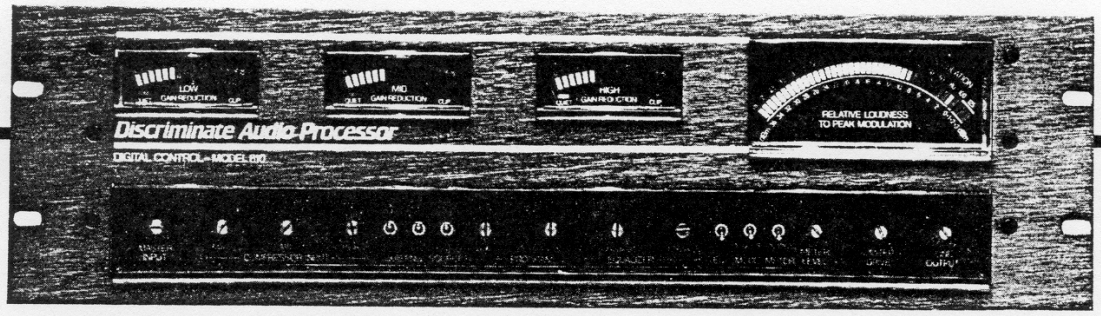


Model 610

The Discriminate Audio Processor

Instruction Manual

DORROUGH ELECTRONICS

5221 Collier Place
Woodland Hills, California 91364
(818) 999-1132

DORROUGH DISCRIMINATE AUDIO PROCESSOR MODEL 610-AM MONO

INSTALLATION PROCEDURES - SHORT FORM

1. Install DAP 610-AM directly at the transmitter.

2. No other limiter should be installed before or after this unit. It will modify the effects of this unit.

3. On the rear, the first terminal block is marked Input 1 and Input 2. Use either one. The second terminal block is marked Output and Ext Meter. Caution, the Output is differential and should never be shorted.

4. The input of the DAP is 20K bridging. Should program channel require termination, a resistor of appropriate value should be placed across the inputs.

5. The DAP is shipped to operate from -4dB to +16dB. Should more gain be needed, slide back the metal top and adjust Input Circuit (on left side of Mother Board and the switch farthest to the left) from the "0" position to the -20 position (switch backward for -20).

6. This unit has been set at the factory and is ready to operate. If some of the adjustments are experimented with, refer to the Certificate of Inspection and reset.

7. With +4dB programming, the three small meter channels should indicate at about half scale. Use the Line Output control on the front panel to adjust transmitter modulation to 100%. Then calibrate the Relative Loudness to Peak Modulation meter using the Meter Level Control on the front panel to correspond to 100%. You may connect your Modulation Monitor directly to the Loudness meter via the rear terminal block on the DAP.

Refer to the Instruction Manual for an expanded explaination of installation procedures.

Dorrough Electronics
5221 Collier Place
Woodland Hills, Ca. 91364
Tel: 818-999-1132
FAX: 818-999-1507

DORROUGH DISCRIMINATE AUDIO PROCESSOR MODEL # 610-FM

PREPARATION: The DAP-610 is shipped with the controls set at normal operating position. Connect audio line to input # 1 as per diagram. Also connect output of 610's to the Stereo Generator, and the composite output of the Generator to the Exciter.

1. With audio supplied to input #1 on both DAP's, adjust Master Input level until an occasional red LED lights in the Low, Mid, or High Gain Reduction meters.
2. Adjust Limiter Drive until Peak Threshold LED flickers on and off.
3. Adjust Line Output level approximately ½ open until completing Generator setup procedure.
4. See note below, then continue with Generator setup instructions.

NOTE: Compressor Inputs should be left as is.

Any change in EQ settings necessitates a re-adjustment of the Limiter Drive.

5. Adjust Meter Level as required.

DORROUGH STEREO GENERATOR MODEL # 80-B

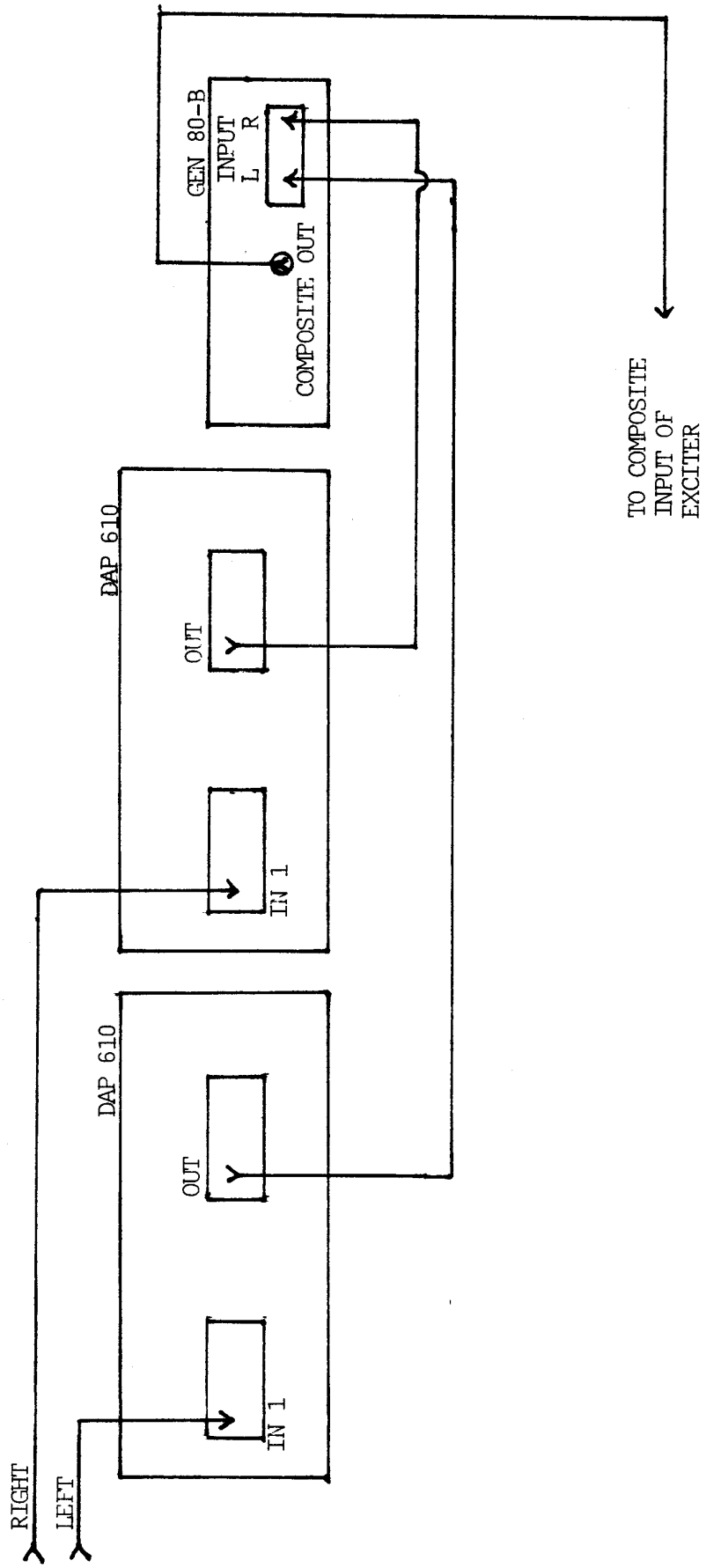
"DYNAMIC" SET-UP INSTRUCTIONS

MATERIAL NEEDED: FM-Stereo receiver equipped with a stereo/mono switch.

1. With generator installed and operating at an input level* that just begins to flicker the normal clip light, tune in station signal on FM receiver.
2. Set generator Mode Switch to the L-R position, and the FM receiver to mono.
3. Adjust generator balance for the best null.
4. Set FM receiver to stereo and adjust receiver balance to the right channel only.
5. Set generator Mode Switch to Left only position.
6. Adjust pilot phase and comp for best null.
7. For the finest adjustment possible, repeat steps 1 through 6.

*Note: Optimum generator input setting is when input pots are slightly more than ½ open. With the generator inputs set this way, desired clipping action is achieved by adjusting the line output pots of the DAP-610s.

SIGNAL FLOW THROUGH PROCESSORS AND GENERATOR



DORROUGH DISCRIMINATE AUDIO PROCESSOR MODEL 610-AM MONO

INSTALLATION PROCEDURES - SHORT FORM

1. Install DAP 610-AM directly at the transmitter.

2. No other limiter should be installed before or after this unit. It will modify the effects of this unit.

3. On the rear, the first terminal block is marked Input 1 and Input 2. Use either one. The second terminal block is marked Output and Ext Meter. Caution, the Output is differential and should never be shorted.

4. The input of the DAP is 20K bridging. Should program channel require termination, a resistor of appropriate value should be placed across the inputs.

5. The DAP is shipped to operate from -4dB to +16dB. Should more gain be needed, slide back the metal top and adjust Input Circuit (on left side of Mother Board and the switch farthest to the left) from the "0" position to the -20 position (switch backward for -20).

6. This unit has been set at the factory and is ready to operate. If some of the adjustments are experimented with, refer to the Certificate of Inspection and reset.

7. With +4dB programming, the three small meter channels should indicate at about half scale. Use the Line Output control on the front panel to adjust transmitter modulation to 100%. Then calibrate the Relative Loudness to Peak Modulation meter using the Meter Level Control on the front panel to correspond to 100%. You may connect your Modulation Monitor directly to the Loudness meter via the rear terminal block on the DAP.

Refer to the Instruction Manual for an expanded explaination of installation procedures.

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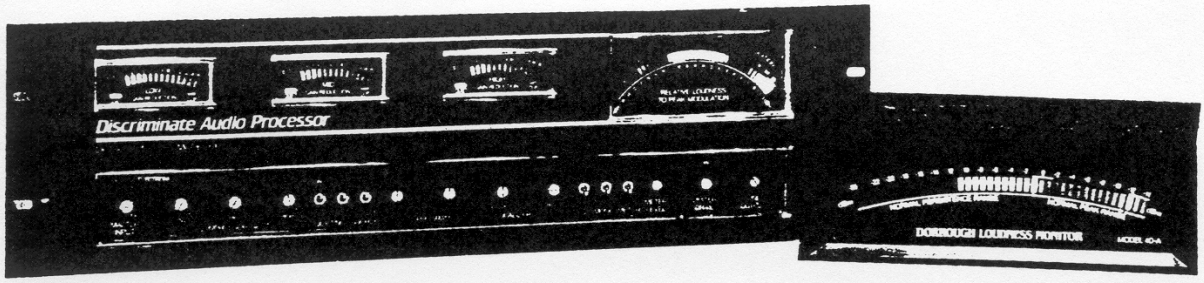
THE FOLLOWING CERTIFICATE OF INSPECTION IS ALSO A TROUBLE SHOOTING GUIDE AS ANY PROBLEM CAN BE DEFINED TO A SPECIFIC SECTION OF THE DISCRIMINATE AUDIO PROCESSOR MODEL 610.

For immediate technical attention from the factory, please call or FAX Dorrough Electronics.

Telephone: 818-999-1132

FAX: 818-998-1507



DORROUGH ELECTRONICS

CERTIFICATE OF INSPECTION

Discriminate Audio Processor Model 610

Tools: Oscilloscope and Audio Generator

1. MOTHER BOARD: Check DC voltages on each regulator located on board for correct reading of +15v, -15v, 5v, and 3v respectively. ____

2. INPUT CIRCUIT (Located on front left side of Mother Board): Audio signal must be seen on pin 20 of J2. U12 and U13 should be checked first if no signal appears. ____

3. LOW, MID, AND HIGH DIGITAL COMPRESSORS (KGLs): Switch Mother Board Input to -20, and VR3 to about 1 o'clock position and increase Front Panel Master Input to light LEDs to full scale. At this point, Low, Mid, and High Compressor Inputs on Front Panel are to be set at one-half open for Low and Mid, and full open for High. ____

4. QUIETING SOURCE: First two switches of the Quieting Source on the Front Panel are placed in "In 1" and "In 2" positions. Decrease Master Input to "O" and check for "Quieting Mode". ____

5. PEAK LIMITER: Use Oscilloscope to check input signal on pin 1 and output signal on pin 3. ____

6. LINE AMPLFIER: Check input signal on pin 1, and output signal on pin 9 and 10. A clean signal should be seen on the Oscilloscope. ____

7. PROGRAM EQUALIZER: Set each of the four Front Panel Program Equalizer pots to 12 o'clock position and check for output signal on the line amplifier with the EQ Switch in the "Out" position. The amplitude on the Oscilloscope should be the same with the Switch in the "Out" position and "In" position. ____

8. CLIP LIGHT FUNCTION LED: Increase Front Panel Limiter Drive pot until Peak Threshold LED fires. Clipping occurs when this light comes on. ____

USE THIS PROCEDURE AS A TROUBLE SHOOTING GUIDE

CAUTION

Do not short the line output to ground. This will damage the output stage. If the system is to be used unbalanced, use one side of the output and ground only; leave the second disconnected.

IMPORTANT

The input control to the peak limiter labeled LIMITER DRIVE determines the amount of clipping desired. This is adjusted subjectively. Turn the control clockwise until you arrive at audible distortion and then back out of the distortion. The LED above the control indicates only that the limiter circuit is active, not that the maximum level set has been reached.

AM STEREO - SUM & DIFFERENCE SETUP

Entry portals for AM stereo operation in Sum & Difference have been provided. In this setup, Input 1 is Left and Input 2 is Right on both units which when paralleled out-of-phase to a second 610, forms the Sum for the first unit and the difference for the second unit.

Internal input attenuators serve as mixers for these two inputs. In order to obtain a proper match in level for these two inputs, feed from a stereo source, a Mono signal. Connect the Left to Input 1 and follow the Input Buffer Setup procedure in order to protect input buffers. Once this is accomplished, feed the Right channel out-of-phase to Input 2 and adjust its internal trim pot until signal nulls. The channels are now balanced. Return Input 2 lead to proper phase. This now forms the Sum of Left plus Right. The input of the second 610 should be paralleled to the first and the same procedure should be followed with the exception that this unit should be left out-of-phase. The second unit then forms the difference. Disconnect the mono source, and return to stereo.

Follow interface instructions from specific Am Stereo Exciter manufacturer to complete the setup.

TABLE OF CONTENTS

INTRODUCTION

Technical alignment procedures are not required for the installation of the Discriminate Audio Processor Model 610 as there are no linearity or DC balance controls due to the use of digital technology. There are input setup adjustments and the lit should be removed.

In order to prevent overload of input buffer amplifiers which cause clipping before the signal reaches the Master Input control, determine if the input pads should be switched in or out. A reference indication of proper ranges for these switches can be determined by setting Master Input control to one-half open, Low and Mid to one-half open, and High Frequency Input, full open. The internal switches and pads should be adjusted so that program will compress no more than 8 to 10 dB. This will be more pronounced on the Mid Meter because of the broadness of this band.

The Input Sensitivity procedure assures that adequate head room is available for program dynamics and transients. These switchable and variable pads are S1 & S2, VR1 & VR2, respectively, and are located on a pc board at the rear terminal internally on units Serial 299 down, and in front of the Low Compressor channel on all others.

The FM units should operate directly into the Stereo Generator ports of Model 80-B.

SPECIFICATIONS

DISCRIMINATE AUDIO PROCESSOR - DIGITAL CONTROLLED MODEL 610

A tri-band AGC (Automatic Gain Control) with Peak Limiter.

TRI-BAND CROSSOVERS AT 3 dB POINTS

Low	20 Hz to 173 Hz
Mid	173 Hz to 6.5 kHz
High	6.5 kHz to 20 kHz

Chosen for best accoustical masking of compression effects. This section is not used for frequency response.

FOUR POSITION EQUALIZER FOR SIGNAL RESPONSE POSITIONED AFTER TRI-BAND

Low	19 Hz to 71 Hz
Low/Mid	71 Hz to 710 Hz
High/Mid	710 Hz to 4.2 kHz
High	4.2 kHz to 15 kHz

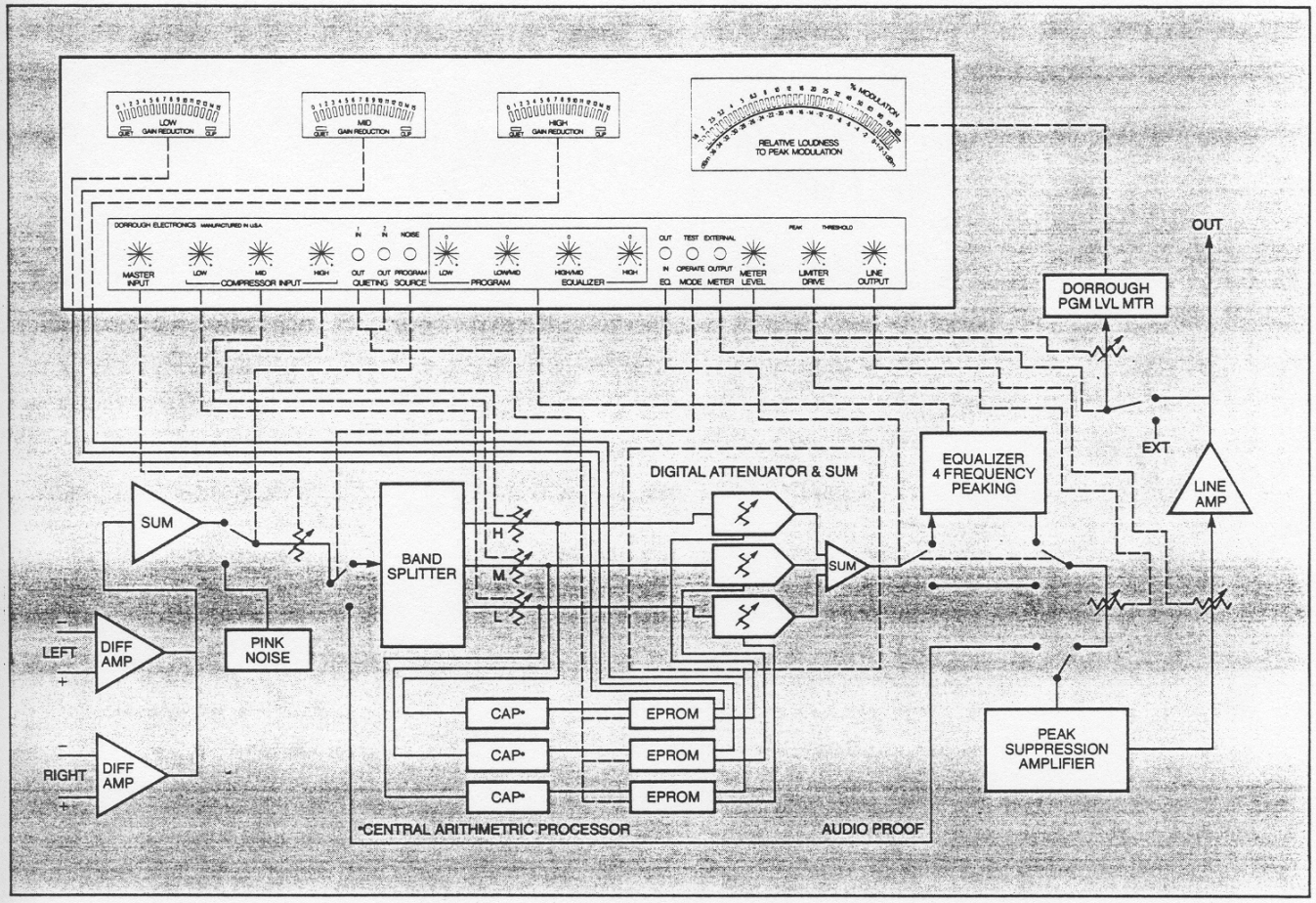
PEAK LIMITER - ACTIVE ADJUSTABLE HARD/SOFT CLIP

COMPRESSION LED METERING - 16 LEDs In 1 dB INCREMENTS

Relative Loudness to Peak Meter on Output
Meter readings for both Internal and External ranges
-10 dB for 0 indication

INPUT	Differential 600 ohm bal. -30 dBm to +20 dBm
MAXIMUM OUTPUT	Balanced to ground +24 dBm
COMPRESSION RANGE	24 dBm in each channel
ATTACK TIME	EPROM factory set
RELEASE TIME	EPROM factory set
THRESHOLDS	EPROM controlled
DISTORTION	.3% below clipping threshold
SIGNAL TO NOISE	72 dBm at compression threshold; 79 dBm in test mode
POWER REQUIREMENTS	110/220 V, 50/60 Hz, 75 watts

Simplified Block Diagram

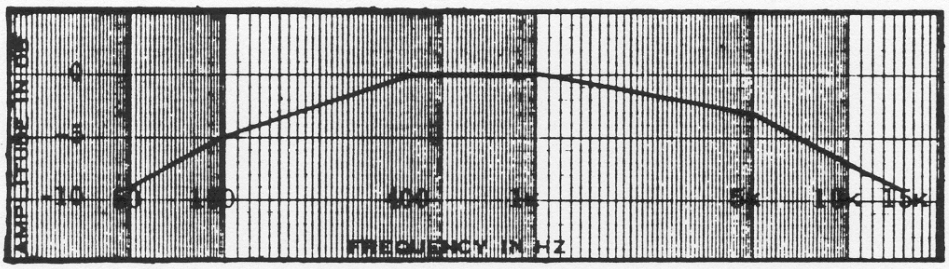


THEORY OF OPERATION

The Discriminate Audio Processor Model 610 makes use of the most up-to-date technology available. The unit has been computer designed to deliver the most colorless and clean audio available.

TRI-BAND SYSTEM

The unit splits the audio into three discriminate bands. One only needs to reflect on loudspeaker technology theory to note that 3-way loudspeaker systems offer low levels of IM distortion. Further investigation into spectral density shows that the maximum amplitudes occur at mid frequencies, with gentle slopes toward the low and high frequencies. Low frequencies exhibit lower amplitudes because, for equal power distribution of amplitude vs time, the longer the period the lower will be the amplitude. The high frequency content in music and speech is also lower in amplitude. This part of the audible spectrum carries the harmonic or overtone content of the program, which by its nature is reduced in amplitude.



Spectral Analysis Showing Amplitude Rolloffs

Even if program material were very bright, electrically, the higher the frequency, the less amplitude necessary to satisfy the ear acoustically.

EQUALIZATION SLOPES

Six dB per octave equalization slopes were chosen as crossover points to the compressors. These slopes make for the best possible acoustic masking of the effects of compression. Intentionally, the three channels do not sum flat electrically, though they sum flat acoustically.

To prove that this system and its crossovers are not modifying the integrity of the program source, listen to the processor summed out-of-phase with the source feeding it. Even with heavy compression, the summation should null smoothly at better than 20 dB.

Thus, the physics of the concept argue with the analysis of tone, but confirm what the ear is able to hear.

DIGITAL CONTROLLED ATTENUATORS

ATTACK TIMES

The band splitter feeds the three digital controlled/analog attenuators through individual input controls on the front panel. These controls determine the amount of AGC action of the compressor channels. The gain changes in the three channels are extremely fast, even at 15 kHz, the attenuation will act on the first one-half cycle. The attenuators will automatically adjust to the dynamic parameters of program. This fast action, rather than the conventional smooth RMS, preserves the differential of the fundamentals, and its harmonic content. In addition, this fast action retards peaks as the channels are summed and prevents intermodulation distortion buildup in the peak clipper.

RECOVERY TIMES

The discriminate channels are identical. The recovery times for each are located on the large motherboard directly under each card. The recoveries, like the crossovers, play an important part in the quality of the system.

Slower times were chosen to allow for better dynamics at even deep compression ranges.

If more sensationalism, that crowded up-beat sound, is desired, these recovery times can be spedup by lowering the value of the time constant resistors.

EQUALIZATION

From the summation of the three channels, a four position equalizer can be switched in for subjective or technical response changes. Q's will move about the spectrum in accordance with the boost and attenuation of the four positions.

SOFT PEAK CLIPPING

The Equalizer feeds the active soft peak clipper. This system does not demand the necessity of a wide band peak limiter. The very nature of the wide band limiter would destroy the quality of the discriminate system feeding it. Rather, a soft clipper is used.

Soft clipping does not mean the lack of good peak protection, but rather the ratio of the clip is spongy. The peak is "slamming" into a padded brick wall. As a result, the waveform then becomes rounded at the top, rather than squared. The current limiting device used limits the rate of acceleration of the leading edge of the input waveform, reducing odd order harmonic content. This is more appealing accoustically.

Soft clipping does not show a high average on an analog modulation monitor, A reading of 75 to 90% is normal and only on sustaining notes will the readings be higher. The true effectiveness of this type of clipping can be seen on an oscilloscope or on the Relative Loudness to Peak Modulation Meter on the output of the DAP. This Meter should be calibrated to the Modulation Monitor which will then enable you to set your clipping level for maximum loudness.

INSTANTANEOUS LED METERING

The Relative Loudness to Peak Modulation Meter serves an important function. First, by nature of the LEDs, it gives an instantaneous reading of the crest factor, in addition to displaying duty time. These two visual functions allow you to consider Peak information and RMS content at the same time.

When applying the Pink Noise source heavily into the Peak Limiter, the Loudness Meter will show a Peak and an Average of a given amount. When the Meter is switched to an external source, such as the Modulation Monitor audio output, it can easily be noted if the reading is identical to that of the output of the processor. If there is modification of the audio peak and the modulated duty time from the transmitter,such as the modulated duty time registering higher, this would show that the transmitter tends to saturate; if the modulation duty time remains constant, but the peak fluctuates, this would indicate probably "ringing" in the transmitter, thus proving that modification of the audio is taking place external to the processor.

Once you calibrate this Meter you will discover how erroneous analog meter readings can be as indicators of complex waveforms.

INSTALLATION AND SETUP PROCEDURES

INSTALLATION

The Am unit and the TV unit should be installed at the transmitter and the FM units should be installed as close to the stereo generator as possible. This system can be installed at the studio when using the Transmitter Drive/ Soft Clipper Dorrough Model 610XU. In this case, the clipper on the studio unit should be used with caution to prevent ringing, overshoot, and unpredictable gain changes between the studio and transmitter interface.

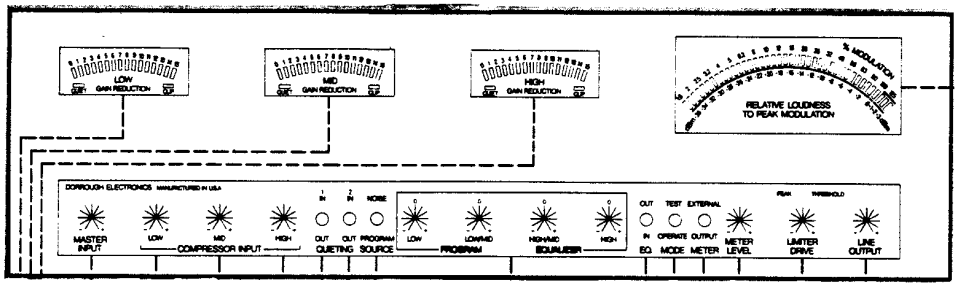
INPUT BUFFERS

To protect input buffer amplifier from overloading, adjust Master Input pot on the front panel one-half open, High Compressor Input full open, and Mid and Low Compressor Inputs one-half open. While feeding program material, adjust internal variable attenuators located in front of the Low Compressor, until one or all compression meters read up to the red LEDs, approximately 8 to 10 dB. These internal controls should be set somewhere between one-half and full open; if not, check Sensitivity Switches located next to the variable attenuators.

INPUTS

When using the unit for mono or for conventional stereo, one unit for left and a second for right, Input 1 or Input 2 can be used. Two inputs have been provided for Sum and Difference processing.

FRONT PANEL ADJUSTMENTS



MASTER INPUT

The two internal variable input attenuators are buffered, mixed, and fed to the Master Input Control on the front panel which then feeds the crossovers. The crossover outputs appear on the panel as Low, Mid, and High Compression Inputs. The crossover points for the compressors are:

Low	20 Hz to 173 Hz
Mid	173 Hz to 6.5 kHz
High	6.5 kHz to 20 kHz

This section is for establishing AGC ranges and is not used for frequency response.

QUIETING SOURCE

There are two switches for noise gating. They are labeled Quieting 1 & 2. In the "up" position, these switches will gate 3 dB each, for a total of 6 dB in the absense of audio. The noise reduction is programmed in the EPROM. This prevents a "click-in" effect when the unit responds to program or returns to a quiescent state. The Quieting Mode is not needed when using small amounts

of compression, approximately 7 dB or less. When the quieting circuits are activated, a quieting LED will illuminate. The systems operate independently for each channel but will track when tied to a second unit. A clip LED in each display window indicates channel overload.

PINK NOISE/PROGRAM SOURCE

The next switch will select either Pink Noise or Program Source. This switch should be in the "down" position when running normal program.

PROGRAM EQUALIZER

The three compressor channels are summed and buffered internally, and electrically feed the Program Equalizer. The Equalizer has four positions.

Low	19 Hz to 71 Hz
Low/Mid	71 Hz to 710 Hz
High/Mid	710 Hz to 4.2 kHz
High	4.2 kHz ro 15 kHz

The Equalizer can be switched In or Out. Subjective timbre and quality is provided by the Equalizer. It should be noted that as you increase any range of frequencies, they will be boosted into the limiter circuit, therefore, slight attenuation of the Limiter Drive may be necessary.

MODE

A Mode switch to bypass the entire Discriminate System is provided. In Operate the Limiter Drive is connected to the output of the Equalizer. In Test position the switch is looking at the internal submix ahead of the Master Input Control.

METER AND METER LEVEL

When the Meter Switch is in the Output position, the Meter is fed by the Meter Level control which can be adjusted to a specific reading for the output of the system. When in the External position, the control is not active. In this position the large Meter is looking at two buffer amplifiers summed and fed by two mixing controls located internally on the Motherboard at the rear of the chassis. This Meter should be calibrated with the Modulation Monitor or any external monitoring source. Calibration should be done with tone.

LIMITER DRIVE

The input control to the Peak Limiter designated Limiter Drive determines the extent of modification of the Peak amplitude in reference to the duty time. The LED indicator located above the control will illuminate when the limiter circuits are active indicating clip threshold. The clip should be adjusted subjectively. The clip ratio can be observed on the Loudness Meter under program conditions. Heavy peak limiting will reduce the differential between Peak and Persistence. Maximum modulation setting should generally be done with dynamic solo material, such as voice. In this way the ear can more readily discern the distortion factor.

LINE OUTPUT

The Line Amplifier is driven by the Line Output control which will vary the output from infinity to +24 dB. This circuit does not use a transformer output, rather it operates as a differential high and low to ground designated as + or - and ground. If the output is to be used unbalanced, it is important not to short high or low to ground. Use one side or the other, and ground.

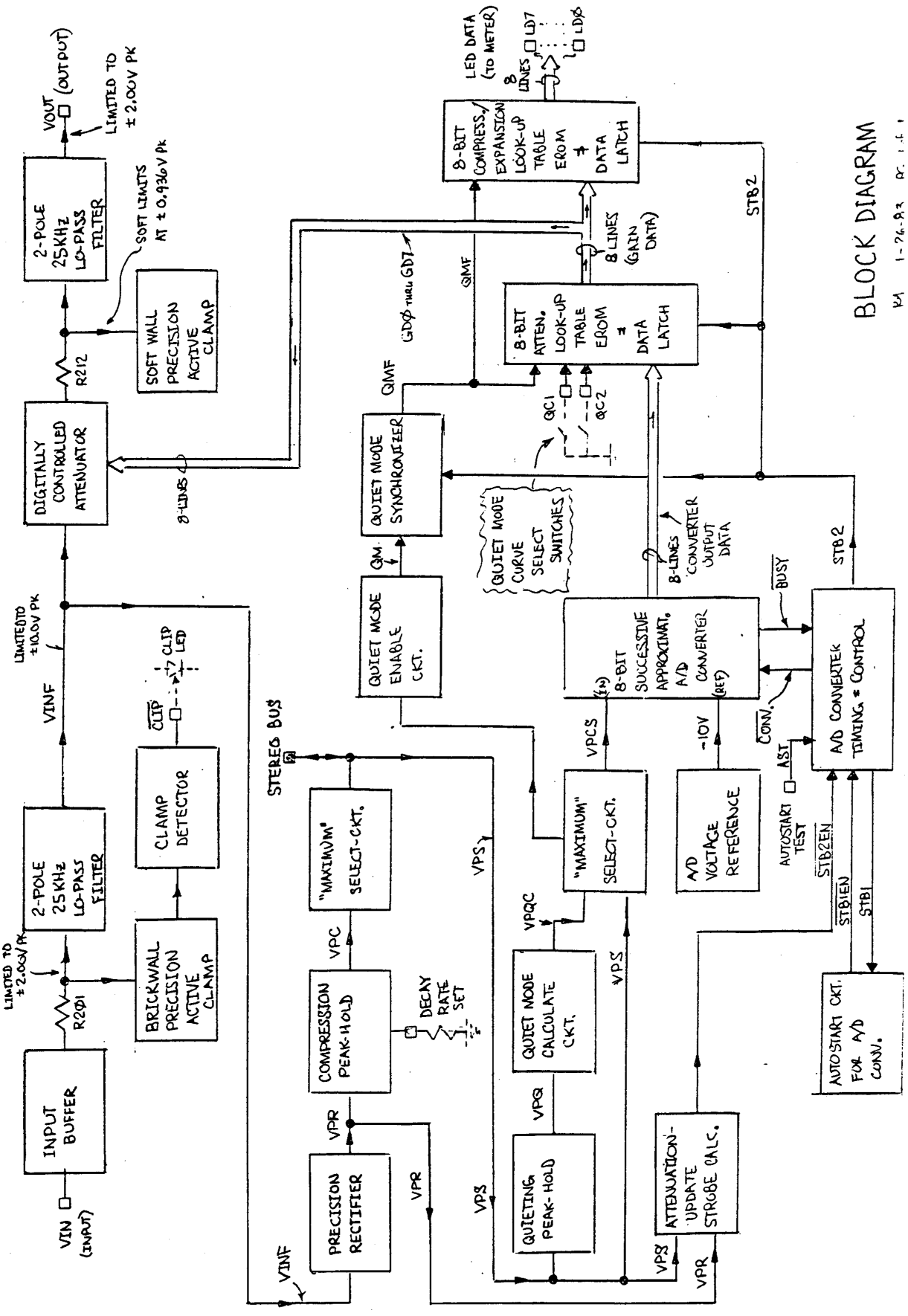
The performance of the Discriminate Audio Processor should not be judged along side of other multibands at the transmitter site while listening to a wide band monitor. Systems begin "chasing", fatigue sets in, and judgements are mistakenly made on extremes of response characteristics that will "in the real world" have no validity. Your evaluation at your transmitter does not take into consideration your total system. Your station is relative to your competition. Your adjustments and judgements should be made by comparison to your competitors. If your station is tuned well, it should sound good on most any radio. The equalization and clipping should be tuned for rich, full, open, yet clean apparent loudness. Brightness alone is not the answer, but overall good fidelity.

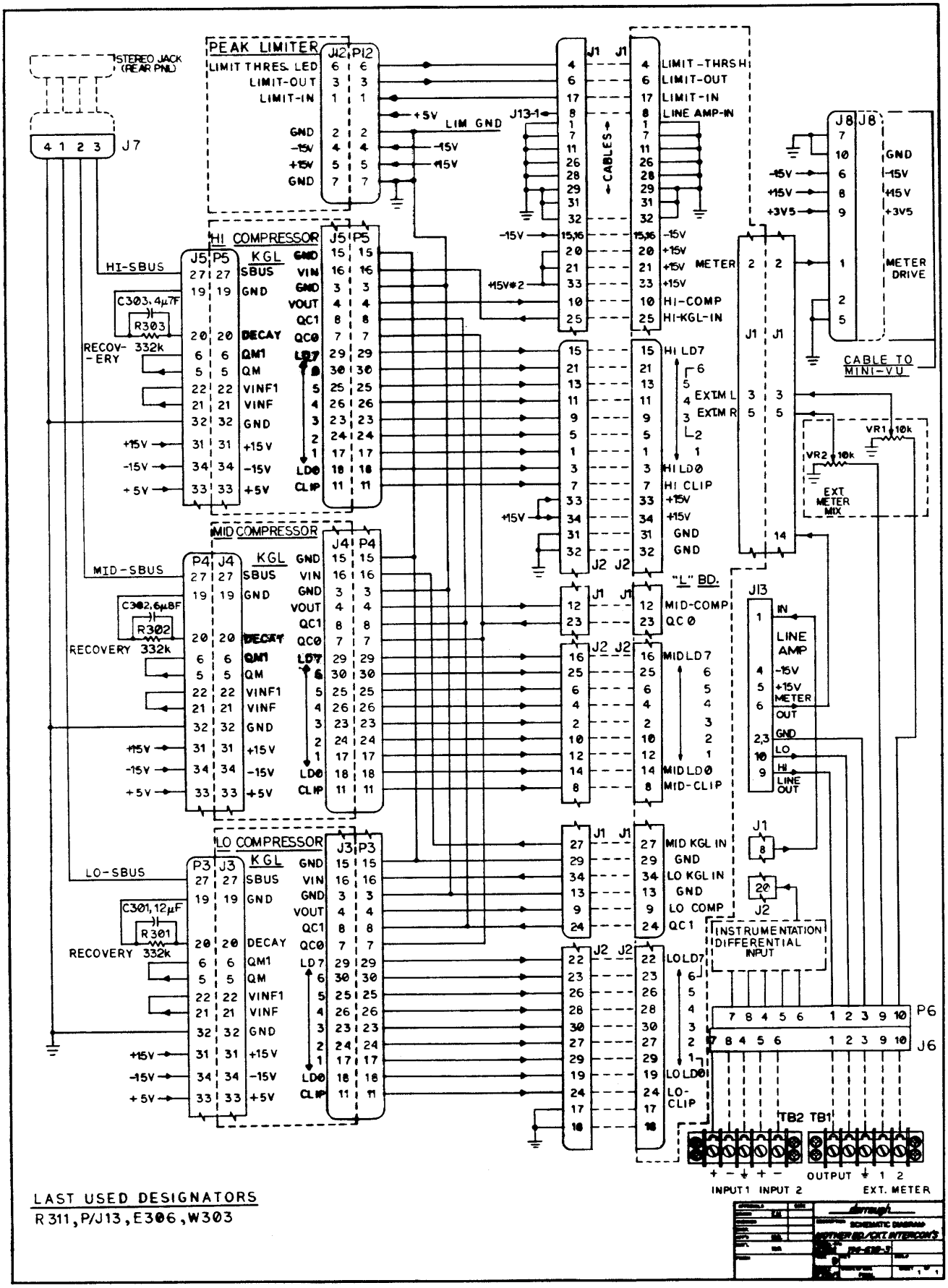
AM STEREO - SUM & DIFFERENCE SETUP

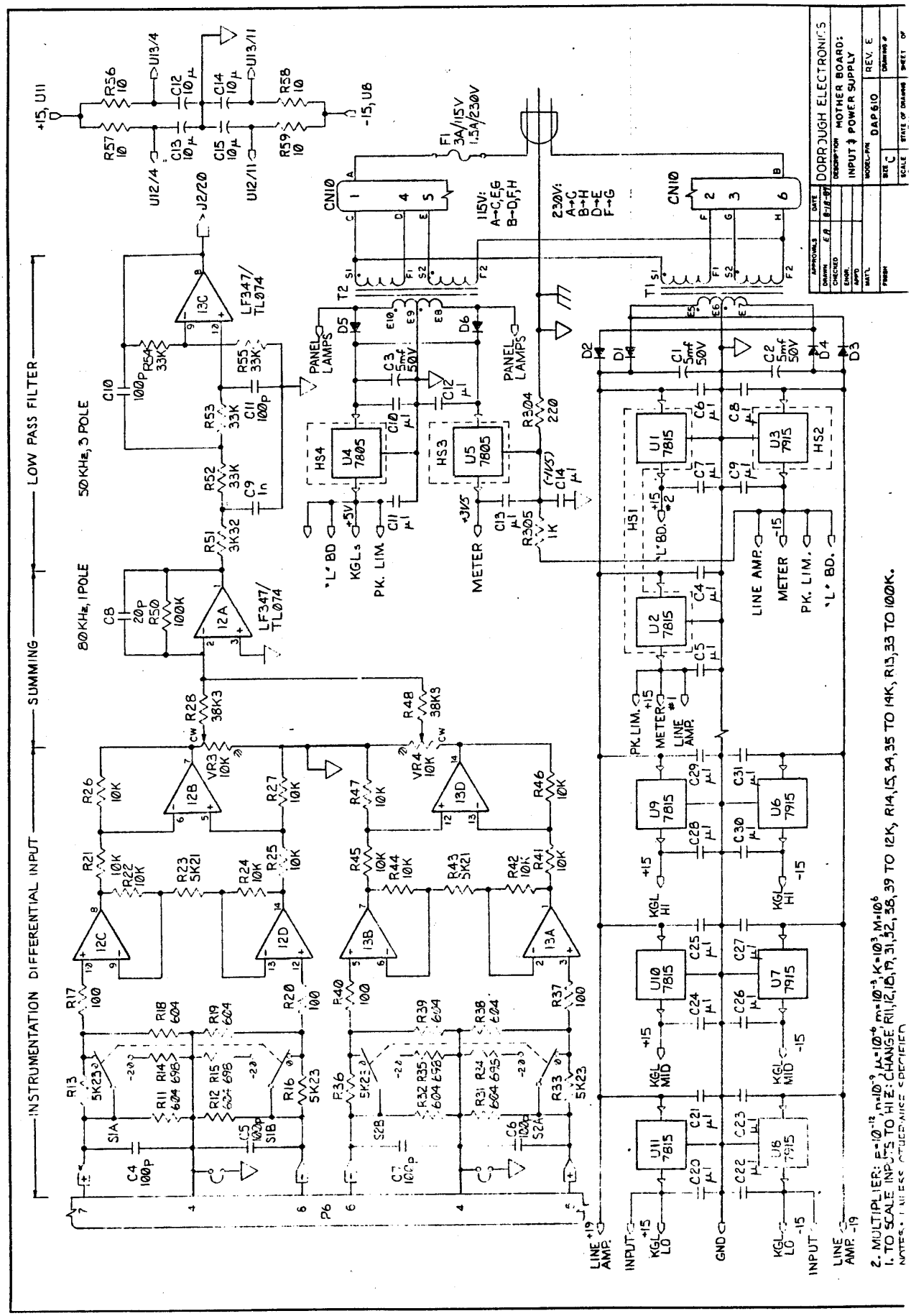
Entry portals for AM stereo operation in Sum & Difference have been provided. In this setup, Input 1 is Left and Input 2 is Right on both units which when paralleled out-of-phase to a second 610, forms the Sum for the first unit and the difference for the second unit.

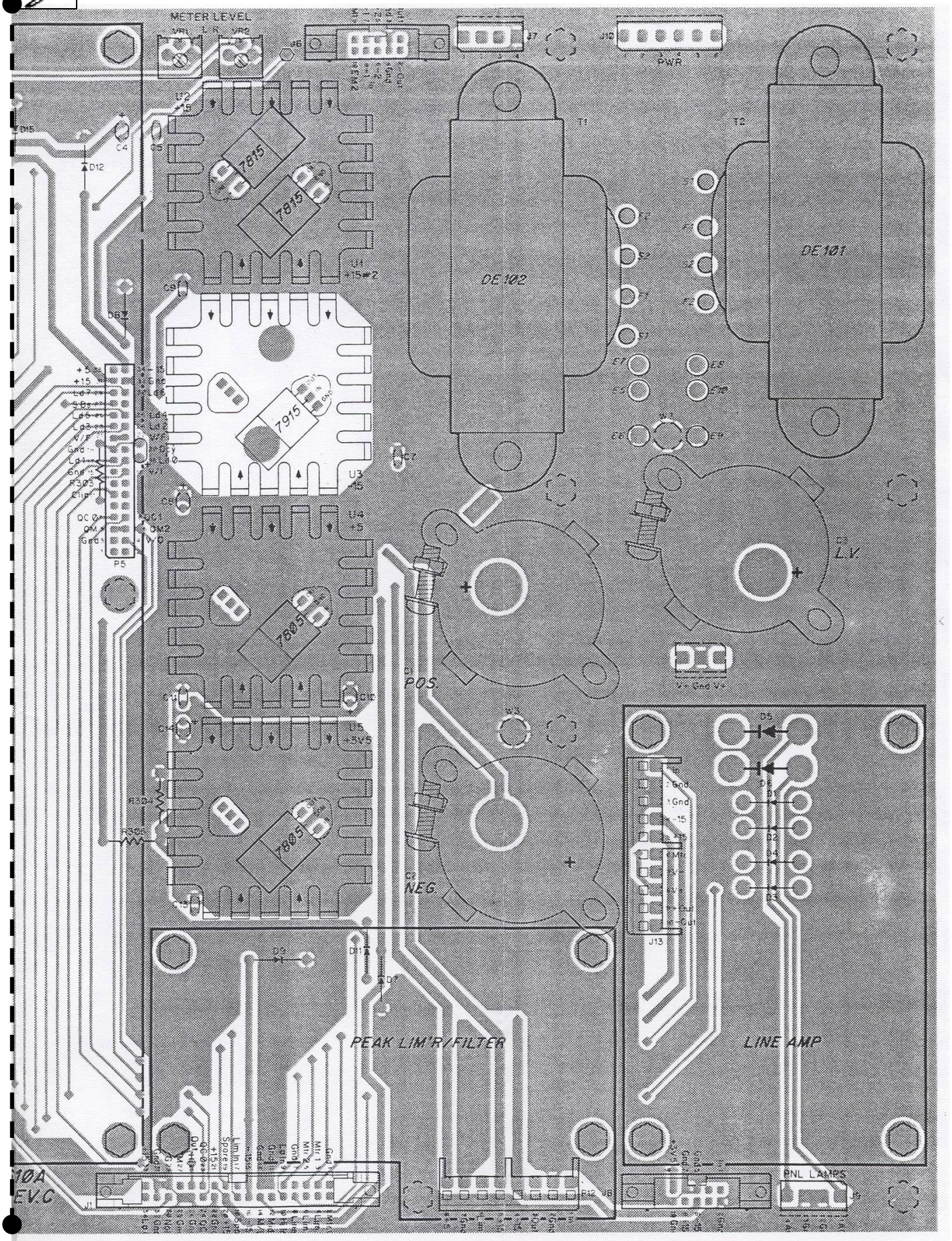
Internal input attenuators serve as mixers for these two inputs. In order to obtain a proper match in level for these two inputs, feed from a stereo source, a Mono signal. Connect the Left to Input 1 and follow the Input Buffer Setup procedure in order to protect input buffers. Once this is accomplished, feed the Right channel out-of-phase to Input 2 and adjust its internal trim pot until signal nulls. The channels are now balanced. Return Input 2 lead to proper phase. This now forms the Sum of Left plus Right. The input of the second 610 should be paralleled to the first and the same procedure should be followed with the exception that this unit should be left out-of-phase. The second unit then forms the difference. Disconnect the mono source, and return to stereo.

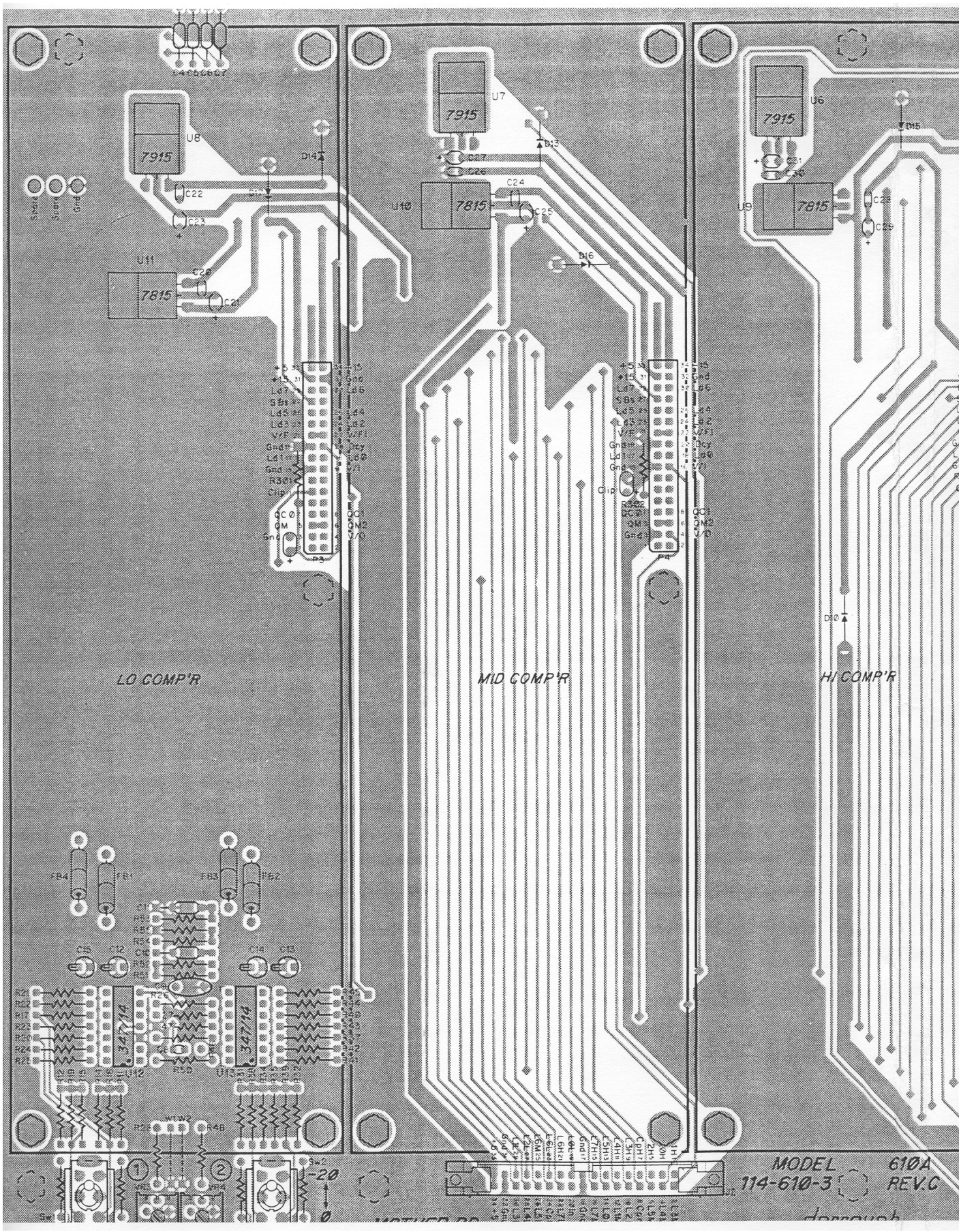
Follow interface instructions from specific Am Stereo Exciter manufacturer to complete the setup.

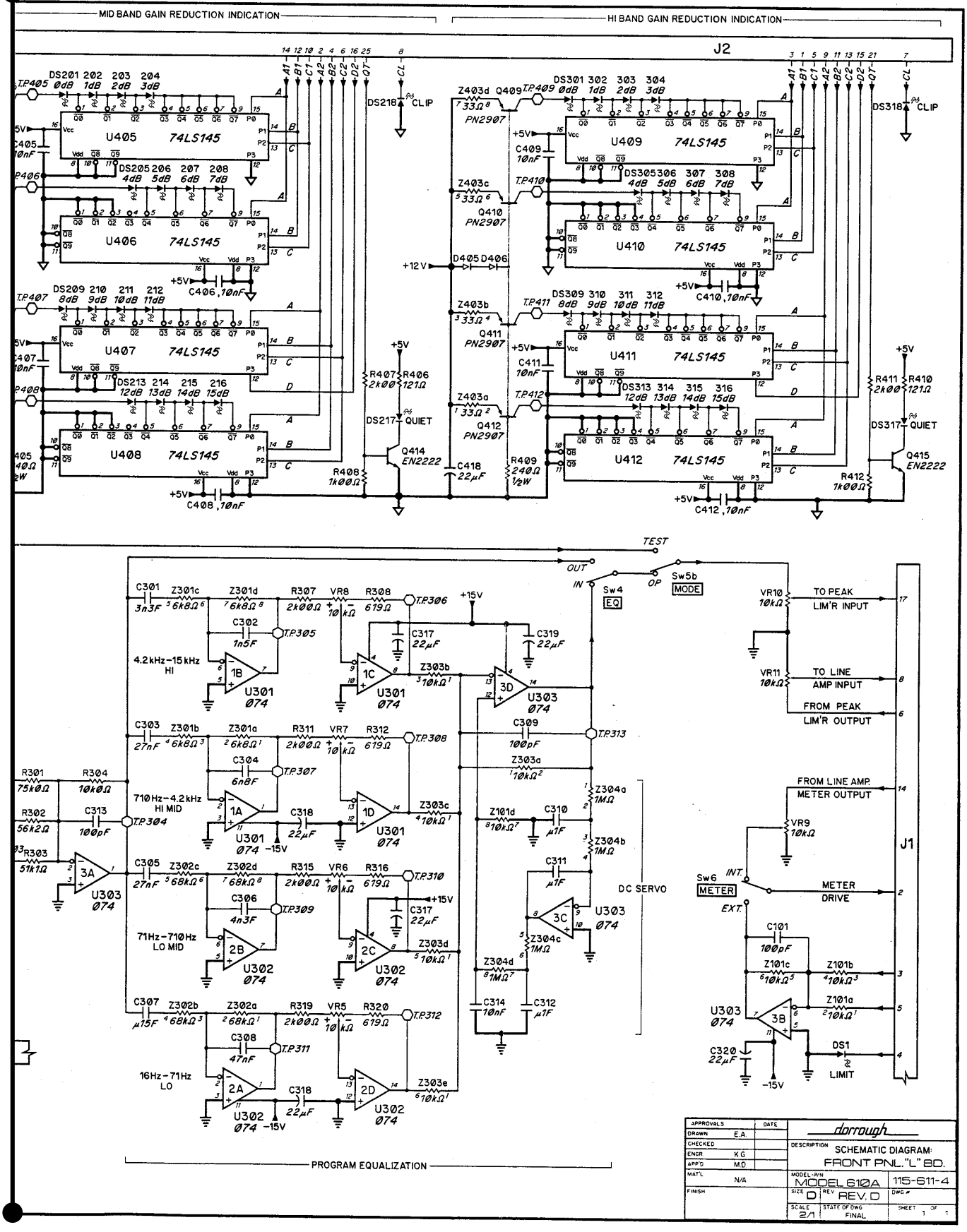

BLOCK DIAGRAM
VIN (INPUT)
INPUT BUFFER
R201
LIMITED TO ±2.00V PK
2-POLE 25KHz LO-PASS FILTER
BRICKWALL PRECISION ACTIVE CLAMP
CLAMP DETECTOR
CLIP
CLIP LED
VINF
LIMITED TO ±10.0V PK
2-POLE 25KHz LO-PASS FILTER
R212
VOUT (OUTPUT)
LIMITED TO ±2.00V PK
SOFT LIMITS AT ±0.936V PK
SOFT WALL PRECISION ACTIVE CLAMP
DIGITALLY CONTROLLED ATTENUATOR
8-LINES
STEREO BUS
PRECISION RECTIFIER
VPR
COMPRESSION PEAK-HOLD
DECAY RATE SET
VPC
"MAXIMUM" SELECT-CKT.
VPS
QUIETING PEAK-HOLD
VPQ
QUIET MODE CALCULATE CKT.
VPQC
"MAXIMUM" SELECT-CKT.
VPCS
ATTENUATION-UPDATE STROBE CALC.
VPQS
QUIET MODE ENABLE CKT.
QM
QUIET MODE SYNCHRONIZER
QMF
GD0 thru GD7
QUIET MODE CURVE SELECT SWITCHES
QC1
QC2
8-BIT ATTEN. LOOK-UP TABLE EROM + DATA LATCH
8 LINES (GAIN DATA)
8-BIT COMPRESS./ EXPANSION LOOK-UP TABLE EROM + DATA LATCH
LED DATA (TO METER)
8 LINES
LD7
LD0
STB2
8-BIT SUCCESSIVE APPROXIMAT. A/D CONVERTER
(+in)
(REF)
8-LINES CONVERTER OUTPUT DATA
BUSY
CONV.
-10V
A/D VOLTAGE REFERENCE
A/D CONVERTER TIMING + CONTROL
AST
AUTOSTART TEST
STB2EN
STB1EN
STB1
AUTOSTART CKT. FOR A/D CONV.

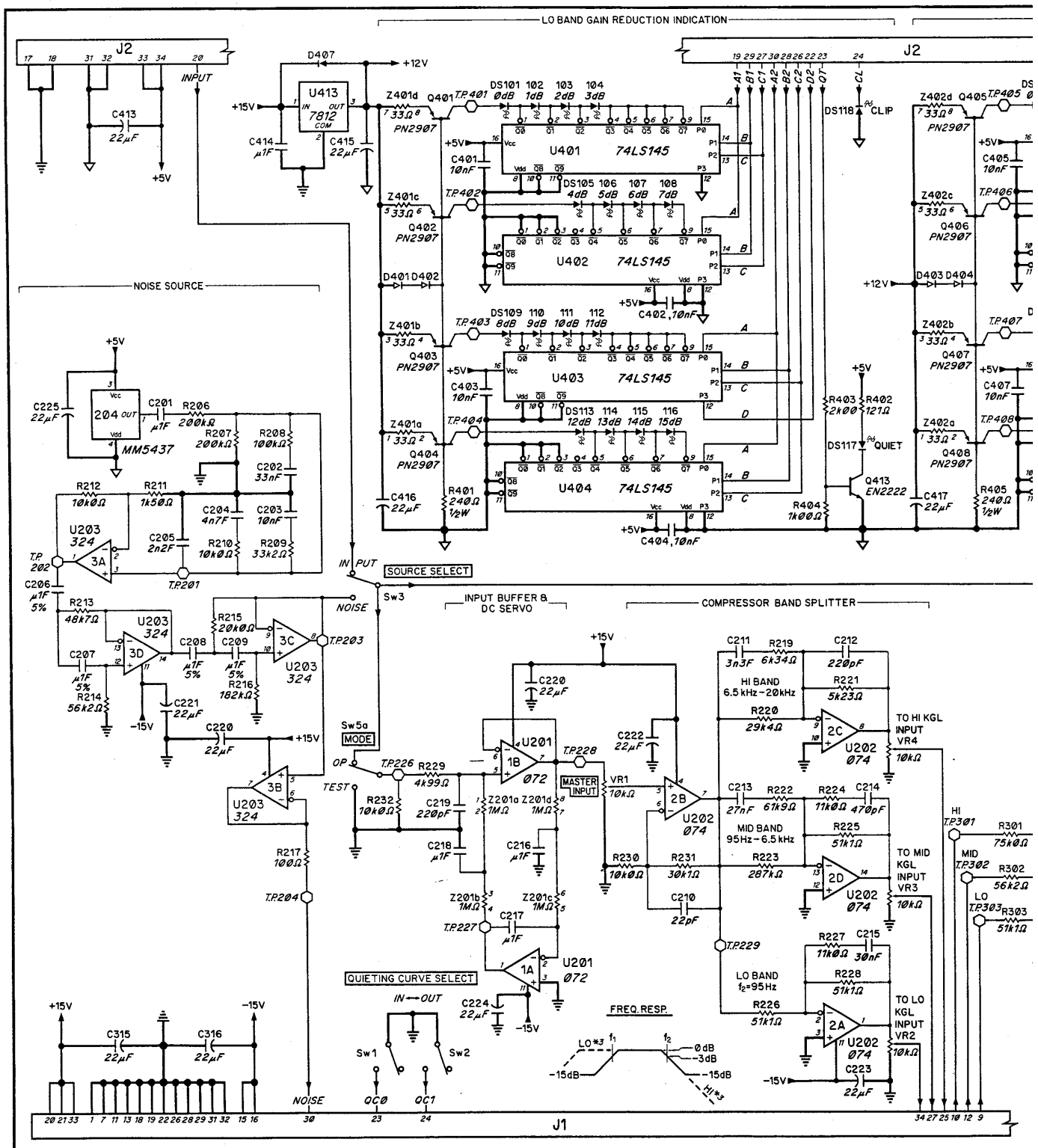

PEAK LIMITER
LIMIT THRES. LED
LIMIT-OUT
LIMIT-IN
GND
-15V
+15V
GND
+5V
LIM GND
STEREO JACK (REAR PNL)
J7
HI COMPRESSOR
MID COMPRESSOR
LO COMPRESSOR
KGL
SBUS
VIN
GND
VOUT
QC1
QC0
DECAY
QM1
QM
VINF1
VINF
LD7
LD0
CLIP
HI-SBUS
MID-SBUS
LO-SBUS
C303, 4μF
R303
C302, 6μF
R302
C301, 12μF
R301
RECOV-ERY 332k
RECOVERY 332k
CABLES
LIMIT-THRSH
LIMIT-OUT
LIMIT-IN
LINE AMP-IN
METER
HI-COMP
HI-KGL-IN
HI LD7
EXTM L
EXTM R
HI LD0
HI CLIP
MID-COMP
QC 0
MID LD7
MID LD0
MID-CLIP
MID KGL IN
LO KGL IN
LO COMP
QC1
LO LD7
LO LD0
LO-CLIP
"L" BD.
LINE AMP
IN
METER
OUT
LO
HI
LINE OUT
INSTRUMENTATION DIFFERENTIAL INPUT
CABLE TO MINI-VU
METER DRIVE
EXT METER MIX
VR1 10k
VR2 10k
TB2 TB1
INPUT 1 INPUT 2
OUTPUT
EXT. METER
LAST USED DESIGNATORS
R311, P/J13, E306, W303


INSTRUMENTATION DIFFERENTIAL INPUT — SUMMING — LOW PASS FILTER
80KHz, 1 POLE
50KHz, 3 POLE
LF347/TL074
+15, U11
-15, U8
U12/4
U12/11
J2/20
U13/4
U13/11
CN10
T1
T2
F1 3A/115V 1.5A/230V
115V: A→C,E,G B→D,F,H
230V: A→C B→H D→E F→G
PANEL LAMPS
KGL's
PK. LIM.
METER
LINE AMP.
'L' BD.
INPUT
GND
KGL HI
KGL MID
KGL LO
DORROUGH ELECTRONICS
MOTHER BOARD: INPUT & POWER SUPPLY
DAP 610
REV. E
SIZE C
SCALE
SHEET OF
2. MULTIPLIER: F=10⁻¹², n=10⁻⁹, μ=10⁻⁶, m=10⁻³, K=10³, M=10⁶
1. TO SCALE INPUTS TO HI Z: CHANGE R11,12,10,19,31,32,38,39 TO 12K, R14,15,34,35 TO 14K, R13,33 TO 100K.


METER LEVEL
PWR
DE102
DE101
L.V.
POS.
NEG
PEAK LIM'R/FILTER
LINE AMP
PNL LAMPS
7815
7915
7805

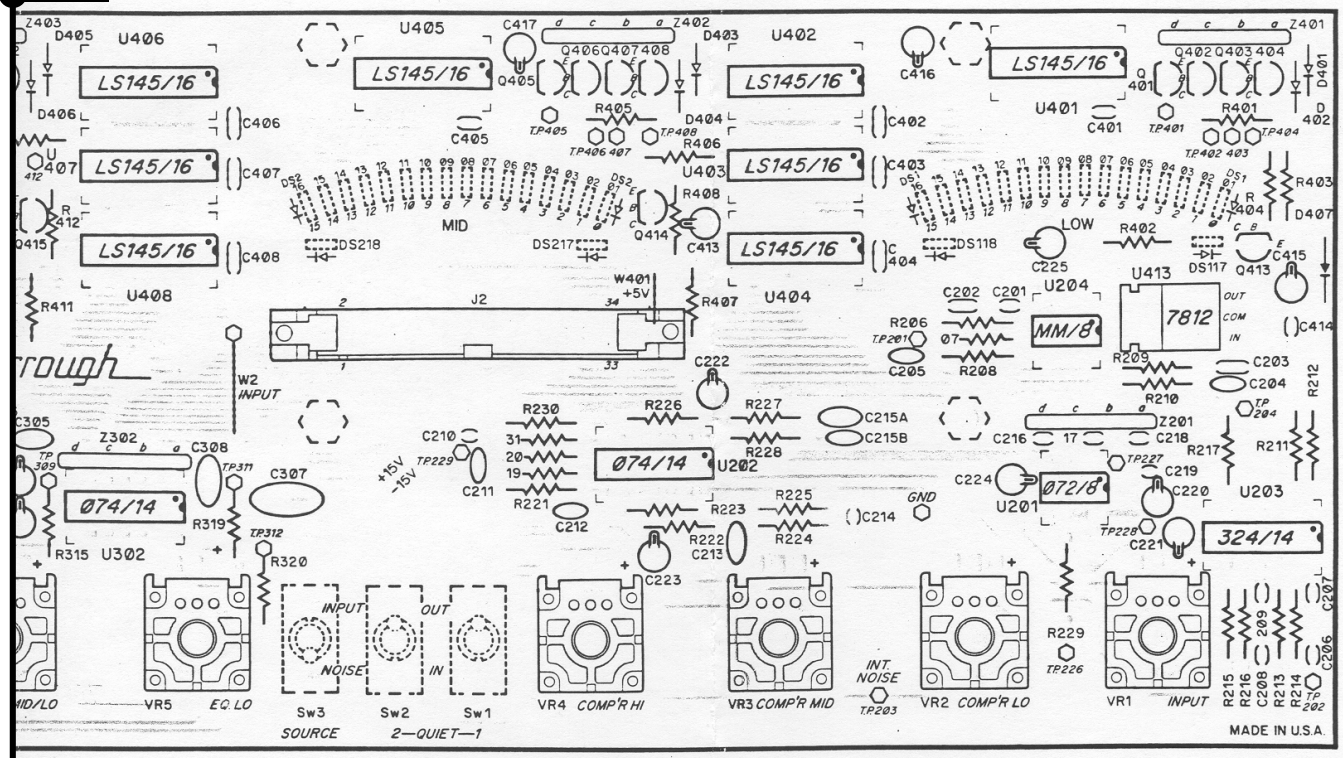

LO COMP'R
MID COMP'R
HI COMP'R
MODEL 610A
114-610-3 REV.C

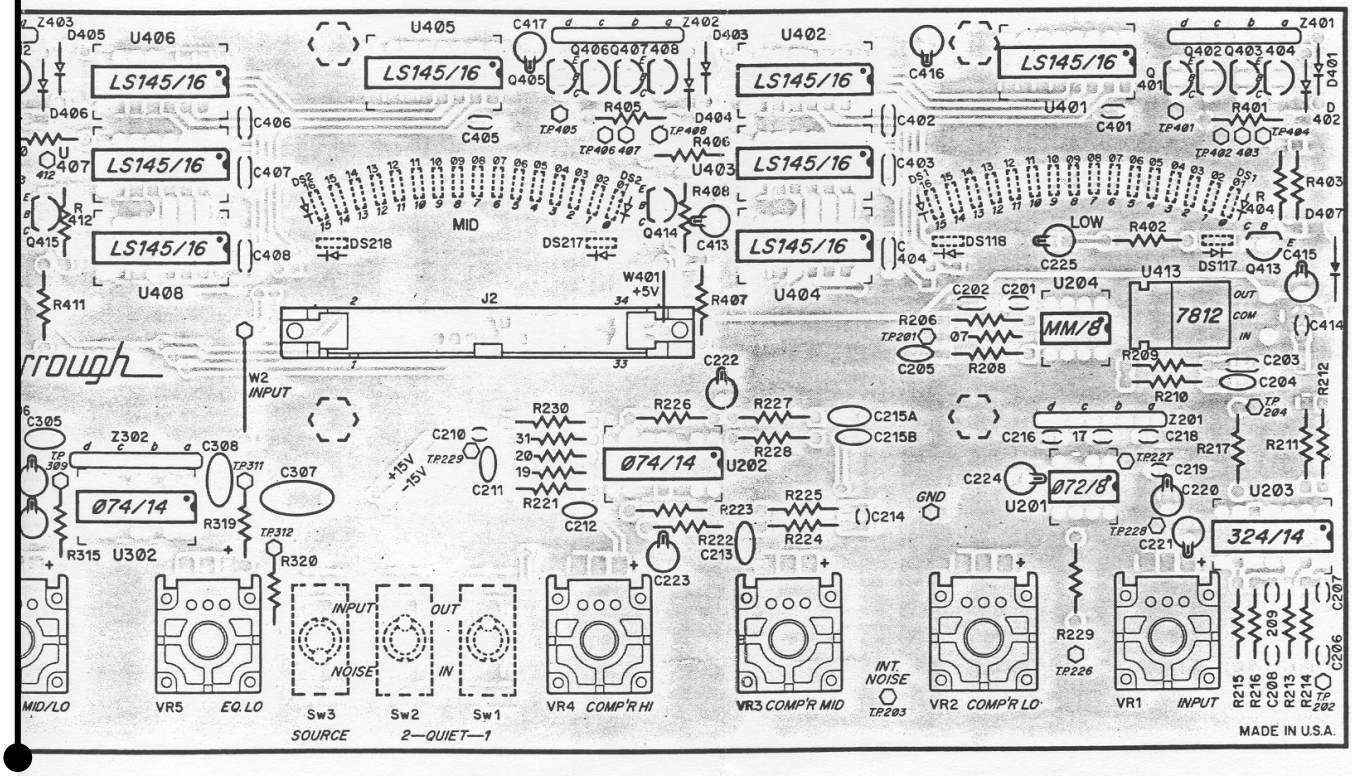

MID BAND GAIN REDUCTION INDICATION
HI BAND GAIN REDUCTION INDICATION
J2
DS201 202 203 204 0dB 1dB 2dB 3dB
DS205 206 207 208 4dB 5dB 6dB 7dB
DS209 210 211 212 8dB 9dB 10dB 11dB
DS213 214 215 216 12dB 13dB 14dB 15dB
DS301 302 303 304 0dB 1dB 2dB 3dB
DS305 306 307 308 4dB 5dB 6dB 7dB
DS309 310 311 312 8dB 9dB 10dB 11dB
DS313 314 315 316 12dB 13dB 14dB 15dB
U405 74LS145
U406 74LS145
U407 74LS145
U408 74LS145
U409 74LS145
U410 74LS145
U411 74LS145
U412 74LS145
DS218 CLIP
DS318 CLIP
DS217 QUIET
DS317 QUIET
Q414 EN2222
Q415 EN2222
Q409 PN2907
Q410 PN2907
Q411 PN2907
Q412 PN2907
D405 D406
+12V
+5V
TEST
OUT
IN
Sw4 EQ
OP
Sw5b MODE
TO PEAK LIM'R INPUT
TO LINE AMP INPUT
FROM PEAK LIM'R OUTPUT
FROM LINE AMP METER OUTPUT
Sw6 METER
INT.
EXT.
METER DRIVE
DC SERVO
4.2kHz–15kHz HI
710Hz–4.2kHz HI MID
71Hz–710Hz LO MID
16Hz–71Hz LO
U301 074
U302 074
U303 074
PROGRAM EQUALIZATION
dorrough
SCHEMATIC DIAGRAM: FRONT PNL."L" BD.
MODEL 610A
115-611-4
REV. D
SCALE 2/1
FINAL



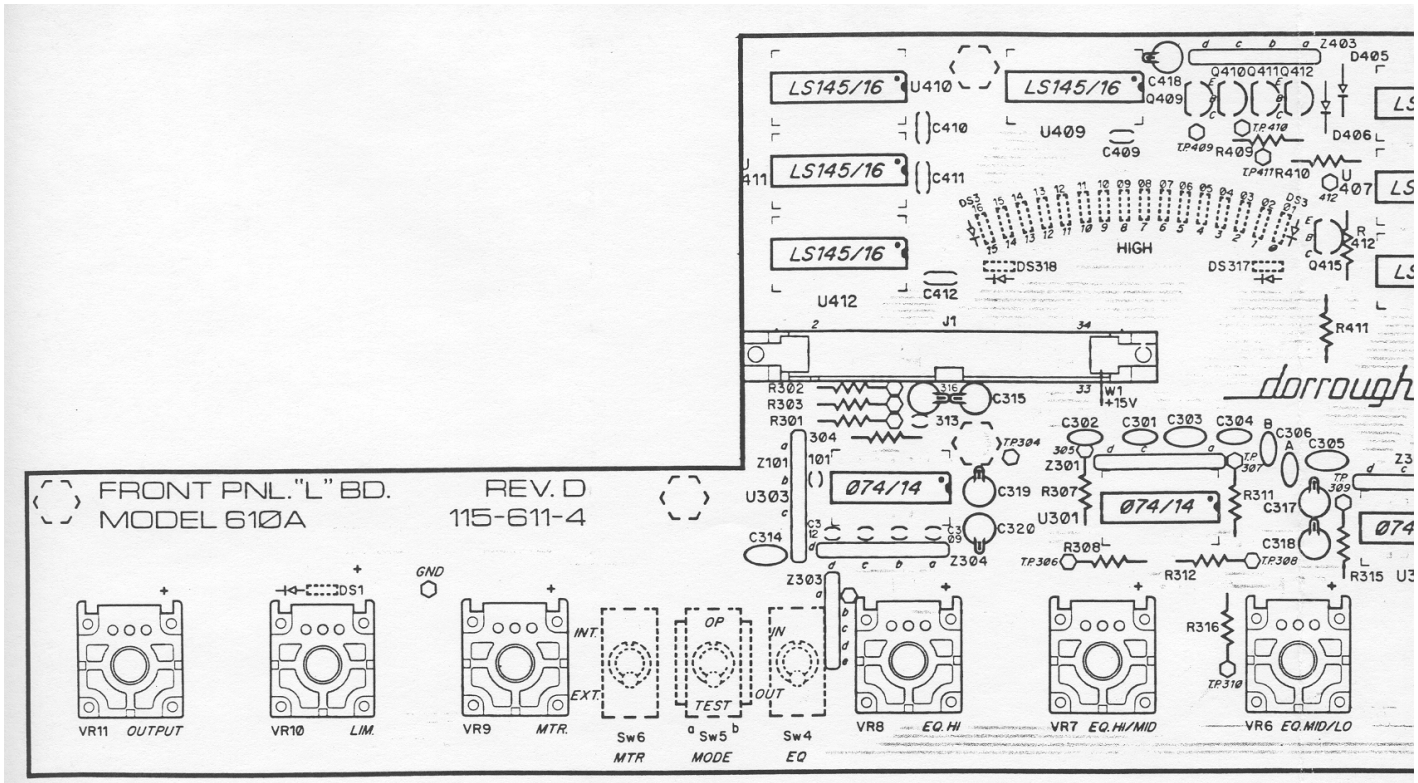
3. KGL ROLLOFF: 10Hz & 25kHz, SPLITTER: 140kHz
2. C215=27nF+3n3F, C306=3n3F+1nF
1. ALL VALUES:
   A. MULTIPLIER AT DECIMAL LOCATION, i.e.:
   3.6kΩ=3k6Ω. .0047μF=4.7nF=4n7F. .22μF=μ22F=220nF
   B. $p=10^{-12}$, $n=10^{-9}$, $\mu=10^{-6}$, $m=10^{-3}$, $k=10^{3}$, $M=10^{6}$, $G=10^{9}$

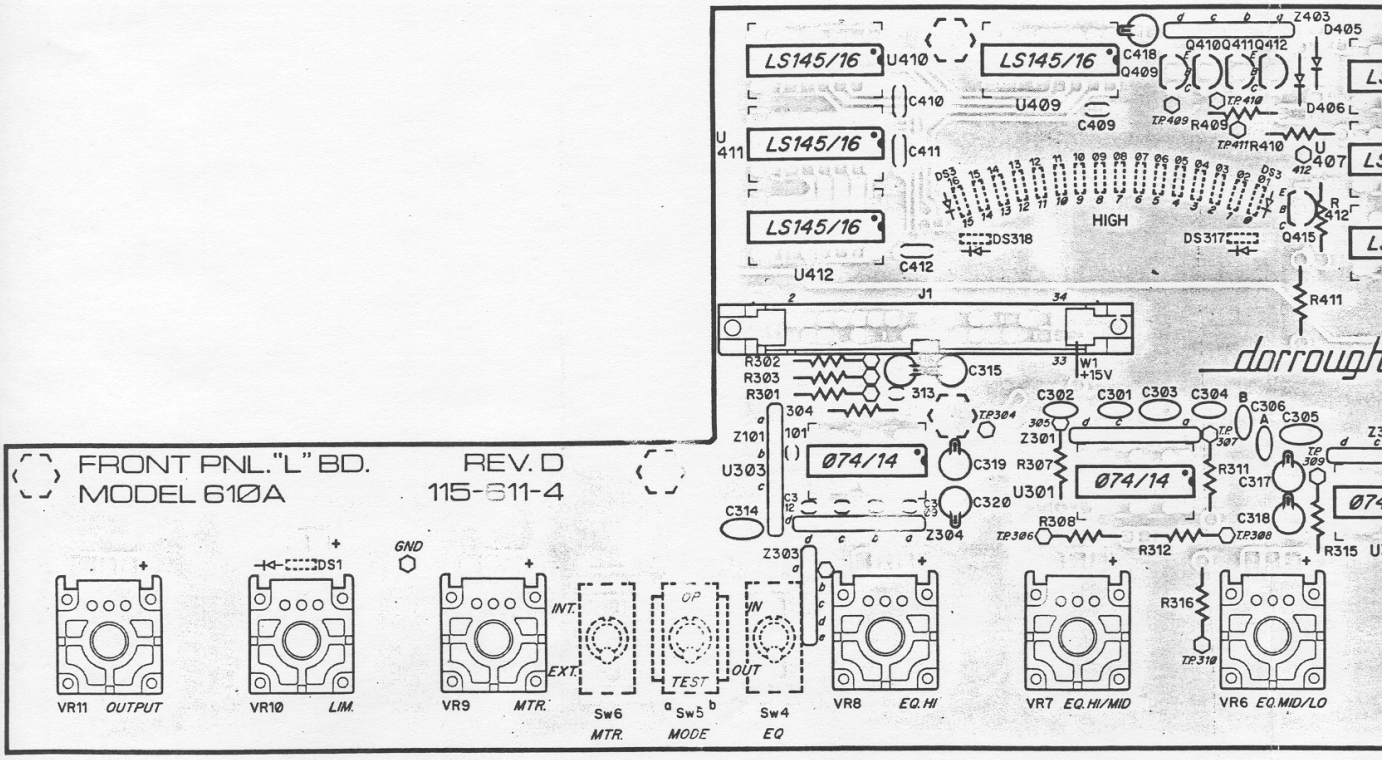
NOTES: UNLESS OTHERWISE SPECIFIED

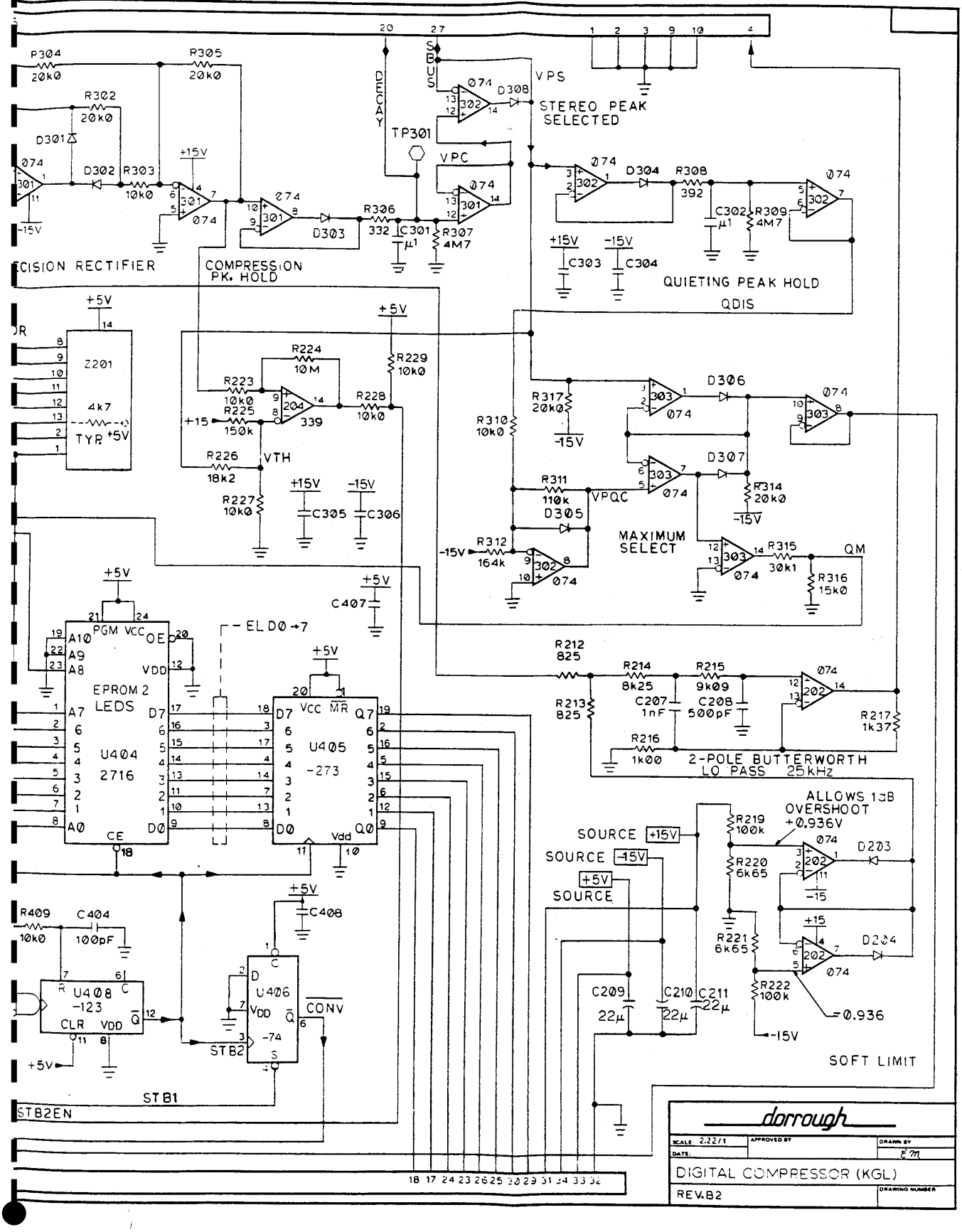


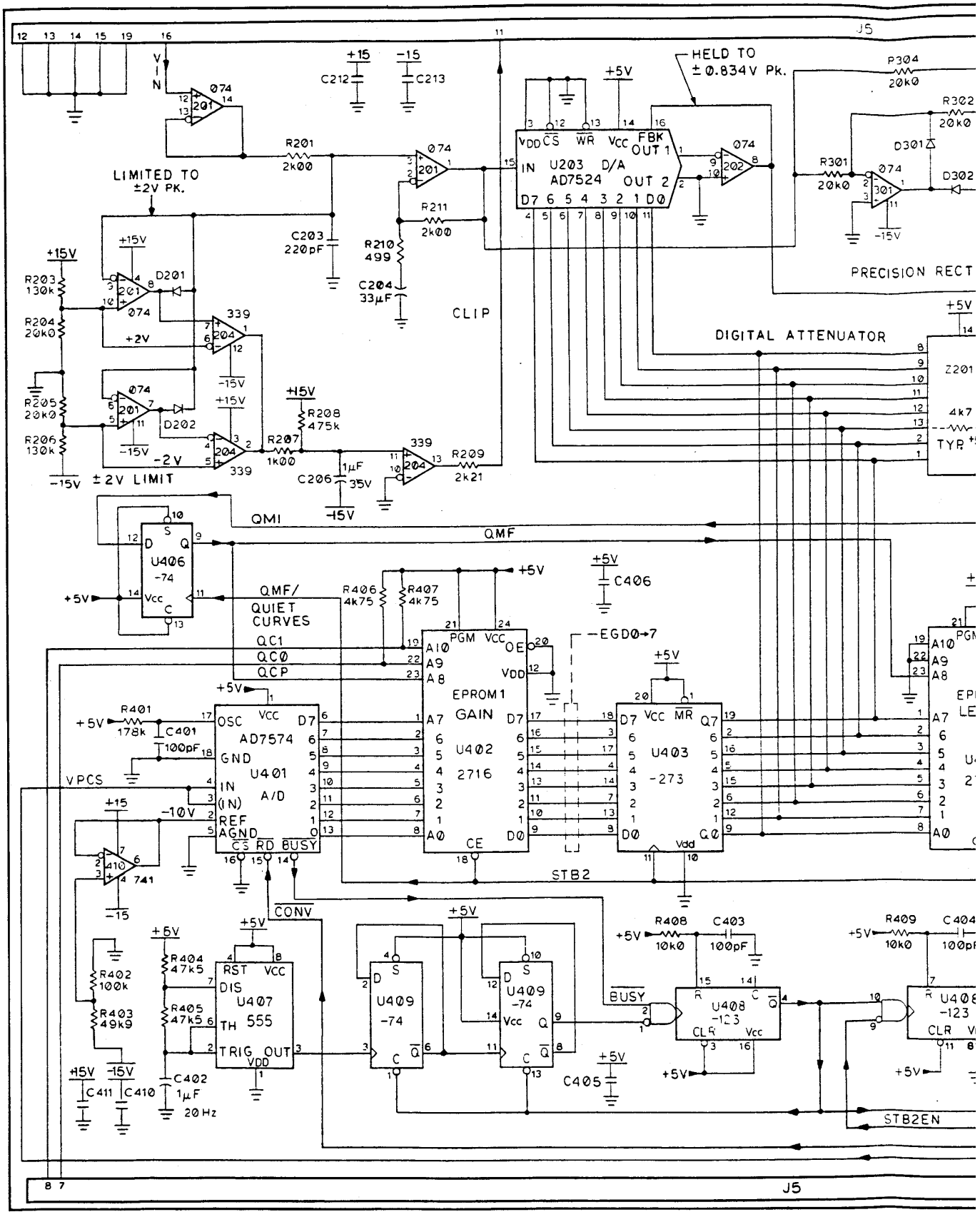


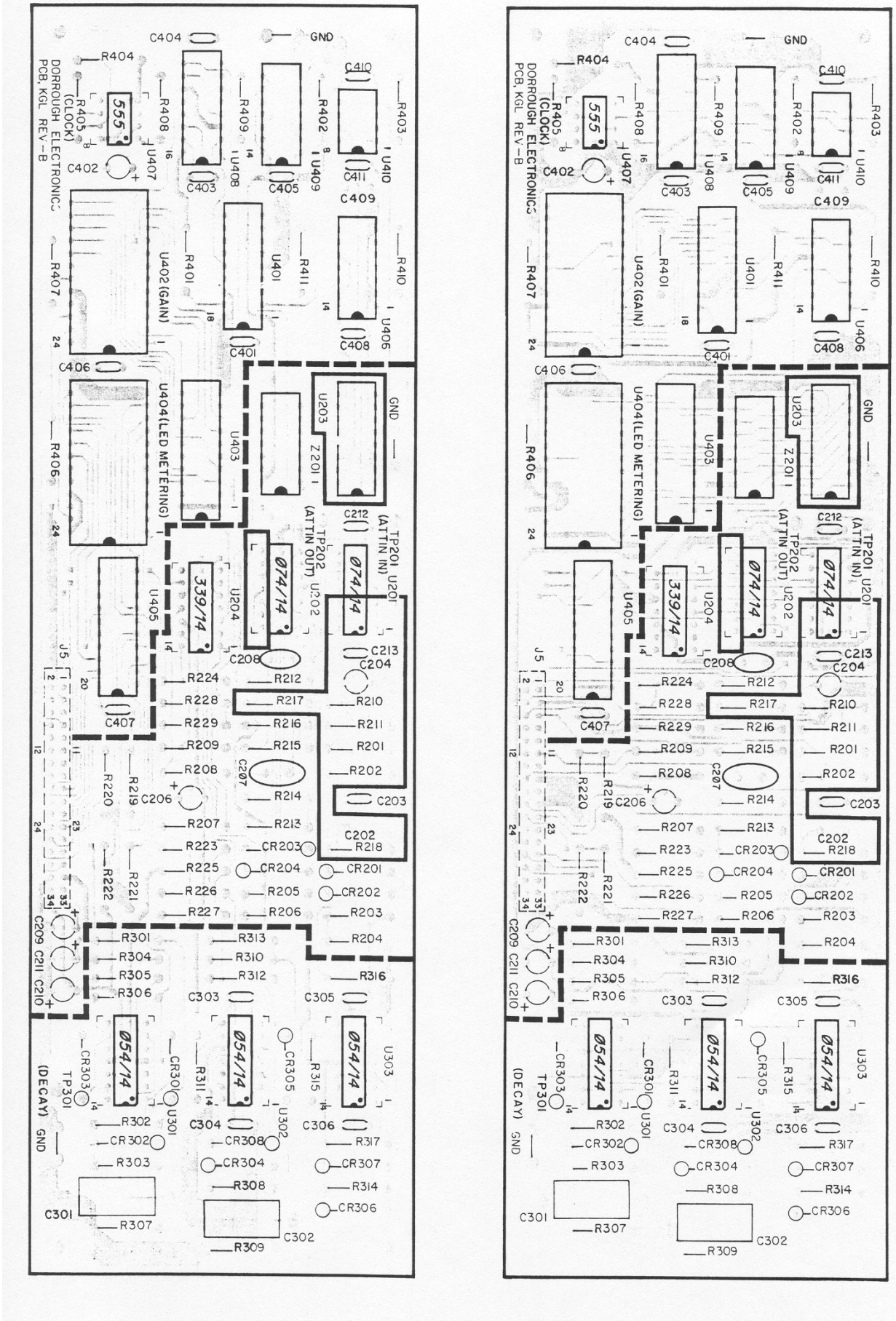
FRONT PNL. "L" BD.
REV. D
115-611-4

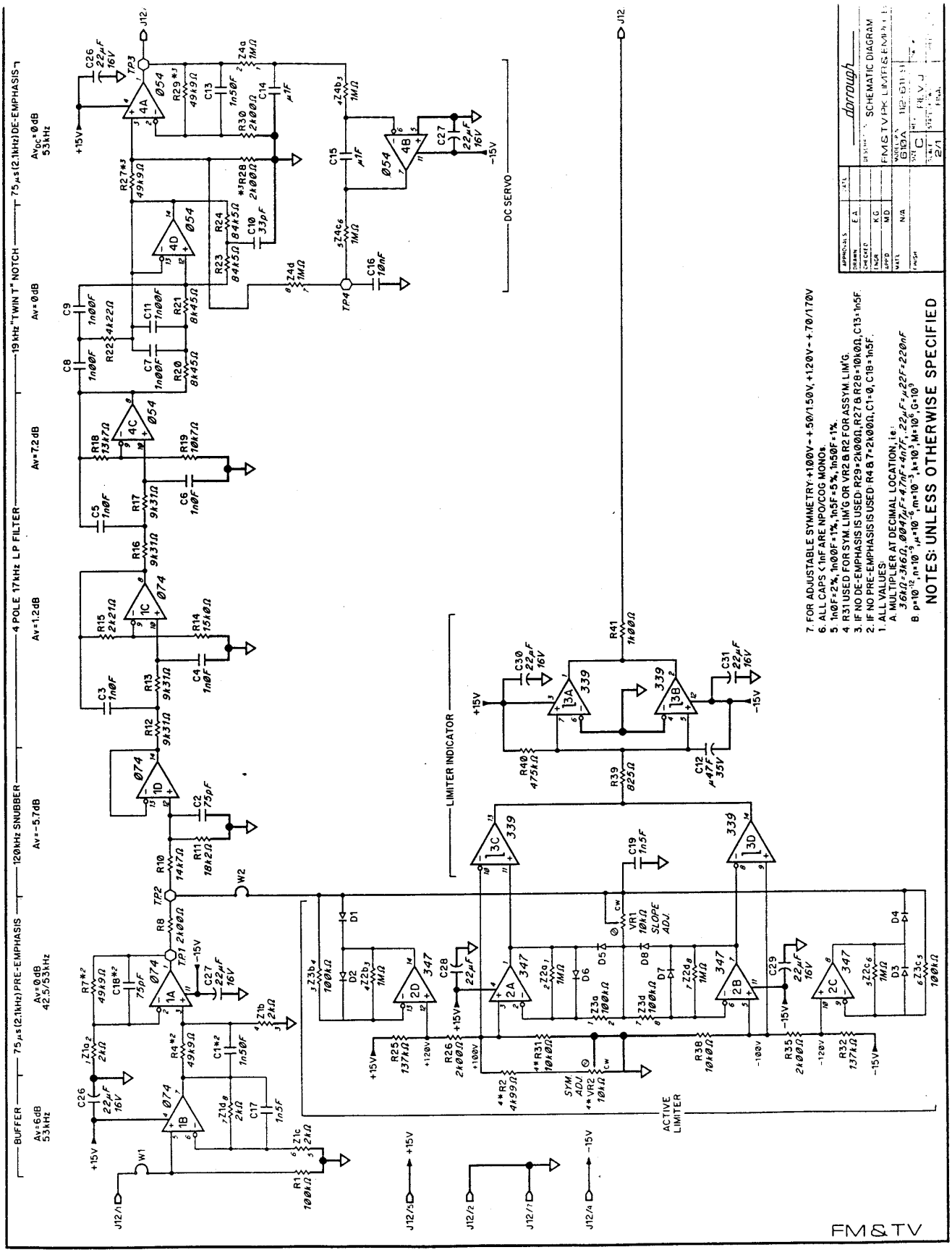

FRONT PNL."L" BD.
MODEL 610A
REV. D
115-611-4
LS145/16
U410
U409
U411
U412
C410
C411
C412
C409
C418
Q409
Q410 Q411 Q412
Z403
D405
D406
R409
R410
R411
R412
Q415
HIGH
DS317
DS318
J1
W1
+15V
R302
R303
R301
C315
313
304
101
Z101
U303
074/14
C319
C320
C314
Z303
Z304
C302
C301
C303
C304
C306
C305
Z301
R307
U301
R311
C317
C318
R308
R312
R315
R316
TP304
TP306
TP307
TP308
TP309
TP310
TP409
TP410
TP411
GND
DS1
INT.
EXT.
OP
TEST
IN
OUT
VR11 OUTPUT
VR10 LIM.
VR9 MTR.
Sw6 MTR.
Sw5 MODE
Sw4 EQ
VR8 EQ. HI
VR7 EQ. HI/MID
VR6 EQ. MID/LO

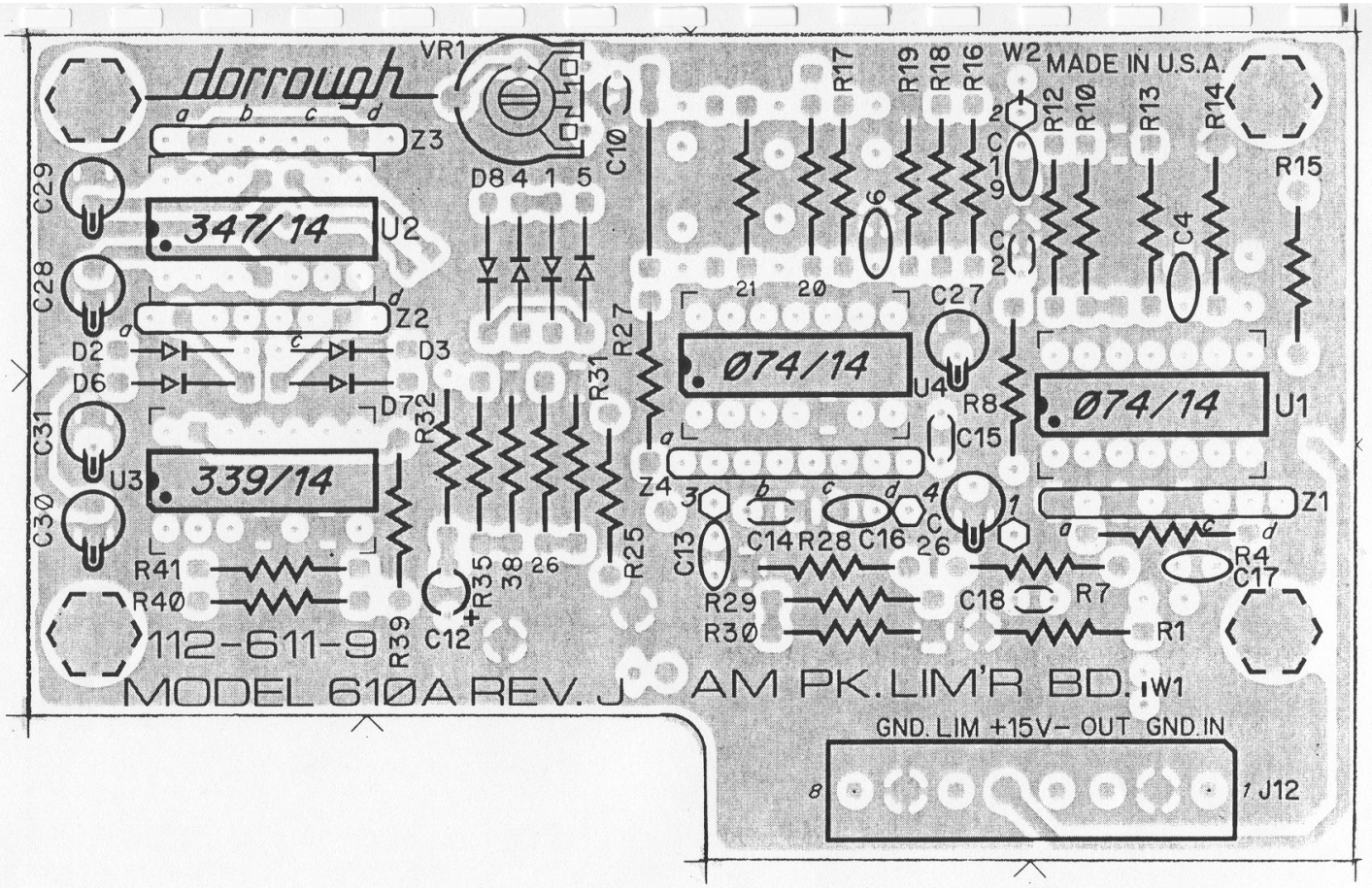

FRONT PNL."L" BD.
MODEL 610A
REV. D
115-611-4
LS145/16
U410
U409
U411
U412
C410
C411
C412
C409
C418
Q409
Q410 Q411 Q412
Z403
D405
D406
R409
R410
R411
R412
Q415
HIGH
DS317
DS318
J1
W1
+15V
R302
R303
R301
C315
313
304
101
Z101
U303
074/14
C319
C320
C314
Z303
Z304
C302
C301
C303
C304
C306
C305
Z301
R307
U301
R311
C317
C318
R308
R312
R315
R316
TP304
TP306
TP307
TP308
TP309
TP310
TP409
TP410
TP411
GND
DS1
INT.
EXT.
OP
TEST
IN
OUT
VR11 OUTPUT
VR10 LIM.
VR9 MTR.
Sw6 MTR.
Sw5 MODE
Sw4 EQ
VR8 EQ. HI
VR7 EQ. HI/MID
VR6 EQ. MID/LO


P304 20kØ
R305 20kØ
R302 20kØ
D301
D302
R303 10kØ
074
301
+15V
-15V
074
CISION RECTIFIER
COMPRESSION PK. HOLD
D303
R306 332
C301 µ1
R307 4M7
TP301
DECAY
SUSS
VPS
VPC
074
302
D308
STEREO PEAK SELECTED
D304
R308 392
C302 µ1
R309 4M7
C303
C304
QUIETING PEAK HOLD
QDIS
+5V
Z201
4k7
TYR +5V
R224 10M
R223 10kØ
R225 150k
R229 10kØ
R228 10kØ
204
339
VTH
R226 18k2
R227 10kØ
C305
C306
R317 20kØ
R310 10kØ
303
D306
D307
R311 110k
VPQC
D305
R312 164k
302
MAXIMUM SELECT
R314 20kØ
R315 30k1
R316 15kØ
QM
C407
EL DØ→7
EPROM 2 LEDS
U404 2716
PGM VCC OE VDD A10 A9 A8 A7 A6 A5 A4 A3 A2 A1 A0 CE D7 D6 D5 D4 D3 D2 D1 D0
U405 -273
VCC MR Q7 Q6 Q5 Q4 Q3 Q2 Q1 Q0 D7 D6 D5 D4 D3 D2 D1 D0 Vdd
R212 825
R213 825
R214 8k25
R215 9kØ9
C207 1nF
C208 500pF
R216 1kØØ
R217 1k37
2-POLE BUTTERWORTH LO PASS 25kHz
ALLOWS 1dB OVERSHOOT +0.936V
SOURCE +15V
SOURCE -15V
SOURCE +5V
R219 100k
R220 6k65
R221 6k65
R222 100k
D203
D204
202
C209 22µ
C210 22µ
C211 22µ
=0.936
SOFT LIMIT
R409 10kØ
C404 100pF
C408
U408 -123
CLR VDD
U406 -74
VDD
CONV
STB2
STB1
STB2EN
18 17 24 23 26 25 30 29 31 34 33 32
dorrough
SCALE 2.22/1
APPROVED BY
DRAWN BY
DATE:
DIGITAL COMPRESSOR (KGL)
REV.B2
DRAWING NUMBER


J5
HELD TO ±0.834V Pk.
LIMITED TO ±2V PK.
CLIP
PRECISION RECT
DIGITAL ATTENUATOR
±2V LIMIT
QMI
QMF
QMF/ QUIET CURVES
EPROM1 GAIN U402 2716
AD7574 U401 A/D
U403 -273
U406 -74
U407 555
U408 -123
U409 -74
STB2
STB2EN
CONV
BUSY
VPCS
EGD0→7
J5


DORROUGH ELECTRONICS
PCB, KGL REV-B
(CLOCK)
(DECAY)
GND
U402 (GAIN)
U404 (LED METERING)
TP201 (ATTN IN)
TP202 (ATTN OUT)
555
Ø74/14
339/14
Ø54/14


BUFFER
75 µs (2.1kHz) PRE-EMPHASIS
120kHz SNUBBER
4 POLE 17kHz LP FILTER
19kHz "TWIN T" NOTCH
75 µs (2.1kHz) DE-EMPHASIS
Av=6dB 53kHz
Av=0dB 42.5/53kHz
Av=-5.7dB
Av=1.2dB
Av=7.2dB
Av=0dB
AvDC=0dB 53kHz
LIMITER INDICATOR
DC SERVO
ACTIVE LIMITER
SYM ADJ
SLOPE ADJ
FM&TV
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL VALUES:
A. MULTIPLIER AT DECIMAL LOCATION, ie.
3.6kΩ=3M6Ω, .0047µF=4.7nF=4n7F, .22µF=µ22F=220nF
B. p=10^-12, n=10^-9, µ=10^-6, m=10^-3, k=10^3, M=10^6, G=10^9
2. IF NO PRE-EMPHASIS IS USED: R4 & T=2k00Ω, C1=0, C1B=1n5F.
3. IF NO DE-EMPHASIS IS USED: R29=2k00Ω, R27 & R28=10k0Ω, C13=1n5F
4. R31 USED FOR SYM. LIM'G OR VR2 & R2 FOR ASSYM. LIM'G.
5. 1n0F=2%, 1n00F=1%, 1n5F=5%, 1n50F=1%.
6. ALL CAPS < 1nF ARE NPO/COG MONO's.
7. FOR ADJUSTABLE SYMMETRY: +100V=+50/150V, +120V=+70/170V
FM&TV LIMITER & ENCODER
SCHEMATIC DIAGRAM
darrough
SIZE C
SHEET 2/1

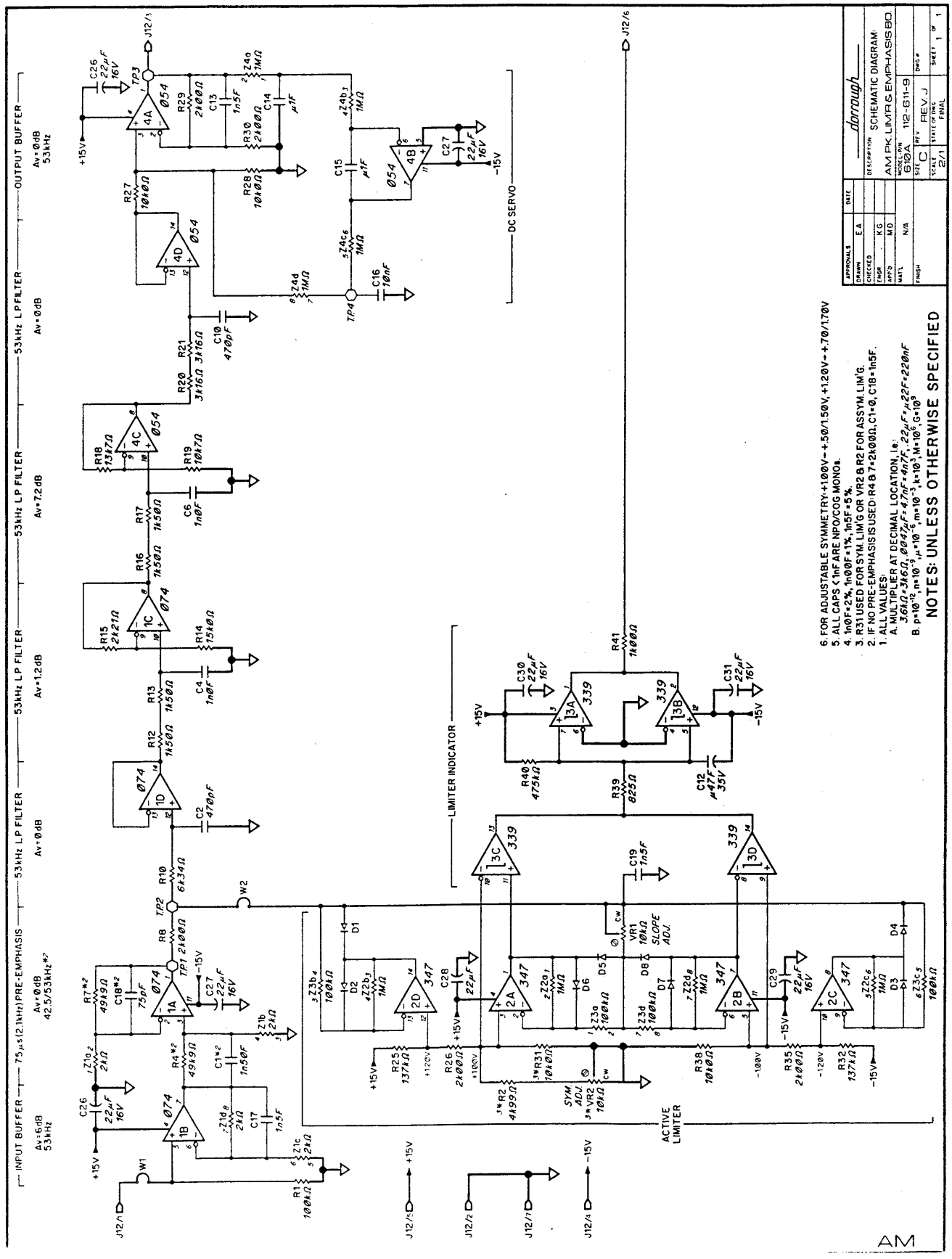


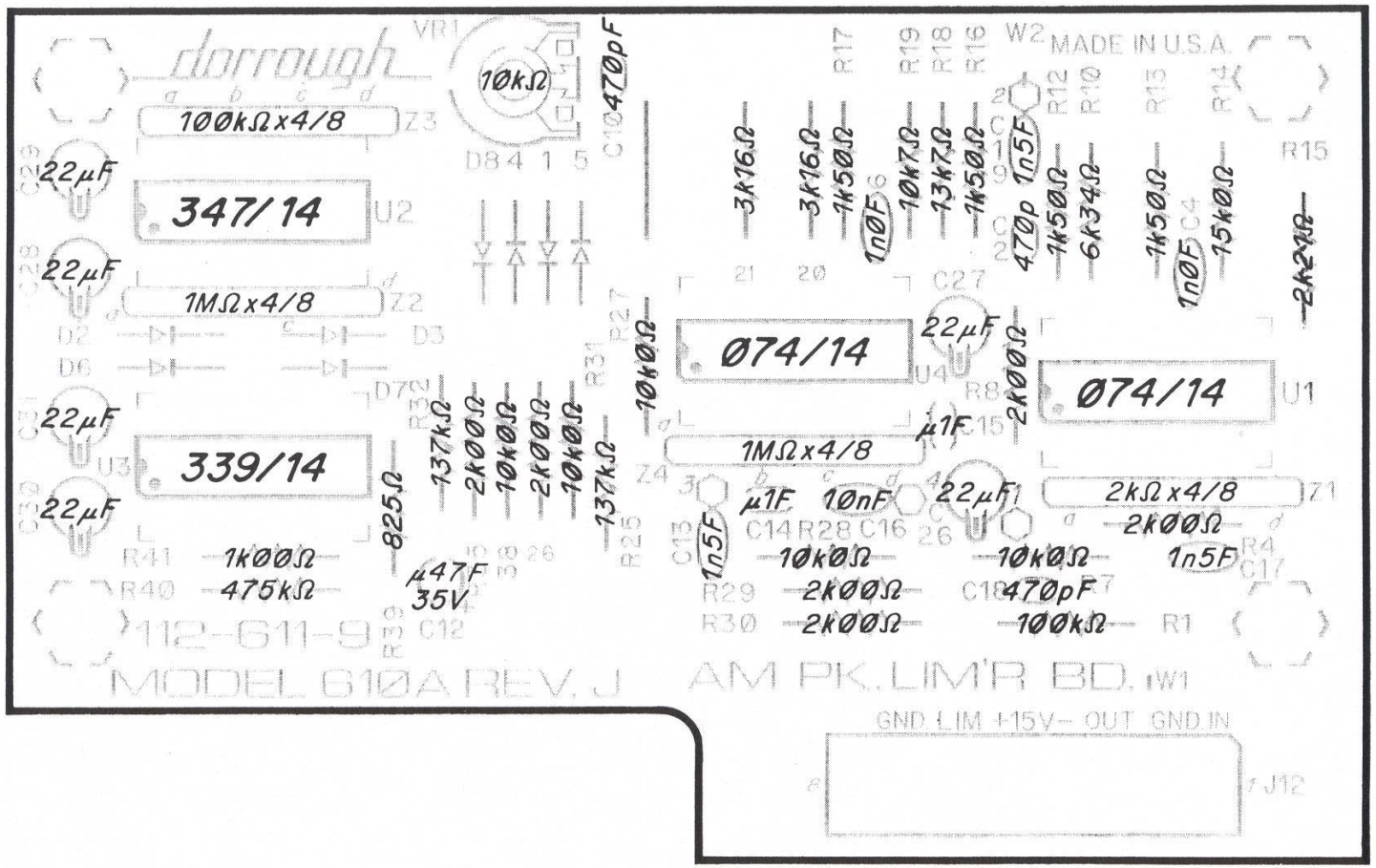
DORROUGH ELECTRONICS

AM, FM & TV PK. LIM'R & EMPHASIS BD

MODEL 610A REV. J 112-611-9

NOMENCLATURE (CID)


INPUT BUFFER
75μs(2.1kHz) PRE-EMPHASIS
53kHz LP FILTER
53kHz LP FILTER
53kHz LP FILTER
53kHz LP FILTER
OUTPUT BUFFER
Av=6dB 53kHz
Av=0dB 42.5/53kHz*2
Av=0dB
Av=1.2dB
Av=0dB
Av=7.2dB
Av=0dB 53kHz
LIMITER INDICATOR
ACTIVE LIMITER
DC SERVO
SYM. ADJ.
SLOPE ADJ.
AM
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL VALUES:
A. MULTIPLIER AT DECIMAL LOCATION, i.e.:
3.6kΩ=3k6Ω, .0047μF=4.7nF=4n7F, .22μF=μ22F=220nF
B. p=10⁻¹², n=10⁻⁹, μ=10⁻⁶, m=10⁻³, k=10³, M=10⁶, G=10⁹
2. IF NO PRE-EMPHASIS IS USED: R4 & 7=2k000Ω, C1=0, C18=1n5F.
3. R31 USED FOR SYM. LIM'G OR VR2 & R2 FOR ASSYM. LIM'G.
4. 1n0F=2%, 1n00F=1%, 1n5F=5%.
5. ALL CAPS < 1nF ARE NPO/COG MONOs.
6. FOR ADJUSTABLE SYMMETRY: +1.00V=+.50/1.50V, +1.20V=+.70/1.70V
dorough
DESCRIPTION SCHEMATIC DIAGRAM
AM PK. LIM'R & EMPHASIS BD
DWG NO 112-611-9
REV J
SIZE C
SCALE 2/1
SHEET 1 OF 1



AM

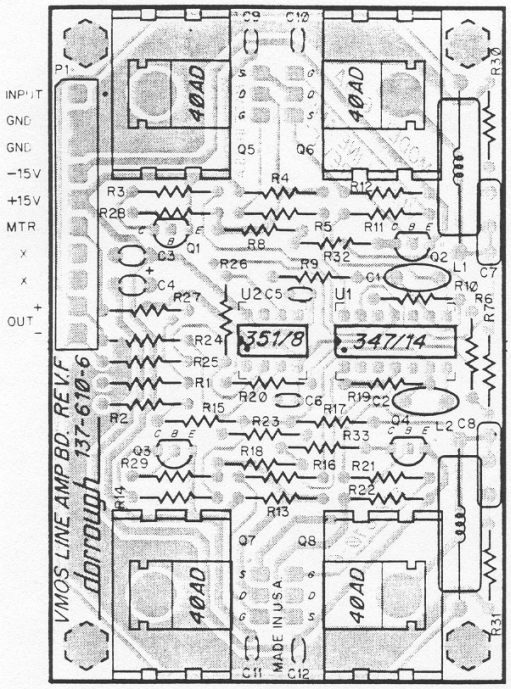
DORROUGH ELECTRONICS

AM, FM & TV PK. LIM'R & EMPHASIS BD.

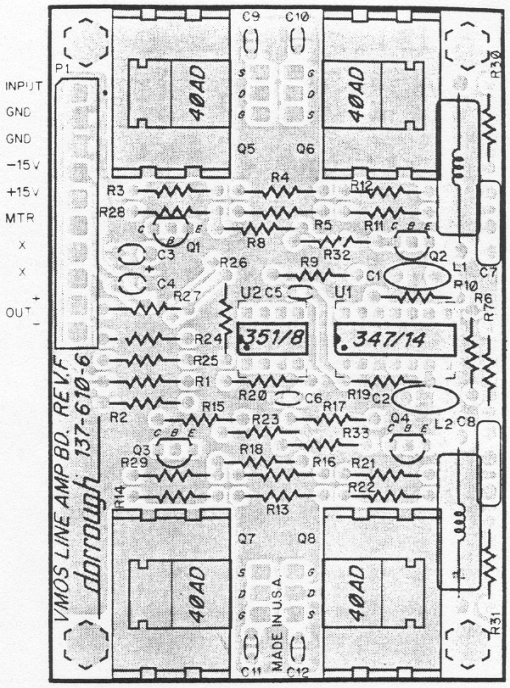
MODEL 610A REV. J

112-611-9

ASSEMBLY DIAGRAM

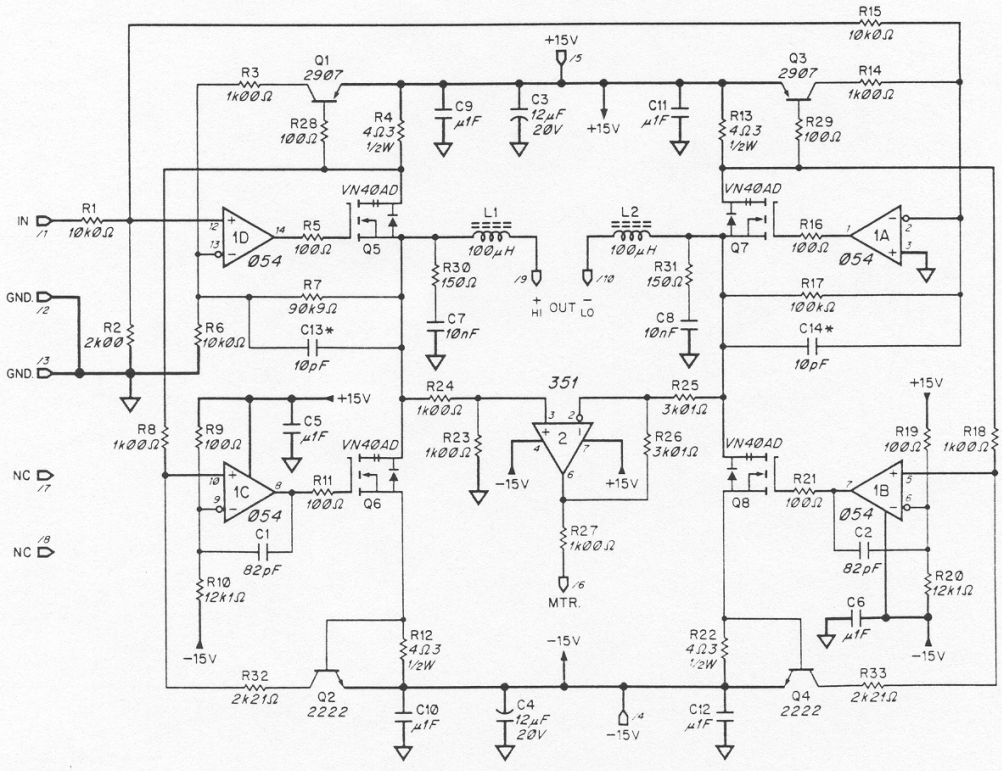


SOLDER SIDE



COMP. SIDE

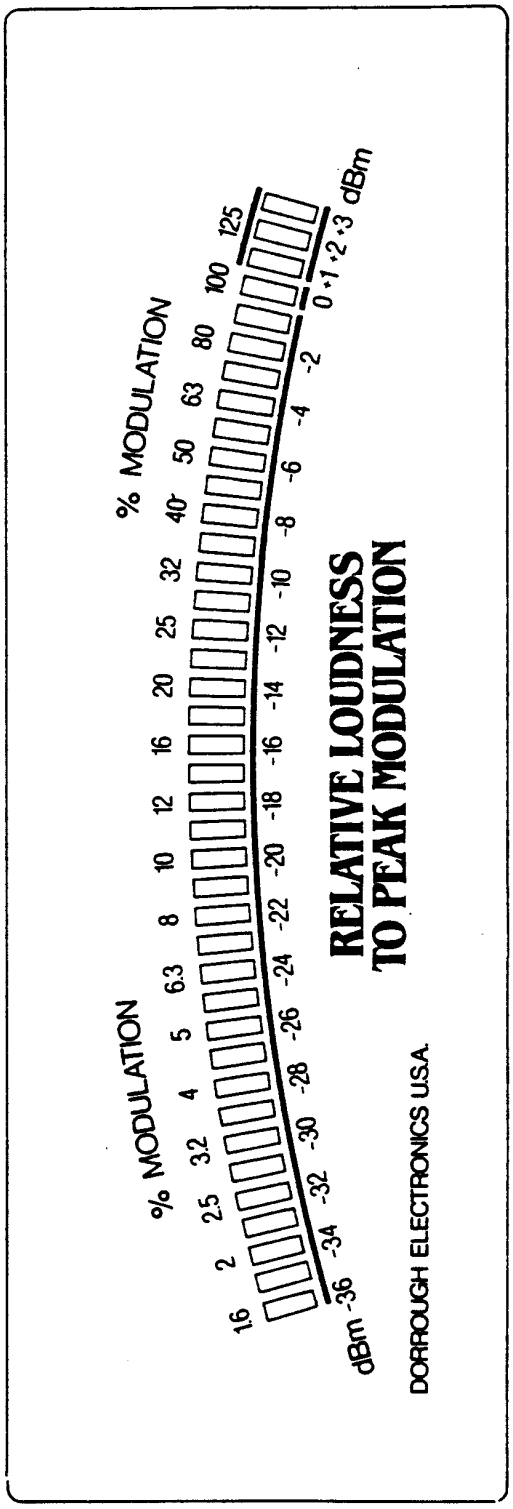
DORROUGH ELECTRONICS
VMOS LINE AMP BD. *REV.F*
MODEL 610A 137-610-6



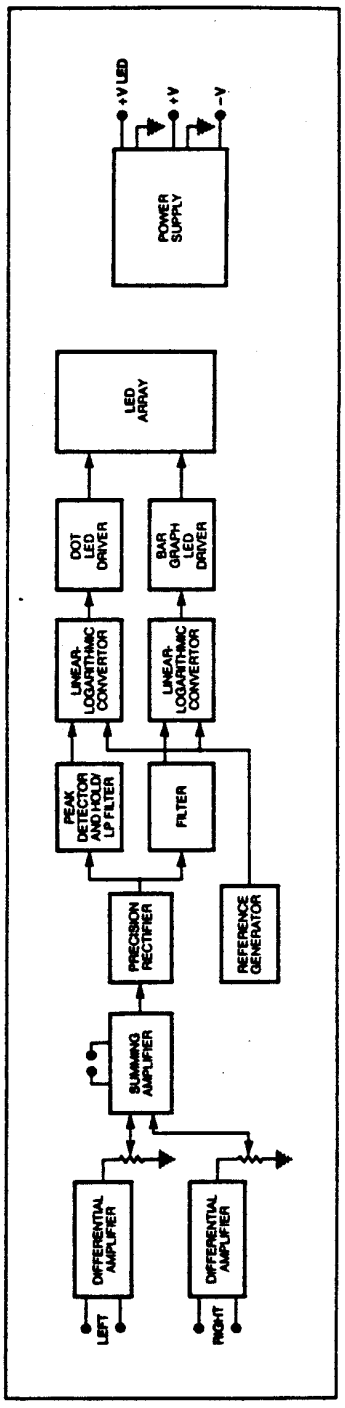
VMOS LINE AMP

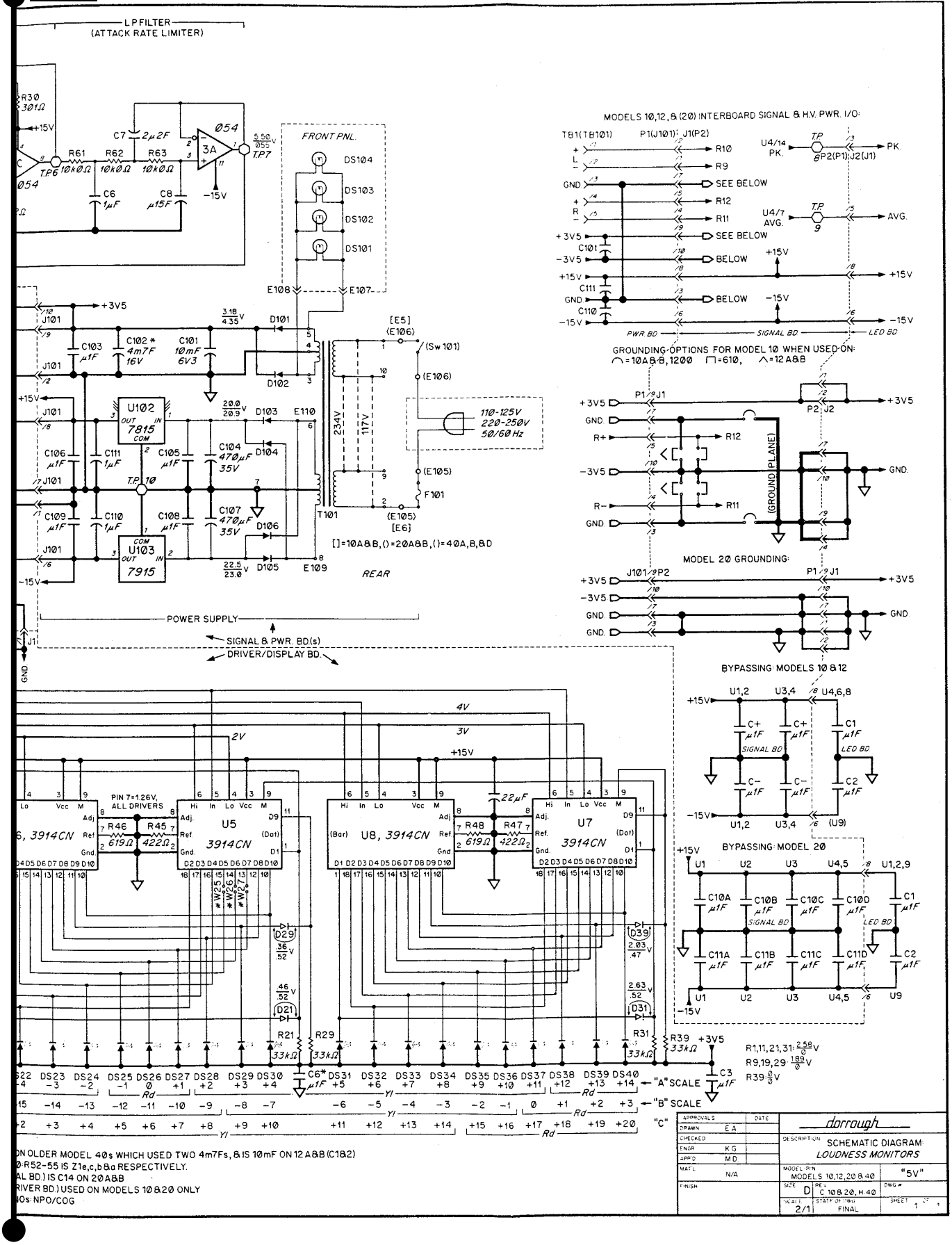
* 2. TACK-ON
1. ALL VALUES
A. MULTIPLIER AT DECIMAL LOCATION, i.e.:
3.6kΩ=3k6Ω, Ø.Ø47µF=47nF=4n7F, .22µF=µ22F=22Ønf
B. $p=10^{-12}$, $n=10^{-9}$, $\mu=10^{-6}$, $m=10^{-3}$, $k=10^{3}$, $M=10^{6}$, $G=10^{9}$

NOTES: UNLESS OTHERWISE SPECIFIED

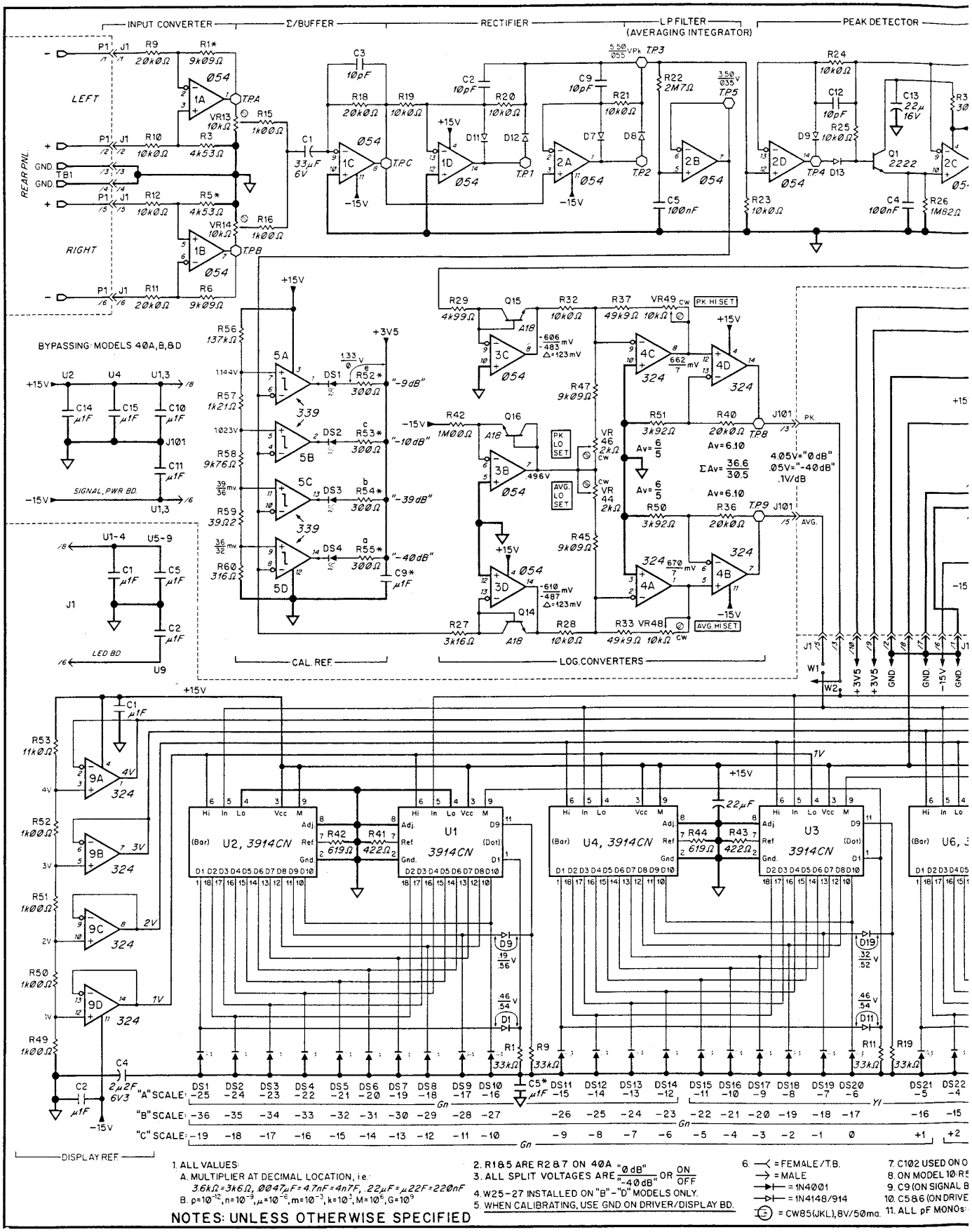


Block Diagram





ON OLDER MODEL 40s WHICH USED TWO 4m7Fs, & IS 10mF ON 12 A&B (C182)
0: R52-55 IS Z1e,c,b & a RESPECTIVELY.
AL BD.) IS C14 ON 20 A&B
RIVER BD.) USED ON MODELS 10 & 20 ONLY
40s: NPO/COG



1. ALL VALUES:
   A. MULTIPLIER AT DECIMAL LOCATION, i.e.:
   3.6kΩ=3k6Ω, .0047μF=4.7nF=4n7F, 22μF=μ22F=220nF
   B. p=10^{-12}, n=10^{-9}, μ=10^{-6}, m=10^{-3}, k=10^{3}, M=10^{6}, G=10^{9}
2. R185 ARE R287 ON 40A "0dB"/"-40dB" OR ON/OFF
3. ALL SPLIT VOLTAGES ARE
4. W25-27 INSTALLED ON "B"-"D" MODELS ONLY.
5. WHEN CALIBRATING, USE GND ON DRIVER/DISPLAY BD.
6. = FEMALE/T.B.
   = MALE
   = 1N4001
   = 1N4148/914
   = CW85(JKL),8V/50ma.
7. C102 USED ON O
8. ON MODEL 10:R5
9. C9 (ON SIGNAL B
10. C5&6 (ON DRIVE
11. ALL pF MONOs

NOTES: UNLESS OTHERWISE SPECIFIED