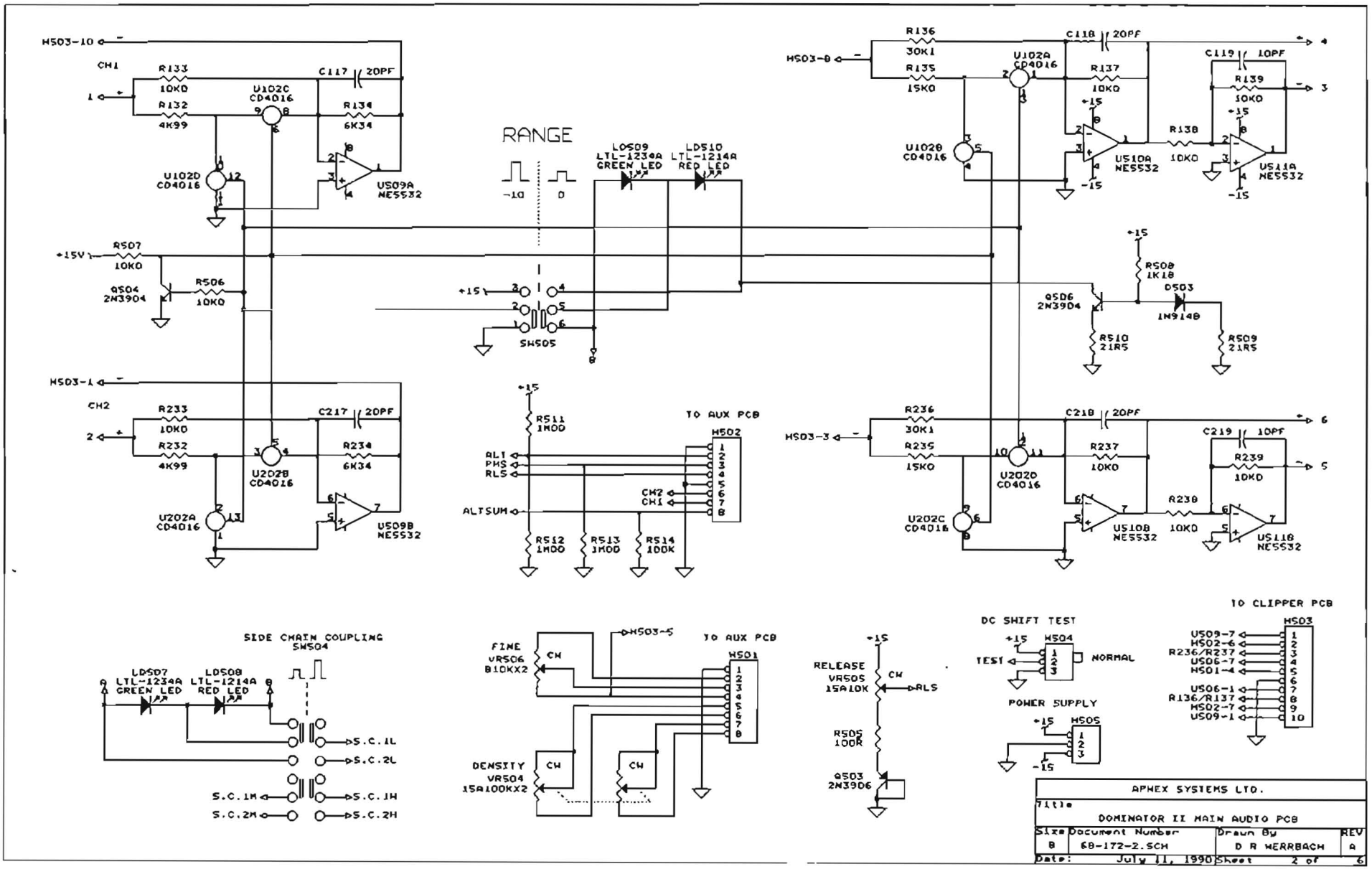
DOMINATOR II PARTS

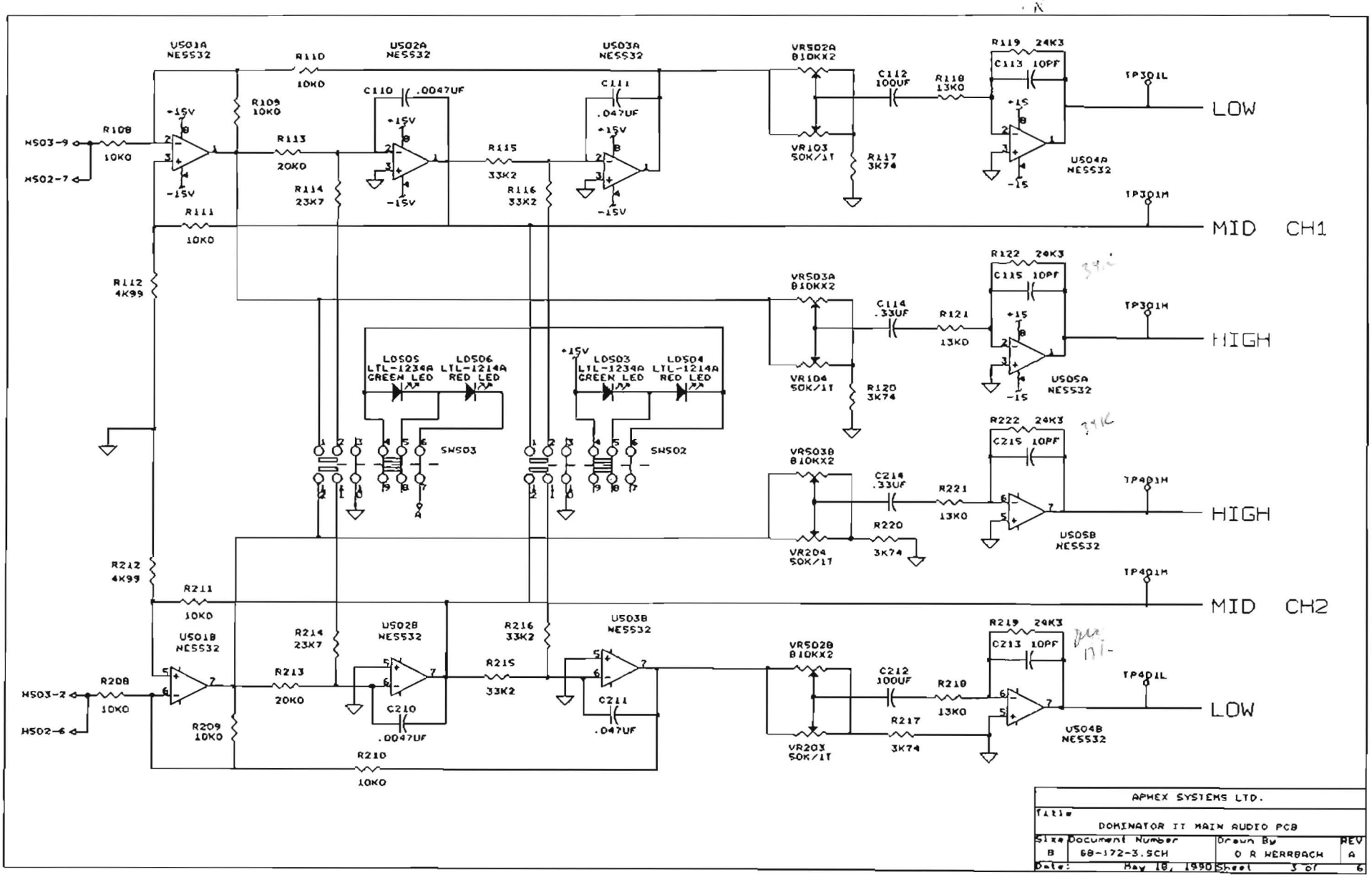
MODEL 720 SUB ASSEMBLIES & ASSORTED PARTS

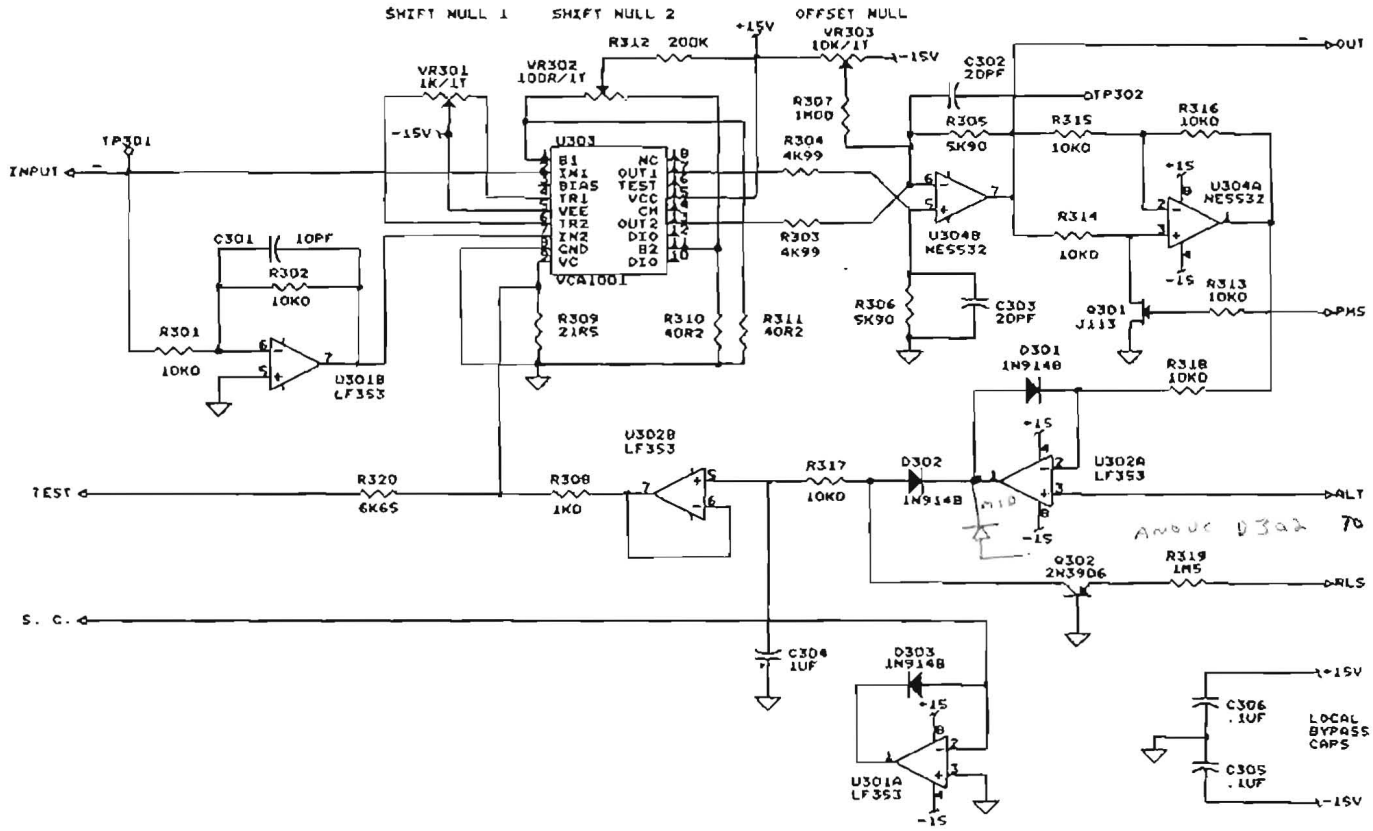
QTY	DESCRIPTION	STOCK#
1	300 MAILER	66-032
1	UNIVERSAL FOAM	120-126
1	MODEL 720 MANUAL	10-720
6	KNOB DAN 150-006 NO LINE	12-014
1	KNOB DAN 150-250	12-015
7	CAP C151 SELCO	14-007
6	SPACER SEASTROM 5712-74-30	61-024
5	STANDOFF 3/4"	62-074
1	HOLE PLUG FASTEX	62-075
11	SCREW 6-32X1/4 SIMS PAN/PHIL	60-063
4	SCREW 6-32X3/8 OVAL/PHIL/BLK	60-033
4	SCREW 10-32X9/16 BLK	60-036
2	SHOLDER WASHER #4	61-015
2	NUT 4-40 RADIAL	63-026
1	HEAT SINK	65-011
1	POLY BAG 12X24	66-052
1	CAUTION LABEL	66-142
1	CABLE 3" UP/UP	54-063-002
1	CABLE 6" UP/UP	54-063-008
1	CABLE 8" UP/UP	54-063-009
1	CORCOM FILTER	42-013
1	TOROID TRANSFORMER	70-009
1	POWER CORD (USA)	54-013
1	CHASSIS	66-215WF
1	COVER	66-216WF
1	PANEL	69-073WF
1	PCB, MAIN AUDIO	68-172SA
1	PCB, DISPLAY/SWITCH	68-176SA
1	PCB, AUX CONTROL	68-177SA
1	PCB, POWER SUPPLY	68-178SA
1	PCB, CLIPPER (MODEL 720)	68-179SA
1	PCB, CLIPPER + PRE/DE EMP(723)	68-180SA


DOMINATOR II
BLOCK DIAGRAM
3-PIN XLR INPUT JACK
RFI FILTER
SERVO-BALANCED INPUT STAGE
LEVEL TRANS-LATOR
MODEL 720
MOD. 723 PRE-EMPHASIS CIRCUIT
BAND SPLITTER
3-BAND LIMITER SECTION
SUMMING STAGE
PROGRAM-MABLE PEAK CLIPPER
LEVEL TRANS-LATOR
MODEL 720
MOD. 723 DE-EMPHASIS CIRCUIT
SERVO-BALANCED OUTPUT STAGE
3-PIN XLR OUTPUT JACK
"600 OHM TERM"
RELAY
"INPUT GAIN"
"RANGE" SWITCH
DE-EMPHASIS ON/OFF
"PROCESS" OFF/ON
REMOTE CONTROL RJ11 JACK
POLARITY DETECTOR
PHS BUS
"STEREO COUPLING"
TEST TONE DETECTOR
FULL WAVE RECTIFIER
"DENSITY"
AUTOMATIC LIMIT THRESHOLD GENERATOR
"OR" COMBINER
ALT BUS
RELEASE TIME DRIVER
RLS BUS
BAR GRAPH DISPLAY
TOTAL LIMITING METER CIRCUIT
"TOTAL LIMITING"
"RELEASE TIME"
COARSE
"PEAK CEILING"
FINE
PEAK CEILING REFERENCE GENERATOR
FULL WAVE RECTIFIER
"LF EQ"
"HF EQ"
MODEL 720
MODEL 720
RELAY
"600 OHM TERM"


CH1 IN
J101 XLR-3F
R102 1K00
L103 220UH
L104 1000UH
RN101 10K
C108 .01UF
C107 22UF/NP
C103 470PF
C104 470PF
C101 470PF
C102 470PF
C106 .01UF
C105 22UF/NP
R101 1K00
L101 220UH
L102 1000UH
RN101 10K
U101B NE5532
RN101 10K
R107 1M00
RN101 10K
VR102 50K/1T
VR101 5K/10T
VR501A 1SA10KX2
R104 100R
R105 4K99
R103 402R
C109 100PF
U101A NE5532
+15V
-15V
1
REMOTE CONTROL J501
1 TALLY
2 GND
3 HOT
4
+15V
Q501 2N3904
R503 1K00
LD501 LTL-1234A GREEN LED
R502 10K0
R504 1K00
LD502 LTL-1214A RED LED
Q502 2N3906
+15V
R501 56R2
K101
D501 1N4003
D502 1N914B
K201
C501 100UF
PROCESS SW501
OFF
ON
J102 XLR-3M
600 OHM SW101
R106 604R 1/2W
K101
CH1 OUT
J202 XLR-3M
600 OHM SW201
R206 604R 1/2W
K201
CH2 OUT
CH2 IN
J201 XLR-3F
R202 1K00
L203 220UH
L204 1000UH
RN201 10K
C208 .01UF
C207 22UF/NP
C203 470PF
C204 470PF
C201 470PF
C202 470PF
C206 .01UF
C205 22UF/NP
R201 1K00
L201 220UH
L202 1000UH
RN201 10K
U201B NE5532
RN201 10K
R206 1M00
RN201 10K
VR202 50K/1T
VR201 5K/10T
VR501B 1SA10KX2
R204 100R
R205 4K99
R203 407R
C209 100PF
U201A NE5532
+15V
-15V
2
LOCAL BYPASS CAPS
+15V
C241 .1UF
C129 .1UF
C240 .1UF
C128 .1UF
-15V
APHEX SYSTEMS LTD.
Title
DOMINATOR II MAIN AUDIO PCB
Size B
Document Number 68-172-1.SCH
Drawn By C R LIDEN
REV A
Date: July 11, 1990
Sheet 1 of 6

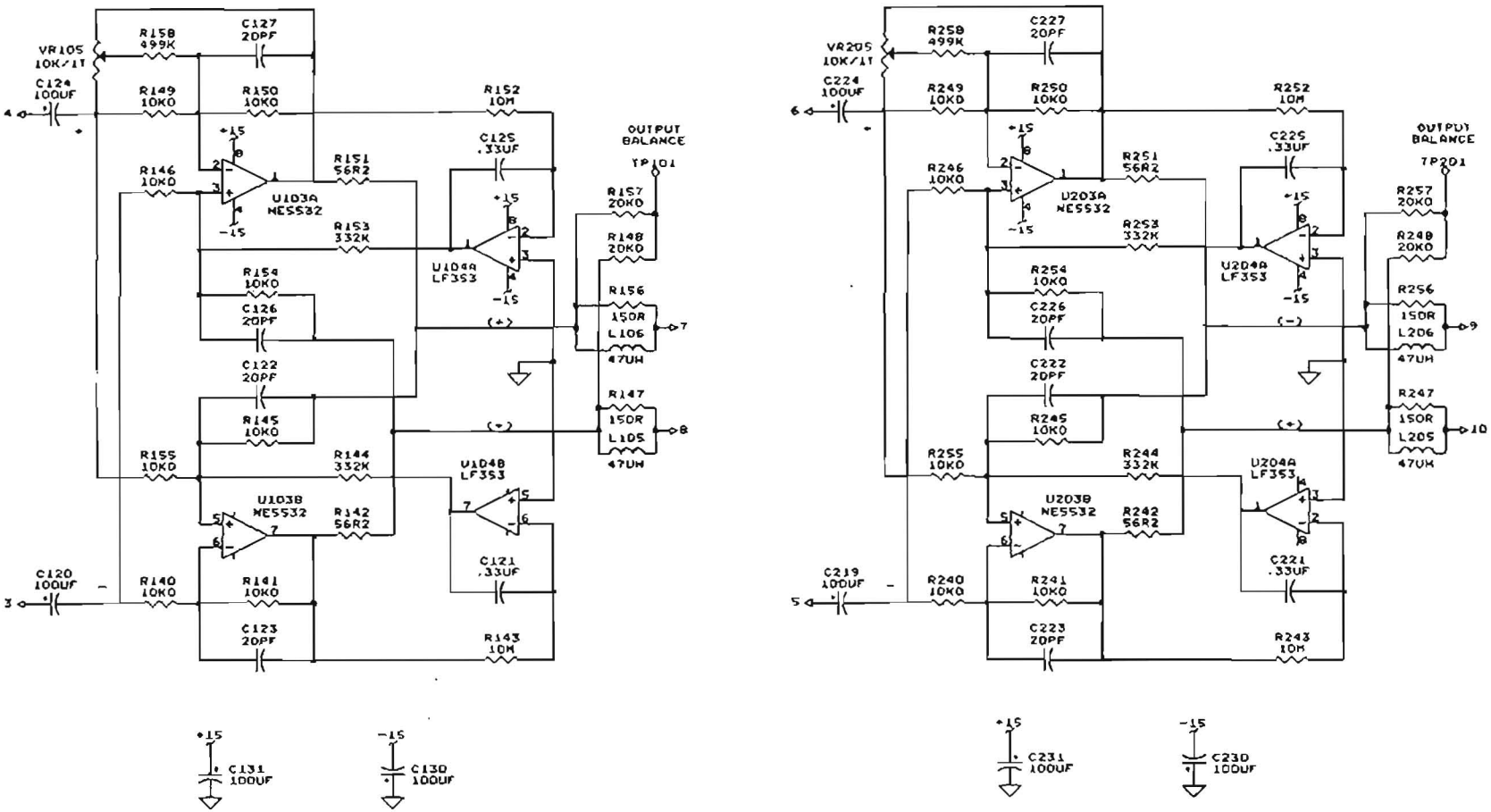

HS03-10
CH1
R133
10KD
R132
4K99
U102C
CD4016
C117
20PF
R134
6K34
U102D
CD4016
U509A
NE5532
+15V
R507
10KD
Q504
2N3904
R506
10KD
HS03-1
CH2
R233
10KD
R232
4K99
U202B
CD4016
C217
20PF
R234
6K34
U202A
CD4016
U509B
NE5532
RANGE
-10
0
LD509
LTL-1234A
GREEN LED
LD510
LTL-1214A
RED LED
+15
SW505
R511
1MOD
TO AUX PCB
HS02
ALI
PHS
RLS
ALTSUM
CH2
CH1
R512
1MOD
R513
1MOD
R514
100K
HS03-9
R136
30K1
R135
15KD
U102A
CD4016
C118
20PF
R137
10KD
U102B
CD4016
U510A
NE5532
C119
10PF
R139
10KD
R138
10KD
U511A
NE5532
R508
1K18
D503
1N914B
Q506
2N3904
R510
21R5
R509
21R5
HS03-3
R236
30K1
R235
15KD
U202D
CD4016
C218
20PF
R237
10KD
U202C
CD4016
U510B
NE5532
C219
10PF
R239
10KD
R238
10KD
U511B
NE5532
SIDE CHAIN COUPLING
SW504
LD507
LTL-1234A
GREEN LED
LD508
LTL-1214A
RED LED
S.C.1L
S.C.2L
S.C.1H
S.C.2H
FINE
VR506
B10KX2
CW
HS03-5
TO AUX PCB
HS01
DENSITY
VR504
15A100KX2
RELEASE
VR505
15A10K
RLS
R505
100R
Q503
2N3906
DC SHIFT TEST
HS04
TEST
NORMAL
POWER SUPPLY
HS05
TO CLIPPER PCB
HS03
US09-7
HS02-6
R236/R237
US06-7
HS01-4
US06-1
R136/R137
HS02-7
US09-1
APHEX SYSTEMS LTD.
Title
DOMINATOR II MAIN AUDIO PCB
Size
B
Document Number
68-172-2.SCH
Drawn By
D R WERRBACH
REV
A
Date:
July 11, 1990
Sheet
2 of
6


U501A NE5532
R110 10K0
U502A NE5532
U503A NE5532
VR502A B10KX2
C112 100UF
R118 13K0
R119 24K3
C113 10PF
TP301L
LOW
R108 10K0
HS03-9
HS02-7
R109 10K0
R113 20K0
C110 .0047UF
R115 33K2
C111 .047UF
R114 23K7
R116 33K2
VR103 50K/1T
R117 3K74
U504A NE5532
TP301M
MID CH1
R111 10K0
R112 4K99
VR503A B10KX2
C114 .33UF
R121 13K0
R122 24K3
C115 10PF
TP301H
HIGH
LDS05 LTL-1234A GREEN LED
LDS06 LTL-1214A RED LED
LDS03 LTL-1234A GREEN LED
LDS04 LTL-1214A RED LED
SWS03
SWS02
VR104 50K/1T
R120 3K74
U505A NE5532
VR503B B10KX2
C214 .33UF
R221 13K0
R222 24K3
C215 10PF
TP401H
HIGH
R220 3K74
VR204 50K/1T
U505B NE5532
R212 4K99
R211 10K0
TP401M
MID CH2
U501B NE5532
R214 23K7
U502B NE5532
R216 33K2
U503B NE5532
VR502B B10KX2
C212 100UF
R210 13K0
R219 24K3
C213 10PF
TP401L
LOW
R208 10K0
HS03-2
HS02-6
R213 20K0
R215 33K2
C210 .0047UF
C211 .047UF
R209 10K0
R217 3K74
VR203 50K/1T
U504B NE5532
R218 10K0
APHEX SYSTEMS LTD.
Title
DOMINATOR II MAIN AUDIO PCB
Size B
Document Number 68-172-3.SCH
Drawn By O R HERRBACH
REV A
Date: May 18, 1990
Sheet 3 of 6

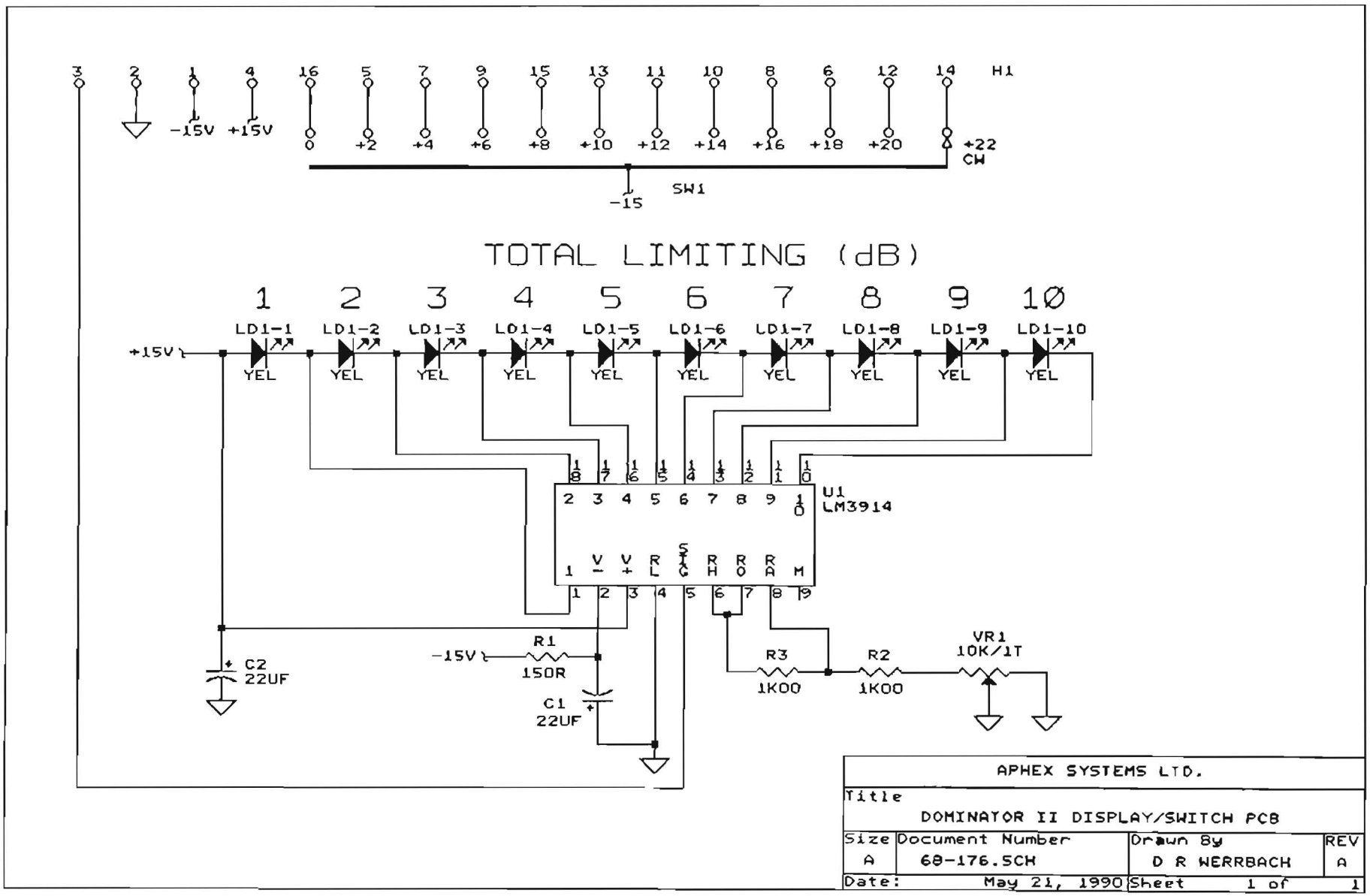


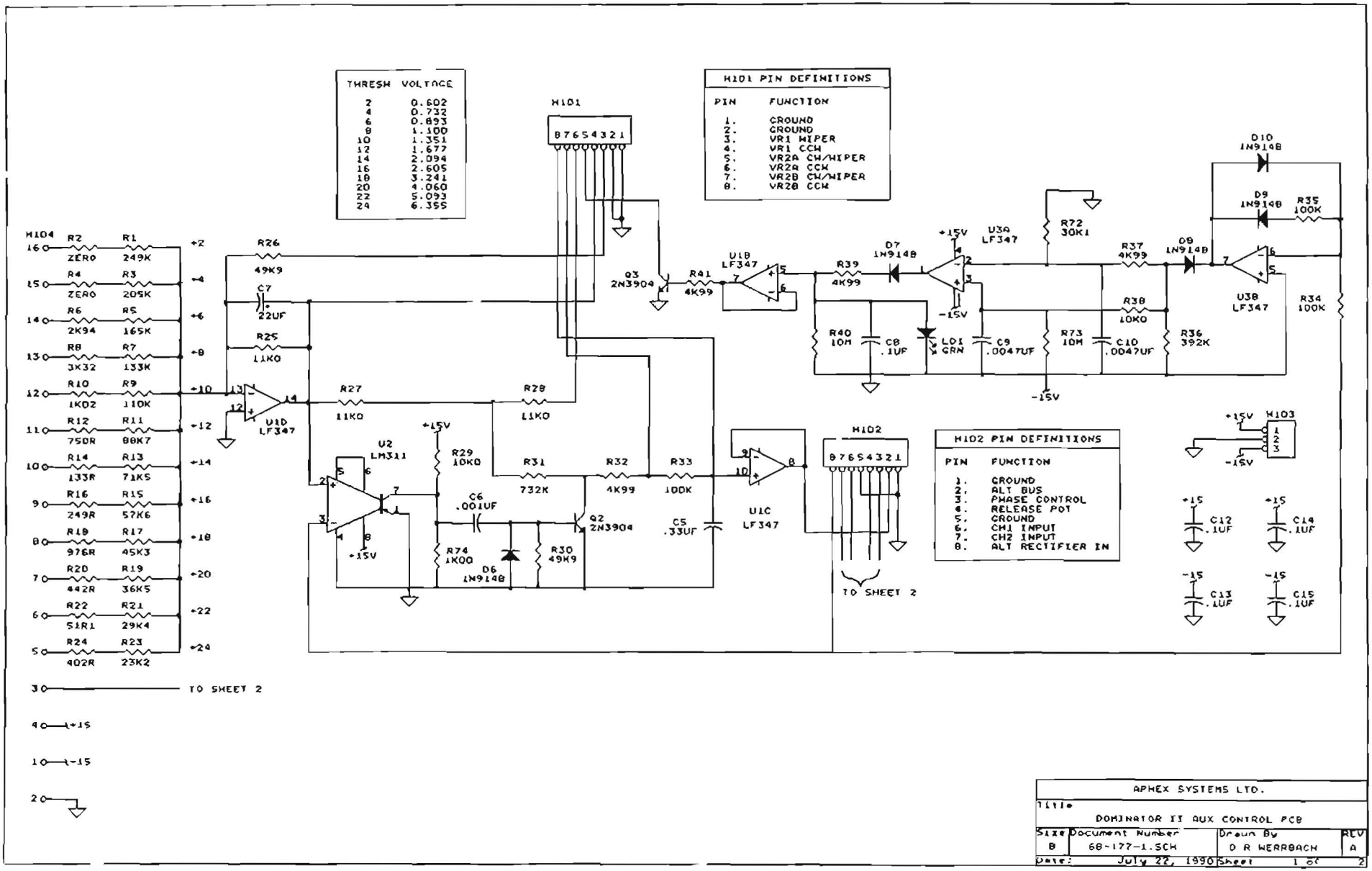
NOTES: THIS CIRCUITRY EXISTS 6 TIMES (3 FOR CHANNEL 1; 3 FOR CHANNEL 2)
CHANNEL 1 USES 300 SERIES PART NUMBERS: SUFFIX L=LOW M=MID H=HIGH
CHANNEL 2 USES 400 SERIES PART NUMBERS: SUFFIX L=LOW M=MID H=HIGH

APHEX SYSTEMS LTD.			
Title: DOMINATOR II MAIN AUDIO PCB			
Size: B	Document Number: 68-172-4.SCH	Drawn By: D R HERRBACH	REV: A
Date: May 18, 1990	Sheet 4 of 6		

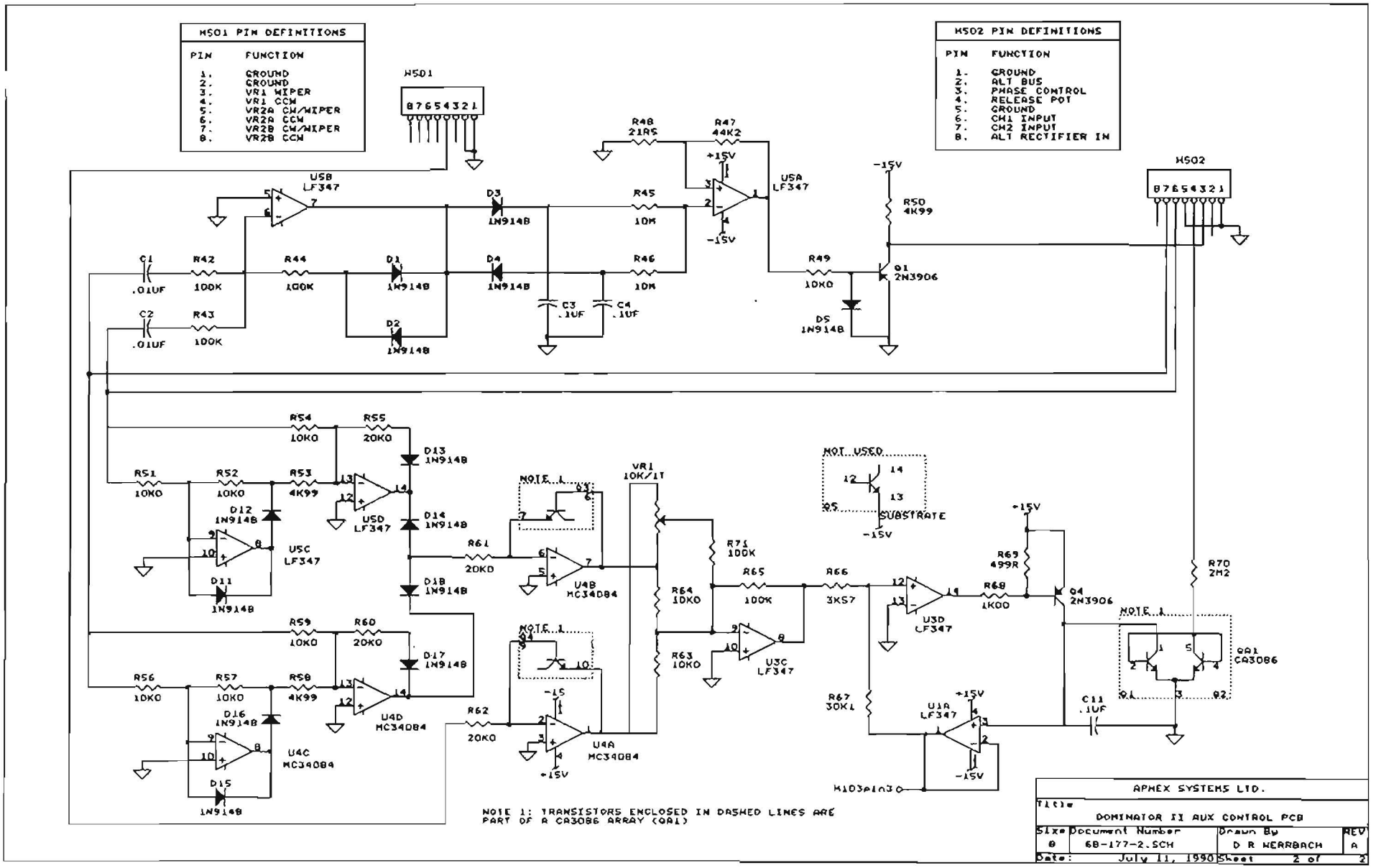


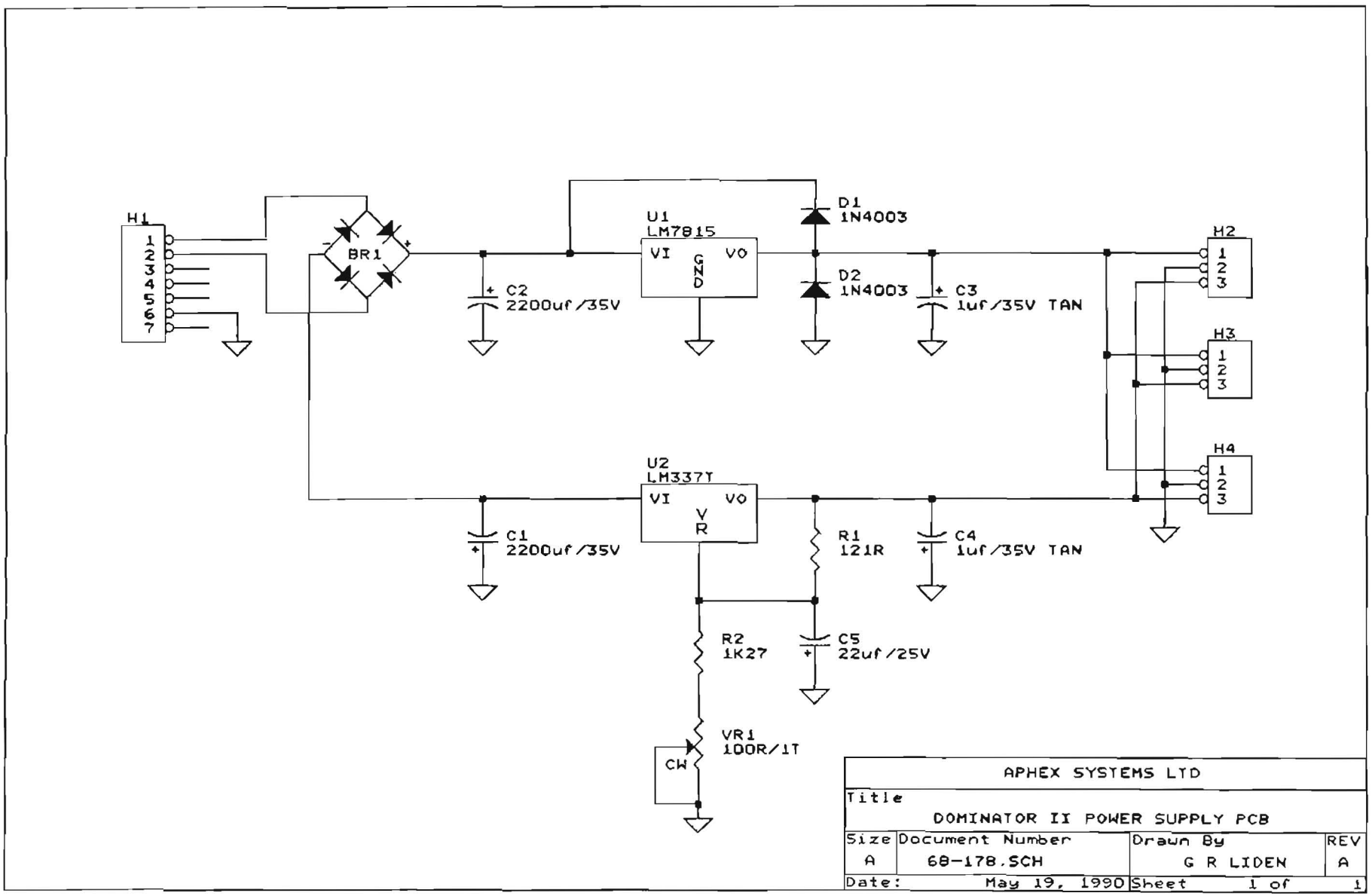
APHEX SYSTEMS LTD.			
Title: DOMINATOR II MAIN AUDIO PCB			
Size: B	Document Number: 68-172-6.SCH	Drawn By: D R HERRBACH	REV: A
Date: May 14, 1990	Sheet 6 of 6		

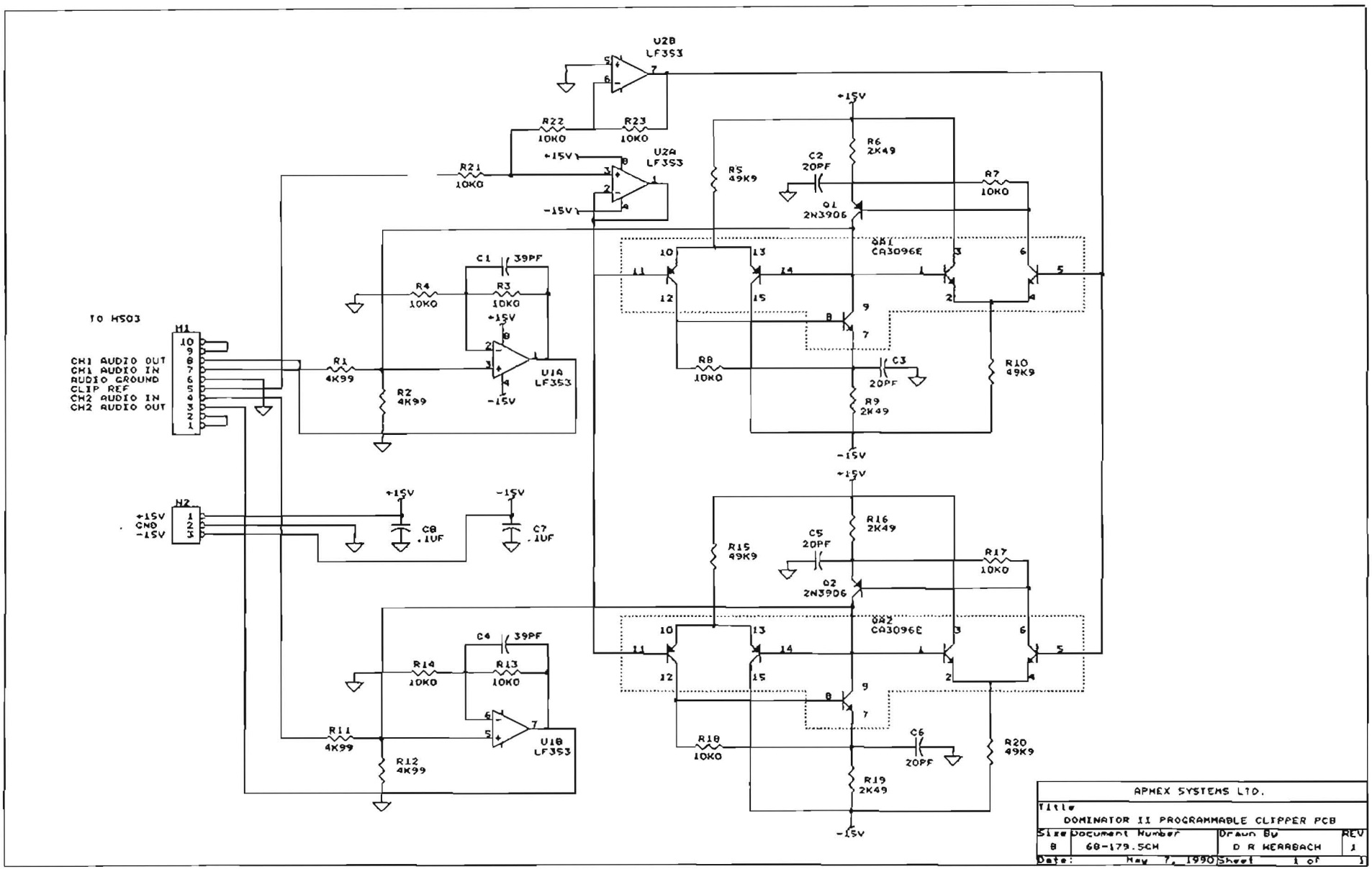

H1
3 2 1 4 16 5 7 9 15 13 11 10 8 6 12 14
-15V +15V
0 +2 +4 +6 +8 +10 +12 +14 +16 +18 +20 +22
CW
SW1
-15
TOTAL LIMITING (dB)
1 2 3 4 5 6 7 8 9 10
LD1-1 LD1-2 LD1-3 LD1-4 LD1-5 LD1-6 LD1-7 LD1-8 LD1-9 LD1-10
YEL
+15V
U1
LM3914
C2
22UF
R1
150R
-15V
C1
22UF
R3
1K00
R2
1K00
VR1
10K/1T
APHEX SYSTEMS LTD.
Title
DOMINATOR II DISPLAY/SWITCH PCB
Size
A
Document Number
68-176.SCH
Drawn By
D R WERRBACH
REV
A
Date:
May 21, 1990
Sheet
1 of
1

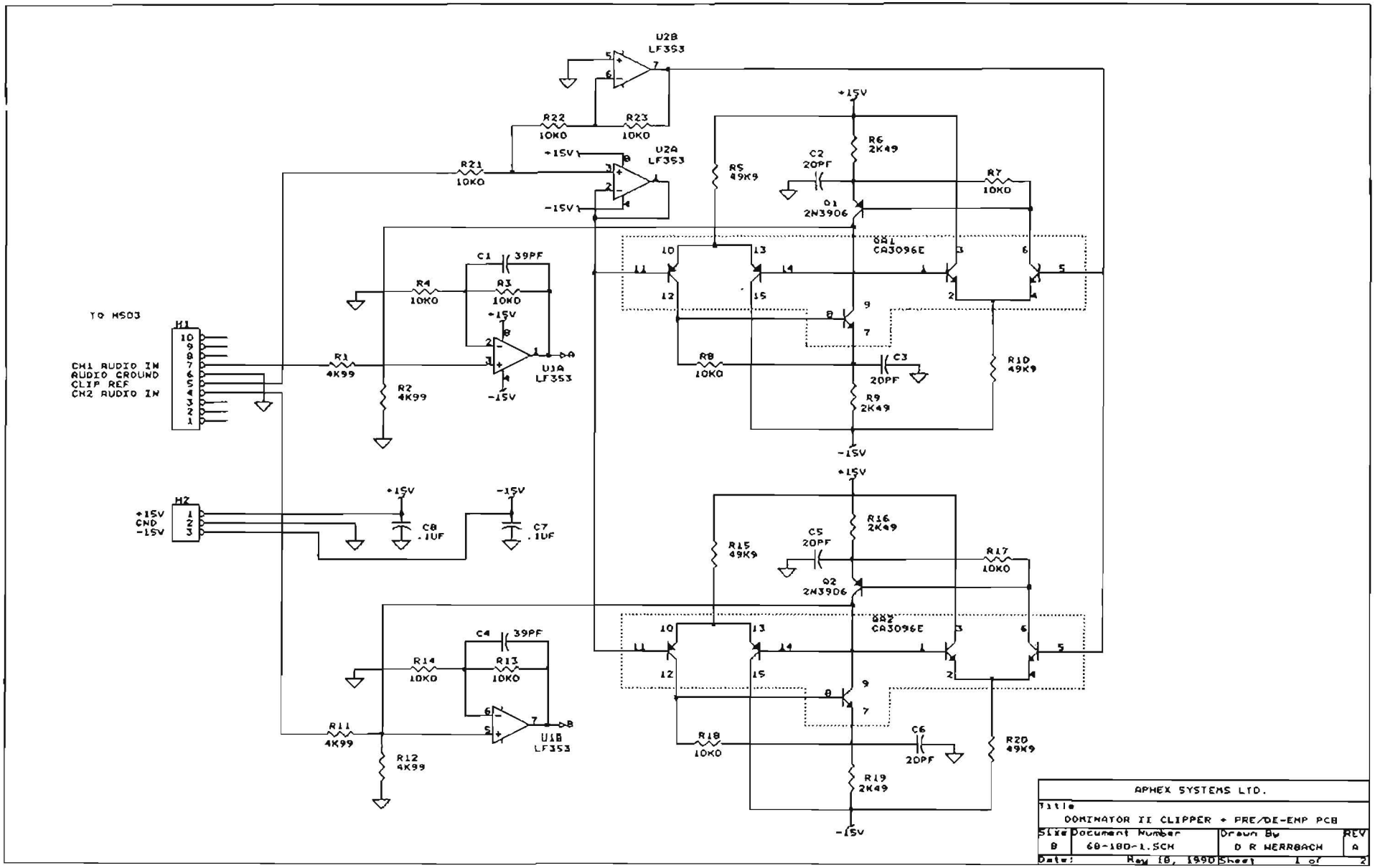


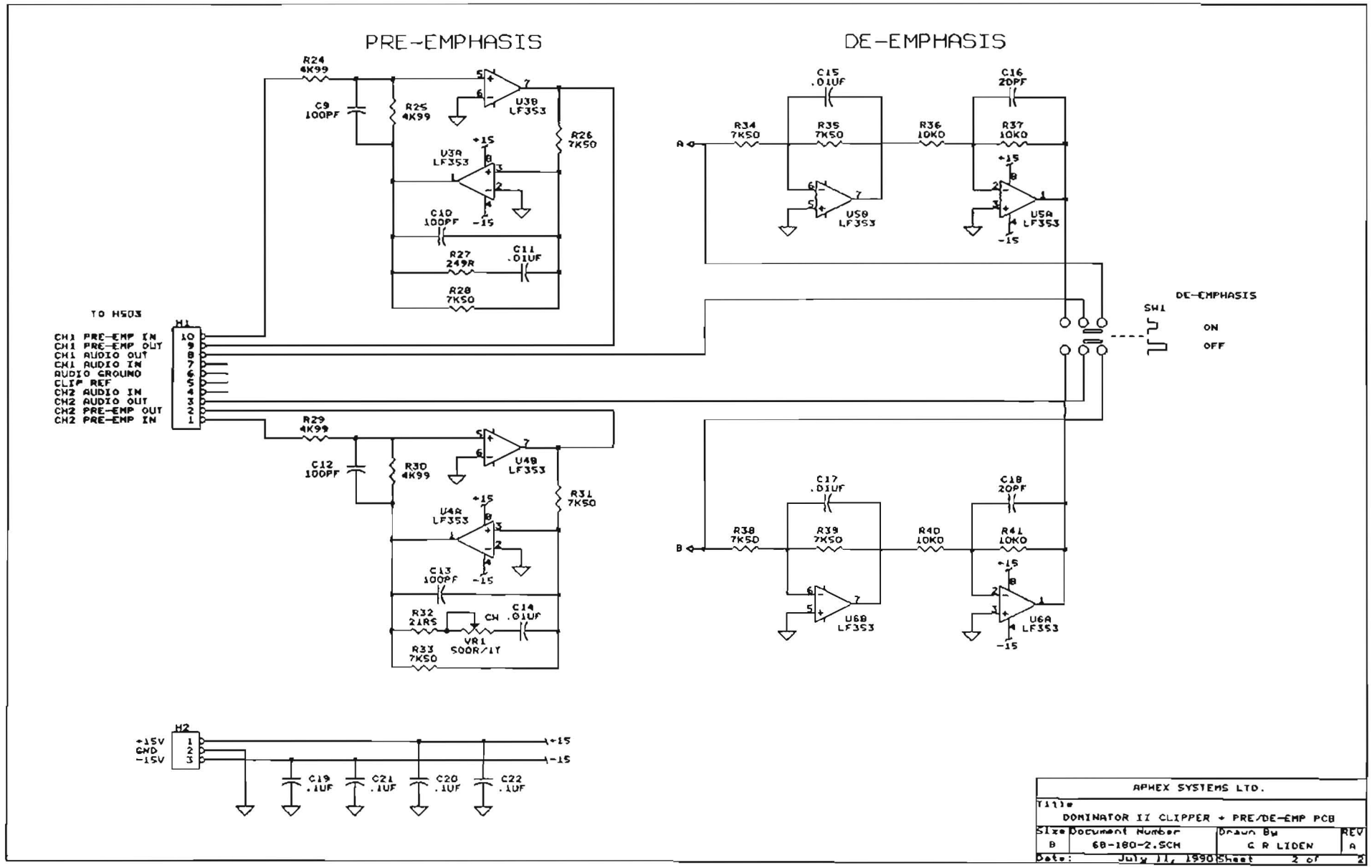
APHEX SYSTEMS LTD.			
Title: DOMINATOR II AUX CONTROL PCB			
Size: B	Document Number: 68-177-1.SCH	Drawn By: D R WERRBACH	REV: A
Date: July 22, 1990	Sheet 1 of 2		


HS01 PIN DEFINITIONS
PIN FUNCTION
1. GROUND
2. GROUND
3. VR1 WIPER
4. VR1 CCW
5. VR2A CW/WIPER
6. VR2A CCW
7. VR2B CW/WIPER
8. VR2B CCW
HS02 PIN DEFINITIONS
PIN FUNCTION
1. GROUND
2. ALT BUS
3. PHASE CONTROL
4. RELEASE POT
5. GROUND
6. CH1 INPUT
7. CH2 INPUT
8. ALT RECTIFIER IN
HS01
87654321
HS02
87654321
R48 21R5
R47 44K2
+15V
-15V
USA LF347
USB LF347
D3 1N914B
R45 10M
R46 10M
R50 4K99
R49 10K0
Q1 2N3906
D5 1N914B
C1 .01UF
C2 .01UF
R42 100K
R43 100K
R44 100K
D1 1N914B
D2 1N914B
D4 1N914B
C3 .1UF
C4 .1UF
R54 10K0
R55 20K0
R51 10K0
R52 10K0
R53 4K99
D13 1N914B
D14 1N914B
D18 1N914B
D12 1N914B
D11 1N914B
USC LF347
USD LF347
NOTE 1
VR1 10K/1T
R61 20K0
U4B MC34084
R71 100K
R64 10K0
R63 10K0
R65 100K
R66 3K57
U3C LF347
U3D LF347
NOT USED
Q5
SUBSTRATE
R69 499R
R68 1K00
Q4 2N3906
R70 2M2
QA1 CA3086
Q1
Q2
C11 .1UF
R59 10K0
R60 20K0
R56 10K0
R57 10K0
R58 4K99
D17 1N914B
D16 1N914B
D15 1N914B
U4C MC34084
U4D MC34084
R62 20K0
U4A MC34084
R67 30K1
U1A LF347
R103 R104 R105
NOTE 1: TRANSISTORS ENCLOSED IN DASHED LINES ARE PART OF A CA3086 ARRAY (QA1)
APHEX SYSTEMS LTD.
Title: DOMINATOR II AUX CONTROL PCB
Size: B
Document Number: 68-177-2.SCH
Drawn By: D R HERRBACH
REV: A
Date: July 11, 1990
Sheet 2 of 2


H1
1
2
3
4
5
6
7
BR1
C2
2200uf/35V
U1
LM7815
VI
GND
VO
D1
1N4003
D2
1N4003
C3
1uf/35V TAN
H2
1
2
3
H3
1
2
3
H4
1
2
3
U2
LM337T
VI
VO
VR
C1
2200uf/35V
R1
121R
C4
1uf/35V TAN
R2
1K27
C5
22uf/25V
VR1
100R/1T
CW
APHEX SYSTEMS LTD
Title
DOMINATOR II POWER SUPPLY PCB
Size
A
Document Number
68-178.SCH
Drawn By
G R LIDEN
REV
A
Date:
May 19, 1990
Sheet
1 of
1


U2B
LF353
R22
10KΩ
R23
10KΩ
U2A
LF353
R21
10KΩ
+15V
-15V
R5
49K9
C2
20PF
R6
2K49
R7
10KΩ
Q1
2N3906
SA1
CA3096E
C1
39PF
R4
10KΩ
R3
10KΩ
TO H503
H1
CH1 AUDIO OUT
CH1 AUDIO IN
AUDIO GROUND
CLIP REF
CH2 AUDIO IN
CH2 AUDIO OUT
R1
4K99
R2
4K99
U1A
LF353
R8
10KΩ
C3
20PF
R10
49K9
R9
2K49
H2
+15V
GND
-15V
C8
.1UF
C7
.1UF
R15
49K9
C5
20PF
R16
2K49
R17
10KΩ
Q2
2N3906
SA2
CA3096E
C4
39PF
R14
10KΩ
R13
10KΩ
R11
4K99
R12
4K99
U1B
LF353
R18
10KΩ
C6
20PF
R20
49K9
R19
2K49
APHEX SYSTEMS LTD.
Title
DOMINATOR II PROGRAMMABLE CLIPPER PCB
Size
B
Document Number
68-179.SCH
Drawn By
D R KERABACH
REV
J
Date:
May 7, 1990
Sheet
1 of
1


U2B
LF353
U2A
LF353
R22
10KO
R23
10KO
R21
10KO
+15V
-15V
R6
2K49
R5
49K9
C2
20PF
R7
10KO
Q1
2N3906
SA1
CA3096E
C1
39PF
R4
10KO
R3
10KO
TO MSO3
H1
CH1 AUDIO IN
AUDIO GROUND
CLIP REF
CH2 AUDIO IN
R1
4K99
R2
4K99
U1A
LF353
R8
10KO
C3
20PF
R10
49K9
R9
2K49
H2
+15V
GND
-15V
C8
.1UF
C7
.1UF
R16
2K49
R15
49K9
C5
20PF
R17
10KO
Q2
2N3906
SA2
CA3096E
C4
39PF
R14
10KO
R13
10KO
R11
4K99
R12
4K99
U1B
LF353
R18
10KO
C6
20PF
R20
49K9
R19
2K49
APHEX SYSTEMS LTD.
Title
DOMINATOR II CLIPPER + PRE/DE-EMP PCB
Size
B
Document Number
60-180-1.SCH
Drawn By
D R WERRBACH
REV
A
Date:
May 18, 1990
Sheet
1 of
2



APHEX SYSTEMS LTD.			
Title: DOMINATOR II CLIPPER + PRE/DE-EMP PCB			
Size: B	Document Number: 68-180-2.SCH	Drawn By: C R LIDEN	REV: A
Date: July 11, 1990	Sheet 2 of 2		