SPA-3

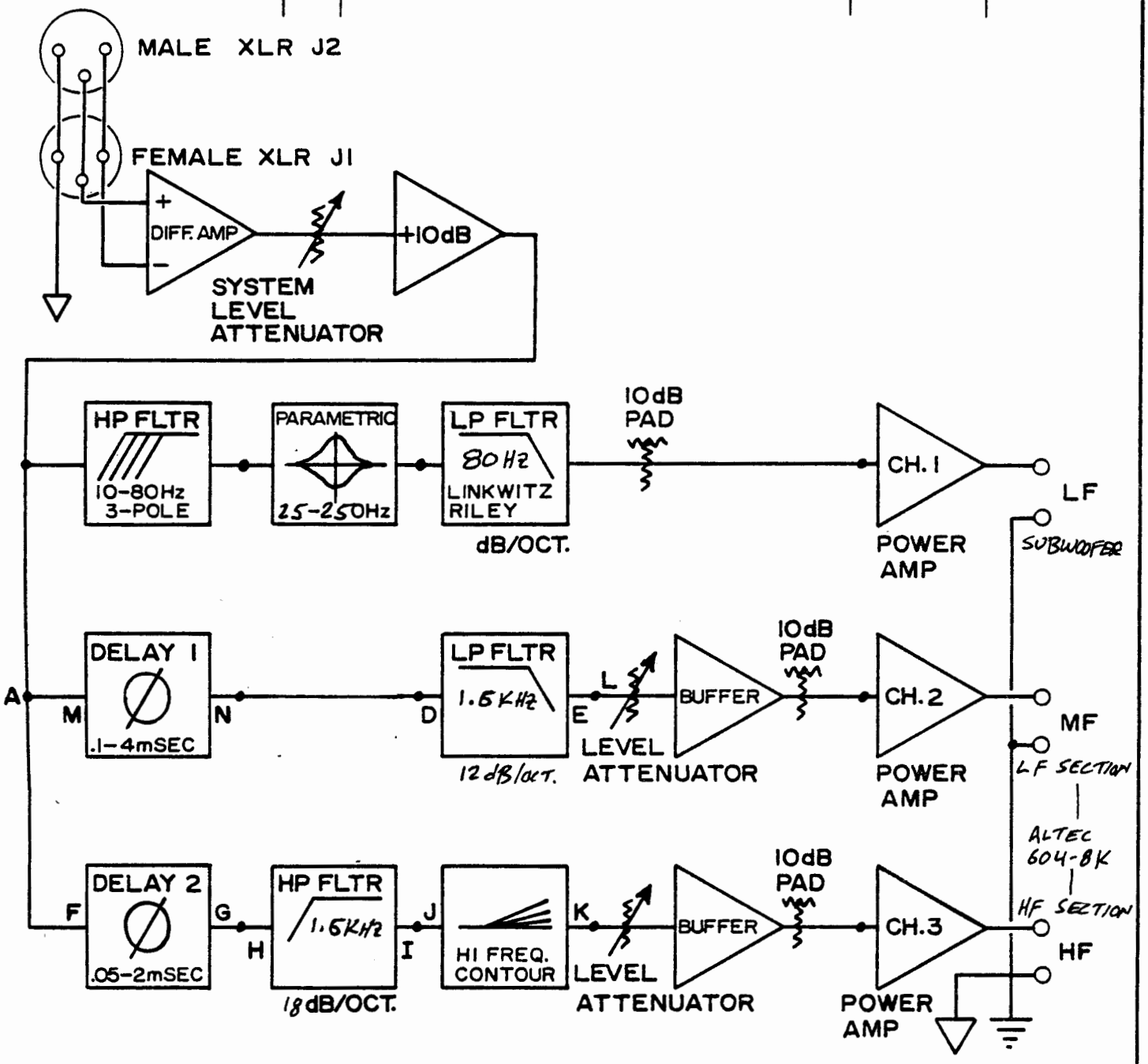
SIGNAL PROCESSING AMP

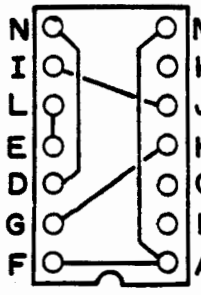
CUSTOMER _____

CONFIGURATION _____

SERIAL NO. _____

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER

P201-3DX

CUSTOMER [redacted]

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

DRAWN	S.W. Selberg	8-26-87
CHECK		
PROJECT ENGR	S.W. Selberg	8-22-85

TITLE

SPA-3 CONFIGURATION 3DX
SYSTEM BLOCK DIAGRAM

SPEAKER SYSTEM [redacted]

SIZE	DRAWING NUMBER	REV
A	9512-7723	

SCALE

SHEET 2 OF 2

THE BGW SPA-1 & SPA-3 SIGNAL PROCESSING AMPLIFIERS

SPA-1 Signal Processing Subwoofer Amplifier • SPA-3 Signal Processing 3-Way Amplifier

Built-in electronic crossovers with up to 24 dB/octave filters • Parametric EQ • All-pass filter delays • Precision digitized attenuators

High performance active balanced input • Socket for input transformer (SPA-3) • High frequency propagation loss compensation (SPA-3)

System reconfiguration via plug-in jumper network (SPA-3) • Controls behind security panel • Turn-on delay & fast-off • A rack full in 5-1/4"

The BGW SPA-1 or SPA-3 – A Rack Full of Power in 5.25 Inches

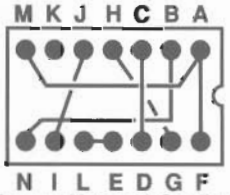
The BGW SPA-1 and SPA-3 are dubbed "signal processing amplifiers" because they are more than just power amps: they contain a number of signal processors that would otherwise have to be purchased in separate packages and interconnected in order to adequately drive the loudspeaker system. By combining the necessary functions in one package, BGW has made it possible to assemble a sound system in less space, for comparable or less money, and with better reliability and performance than was previously available. What's more, the system designer can use these products as basic "toolboxes" from which almost any sound system can be created.

The SPA-3 is the more flexible and more complex of the two models, since it includes three power amplifiers and numerous processors that can be set up in almost unlimited configurations optimized for the drivers in any system. The SPA-1 has the required signal processors and two power amplifiers of sufficient horsepower to drive the subwoofers for almost any sound system. These two products can be used together, or separately, as needs dictate.

SPA-3A: Your Own System Design, Professionally Packaged

Many Functions, Easily Reconfigured

This product utilizes a modular design wherein functional blocks can be reconfigured in seconds via plug-in "headers." These 14-pin jumper-networks are about the size of an IC, come in numerous factory preset configurations, and/or may be reconfigured in the field.



Header (Jumper Network) Configures SPA-3

Standard blocks include three power amplifier modules, two signal delays, a 3-way electronic crossover network, a Switchset™ subsonic filter, a low frequency parametric EQ, a high frequency contour filter, three digitized attenuators, and several buffer amplifiers, pads, and a differential input circuit. An octal socket is provided for an optional input transformer. This same socket may be used for the various signal take-off points (to drive additional external power amps, for example). You can readily change the location of the attenuators, delays, etc., within the signal flow, the way signals mix (or don't mix), and so forth.

If you don't need all the processing capability, you can order the system without these options (i.e., less the parametric EQ or one of the delays).

Precision and Repeatability

EQ characteristics, delay times, attenuator levels, and virtually all adjustments are accessible on the front panel behind a removable security cover. These settings are made via precision, calibrated rotary controls or miniature digi-switches so you can document the values from testing. Correct settings can be re-established quickly and accurately, and multiple systems will closely track each other.

The attenuators are a unique design; a digi-switch arranges 1% precision resistors providing approximately 0.1 dB accuracy down to at least -40 dB. In the standard configuration, one attenuator adjusts overall system level (0 to -89 dB), and two more attenuators scale amp channels 2 & 3 in 1 dB increments below system level. The attenuators can be ordered optionally at twice the resolution (1/2 dB scaling).

Packaged for the Professional, Designed For Unskilled Use

Both the SPA-1 and SPA-3 are strong enough for touring, yet also equipped with the connections you want for permanent installations. Everything is contained in a compact 5-1/4" high rack-mount chassis. A modular design facilitates service, and flexi-circuits reliably link individual modules while minimizing hand wiring. Each amplifier module is constructed around a heavy, extruded aluminum heat sink, and can be swapped out in minutes. (Precision controls make recalibration a snap.) Signal processing functions can be hard-wire bypassed. Of course, with fewer cables, there is less opportunity for installation errors, oxidized contacts, or cable faults — basically you eliminate many of the problems associated with large, complex sound systems.

Interface with the rest of your equipment is straightforward. Parallel-wired male and female balanced XLRs handle the inputs (although in some configurations, one of the XLRs can be used as a buffered output). Ground lift and phase reversal are there, too. The power amplifier outputs are brought to 5-way binding posts for use with tinned leads, banana plugs, or terminal lugs. In addition, the octal socket that accepts an optional input transformer also may be used to tap interstage signals for feed to additional external processors or amplifiers (one SPA-3 can serve as the master amp/processor, and other amps then serve as slaves). Five buffer amplifiers are built into the SPA-3, and some of these may be used as line drivers.

While it's loaded with functions and lots of custom-tunable processing, once the SPA is installed, it is very straightforward to use. Just turn it on. The magnetic circuit breaker/power switch even turns itself off so an untrained operator can immediately respond to any fault. Signal presence and clip LEDs on each channel make it easy to verify normal operation. The rest of the controls and adjustments are discreetly out of reach behind the front-panel security cover.

Outstanding Performance

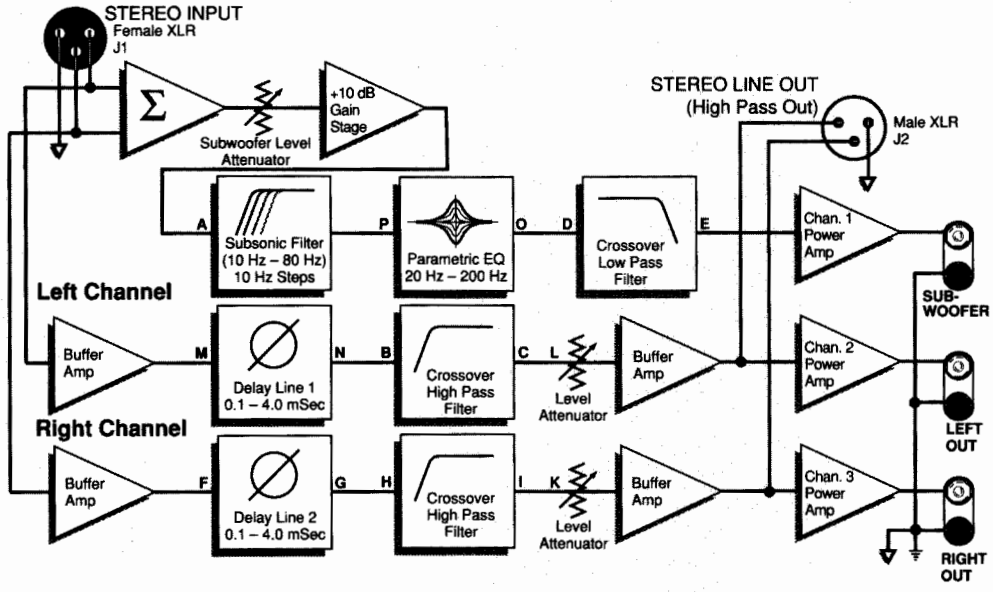
Often in electronics, multi-function boxes represent compromises in order to squeeze a lot of function into a little space. Not so with the SPA-1 and SPA-3. For example, the power amplifiers are top quality, using proven BGW technology, with very conservative ratings. The SPA-3 will deliver 200 watts into 8 ohms for each of its three amp modules, thus allowing plenty of headroom for compression drivers. The low frequency output will deliver 400 watts into 4 ohms – ample for very solid bass reproduction. This model is convection cooled, making it physically quiet enough for use in a control room. The use of a compact toroidal transformer further silences the chassis, while reducing stray magnetic fields to avoid inducing hum in adjacent rack-mounted components. Electronically, the system is also quiet, using low-noise TL074 and 5532 opamps. High common mode rejection is afforded by a differential input that includes HF & DC gain trim for optimization of CMRR. If you require the utmost in common mode range (as in very high noise environments), you can plug in an optional input transformer at any time.

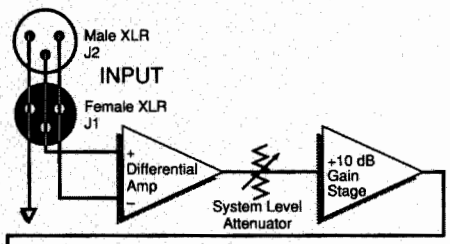
We have, in fact, put in extra touches to preserve signal quality. For example, the

A Few of the Many Ways the SPA-3 Can Be Configured

Stereo Full-Range System With Mono Subwoofer

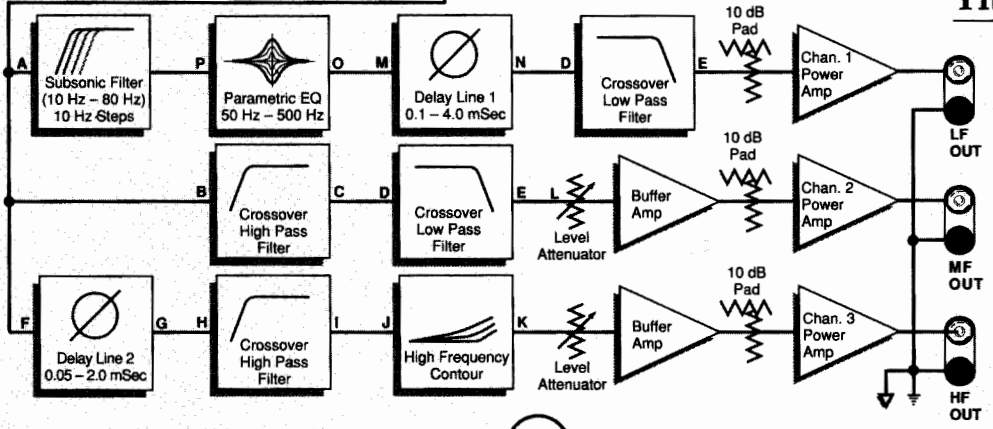
This system includes a 2-way crossover network. The low frequency (subwoofer) section includes parametric equalization and a precision subsonic filter. Separately adjustable signal delays are provided for the left and right high-pass outputs so that the wavefronts from these speakers can be aligned with the wavefront from the subwoofer. A separate high-pass stereo output is provided for additional stereo amplifiers and speakers.





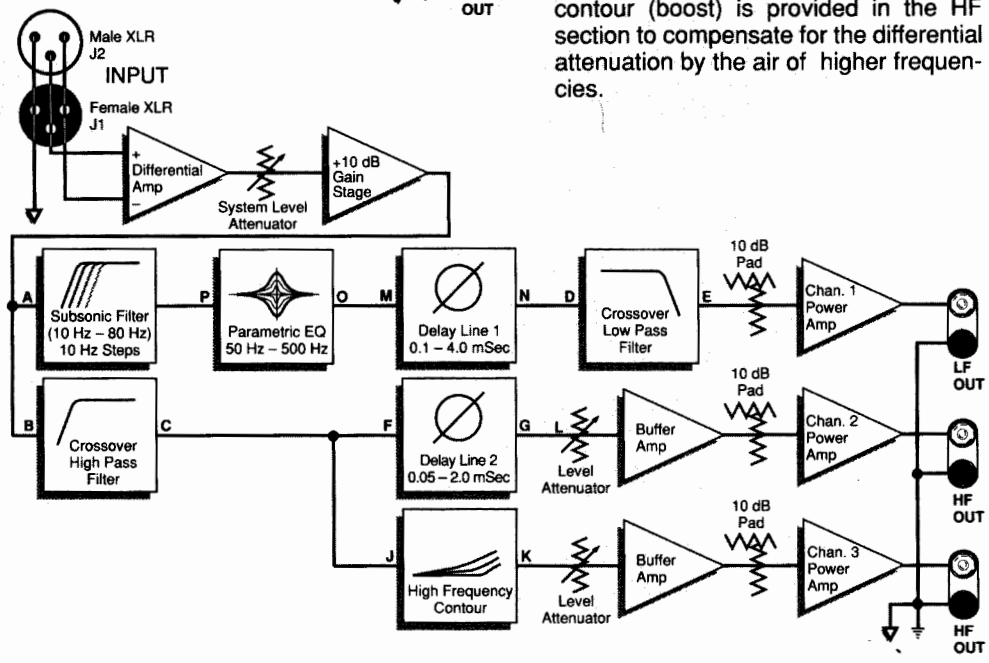
Three-Way Full-Range System

This full-range system utilizes a three-way crossover. The low frequency section includes its own precision subsonic filter, parametric EQ, and signal delay for wavefront arrival compensation due to the nearer proximity of the low frequency cone in relation to the diaphragm on the midrange compression driver/horn assembly. The high frequency output has a signal delay for wavefront arrival compensation (the same reason as the LF delay, though scaled differently) due to the relatively closer location of the driver diaphragm on a shorter horn. High frequency contour (boost) is provided in the HF section to compensate for the differential attenuation by the air of higher frequencies.



Two-Way Full-Range System with Near- and Long-Throw High Frequency Drivers

This full-range system utilizes a two-way crossover, yet has three outputs. The LF section includes its own precision subsonic filter, parametric EQ, and signal delay for wavefront arrival compensation due to the nearer proximity of the low frequency cone in relation to the diaphragm on the compression drivers in the long-throw, high-frequency horns. Both HF outputs cover the same band, but one is for a near-throw fill speaker cluster, and the other is for a long-throw cluster. The near-throw cluster has shorter horns, and hence a signal delay to compensate for wavefront arrival in the overlapping coverage zone. The long-throw output has a high frequency contour (boost) to compensate for HF attenuation in the air.



signal going into each delay section is 10 dB above nominal, with a 10 dB attenuator following the delay; this preserves best S/N performance through the circuit. Indeed, the overall performance of the SPA-1 and of the SPA-3 is top quality. These units are, however, easier to set up and more cost effective than the rack full of separate high-quality components they each replace.

Unique Signal Delays

The SPA-1 has one delay section, and the SPA-3 has two delay sections. Your signals are not quantized (digitized), and consequently there is none of the potential degradation of A/D –D/A conversion, anti-aliasing filtration, etc. Instead, we use special all-pass delays that are very linear with regard to delay over frequency. Our unique "stagger tuning" design that assures maximally flat response was devised over several months of computer aided design.

The precision delay-controlled driver alignment made possible by these units means you'll need less corrective EQ because initial speaker system response is flatter, and dispersion is better controlled. Hence you enjoy better overall sound quality. Typically, you'll use the delay on the low band because the voice coil of a direct radiator woofer will be physically mounted closer to the listener than that of a horn-mounted compression driver. Thus, the delay brings the two wavefronts into alignment in the crossover region, which reduces lobing and phase cancellation, and provides the intended directional characteristics. Delay Nº1 in the SPA-3 is permanently installed in channel 1 (the LF channel) and is adjustable in 100 µS increments (1.35") to a maximum of 4 milliseconds (4-1/2'). Delay Nº 2 can be inserted in the mid- or high-frequency path (channels 2 or 3), or both, and is adjustable in ten 50 µS increments (0.68") to a maximum of 2 milliseconds (2-1/4').

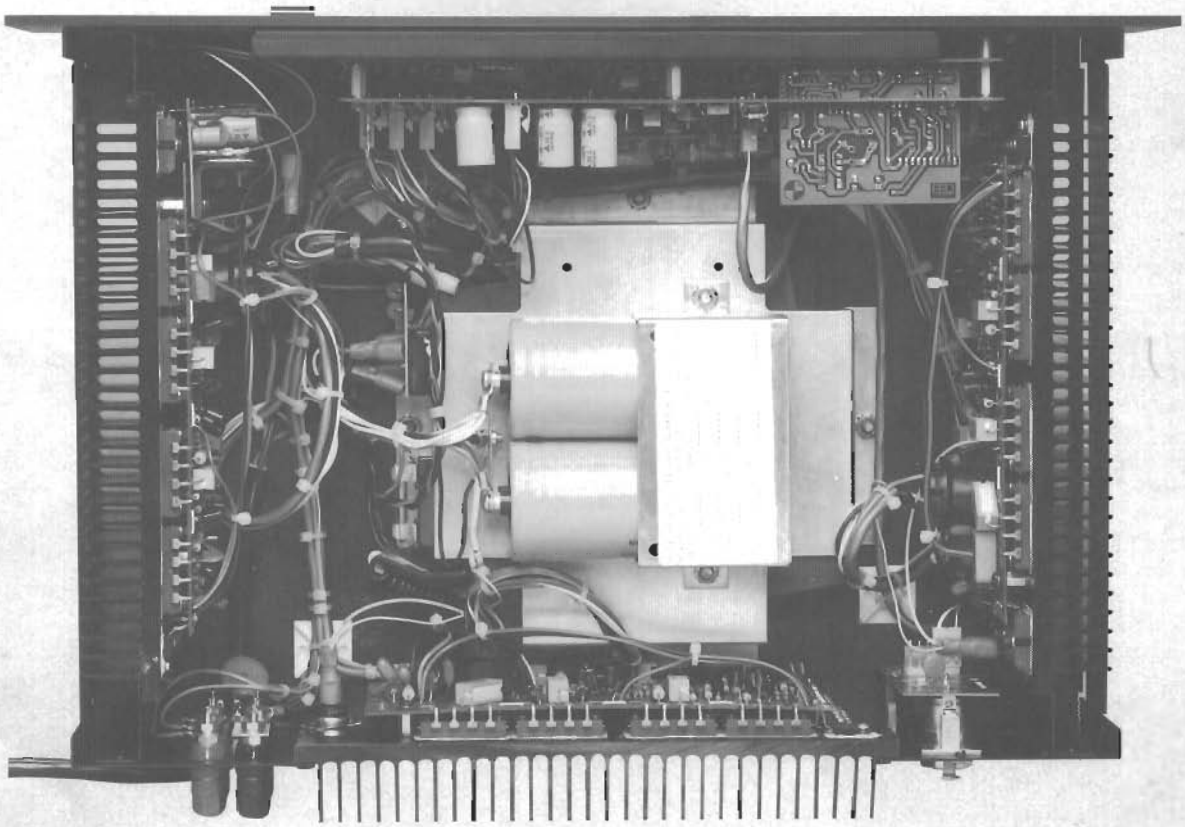
An Electronic Crossover with Subsonic Filter, HF Contour & LF Parametric EQ

The SPA-3 has numerous filter functions. Two low-pass and two high-pass sections permit configuration of the system into a 3-way full-range triamplifier (or a biamplifier). The standard filters are 24 dB/octave (4-pole) Linkwitz-Riley type, each consisting of dual 12 dB/octave filters. They are 6 dB down at the crossover point, and have a smoother sound. However, you can order the latter, or you can order Butterworth filters in 1, 2, 3 or 4 pole configurations if you prefer. The unit also comes with a set of component value tables so you can configure your own custom-designed crossover in the field.

There is a precision subsonic high pass filter to eliminate unwanted noise and potentially damaging DC or infrasonic transients. Standard configuration is an 18 dB/octave (3-pole) Butterworth, adjustable from 10 Hz to 80 Hz in 10 Hz steps; optional ranging is available.

To correct for overall system response, a parametric equalizer is included in the low frequency channel. The center frequency is adjustable over the decade from 30 Hz to 300 Hz, Q from 0.5 to 2.0, and the gain range is ±6 dB. Optional frequencies are available.

A filter is provided specifically for compensation of rolloff due to horn/driver response and air attenuation. The High Frequency Contour processor is a single-pole (6 dB/octave) filter providing 0 to 9 dB of boost in 1 dB increments, with a corner frequency selectable at 5 kHz or 10 kHz. Optional High-Resolution (0.5 dB) incremental boost is available.



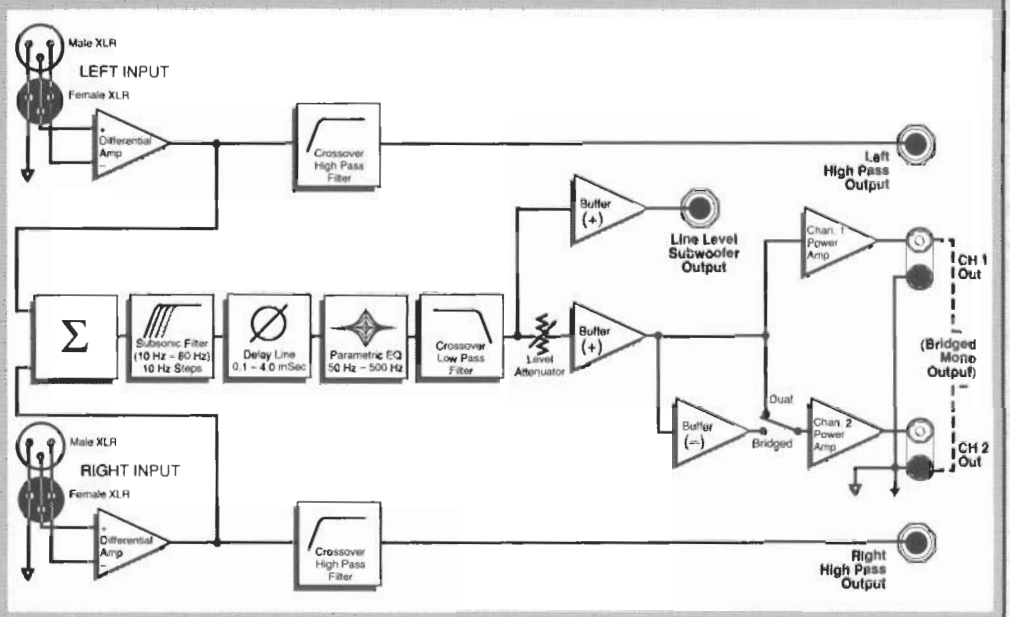
Inside The SPA-3: A Neat, Modular Layout

The SPA-1 Subwoofer Amplifier System

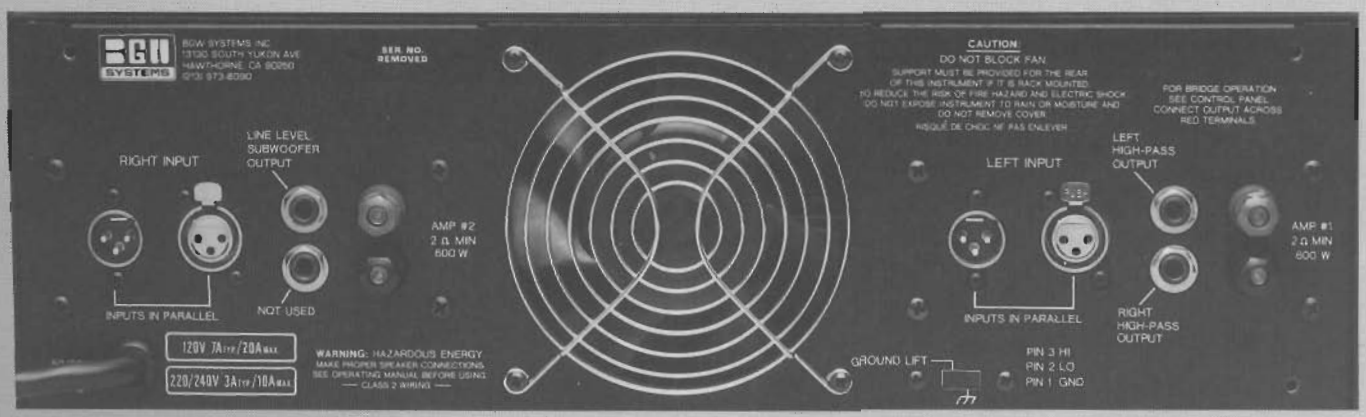
This unit is based on the same concept as the SPA-3, but is designed for use as either a dual channel full-range amplifier, or a bridged (mono) amp. It is ideal for driving subwoofers, though its performance is absolutely uncompromising in full-range applications as well.

The SPA-1 will deliver 250 watts per channel into 8 ohms or 600 watts per channel into 2 ohms in either the 2-channel discrete or summed input (dual mono) mode. When operated in bridged output mode, it will deliver a whopping 1200 watts into 4 ohms. To dissipate this kind of power, the SPA-1 is forced air cooled.

The basic functional blocks of the SPA-1 include a 2-way electronic crossover network, a summing amplifier to mix the left and right inputs to a mono signal (for driving a subwoofer) while providing discrete high-passed L & R line outputs to other amps, a subsonic filter, a signal delay, and a parametric equalizer.



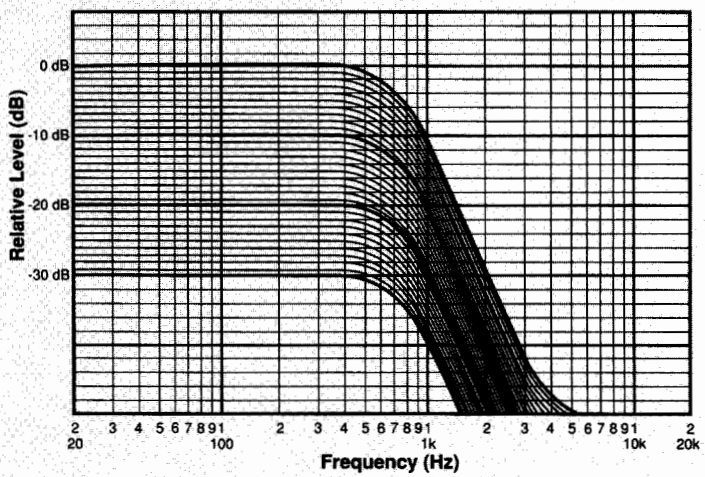
Block Diagram: The SPA-1 with Dual Mono or Bridged Mono Output



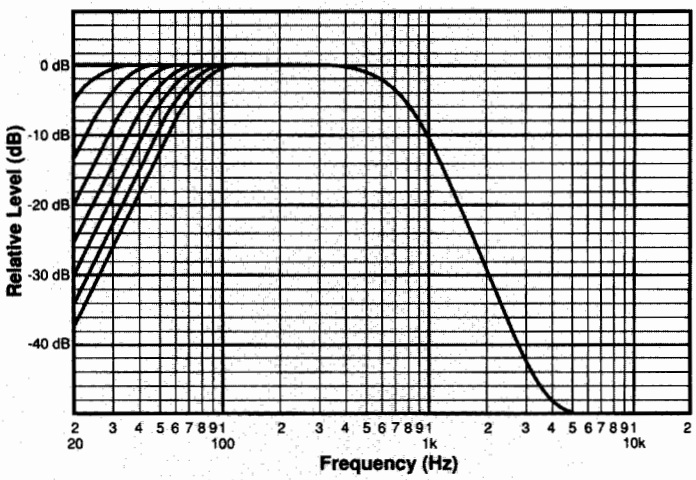
The SPA-1 Rear Panel

The SPA-3 Rear Panel

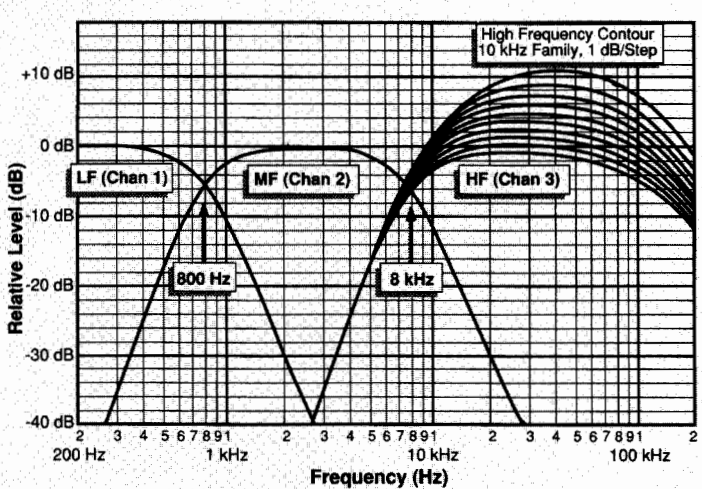
SPA-3 Typical Performance Graphs



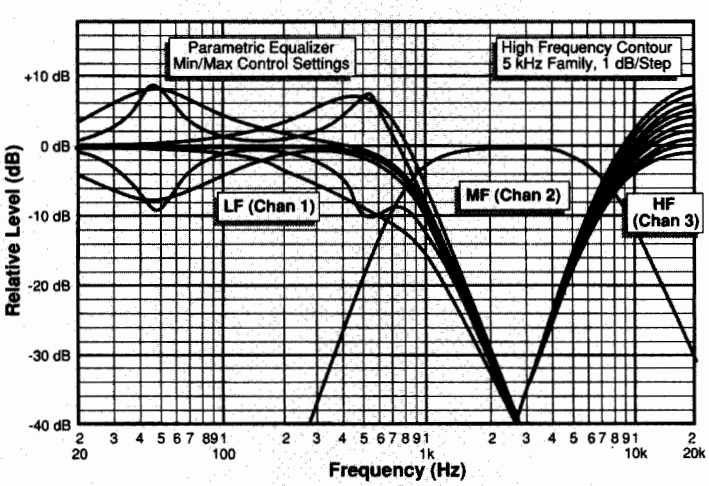
System Attenuator Accuracy
(1 dB Steps, Low Frequency Channel)



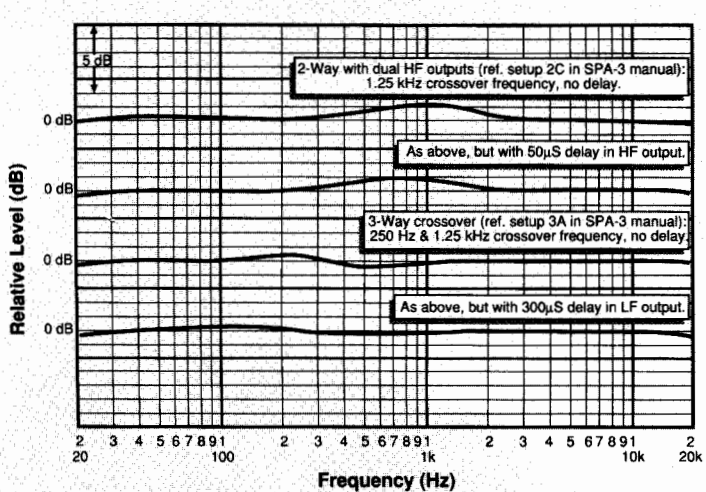
High-Pass Filter Frequency Response
(Family of Curves, Low Frequency Channel)



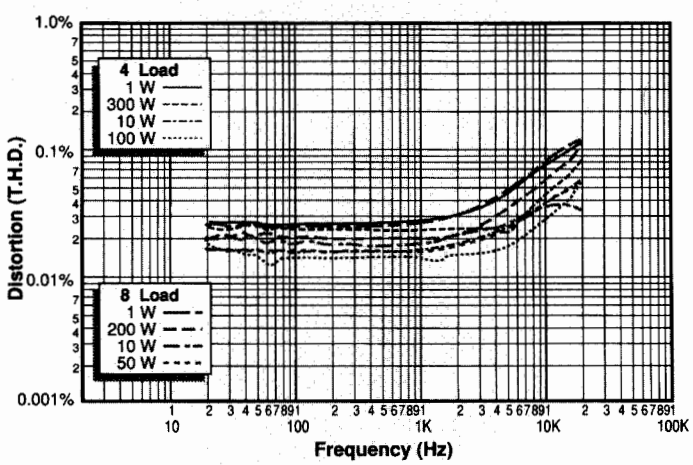
System Frequency Response (Wideband)
(24 dB/Octave Linkwitz-Riley Crossover)



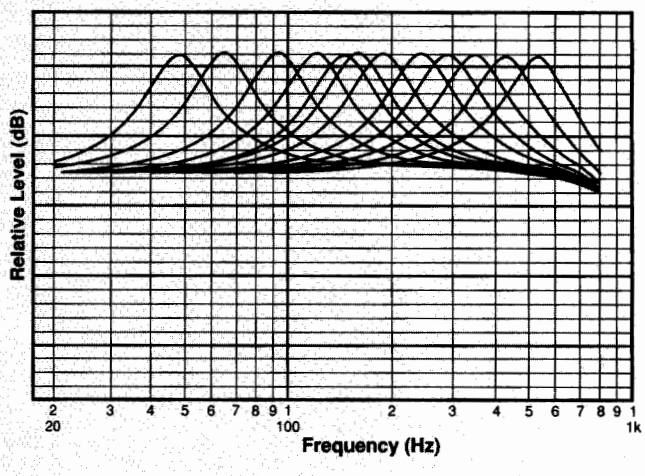
Low & High Frequency Equalizer Response
(24 dB/Octave Linkwitz-Riley Crossover)



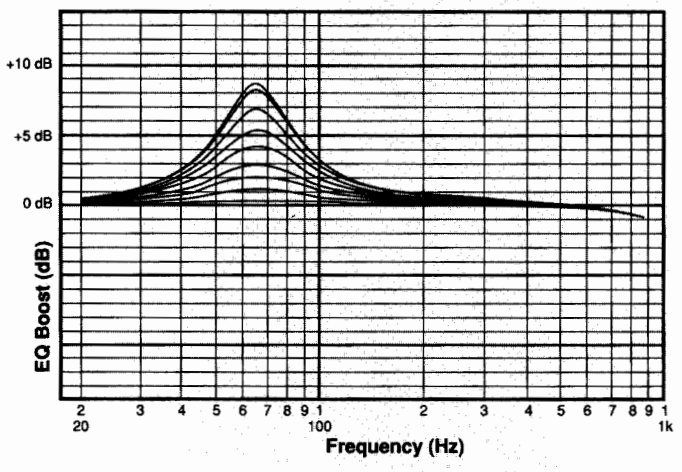
Summed Crossover Outputs
(System configurations described in SPA-3 Operation Manual)



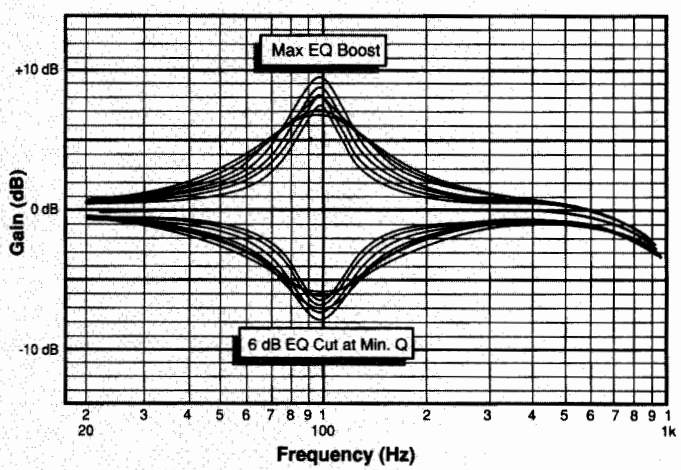
Total Harmonic Distortion vs. Frequency vs. Power
(BGW 7510 Power Amplifier Module, 4Ω & 8Ω Loads)



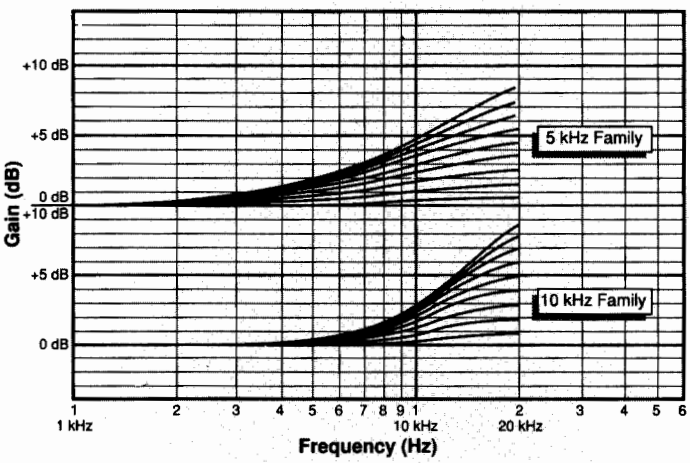
Parametric EQ: Frequency Control Rotation



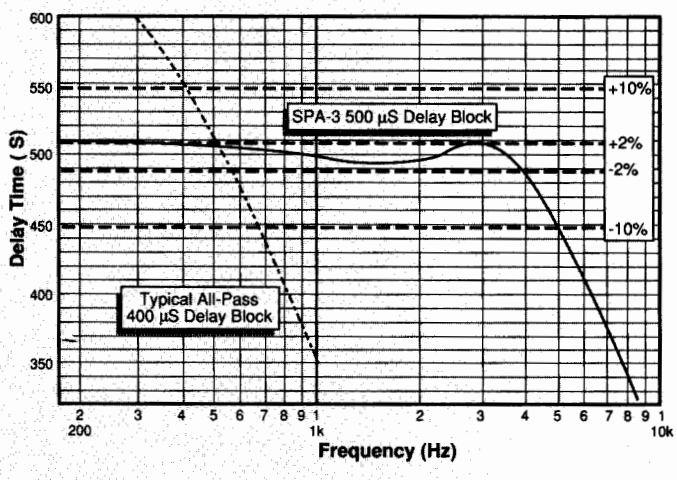
Parametric EQ: Level Control Rotation (Boost)



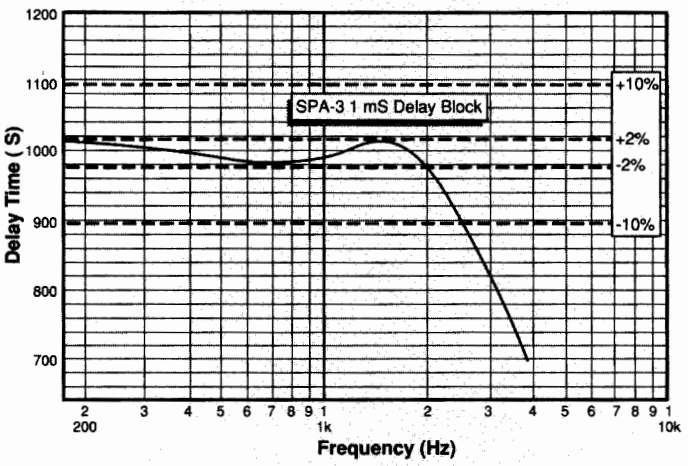
Parametric EQ: Q Control Rotation
(Max Boost Curves, Cut Curves Set at -6 dB With Minimum Q)



HF Contour: 5 kHz & 10 kHz Boost Curve Families



Delay vs. Frequency at 500 Microseconds Nominal
(Exceptionally Flat Delay Curve Compared to Other Units)



Delay vs. Frequency at 1 Millisecond Nominal
(Consistently Flat Delay Curve at Increased Delay Time)

SPA-1 & SPA-3 Specifications

	SPA-1		SPA-3	
Power Output	*Dual CH Mode*	*Bridge Mono*	*LF Section*	*MF & HF Sections*
16 ohms	125 W/CH	400 W	125 W/CH	125 W/CH
8 ohms	250 W/CH	800 W	250 W/CH	250 W/CH
4 ohms	400 W/CH	1200 W	400 W/CH	300 W/CH
2 ohms	600 W/CH	N/A	N/A	N/A
Maximum Gain	30 dB Each Channel		30 dB Each Channel	
Attenuation	Precision stepped rotary decimal switches adjustable in 1 dB steps; from 0 to 89 dB attenuation.		Precision stepped rotary decimal switches adjustable in 1 dB steps; from 0 to 89 dB attenuation. Three attenuators are provided: System Level, Mid and High Output.	
Attenuation Accuracy	±0.10 dB from indicated value, down to -40 dB.		±0.10 dB from indicated value, down to -40 dB.	
Frequency Response	Determined by filter settings.		Determined by filter settings.	
Input Impedance	15 kohms with active balanced input or optional factory-provided transformer.		15 kohms with active balanced input or optional factory-provided transformer.	
CMRR	Greater than 80 dB.		Greater than 80 dB.	
Crossover				
Frequency (ies)	Customer specified ISO frequency.		Customer specified ISO frequency.	
Slope Rate	24 dB/octave standard; customer to specify as single 24 dB slope or dual 12 dB + 12 dB slopes; 6, 12 or 18 dB/octave on special order.		24 dB/octave standard; customer to specify as single 24 dB slope or dual 12 dB + 12 dB slopes; 6, 12 or 18 dB/octave on special order.	
Filter Type	Linkwitz-Riley standard; Butterworth optional.		Linkwitz-Riley standard; Butterworth optional.	
High-Pass (Subsonic) Filter				
Frequency	10, 20, 30, 40, 50 60, 70 or 80 Hz, or bypass.		10, 20, 30, 40, 50 60, 70 or 80 Hz, or bypass.	
Slope Rate	18 dB/octave (Butterworth).		18 dB/octave (Butterworth).	
Parametric Equalizer				
Frequency Range	F_c 25 Hz to 250 Hz.		F_c 50 Hz to 500 Hz.	
Q Range	0.5 to 2.0.		0.5 to 2.0.	
Gain Range	±6 dB.		±6 dB.	
All-Pass Delay				
Delay 1 Time and Resolution	100 µS to 4.0 mS (or bypass). 10 steps of 100 µS, 1 step of 1 mS, 1 step of 2 mS.		LF: 100 µS to 4.0 mS (or bypass). 10 steps of 100 µS, 3 steps of 1 mS; 2.5 kHz linear delay bandwidth.	
Delay 2 Time and Resolution	N/A		MF/HF: 50 µS to 2.0 mS (or bypass).10 steps of 50 µS, 3 steps of 0.5 mS; 5 kHz linear delay bandwidth.	
Linearity	+2%, -10% up to 1200 Hz.		+2%, -10% up to 1200 Hz.	
System S/N Ratio	Better than 100 dB (unweighted) with 1 step of 2 mS delay.		Better than 100 dB (unweighted) with 1 step of 2 mS delay.	
Dimensions				
Height	5.25"		5.25"	
Width	19"		19"	
Depth	13.7"		13.7"	
Net Weight	41 pounds		43 pounds	

NOTES

Power ratings are continuous average sine wave, all channels driven (where applicable); SPA-3 "Total Power" is FTC rating. THD at maximum power output varies depending on selected signal processing; amplifier modules alone typically produce under 0.05% THD at rated power. All measurements assume 120V AC power input.

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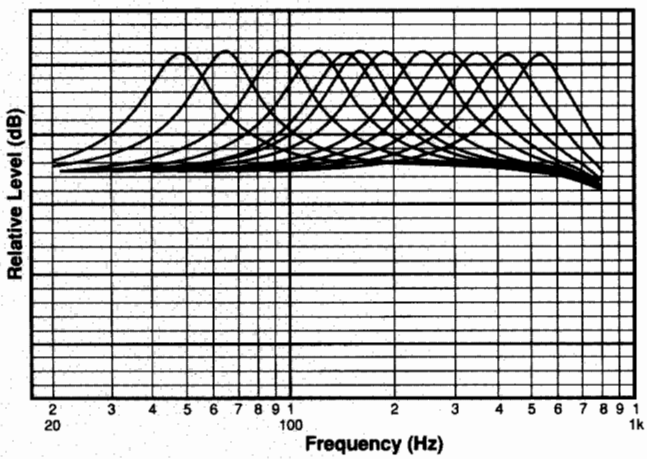
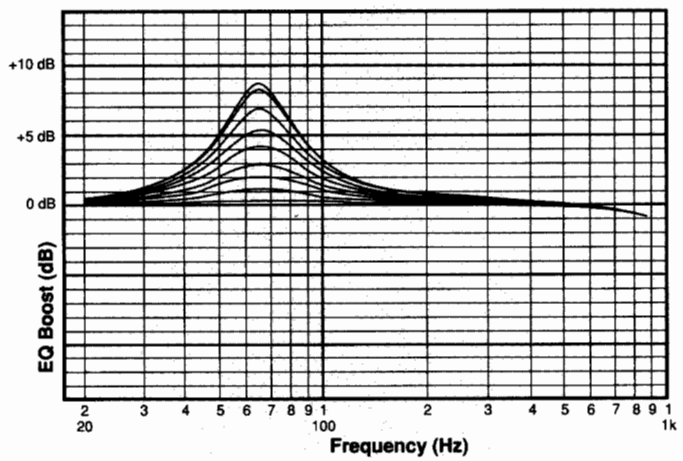
All specifications and features are subject to change without notice.

BGW SYSTEMS

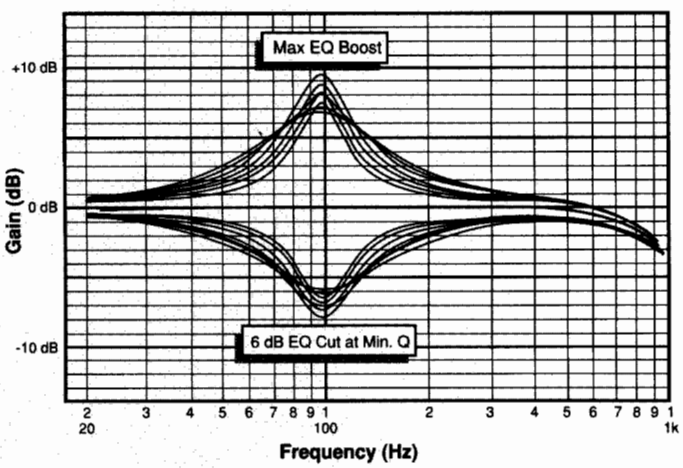
BGW Systems, Incorporated
13130 South Yukon Avenue, Hawthorne, California 90251-5042 FAX (213) 676-6713 Telex: 66-4494 **Phone (213) 973-8090**
Distributed in Canada by AKG Acoustics, 601 Milner Ave., Scarborough, Ontario M10 1M8 (416) 292-5161



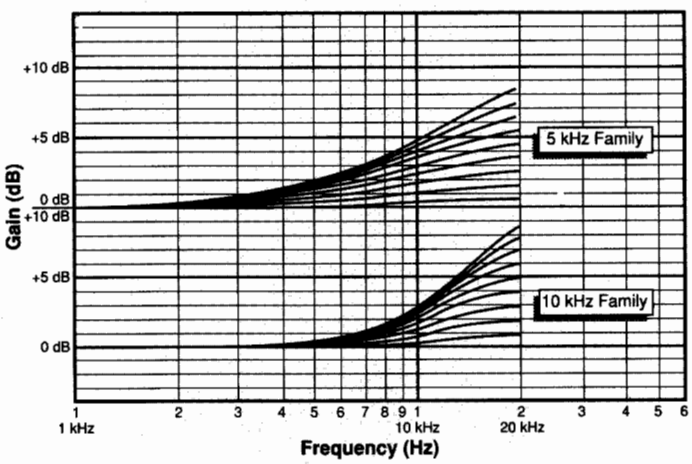
Parametric EQ: Frequency Control Rotation



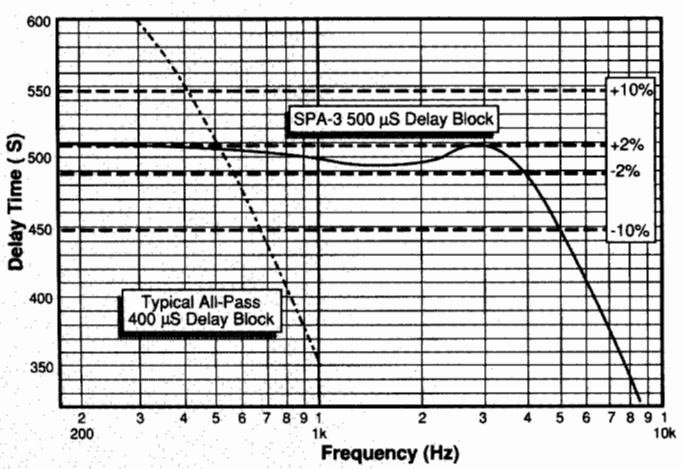
Parametric EQ: Level Control Rotation (Boost)



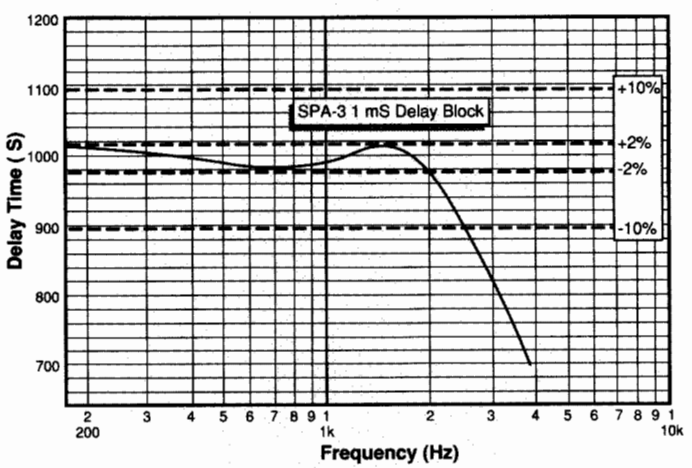
Parametric EQ: Q Control Rotation
(Max Boost Curves, Cut Curves Set at -6 dB With Minimum Q)



HF Contour: 5 kHz & 10 kHz Boost Curve Families



Delay vs. Frequency at 500 Microseconds Nominal
(Exceptionally Flat Delay Curve Compared to Other Units)



Delay vs. Frequency at 1 Millisecond Nominal
(Consistently Flat Delay Curve at Increased Delay Time)

The BGW SPA-3 Signal Processing Amplifier

by Jesse Klapholz and Richard Feld

BGW has been manufacturing time-proven, reliable power amplifiers for over 10 years. These have been more of a traditional type—two channels and volume controls. While BGW's only other entry into the signal processing sector has been an electronic crossover, this new amplifier has incorporated several new and unique features. The name SPA-3, which stands for Signal Processing 3-Way Amplifier, tells part of the story. It consists of a three-channel power amplifier, and a crossover/alignment-delay/eq section.

The three-rack-space unit has a removable security cover on its front panel, which provides access to the various level, eq, and delay settings. All of the functions are easy to set and are completely repeatable by the use of detent-type thumbwheel, slide, and DIP switches. Included on the front panel are a 20-amp magnetic circuit breaker (which acts as both an overcurrent protection device and power switch); power, and input signal presence LED's; and signal and clip indicator LED's for each of the three channels. The rear-panel includes three sets of standard five-way binding post outputs, parallel male/female balanced XLR-type input connectors, an octal-socket for an optional input transformer, and a ground lift switch.

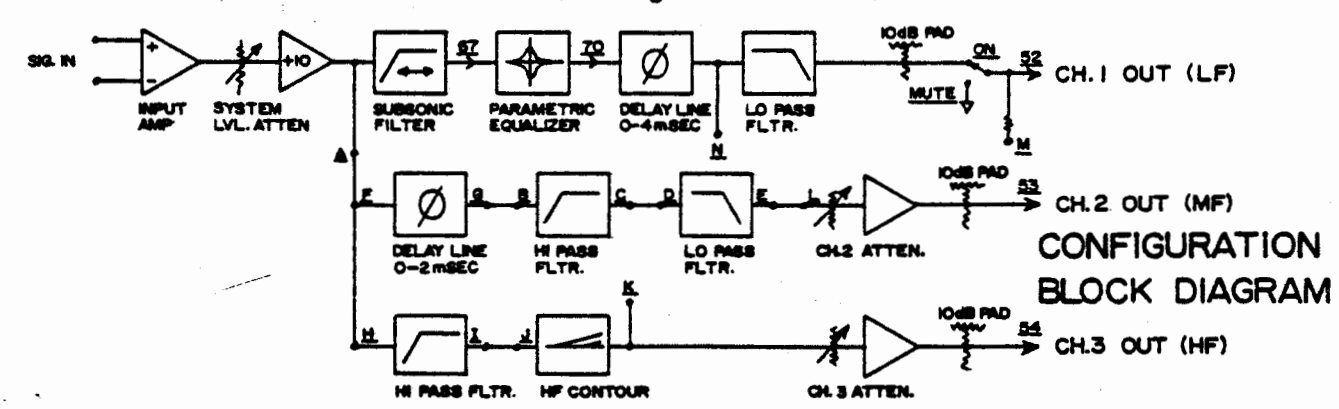
Opening the amplifier uncovers a well designed layout, with circuit cards easily removed for servicing, and headers easily reached for user changeable options. A closer inspection revealed high-quality low-noise op-amps were used throughout the signal processing circuits (TLO74's and 5532's). Also, the input circuit incorporated phase-reversal jumpers, and CMR (Common Mode Rejection) adjustment. A main reason for using a balanced input is to optimize CMR. Both the high-frequency and DC gain are adjustable and the second half of the input—a feature not even found on many recording consoles.

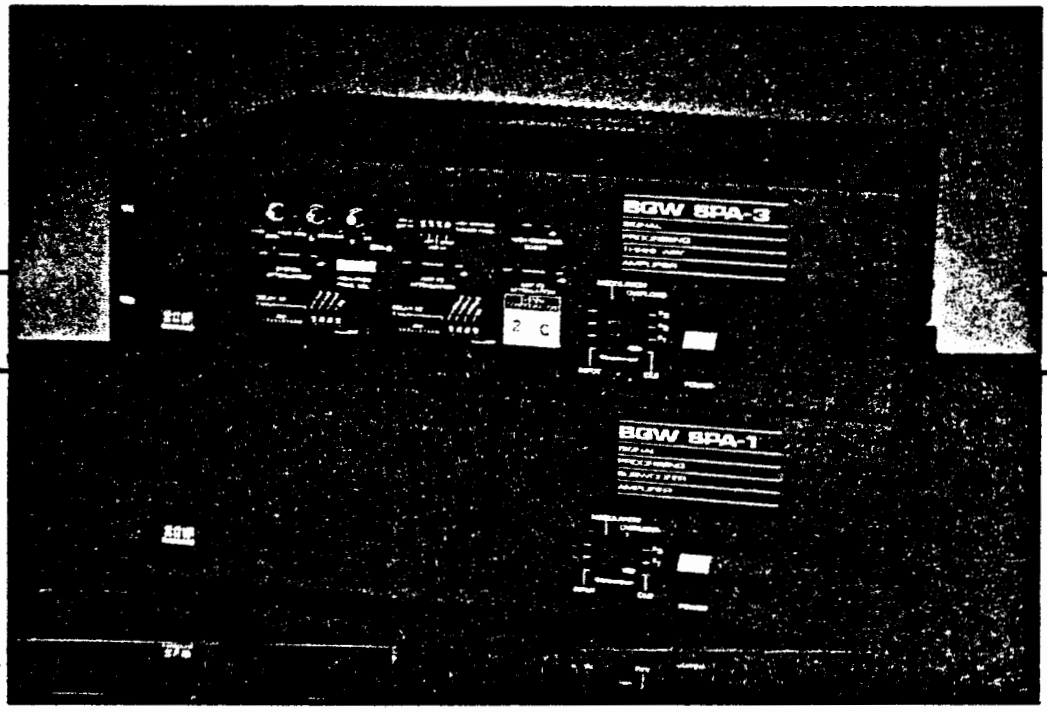
We just mentioned *headers* above. These are DIP sockets into which jumpers may be installed using a 14-pin block assembly the size of an IC-chip. These jumpers are used to configure the signal flow through the amplifier. The overall block diagram of the signal processing section is shown in Figure 1. Channel 1, or the low-frequency output, is hard-wired as follows: subsonic filter, parametric equalizer, 0-4 ms delay-line, and low-pass filter.

The delay will allow for up to 4.5 feet of alignment correction in the low-end with 100 us/step adjustments (100 us equals approximately 1.35 inches). The Mid/Hi Frequency delay will allow for up to 2.25 feet of correction with ten 50 us/step adjustments (50 us equals approximately .68 inches).

Channels two and three share five remaining blocks which are: two high-pass filters, a low-pass filter, a 0-2 ms delay-line, and a high-frequency contour equalizer. These channels are usually used for mid- and high-frequencies, and can derive their input signals from one of the three following stages: a) after the system in-

Figure 1





put level control; b) after the sub-sonic filter, parametric eq, and delay; and c) after a), c), and a low-pass filter. A *flow-chart* can be drawn, and implemented by simply wiring jumpers into a DIP header, providing for several variations in either two- or three-way setups.

A turn-on-delay/fast-off circuit is built into the amplifier to eliminate transients and *thumps* into the loudspeakers at power-up/power-down. The crossover network used is the currently accepted state-of-the-art Linkwitz/Riley type, with either 4th-order or *dual 2nd-order* slopes available. The dual-slope scheme, according to some, sounds better and still affords twice the power handling capability through the crossover region (more on this may be found in *Directing the Signal Flow*, October 1986 *Sound & Communications Magazine*). However, 12 dB/octave Butterworth filters are also available for those *die hards* who still use them.

The Tests

We tested the SPA-3 with a Sound Technology 1710, and a Tektronix 502 oscilloscope. These instruments are commonly used and the test procedures are ones that any technician should be normally performing. Our tests used standard test bench resistive loads.

Upon power up, we ran the amplifier to clipping and verified smooth wave deformation which caused only minimal temperature increase of the heat sinks at these above normal output levels. The crossover frequencies were 800 Hz and 5 kHz. Since the amplifier was not set up as a full-range system, we were not able to test for IM distortion. These tests, however, would not be applicable because the individual amplifier channels are used over restricted bandwidths.

It should be noted that these tests are the same as testing a system from delay input, through eq/crossover, to amplifier output. There are from three to five stages of processing in any one amplifier channel with up to some 76 op-amps in the SPA-3 in all.

The manufacturer does not specify distortion figures for the amplifier, but we ran wide-band THD tests in all three channels, at both 8 and 4 ohm loads. We found the amplifier to have more than acceptable THD levels, and the power output exceeded that specified by the manufacturer. Also, the signal-to-noise was not specified. These measurements were very good in all three channels as shown in our measurements. The amplifier performed well throughout our tests and never overheated or went into protection mode.

Comments

We found the amplifier to be easily adaptable to a number of design/install situations. The precision level controls allow for exact gain structures to be established within a system and repeatability is simple. The parametric equalizer can be used for a step-down eq, or power response correction of low-frequency devices. The high-frequency eq is really utilitarian, in that it will compensate for the roll-off common to all constant-directivity type horns. This eliminates the need for external eq—reducing overall noise levels—a feature incorporated in some of the better crossover networks.

The optional input transformer socket can be used to bring out any signal processing block output. Thus, the crossover, delay, and eq can be used to drive other amplifiers. Furthermore, just about any frequency can be easily modified by changing a capacitor,

REP NEWS

AKG Acoustics has announced the appointment of several new representative firms. **ProMusica Sales** in Keene, New Hampshire, will represent all AKG products to the professional audio and music dealers in New England. **VF Sales** in Natick, Massachusetts, continues to represent AKG products to the hi-fi market. **Profit Line Marketing** in San Rafael, California, will represent AKG products to the hi-fi market in northern California. **J.N.D.** in Fairfax, California, continues as pro products representative. **Sound Marketing** in Palos Heights, Illinois, will represent all AKG products to all dealers in Indiana and Kentucky. **Central Electronics Sales Company** in Royal Oaks, Michigan, will represent all AKG products to all dealers in Michigan.

Lowell Manufacturing Company has appointed **Lichtenauer & Associates** to represent the company in northern California and northern Nevada.

Martin America has appointed three new rep firms to handle Martin Audio Products of London. They are **North Coast Marketing** in Erie, Pennsylvania; **Ludwig Marketing** in Kenosha, Wisconsin; and **Central Electronics Sales Co.** in Royal Oak, Michigan. North Coast will serve Ohio, West Virginia, and western Pennsylvania; Ludwig will serve Illinois, Indiana, Kentucky and Wisconsin; and Central will serve Michigan.

the high-frequency contour eq for example. The *programmable* signal processing combined with three good-sized power amplifiers in a compact package will find itself useful in many integrated or single cluster type systems.

Specifications:

	MANUFACTURER'S	LAB TEST'S
Distortion THD	n/a	<.02%, 280W <.04%, 450W
Max Power Low Section	250W @ 8 ohms 400W @ 4 ohms	280W @ 8 ohms 450W @ 4 ohms
Max Power Mid/High Section	250W @ 8 ohms 300W @ 4 ohms	260W @ 8 ohms 450W @ 4 ohms
Signal to Noise Ratio	>100dB unweighted	>112 dB, low >106 dB, mid >102 dB, hi
Common Mode Rejection	n/a	>80 dB

GENERAL SPECIFICATIONS

Attenuation	Precision stepped rotary decimal switches adjustable in 1 dB steps, provides from 0 to 89 dB attenuation. Three attenuators are provided, system level, mid, and high output.
Input Impedance	15K ohms, transformer or active balanced
High Pass Frequencies	10, 20, 30, 40, 50, 60, 70, 80 Hz or bypass
Crossover Fc	User specified ISO centers, specify slope as 24 dB/octave Linkwitz-Riley, 12 dB + 12 dB dual-point, or 12 dB/octave Butterworth.
Parametric Equalizer	Fc: 50 Hz - 500 Hz Q: 0.5 - 2.0 Boost/Cut: +/- 6 dB
Delay	Low-Frequency: 10 steps of 100 ms, 3 steps of 1 ms; delay range from 100 µs to 4.0 ms Mid/Hi-Frequency: 10 steps of 50 µs, 3 steps of 0.5 ms; delay range from 50 µs to 2.0 ms
Dimensions	5.25"H x 19"W x 13.1"D
Net Weight	43 pounds
Price	$2499 pro net

RACK MOUNTING HINTS

Use care when mounting equipment in a rack enclosure. Place the heaviest units near the bottom of the rack. Equipment cannot always be supported by Front Panels alone. This is especially true of amplifiers whose depth is more than twice their height. Uniform support can be insured by installing bottom or side rails.

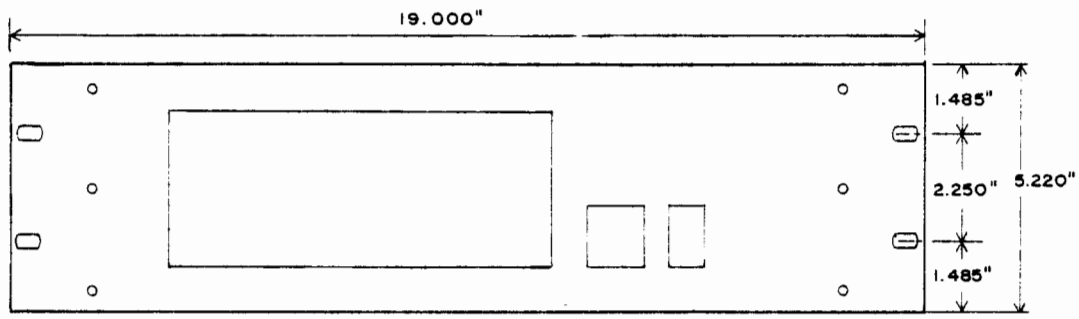
When racks are to be transported or used in a mobile installation, some means of securing the rear of the equipment is required. This will restrict movement of the equipment in any direction in the rack enclosure. Likewise, equipment weighing more than 50 lbs require rear support to prevent distorting or breaking the Front Panel. BGW Power Amplifiers are fitted with Rear Panel Support provisions for this purpose. Please refer to the CHASSIS DIMENSIONS AND REAR SUPPORT DETAIL drawing in this manual. Angle brackets attached to the sides or bottom of the rack enclosure, and fitted to mate up with the mounting holes on the Rear Panel is one suggestion.

NOTE: DO NOT ALLOW MORE THAN 1/2" OF SCREW SHANK INSIDE CHASSIS. Select a screw length of about 1/4" greater than the bracket/washer thickness.

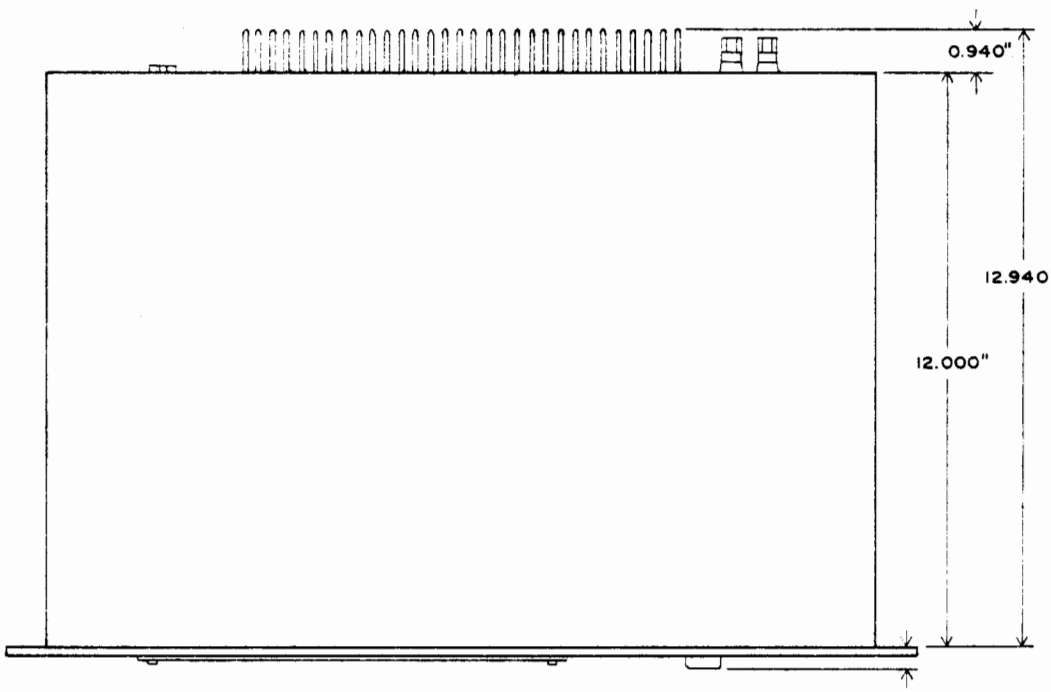
To protect the Front Panel finish from deep scratches occuring around the rack mount slotted holes, use NYLON Finishing Washers between the mounting screws and the Front Panel. #10-32 hardened machine screws are recommended, and is the size required for the rear support provisions. (Avoid "packaged" hardware found in consumer discount lumber/hardware stores, as most of it is too soft and can shear off easily. Hex-key style hardware, in general, has the proper hardness ratings).

Unless the rack enclosure is small, and/or light enough in weight to lay down on its' back, allowing the amplifier(s) to be easily positioned and "bolted in" by yourself, LET SOMEONE ASSIST YOU! While lighter weight equipment can be installed by one person into <u>vertical</u> rack enclosures (by performing a "circus balancing act" sometimes), attempting the same with 50 lbs-PLUS amplifiers can lead to VERY PAINFUL PERSONAL INJURY or DAMAGE to the equipment (OR BOTH)! Again, LET SOMEONE ASSIST YOU ! Very little intelligence is involved in one person on each side of a 50 to 80 lb amplifier and, <u>together</u>, slipping it into position and start the mounting hardware threading into the <u>proper</u> rack rail holes ("Does your side line up? Mine neither. Let's slide it up one position"), and share the tool to tighten the mounting hardware. Within moments, the amplifier is in place.

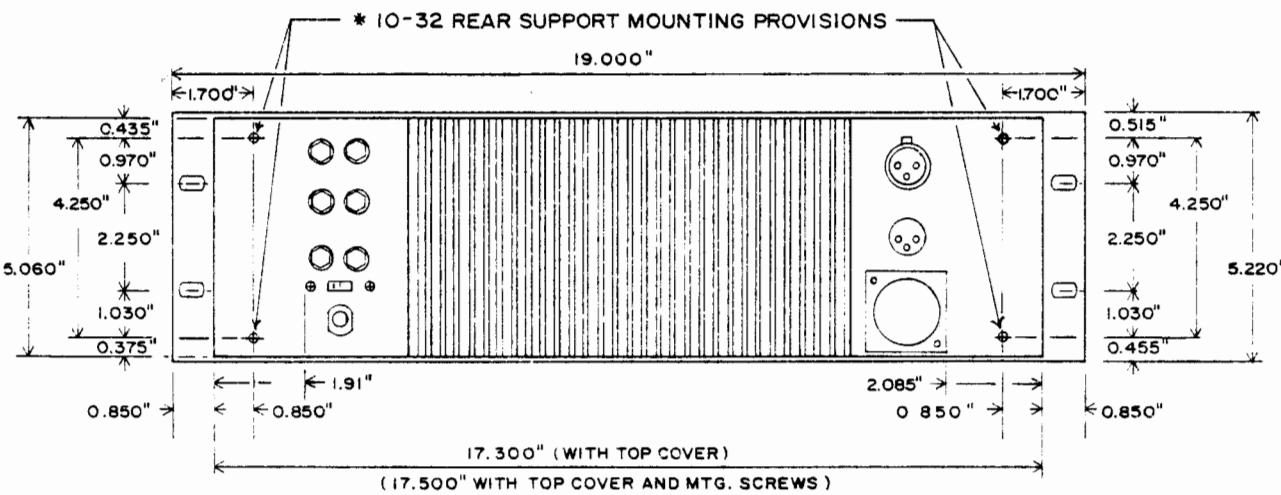
The better quality (and more expensive) rack mount enclosures provide (or have provisions for) front-to-back, right angle steel



FRONT VIEW



TOP VIEW



REAR VIEW

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

BGW SYSTEMS

TITLE: SPA-3 CHASSIS DIMENSION AND REAR SUPPORT DETAIL

SIZE: C | DRAWING NUMBER: 9512 - 7723 | REV

SCALE 1/2 | SHEET 1 OF 1

DRAWN	6-21-88	
CHECK	6-21-88	
PROJECT ENGR	4-21-86	

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

DO NOT SCALE DRAWING

NOTES: UNLESS OTHERWISE SPECIFIED

support brackets, in addition to identical, aligned rack-mount rails at the rear of the enclosure. (At least, they are supposed to be aligned with the front rack rails). If the bottom support brackets are used, a blank rack panel will be required between the bottom of most BGW products and the top of the next unit, as the chassis bottom is very close to being flush with the bottom of the front panel.

A most clever arrangement we have seen for the rear support made use of #10-32 threaded, tapered guide pins bolted into the Rear Support Provision holes, and mating bushings installed into aligned right angle brackets attached to the enclosure side walls. Front panels were secured with (quality) standard hardware. This made installation and removal of the amplifiers easy, once the input, output and power cord connections were detached.

KEEPING IT COOL

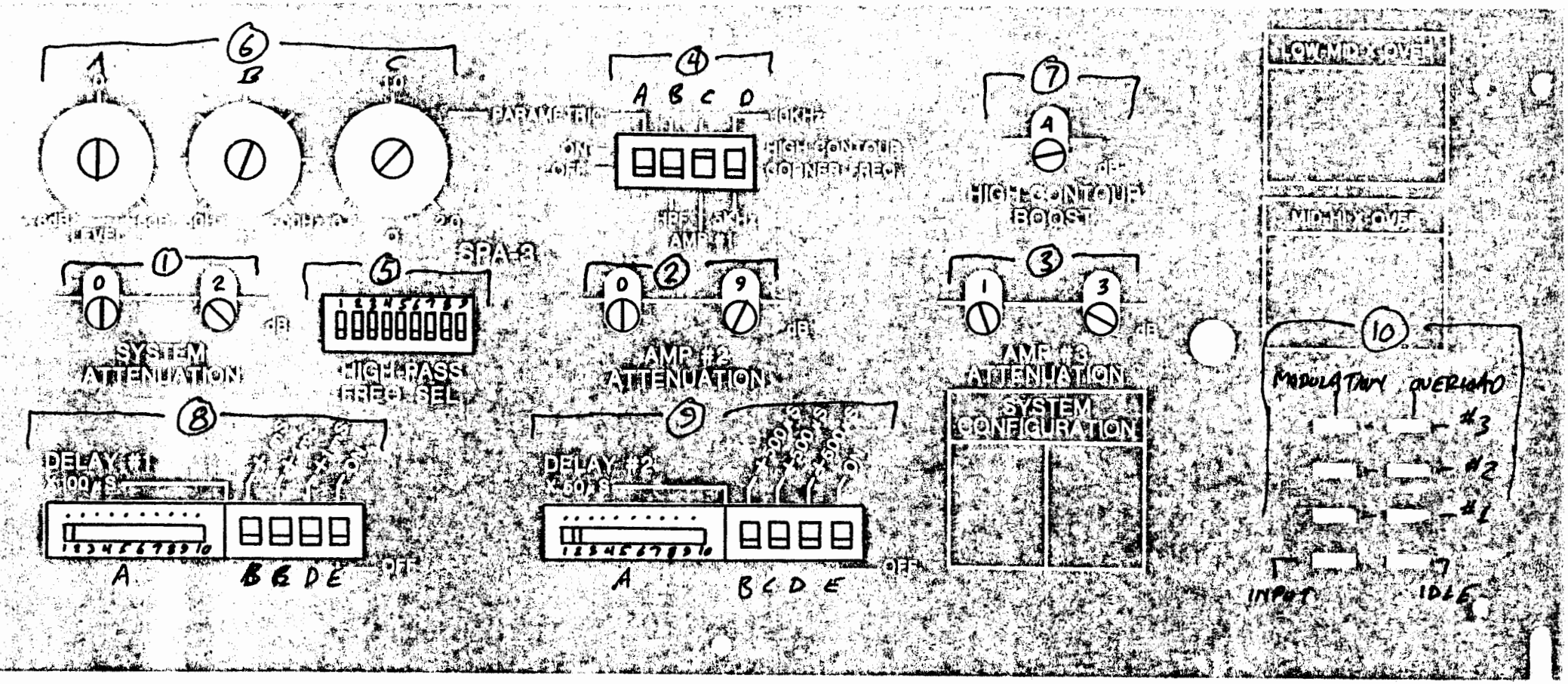
A power amplifier draws energy from a primary electrical service, usually a 120 Volt service, to drive loudspeaker systems with an audio signal. Typically, only half of the energy can be delivered to the loudspeakers; the remaining energy is converted into heat, and must be dissipated (ventilated) into the air.

Air circulating past heat-producing components absorbs the heat and carries it away. To accomplish this, low and medium power amplifiers rely on natural convection currents, while most high power amplifiers use fans. If the air flow is obstructed, the resulting rise in heat may cause an amplifier to stop working or fail.

Circulating air currents must not be cut off when installing power amplifiers in Racks or small cases. Power amplifiers using convection cooling require spacing between each other to permit air flow between them. Power amplifiers using forced-air cooling, on the other hand, can usually be stacked close ot each other and may not need any blank panel spacing between them.

To improve natural convection currents within a rack, a 'chimney' can be created by closing the back of the rack and venting the rack at the bottom to let in fresh cool air, and at the top to exhaust hot air. Vents should be large rectangular slots approximately 19" wide by 4" high.

The Rack cabinet will require some type of blower if a large air-flow is required. It is best to exhaust air from the top of the rack rather than to blow it in from the bottom. There will be less dust and dirt in the rack this way, if the bottom vent is sufficiently large. It is advisable to provide dust filters at both the air inlet and exhaust outlets of the rack. Likewise, periodic maintainence is required to clean the filters. If no filters are used, then similar maintainence should be performed on the amplifiers to prevent heat buildup or failure from conductive elements that may be in the dust.



SPA-3 CONTROL PANEL (FIG. 1)

DESCRIPTION OF CONTROL FUNCTIONS & INDICATORS

Refer to Control Panel Fig. 1

SIGNAL LEVEL ATTENUATORS: Control groups (1), (2), and (3) provide the operator/system installer with an extremely accurate set of calibrated attenuators. These are oriented to read out directly in dB LOSS by using a X10dB and a X1dB control, hence the term DIGI-SWITCH. Accuracy is typically ±.05dB over the first 40dB range. Meaning, dial up 13dB Attenuation, you get 13dB. Unit to unit, consistently!

'Normal' SPA-3 System Configurations designate Attenuator Group (1) as the System Master Level Control. Amplifier Channels 1, 2, and 3 output levels follow this control setting. (In 3-Way Configurations, CH. 1 is LF; CH. 2 is MF; CH. 3 is HF). For relocation of the System Master, or rescaling the Attenuators for 1/2 dB Steps/ 5 dB Steps, refer to the System Applications section (See Table of Contents).

CHANNEL MUTE FUNCTIONS: Channel 2 and Channel 3 Level Attenuators provide output level balance relative to Channel 1, which 'normally' has no Level Attenuator, but is equipped with a MUTE Switch (4C). The MUTE function for Ch. 2 and Ch. 3 is provided by the X90 position of the Level Attenuators. In addition to the controls having detents, they have no mechanical 'stop', allowing you to dial from '0dB' to '-90dB' in one clockwise step. System mute function is performed in the same way.

HIGH PASS FILTER: Controls (5) and (4B) provide an adjustable 18dB/OCT. Subsonic Filter and an ON/OFF switch. Cut-off Frequencies range from 10Hz to 80Hz in 10Hz steps. Control (5) is a 9-Position On/Off switch that requires the use of the SWITCHSET™ Code Chart silkscreened on the inside of the Security Cover Plate. It is restated here with, perhaps, greater clearity.

FREQ.	SWITCHSET™ SETTINGS
10Hz	Pos. 1-9 ALL OFF
20Hz	Pos. 1, 4, 7 ON
30Hz	Pos. 2, 5, 8 ON
40Hz	Pos. 1, 2, 4, 5, 7, 8 ON
50Hz	Pos. 3, 6, 9 ON
60Hz	Pos. 1, 3, 4, 6, 7, 9 ON
70Hz	Pos. 2, 3, 5, 6, 8, 9 ON
80Hz	Pos. 1-9 ALL ON

(Pos. Numbers Not Stated are OFF)

'Normal' placement of this Function Block is in the Low Frequency Channel (Ch. 1), preceeding the Parametric Equalizer. Optional Freq. Range, Hz/Step, relocation, and other slopes are covered in the the Applications Section (See Table of Contents).

PARAMETRIC EQUALIZER: Control Group (6A-6C) and (4A) is the only set of controls that are continuously variable, a departure from the 'DIGI-SWITCH' precision characteristic of all other SPA-3 controls. The four controls provided are as follows:

(4A). EQ IN/OUT Switch;

(6A). Boost/Cut...nominally ± 6dB at minimum Q setting;

(6B). Fc...this allows tuning of the Equalizer over a one decade frequency range, 'normally' 50-500Hz;

(6C). Q...this control really should have been labeled 'Freq. Bandwidth', as the chosen 'Q' range spans from 1/3 OCT. to 1 OCT. in width, and is easier to relate to.

Refer to the SPA-3 Typical Performance Graphs for Frequency Response characteristics.

'Normal' placement of this Function Block is in the Low Frequency Channel (Ch. 1), between the adjustable High-Pass Filter and Delay Line #1. Alternate Frequency Tuning Ranges, relocation, or elimination of this Function is covered in the System Applications section (See Table of Contents).

DELAY LINE #1: Control Group (8A-8E) is formated in two seperate control actuator groups. (8E) is the Delay IN/OUT switch. Slide switch (8A) is a 10-Position linear control that provides 100 uSEC Delay/Step, configured as a 1000 uSEC Tapped-Delay Line. Switch controls (8B), (8C), and (8D) allow insertion of 1 mSEC Delay Line Sections in series with the Tapped-Delay Line. Minimum Delay is 100 uSEC, and maximum Delay is 4.0 mSEC.

'Normal' placement of this Function Block is in the Low Frequency Channel (Ch.1), between the Parametric Equalizer and the Low-Pass portion of the SPA-3's Crossover Filter section.

DELAY LINE #2: Control Group (9A-9E) is, like its' counterpart (Delay Line #1), similarly formated in two seperate control actuator groups. (9E) is the Delay IN/OUT switch. Slide switch (9A) is a 10-Position linear control that provides 50 uSEC Delay/Step, configured as a 500 uSEC Tapped-Delay Line. Switch controls (9B), (9C), and (9D) allow insertion of 500 uSEC Delay Line Sections in series with the Tapped-Delay Line. Minimum Delay is 50 uSEC, and maximum Delay is 2.0 mSEC.

Placement of this Function Block, if used, is normally in either Channel 2 or Channel 3, depending on that required of the Loudspeaker components used.

HIGH FREQUENCY CONTOUR BOOST: Controls (7) and (4D) are included to provide POWER RESPONSE CORRECTION EQUALIZATION to commonly-used Constant-Directivity Horns/Compression Drivers. Two seperate 'Family of Equalization Curves' are provided by switch (4D), labeled '5kHz' and '10kHz', and adjusted in 1dB steps by DIGI-SWITCH control (7). Please refer to the SPA-3 Typical Performance Graphs for clarification.
The stock equalization provided approximate that required for either 1" Throat HF Drivers (10kHz setting), or 2" Throat HF Drivers (5kHz setting). 'Normal' placement of this Function Block is in Channel 3, following the High Pass Crossover Filter and immediately preceeding the Level Attenuator. As the System Applications and Transducer Response Library for the SPA-3 is continually growing, this Function Block is, of course, not limited to the 'normal' production item. For alternate EQ response curves, or relocation of this Equalizer, refer to the System Applications section (See Table of Contents).

POWER SWITCH: In a normal installation, only one control is present to the System operator: the Power Switch. Locked behind the Security Cover Plate are all the System Installer/Tuner Controls. Once proper System 'Tuning' is achieved, the Cover Plate is locked in place, and 'Operator-Mentality' set in motion: "This is only a Power Amplifier. It has no controls-only a Power Switch." The switch is actually a Magnetic Circuit Breaker, and a main System Protection Device.

LED DISPLAY INDICATORS: Eight LED Indicators are provided. These are grouped into two Signal-Directed color bands, and a single, Non-Signal indicator, marked IDLE. This is the POWER ON INDICATOR, and is GREEN in color. With the Power Switch depressed, and the SPA-3 plugged into a 'live' power outlet, this GREEN LED should be illuminated.

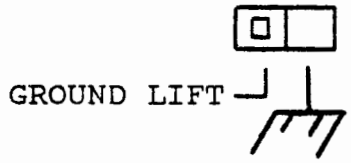
Adjacent to this 'IDLE' Indicator is the Signal Input Presence Indicator, marked INPUT. It, and all the LEDs in the 'MODULATION' column are ORANGE in color. This 'INPUT' Indicator will illuminate whenever an input signal exceeding approximately 60 mV peak (-22dBM re: 0.775 V) is present, REGARDLESS of any control settings. In 'Multi-channel' Sound Systems, this Indicator is invaluable in tracing down system faults or system checkout without the Speaker System in place.

The remainder of the 3-Channel Display provides indication of Power Amplifier signal output level. These are grouped in two columns: MODULATION (ORANGE LEDs, Left column); and OVERLOAD (RED LEDs, Right column). The MODULATION Indicators will illuminate whenever the output level exceeds approximately 0.9V peak. Similarly, the OVERLOAD Indicators will illuminate whenever the output level exceeds approximately 51V peak (36V RMS).

The nature of Signal Detection provided in the LED Indicator circuits is Positive-Peak Voltage, AC-Coupled. True Clip indication is not (presently) provided. RED-level indication,

therefore, doesn't absolutely depict a distorted signal output condition. Nor will a shorted output condition, or True clipping into low impedance loads cause the RED LEDs to illuminate.

REAR PANEL CONTROL FUNCTIONS: There is only one System Installer-Oriented control on the Rear Panel: CHASSIS GROUND/SIGNAL GROUND ISOLATION SWITCH. It bears the markings about it:



As this section is meant for Description of control functions, the proper use of this switch shall not mark the beginning of the volumes of text that could follow. Instead, let us say it allows the Installer to isolate Signal Ground from AC Power Ground and facillate proper System Grounding Techniques. For further discussion, refer to the INSTALLATION INSTRUCTIONS; SYSTEM GROUNDING section (See Table of Contents).

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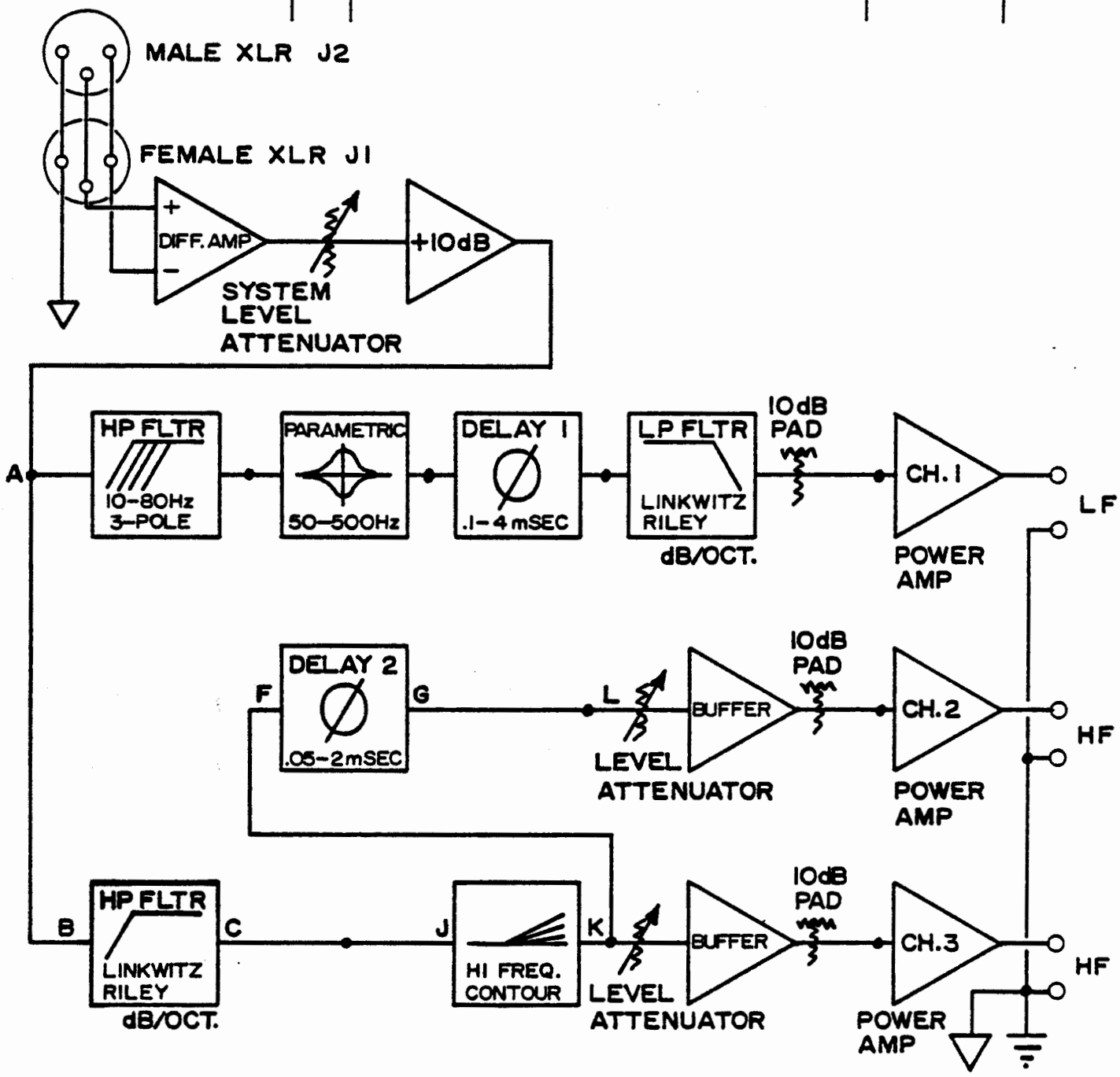

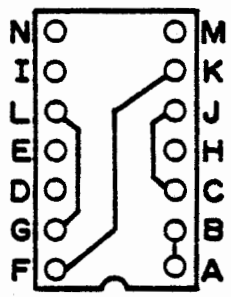

PLUG-IN HEADER

P201-2A

CUSTOMER	
DRAWN S.W. Selberg 8-28-87	
CHECK	
PROJECT ENGR S.W. Selberg 8-22-85	
SPEAKER SYSTEM	

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE

SPA-3 CONFIGURATION 2A SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
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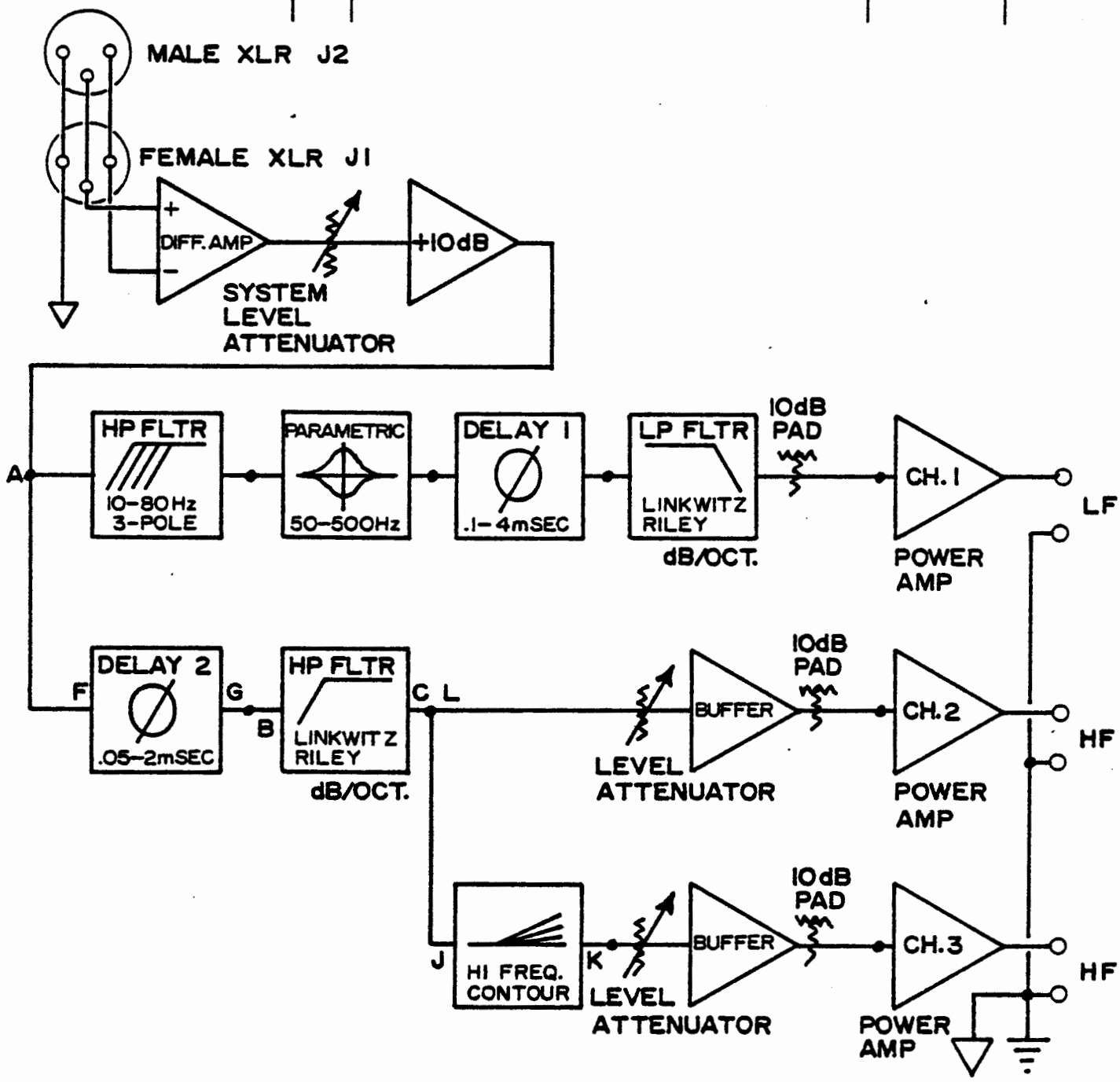
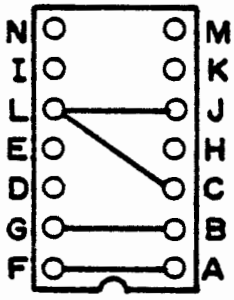
SCALE		SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER
P201-2B

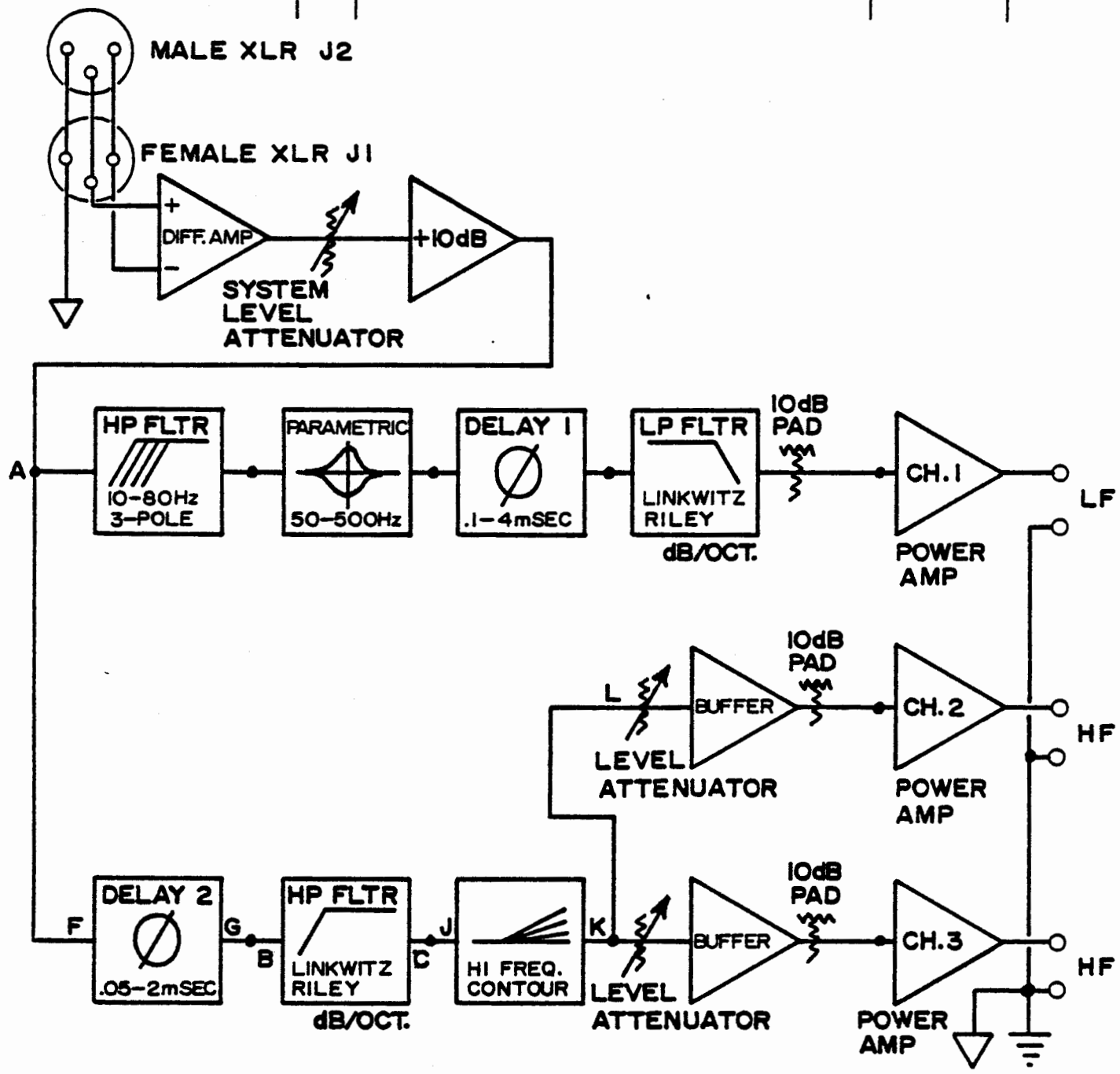
CUSTOMER	
DRAWN S.W. Selberg 8-29-87	
CHECK	
PROJECT ENGR S.W. Selberg 8-22-85	
SPEAKER SYSTEM	

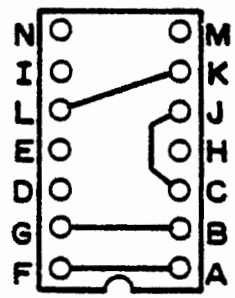
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 CONFIGURATION 2B SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
A	9512-7723	
SCALE		SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

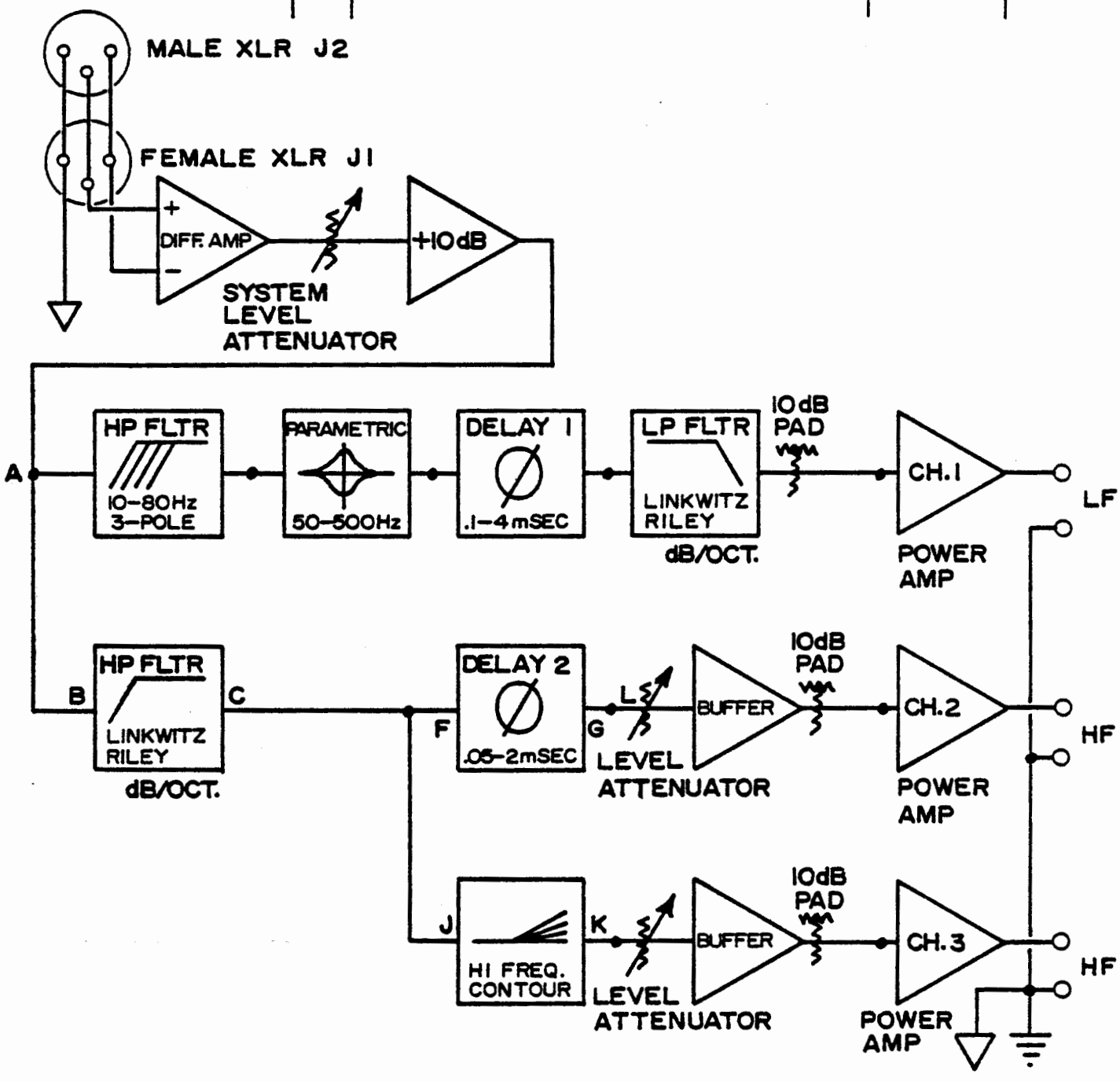


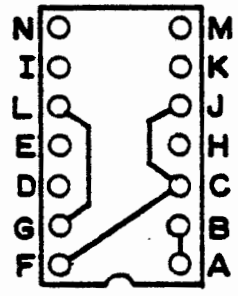


PLUG-IN HEADER
P201-2C

CUSTOMER		BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Selfberg	8-22-87	TITLE SPA-3 CONFIGURATION 2C SYSTEM BLOCK DIAGRAM	
CHECK			
PROJECT ENGR S.W. Selfberg	8-22-85		
SPEAKER SYSTEM J		SIZE A	DRAWING NUMBER 9512-7723 REV
		SCALE	SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER
P201-2D

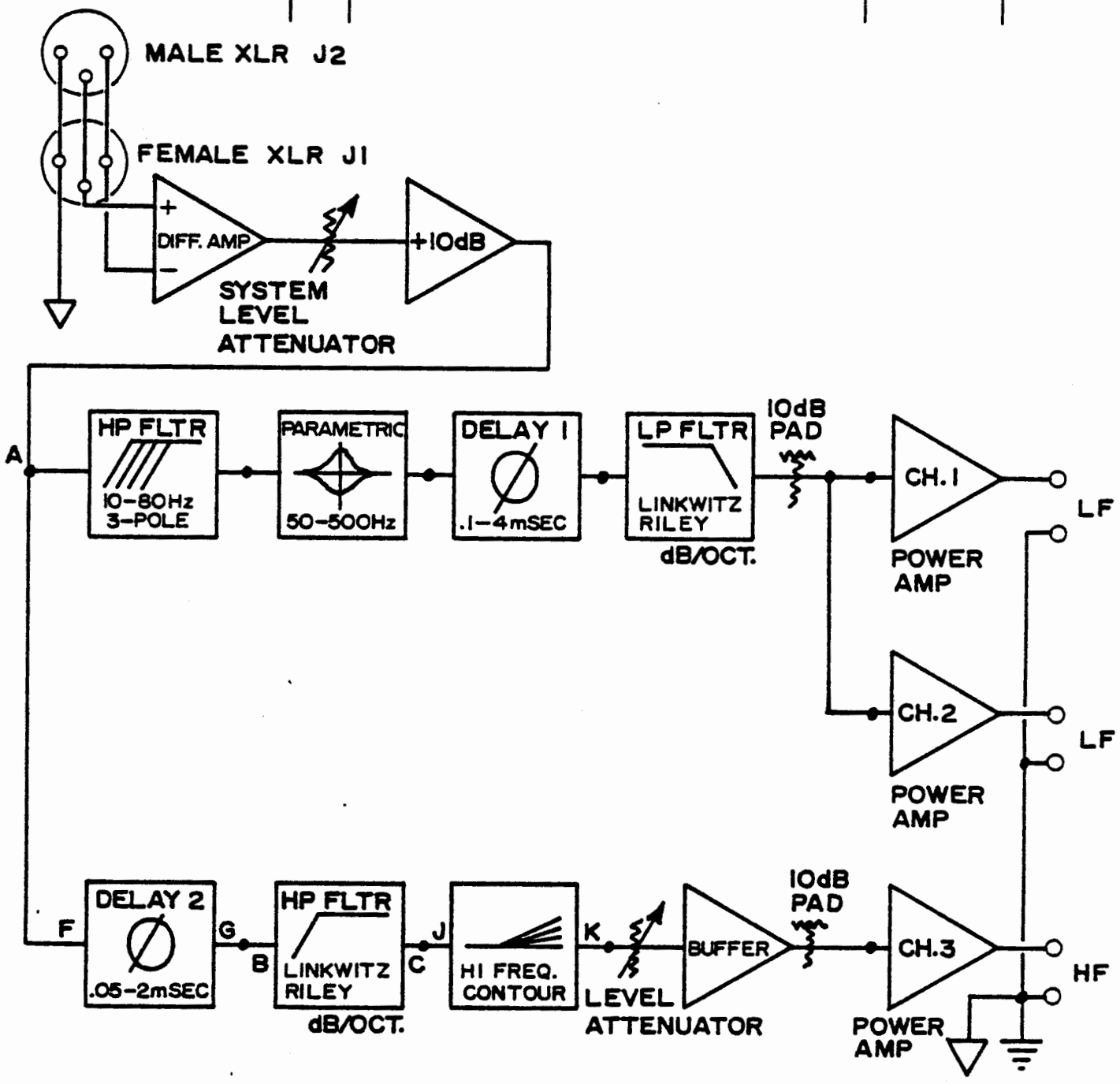
CUSTOMER		
DRAWN S.W. Selberg	8-29-87	
CHECK		
PROJECT ENGR S.W. Selberg	8-22-85	
SPEAKER SYSTEM		

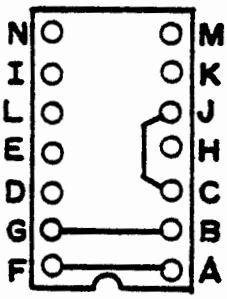
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 CONFIGURATION 2D
SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
A	9512-7723	
SCALE		SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

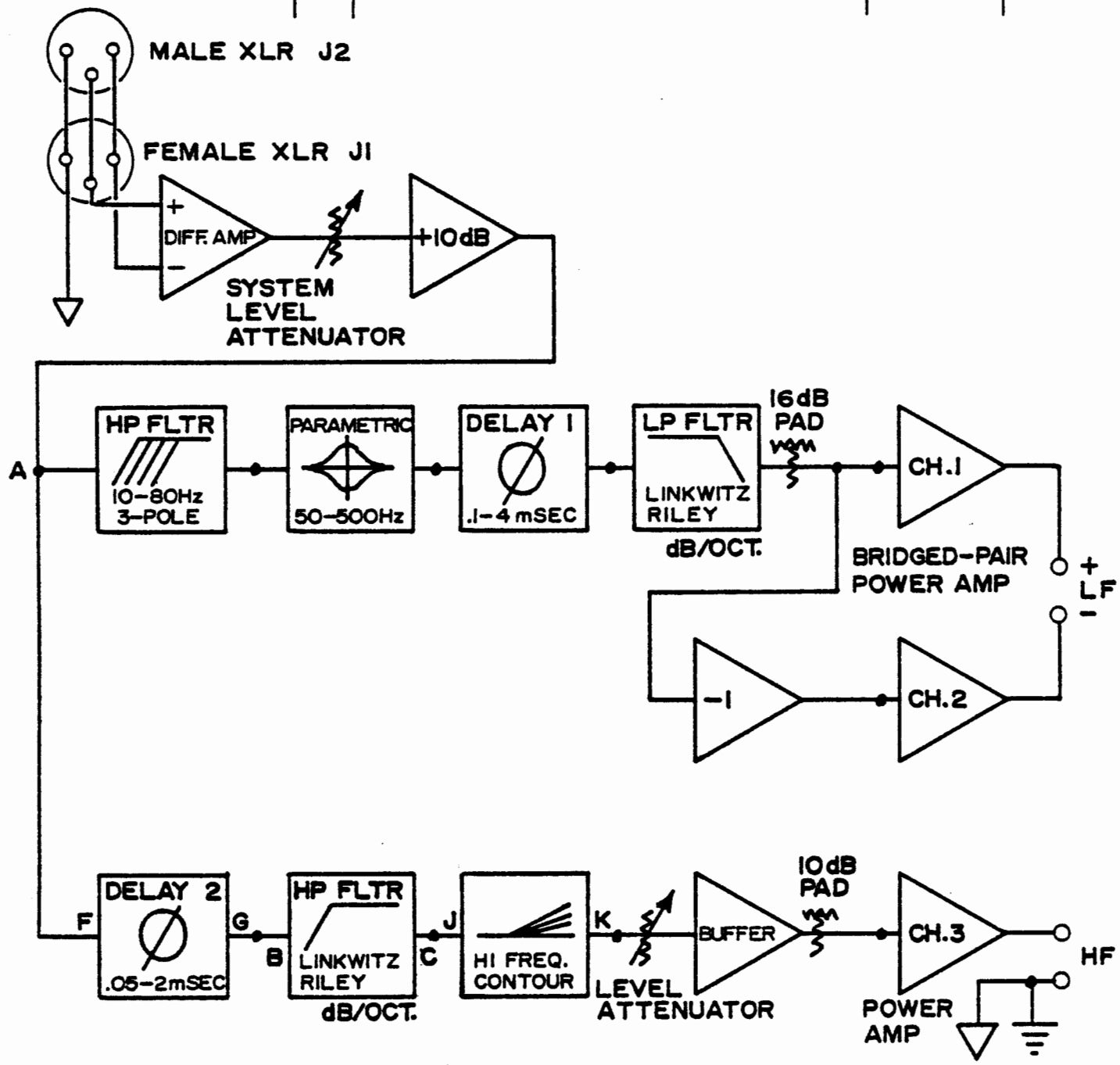


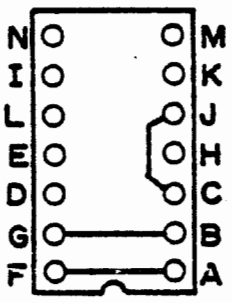


PLUG-IN
HEADER
P201-2E

CUSTOMER		BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Selberg	8-27-87	TITLE SPA-3 CONFIGURATION 2E (2-WAY W/DUAL LF CHANNELS) SYSTEM BLOCK DIAGRAM	
CHECK			
PROJECT ENGR S.W. Selberg	8-22-85		
SPEAKER SYSTEM		SIZE: A	DRAWING NUMBER: 9512-7723 — REV
		SCALE	SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER
P201-2F

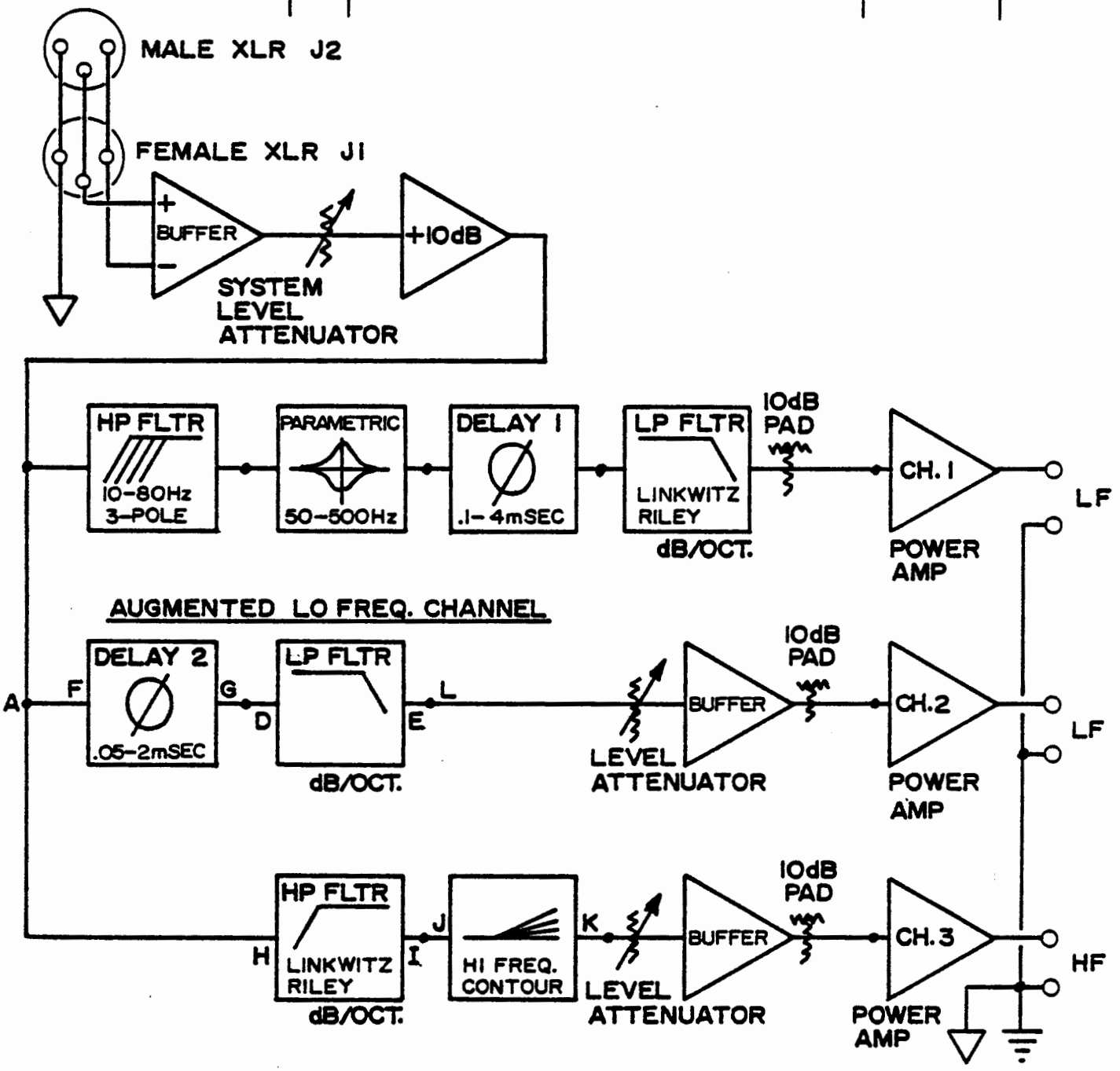
CUSTOMER	
DRAWN S.W. Selberg 8-27-87	
CHECK	
PROJECT ENGR S.W. Selberg 8-22-85	
SPEAKER SYSTEM	

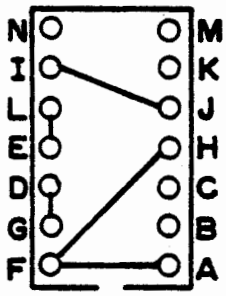
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 CONFIGURATION 2F
(HI-POWER 2-WAY)
SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
A	9512-7723	
SCALE		SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



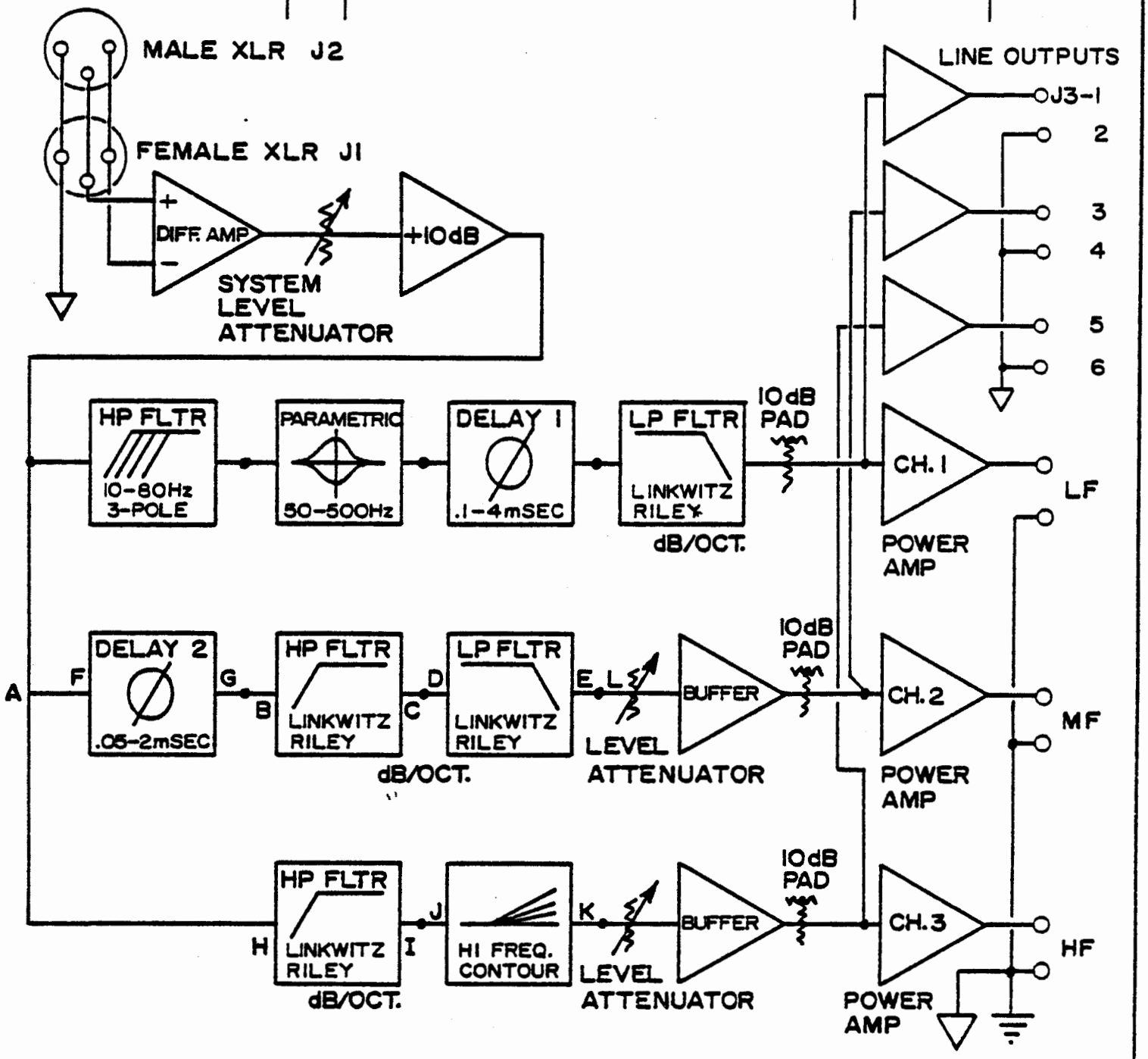


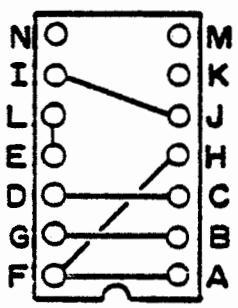
PLUG-IN HEADER

P201-2G

CUSTOMER	BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Selberg	8-30-87	TITLE SPA-3 CONFIGURATION 2G (2-WAY W/AUGMENTED LF CH. ADDED) SYSTEM BLOCK DIAGRAM
CHECK		
PROJECT ENGR S.W. Selberg	8-22-85	
SPEAKER SYSTEM	SIZE A	DRAWING NUMBER 9512-7723 REV
	SCALE	SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



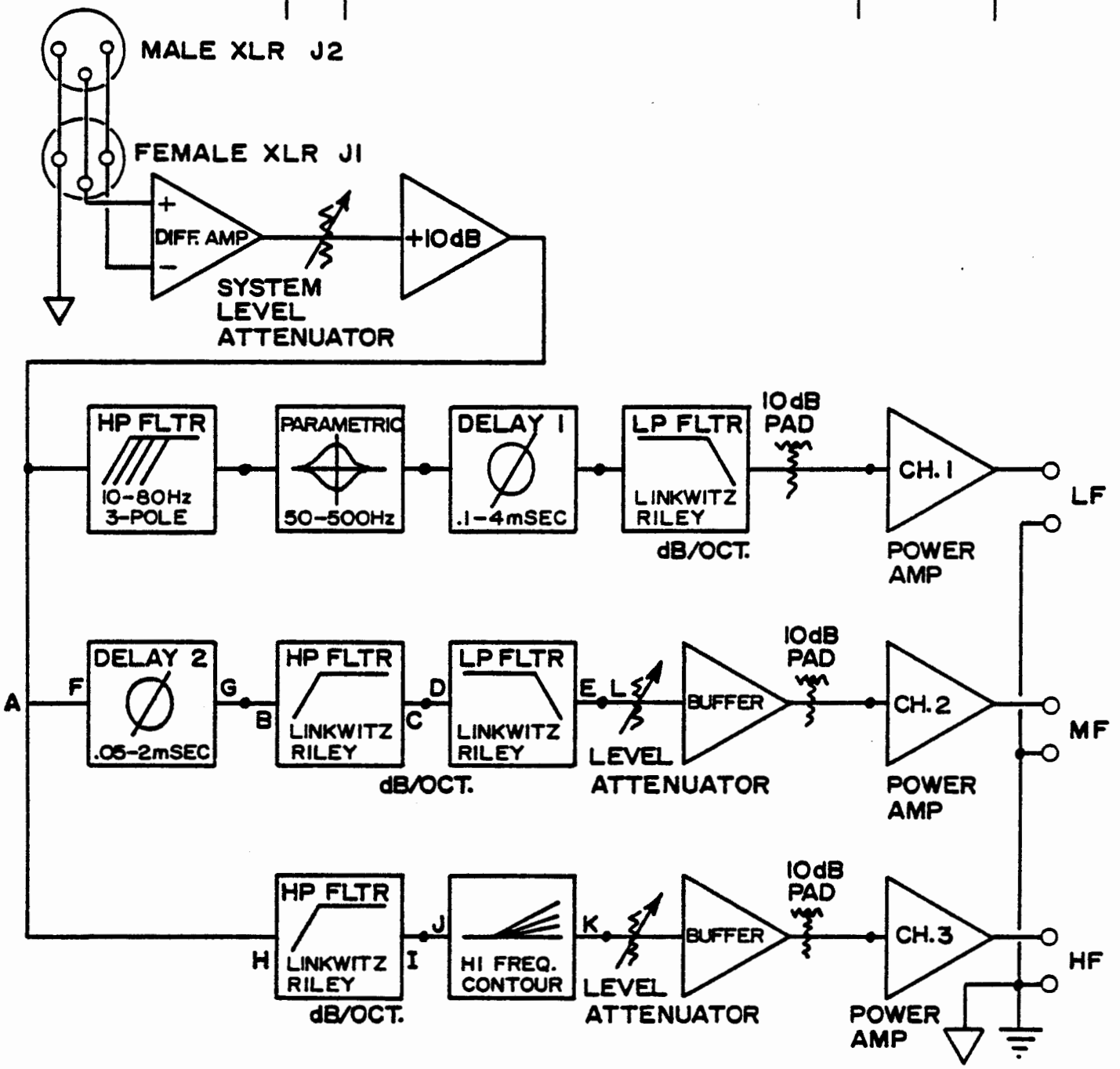


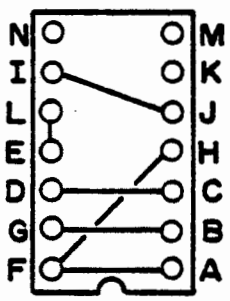
PLUG-IN HEADER
P201-3A

CUSTOMER		BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090
DRAWN S.W. Selberg	8-26-87	TITLE SPA-3 CONFIGURATION 3A (W/BUFFERED LINE OUTPUTS) SYSTEM BLOCK DIAGRAM
CHECK		
PROJECT ENGR S.W. Selberg	8-22-85	
SPEAKER SYSTEM		SIZE A — DRAWING NUMBER 9512-7723 — REV
		SCALE — SHEET OF

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A31195

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

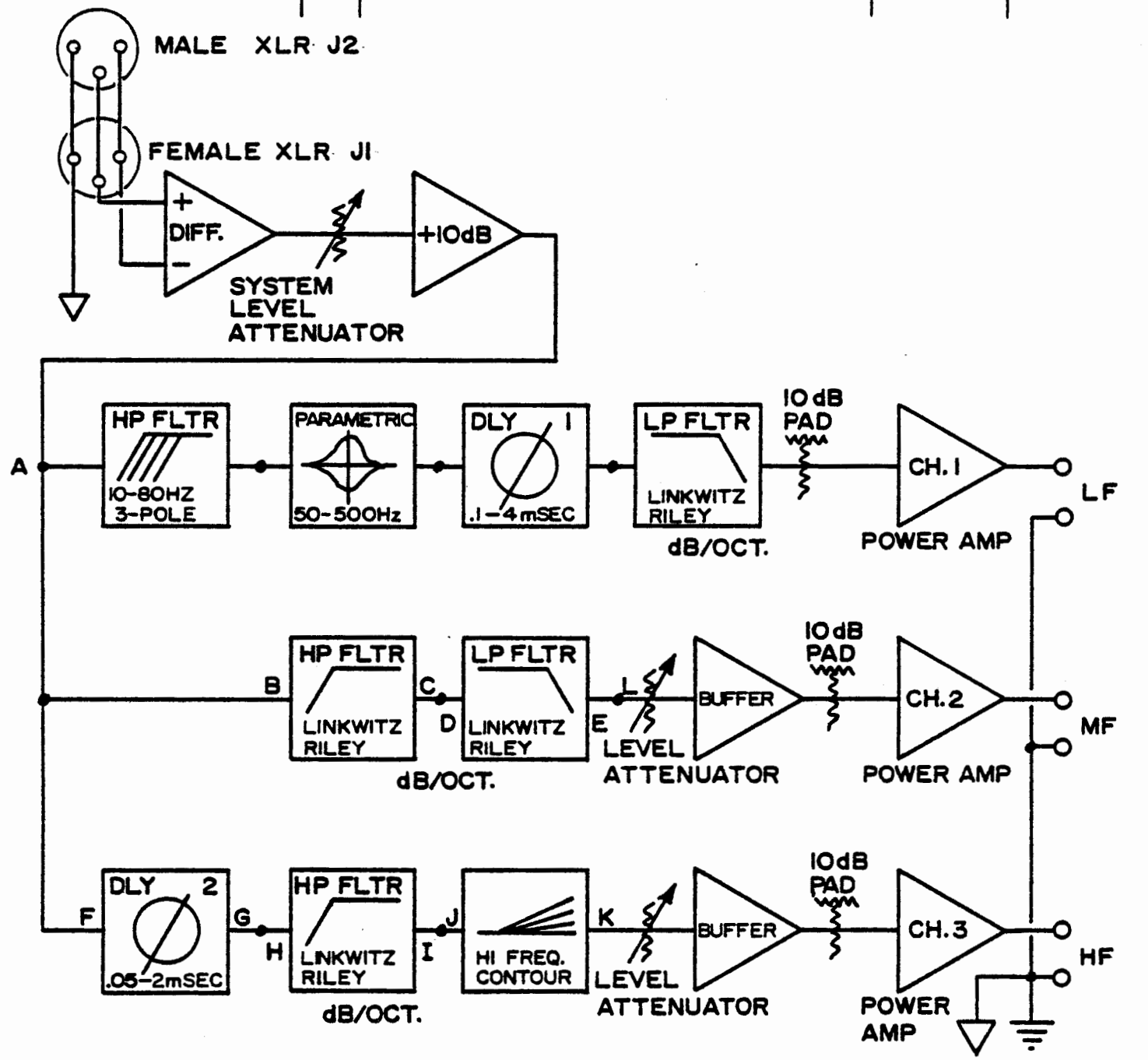


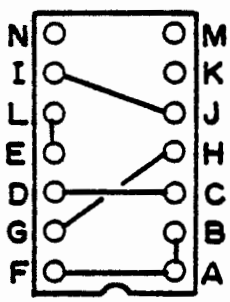


PLUG-IN HEADER
P201-3A

CUSTOMER	BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090
DRAWN S. W. Selberg 8-26-87 CHECK PROJECT ENGR S. W. Selberg 8-22-85	TITLE SPA-3 CONFIGURATION 3A SYSTEM BLOCK DIAGRAM
SPEAKER SYSTEM	SIZE A · DRAWING NUMBER 9512-7723 · REV SCALE · SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER
P201-3B

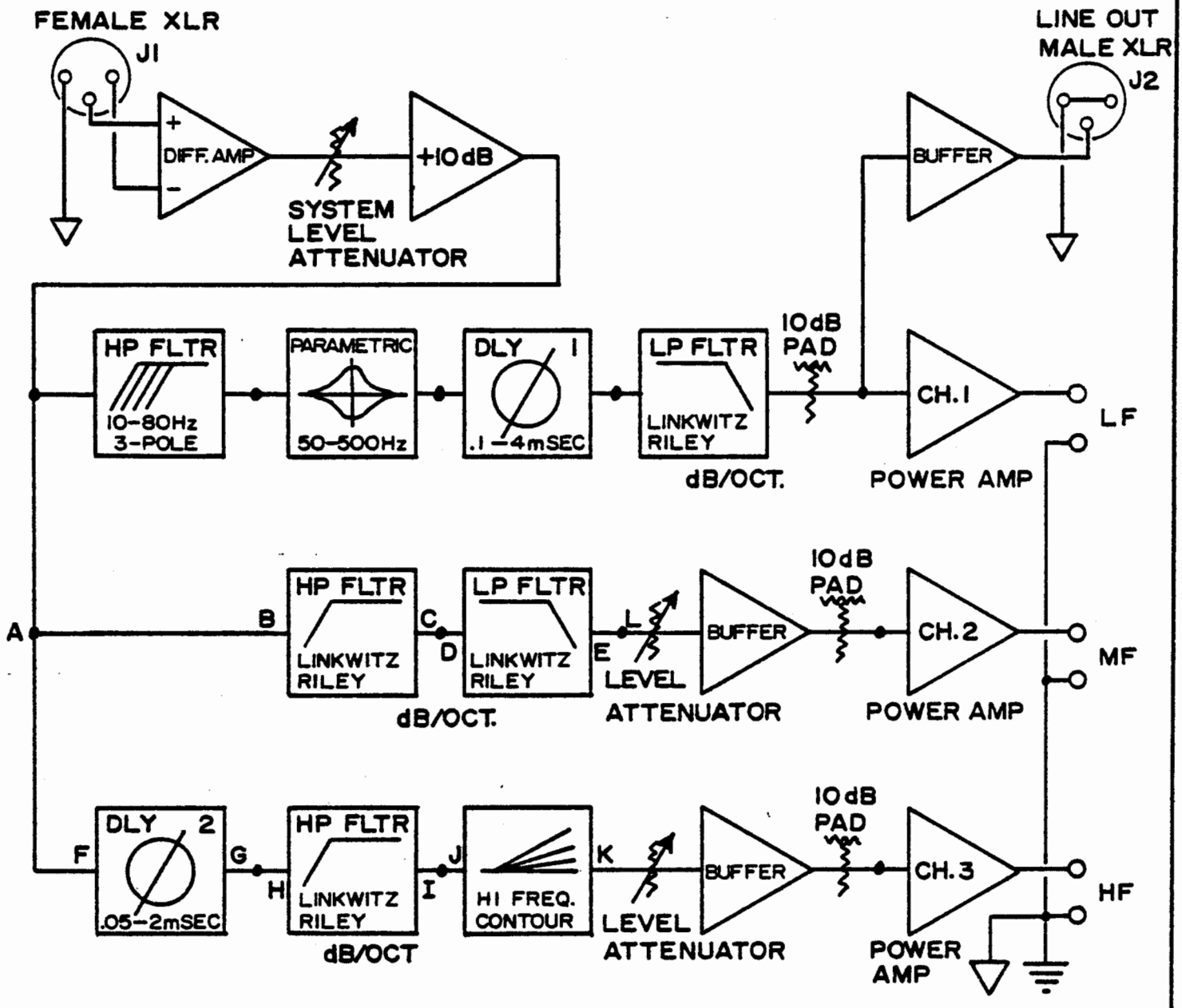
CUSTOMER		
DRAWN S.W. Selberg	8-26-87	
CHECK		
PROJECT ENGR S.W. Selberg	8-22-85	
SPEAKER SYSTEM		

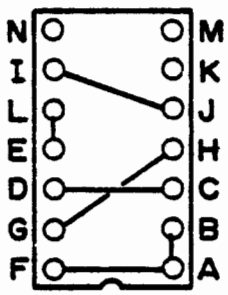
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 CONFIGURATION 3B SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
A	9512-7723	
SCALE		SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER
P201-3B

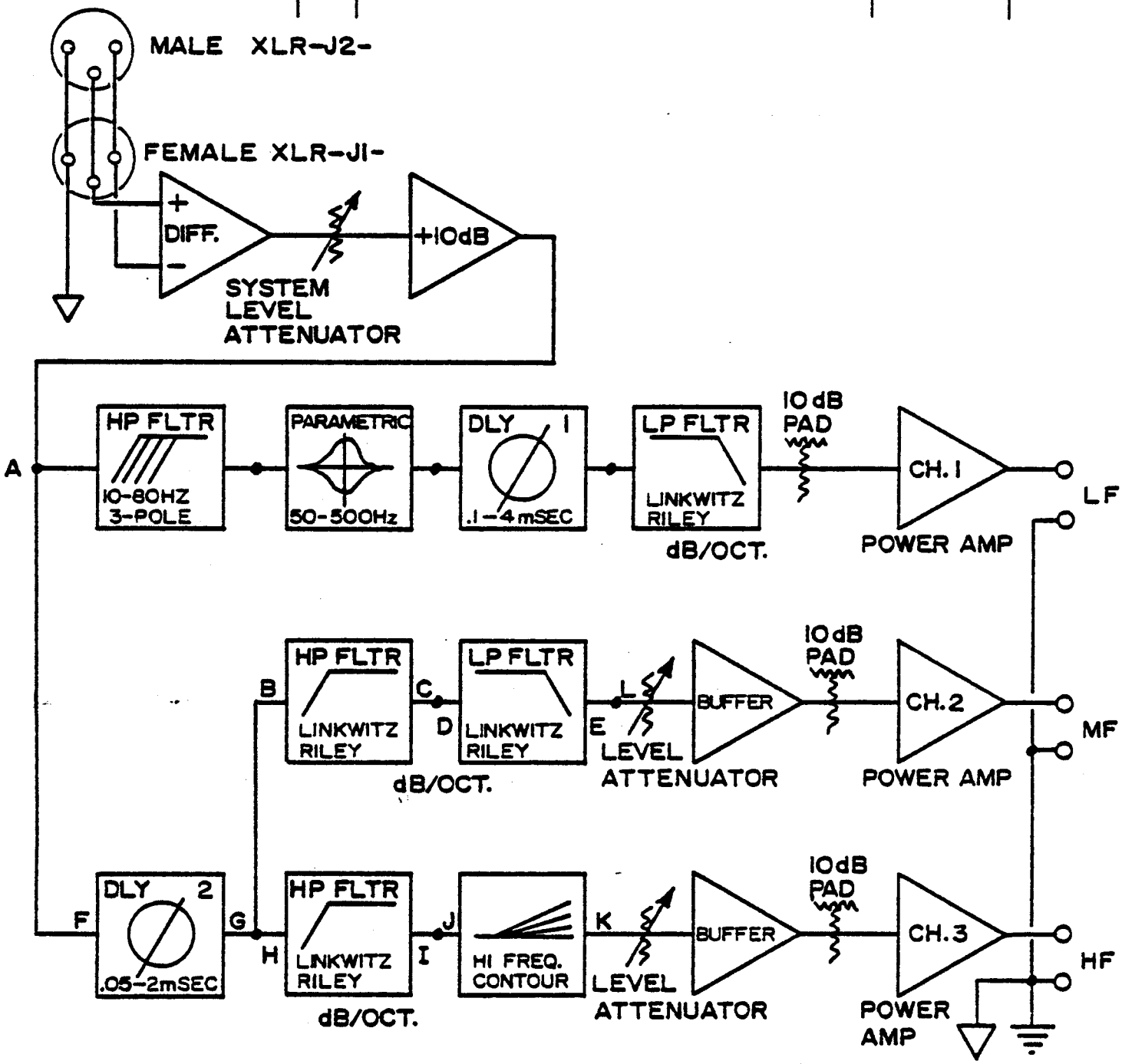
CUSTOMER	
DRAWN S.W. Selberg 8-26-87	
CHECK	
PROJECT ENGR S.W. Selberg 8-22-85	
SPEAKER SYSTEM	

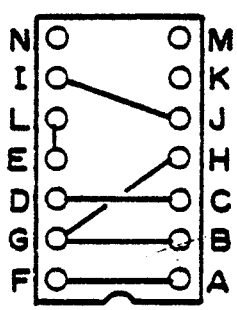
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 CONFIGURATION 3B
(W/ LO FREQ. LINE OUTPUT ADDED)
SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
A	9512-7723	
SCALE		SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

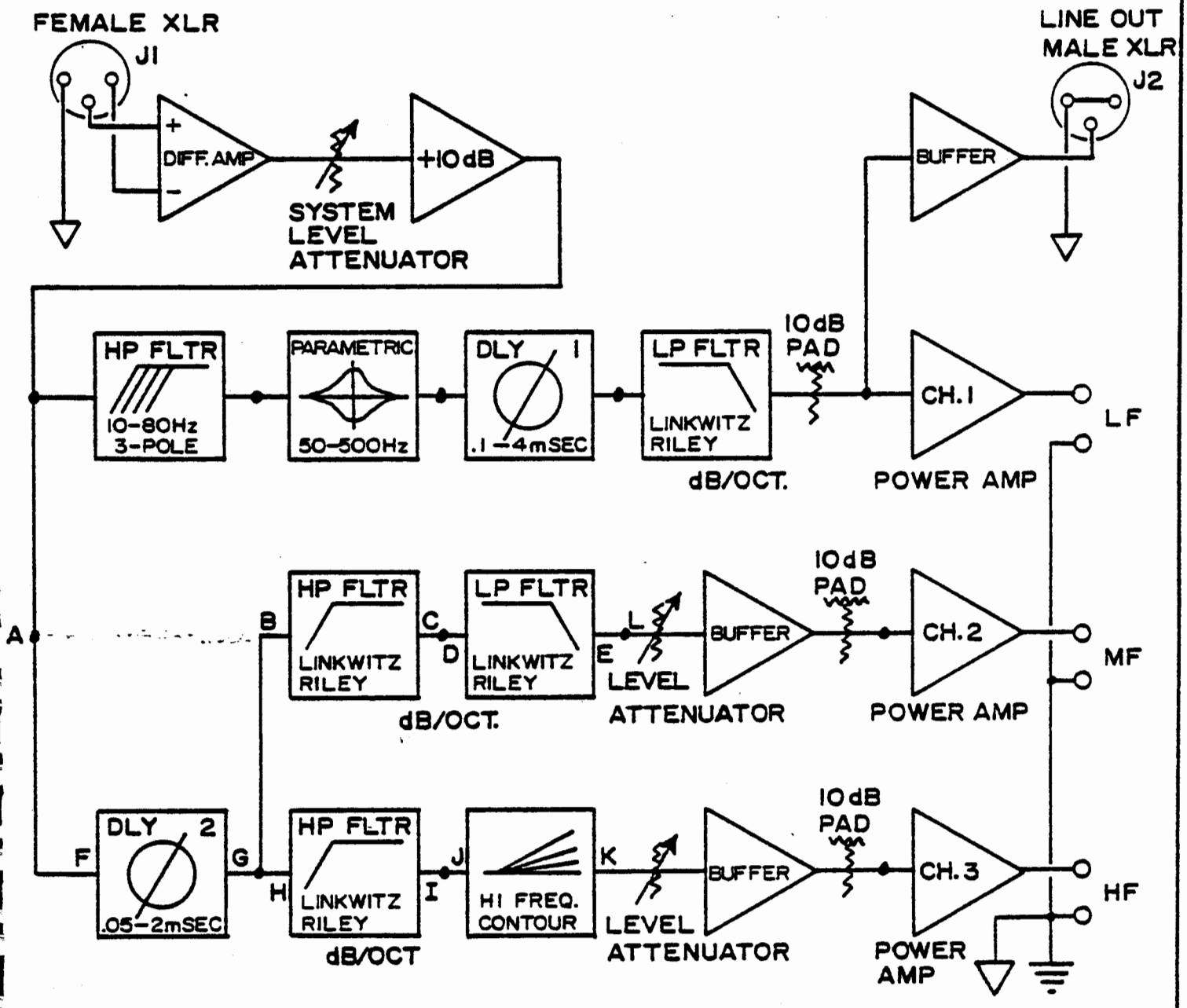


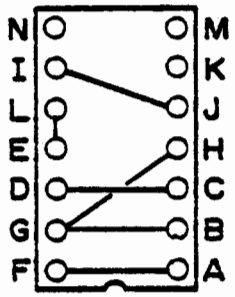


PLUG-IN
HEADER
P201-3B

CUSTOMER	BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Selberg	8-26-87	TITLE SPA-3 CONFIGURATION 3C SYSTEM BLOCK DIAGRAM
CHECK		
PROJECT ENGR S.W. Selberg	8-22-85	
SPEAKER SYSTEM	SIZE A	DRAWING NUMBER 9512-7723 REV
	SCALE	SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

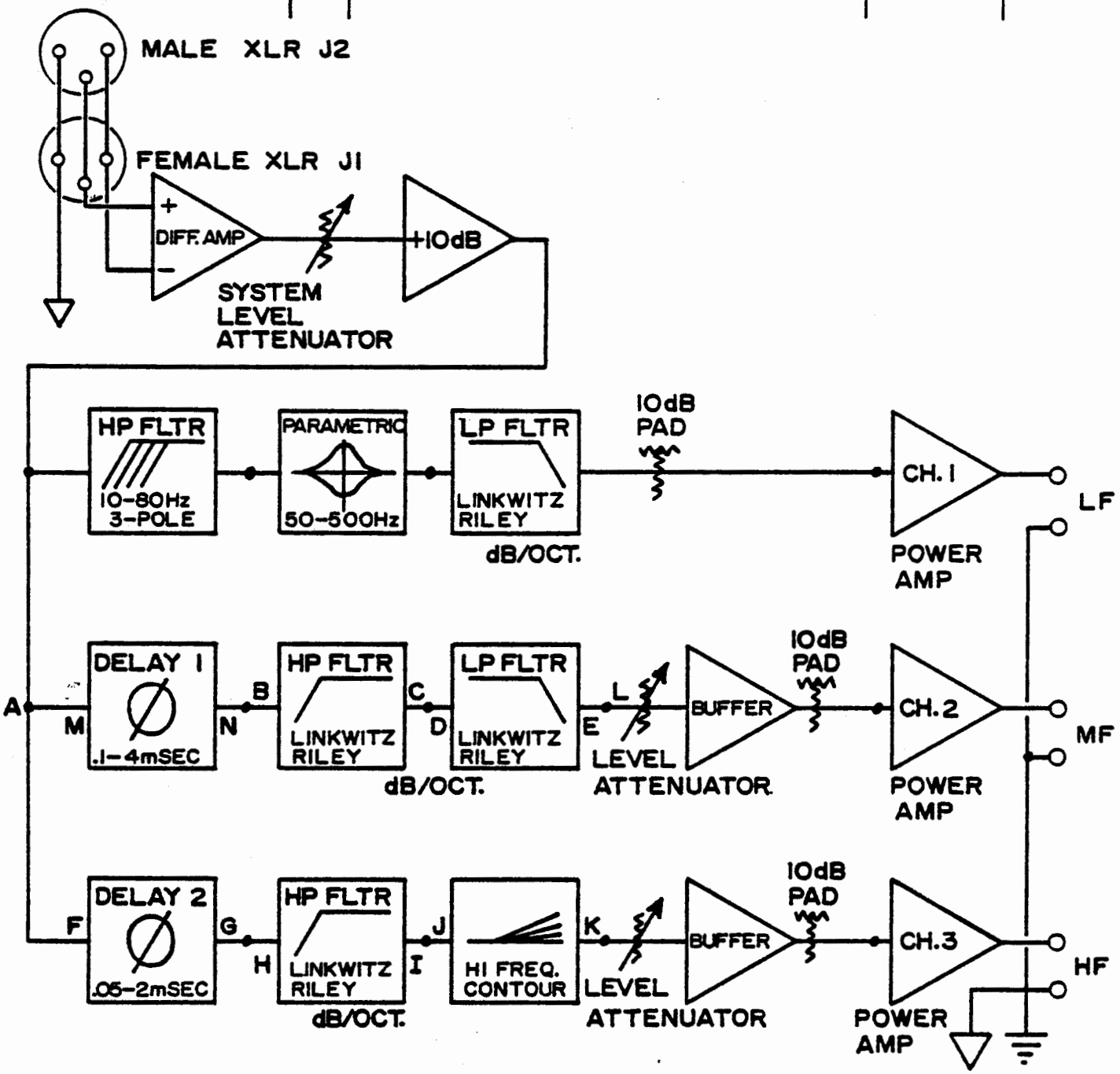


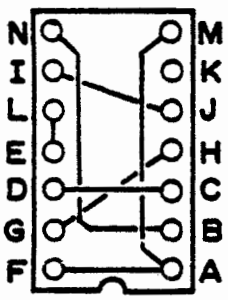


PLUG-IN HEADER
P201-3C

CUSTOMER		BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Selberg	8-26-87	TITLE SPA-3 CONFIGURATION 3C (W/ LO FREQ. LINE OUTPUT ADDED) SYSTEM BLOCK DIAGRAM	
CHECK			
PROJECT ENGR S.W. Selberg	8-22-85		
SPEAKER SYSTEM		SIZE A	DRAWING NUMBER 9512-7723
		SCALE	SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER
P201-3D

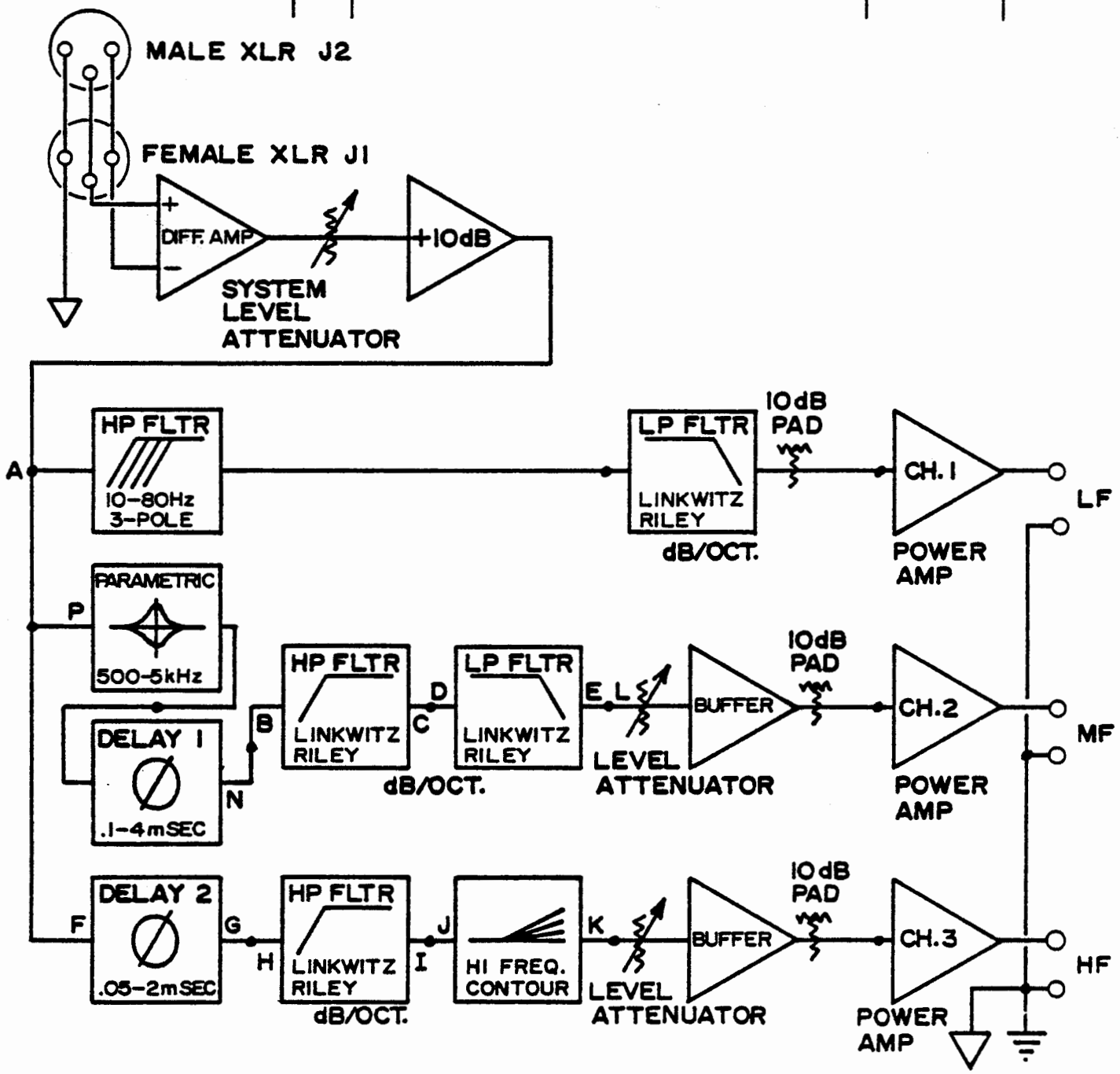
CUSTOMER	
DRAWN S.W. Selberg 8-26-87	
CHECK	
PROJECT ENGR S.W. Selberg 8-22-85	
SPEAKER SYSTEM	

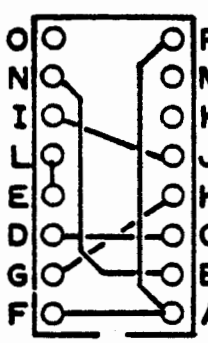
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 CONFIGURATION 3D SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
A	9512-7723	
SCALE		SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





PLUG-IN HEADER

P201-3E

CUSTOMER	
DRAWN S.W. Selberg 8-30-87	
CHECK	
PROJECT ENGR S.W. Selberg 8-22-85	
SPEAKER SYSTEM	

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

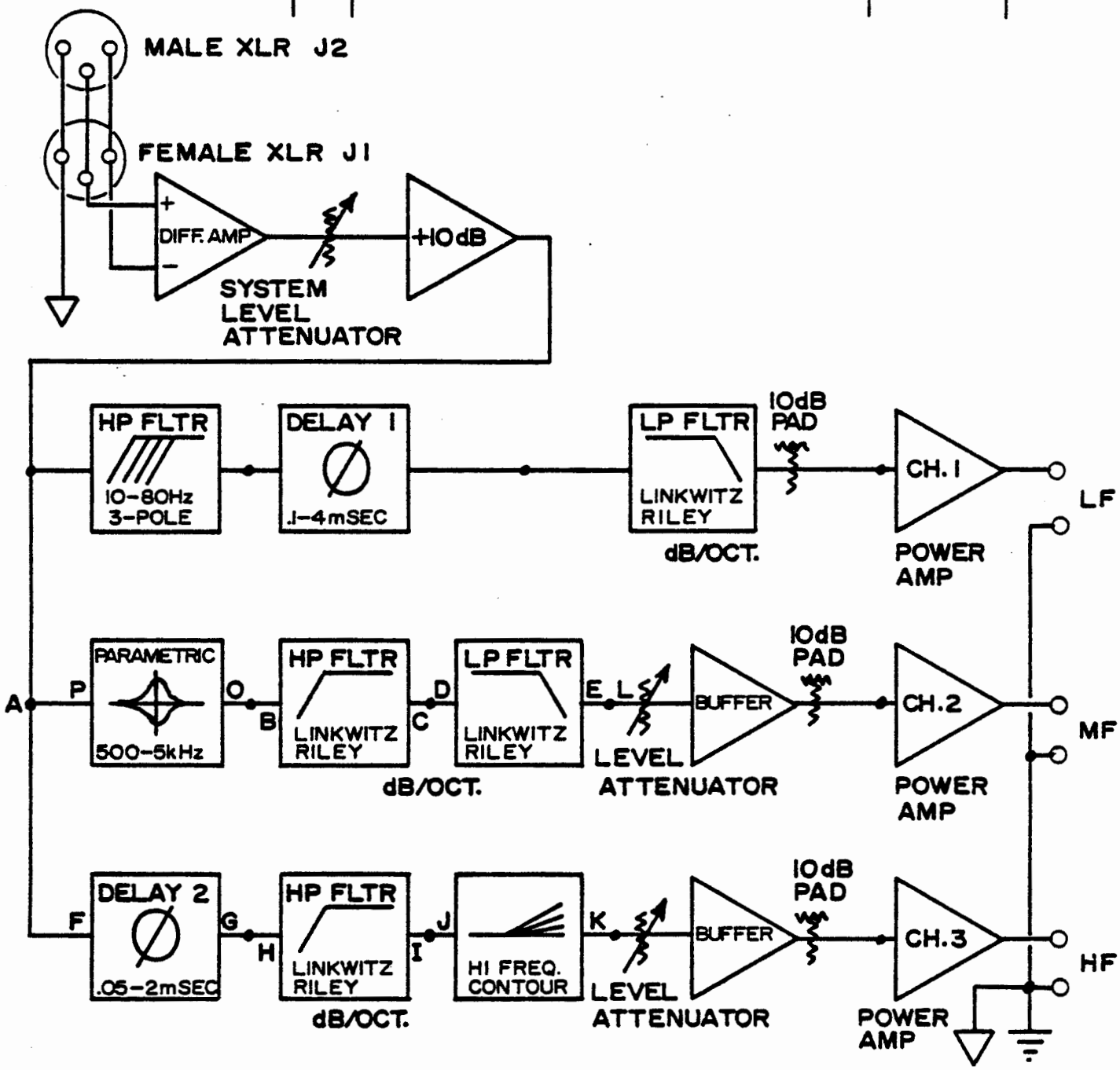
TITLE

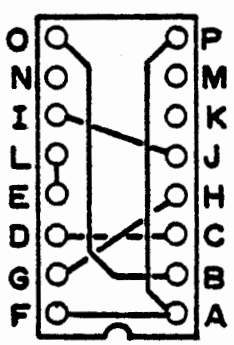
SPA-3 CONFIGURATION 3E SYSTEM BLOCK DIAGRAM

SIZE	DRAWING NUMBER	REV
A	9512-7723	

SCALE | SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

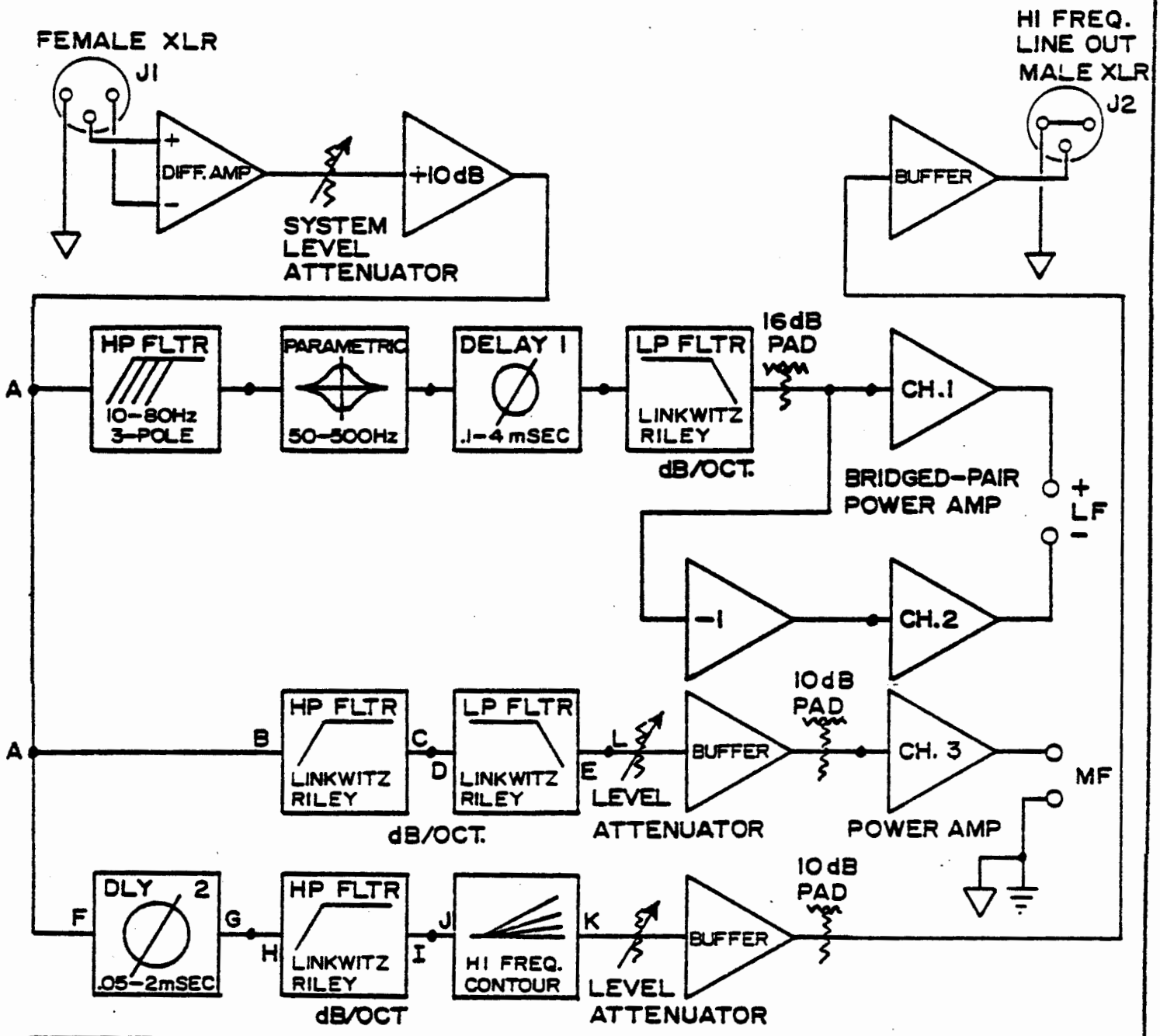


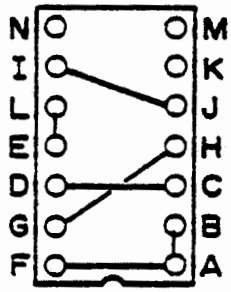


PLUG-IN HEADER
P201-3F

CUSTOMER		BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Solberg	8-30-87	TITLE SPA-3 CONFIGURATION 3F SYSTEM BLOCK DIAGRAM	
CHECK			
PROJECT ENGR S.W. Solberg	8-22-85		
SPEAKER SYSTEM		SIZE A	DRAWING NUMBER 9512-7723 REV
		SCALE	SHEET OF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

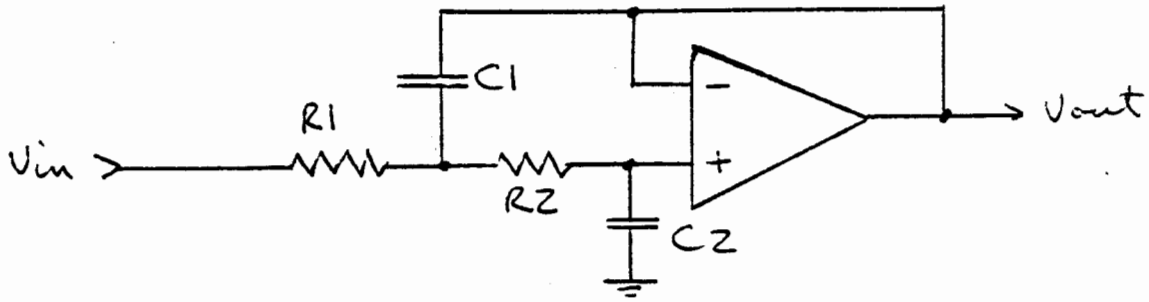




PLUG-IN HEADER
P201-3G

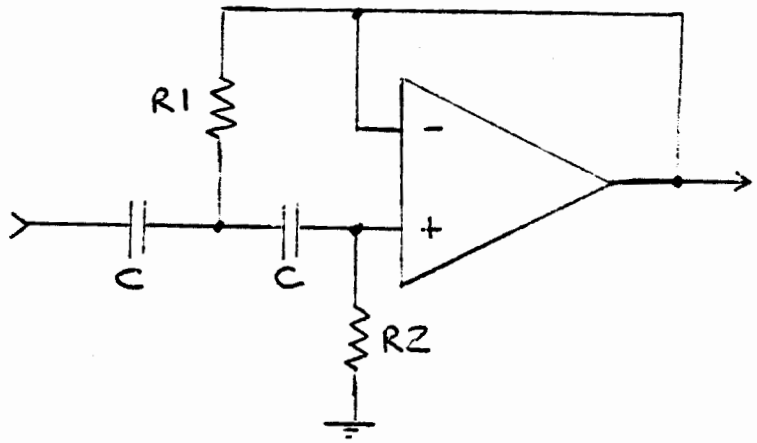
CUSTOMER	BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Selberg	9-9-87	TITLE: SPA-3 CONFIGURATION 3G (HI POWER 3-WAY-EXT. HF. AMP REQ'D) SYSTEM BLOCK DIAGRAM
CHECK		
PROJECT ENGR S.W. Selberg	8-22-85	
SPEAKER SYSTEM	SIZE A	DRAWING NUMBER 9512-7723 REV
	SCALE	SHEET OF

Butterworth 2-pole Low Pass Filter Component Values



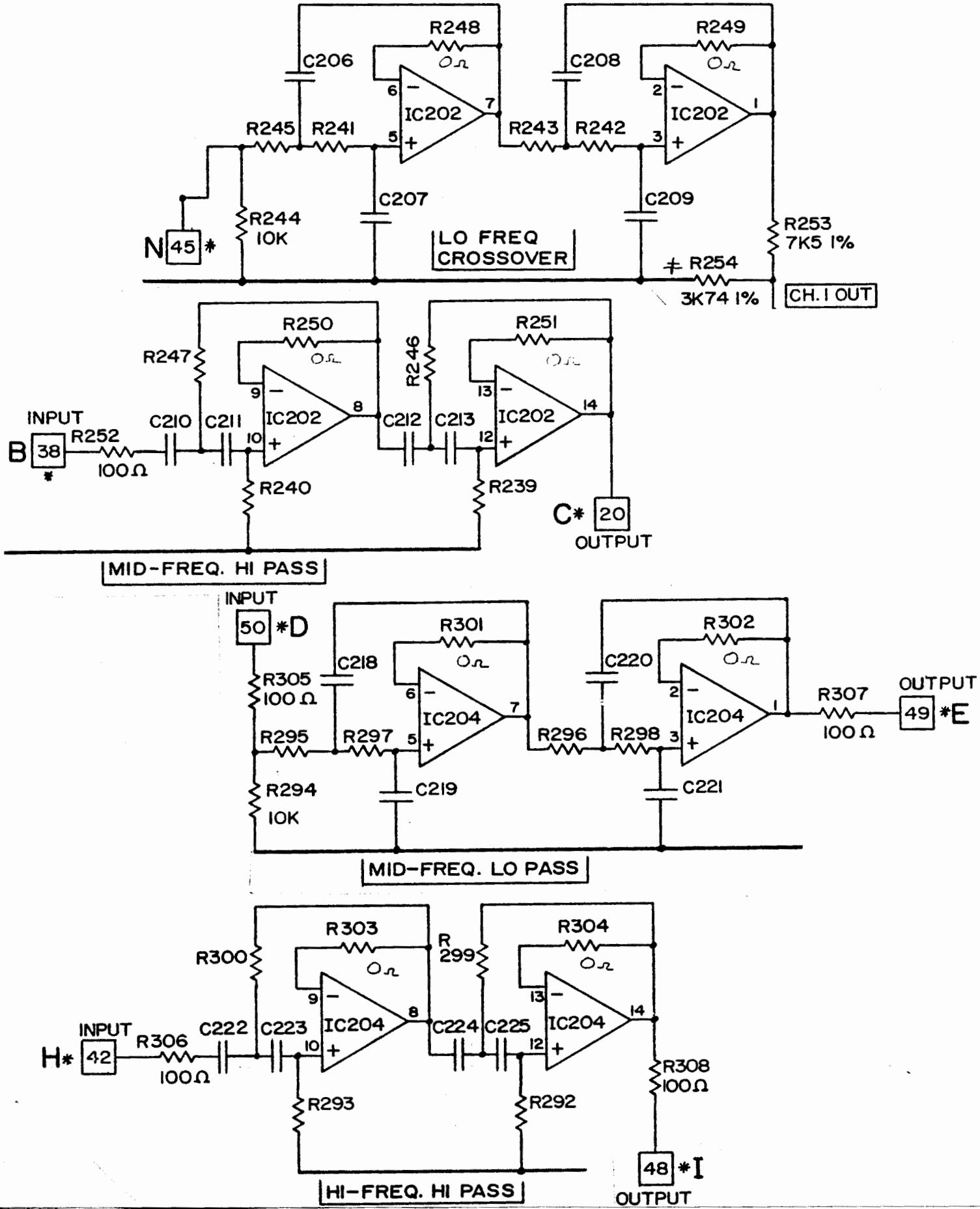
Frequency	R1	R2	C1	C2
40	45.3K	75K	.1 uf	.047 uf
50	35.7K	60.4K		
63	28.7K	47.5K		
80	22.6K	37.4K		
100	18.2K	30.1K		
125	14.3K	23.7K		
160	11.3K	18.7K		
200	9.09K	15.0K		
250	7.32K	11.8K		
315	12.1K	20.5K	.047 uf	.022 uf
400	9.53K	16.2K		
500	7.68K	12.7K		
630	6.04K	10.2K		
800	9.76K	18.2K	.022 uf	.010 uf
1.00K	7.87K	14.7K		
1.25K	6.34K	11.8K		
1.60K	11.3K	18.7K	.010 uf	. 0047 uf
2.00K	9.09K	15.0K		
2.50K	7.32K	11.8K		
3.15K	12.1K	20.5K	.0047 uf	.0022 uf
4.00K	9.53K	16.2K		
5.00K	7.68K	12.7K		
6.30K	6.04K	10.2K		
8.00K	9.76K	18.2K	.0022 uf	.001 uf
10.0K	7.87K	14.7K		
12.5K	6.34K	11.8K		

BUTTERWORTH 2-POLE HIGH PASS FILTER COMPONENT VALUES



Frequency (hz)	R1	R2	C
40	12.7K	25.5K	.22uf
50	10.2K	20.5K	
63	8.06K	16.2K	
80	14.0K	28.0K	.10uf
100	11.3K	22.6K	
125	9.09K	18.2K	
160	6.98K	14.0K	
200	12.1K	24.3K	.047uf
250	9.53K	19.1K	
315	7.68K	15.0K	
400	12.7K	25.5K	.022uf
500	10.2K	20.5K	
630	8.06K	16.2K	
800	14.0K	28.0K	.010uf
1.00K	11.3K	22.6K	
1.25K	9.09K	18.2K	
1.60K	6.98K	14.0K	
2.00K	12.1K	24.3K	.0047uf
2.50K	9.53K	19.1K	
3.15K	7.68K	15.0K	
4.00K	12.7K	25.5K	.0022uf
5.00K	10.2K	20.5K	
6.30K	8.06K	16.2K	
8.00K	14.0K	28.0K	.0010uf
10.0K	11.3K	22.6K	
12.5K	9.09K	18.2K	

SPA-3 9008-7723
CROSS-OVER SCHEMATICS



Engineer:

Customer:
Designator:
Date:

SPA-3
9008-7723

CROSSOVER COMPONENT SPECIFICATION

Crossover frequencies:

Low-Mid: Type:
Mid-High: Type:

2A 2B 2C 2D 2E 2F 3A 3B 3C

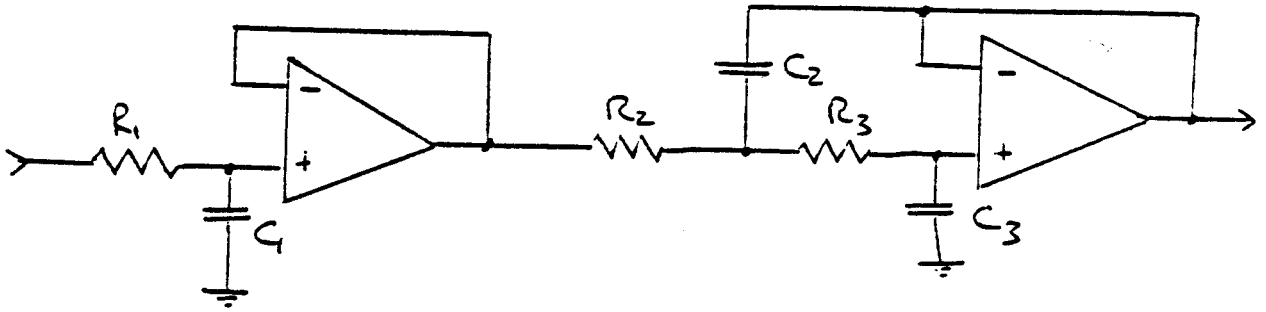
IC 202:

R239		C206
R240		C207
R241		C208
R242		C209
R243		C210
R244	10K 5%	C211
R245		C212
R246		C213
R247		

IC 204:

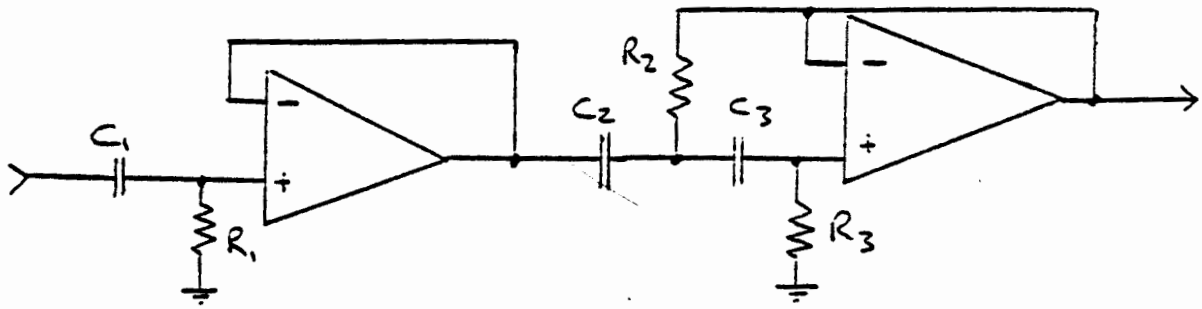
R292		C218
R293		C219
R294	10K 5%	C220
R295		C221
R296		C222
R297		C223
R298		C224
R299		C225
R300		

3-POLE BUTTERWORTH LOW PASS FILTER

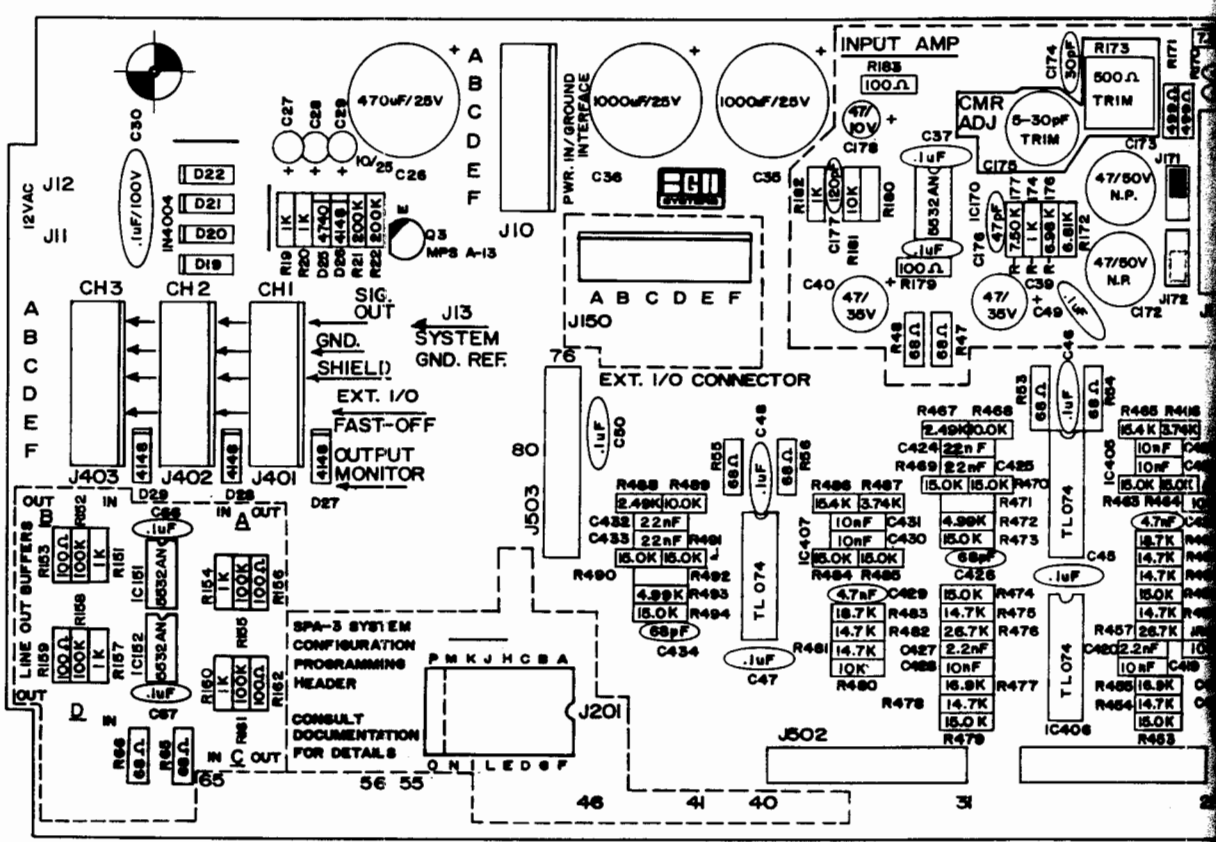


Frequency	R_1	R_2	R_3	C_1	C_2	C_3
40	40.2K	121K	59.0K	.1uf	.1uf	22nf
50	31.6K	97.6K	47.5K			
63	25.5K	76.8K	37.4K			
80	20.0K	60.4K	29.4K			
100	15.8K	48.7K	23.7K			
125	12.7K	39.2K	19.1K			
160	10.0K	30.9K	14.7K			
200	7.87K	24.3K	11.8K			
250	6.34K	19.6K	9.53K			
315	10.7K	15.4K	7.50K	47nf		
400	8.45K	27.4K	12.1K		47nf	10nf
500	6.81K	22.1K	9.76K			
630	11.5K	17.4K	7.68K	22nf		
800	9.09K	13.7K	6.04K			
1.00K	7.15K	23.2K	10.5K		22nf	4.7nf
1.25K	12.7K	18.7K	8.45K	10nf		
1.60K	10.0K	14.7K	6.49K			
2.00K	7.87K	24.3K	11.8K		10nf	2.2nf
2.50K	6.34K	19.6K	9.53K			
3.15K	10.7K	15.4K	7.50K	4.7nf		
4.00K	8.45K	27.4K	12.1K		4.7nf	1.0nf
5.00K	6.81K	22.1K	9.76K			
6.30K	11.5K	17.4K	7.68K	2.2nf		
8.00K	9.09K	13.7K	6.04K			
10.0K	7.15K	23.2K	10.5K		2.2nf	470pf

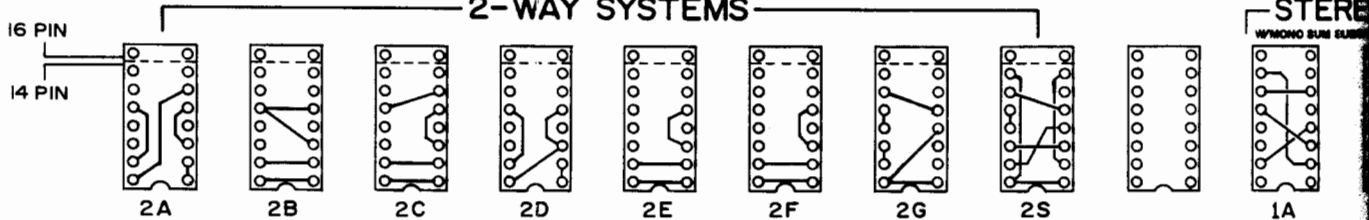
3-POLE BUTTERWORTH HIGH PASS FILTER



Frequency	R_1	R_2	R_3	C_1	C_2	C_3
40	40.2K	20.0K	80.6K	.1uf	.1uf	.1uf
50	31.6K	15.8K	63.4K			
63	25.5K	12.7K	51.1K			
80	20.0K	10.0K	40.2K			
100	15.8K	7.87K	31.6K			
125	12.7K	6.34K	25.5K			
160	10.0K	10.5K	42.2K	.1uf	47nf	47nf
200	7.87K	8.45K	34.0K			
250	6.34K	6.81K	27.4K			
315	10.7K	11.5K	46.4K	47nf	22nf	22nf
400	8.45K	9.09K	36.5K			
500	6.81K	7.15K	28.7K			
630	11.5K	12.7K	51.1K	22nf	10nf	10nf
800	9.09K	10.0K	40.2K			
1.00K	7.15K	7.87K	31.6K			
1.25K	12.7K	6.34K	25.5K	10nf		
1.60K	10.0K	10.5K	42.2K		4.7nf	4.7nf
2.00K	7.87K	8.45K	34.0K			
2.50K	6.34K	6.81K	27.4K			
3.15K	10.7K	11.5K	46.4K	4.7nf	2.2nf	2.2nf
4.00K	8.45K	9.09K	36.5K			
5.00K	6.81K	7.15K	28.7K			
6.30K	11.5K	12.7K	51.1K	2.2nf	1.0nf	1.0nf
8.00K	9.09K	10.0K	40.2K			
10.00K	7.15K	7.87K	31.6K			

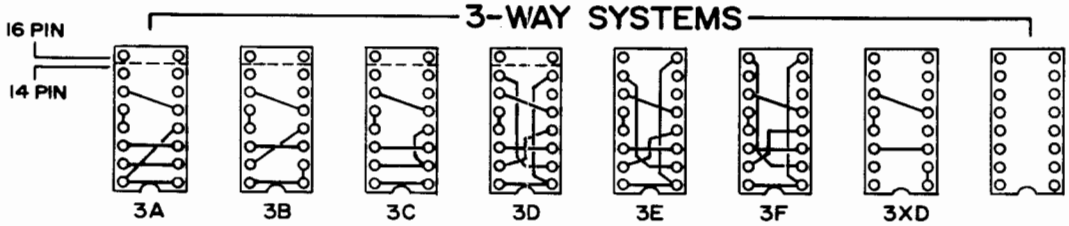


2-WAY SYSTEMS



-PLUG-IN PROGRAMMING HEADER WIRING DIAGRAMS-

3-WAY SYSTEMS

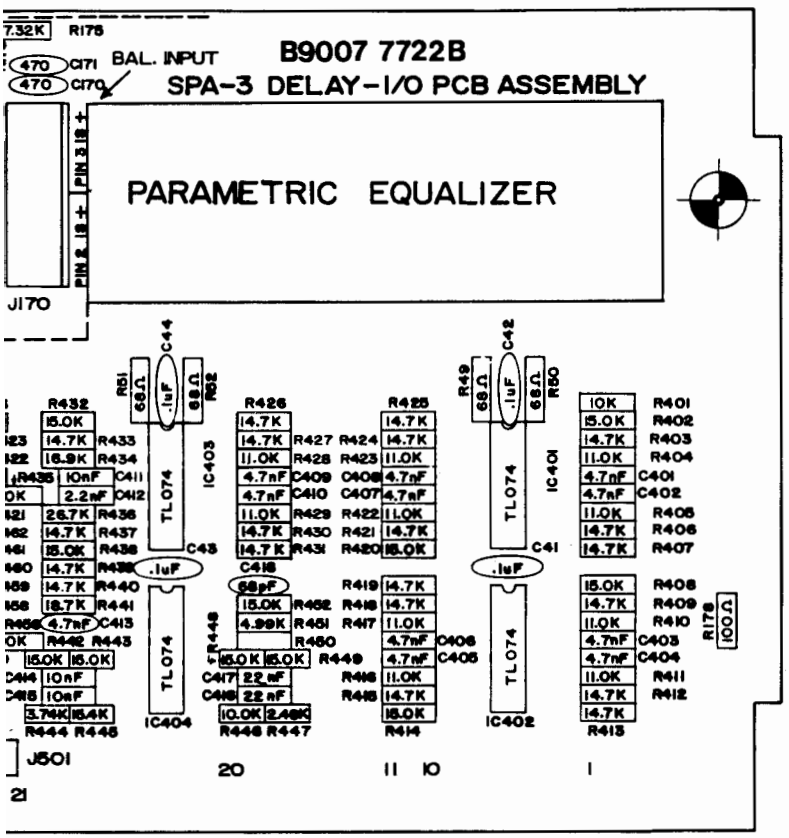


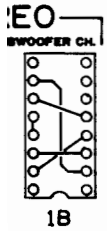
4. CAPACITORS REMAINING IN C400 SERIES ARE 5% WINDOW BATCH-SORTED FROM ± 5% PARTS.
3. CAPACITORS C414/15, 416/17, 422/23, 424/25, 430/31, 432/33 ARE 1% MATCHED PAIRS.
2. ALL RESISTORS W/ TWO SIGNIFICANT DIGITS (XX Ω) ARE 1/4W 5% CARBON FILM.
1. ALL RESISTORS W/ THREE SIGNIFICANT DIGITS (XX.X K) ARE 1% METAL FILM, 1/4W.

NOTES: UNLESS OTHERWISE SPECIFIED.

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A12012

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





LINE OUT BUFFERS	I/O CONNECTIONS
A IN	
A OUT	
B IN	
B OUT	
C IN	
C OUT	
D IN	
D OUT	

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED

DIMENSIONING AND TOLERANCING PER USASI Y14.5.

DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.

TOLERANCE ON DECIMALS: XX = ± .03 XXX = ± .010.

TOLERANCE ON ANGLES = ± 0° 30'

BREAK SHARP EDGES .010 MAX.

SURFACE ROUGHNESS 125

CUSTOMER

DRAWN Steven W. Sellberg 7-31-87

CHECK

PROJECT ENGR Steven W Sellberg 4-21-86

SYSTEM

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 I/O PCB COMPONENT PLACEMENT GUIDE

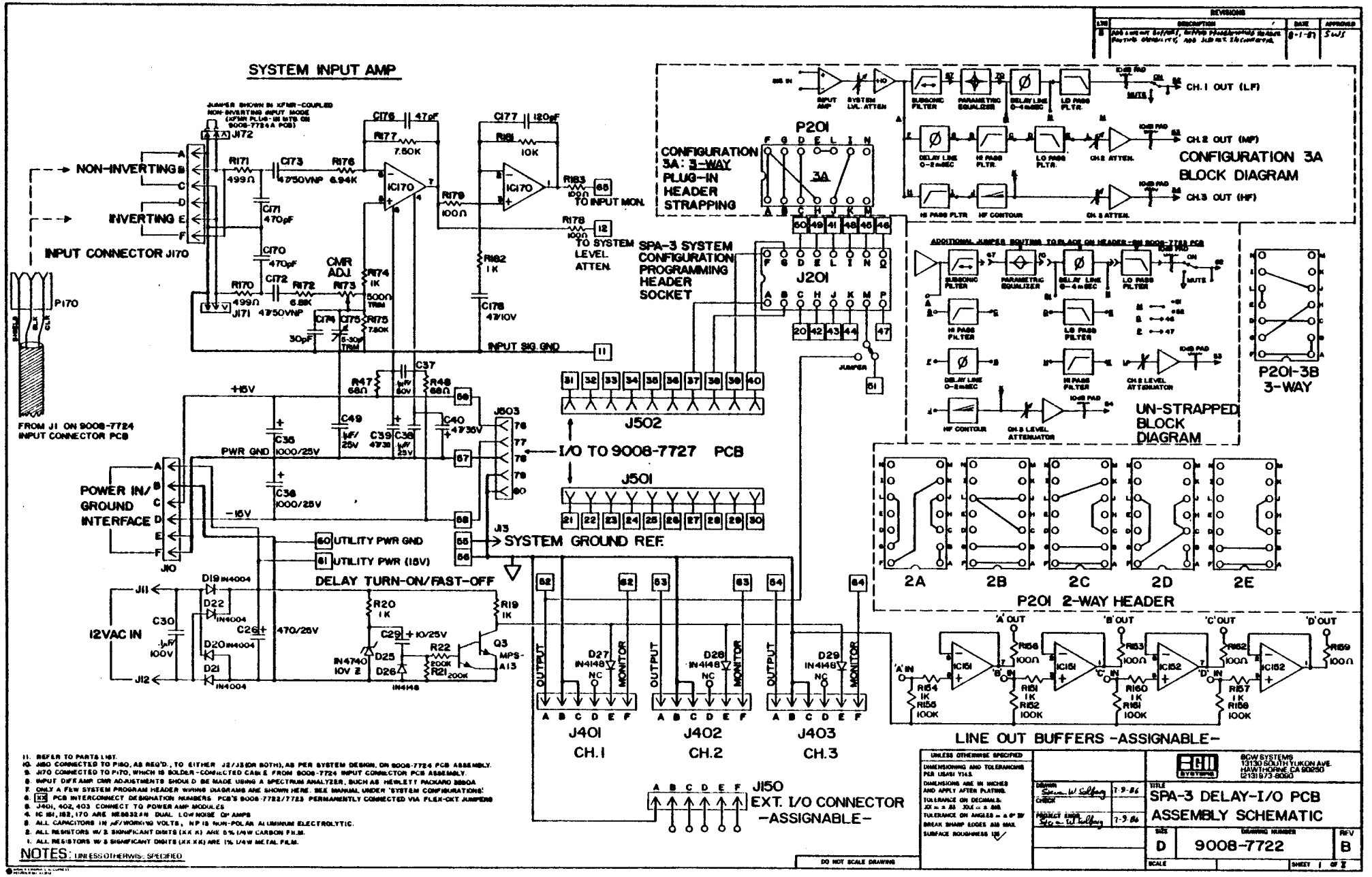
SIZE D

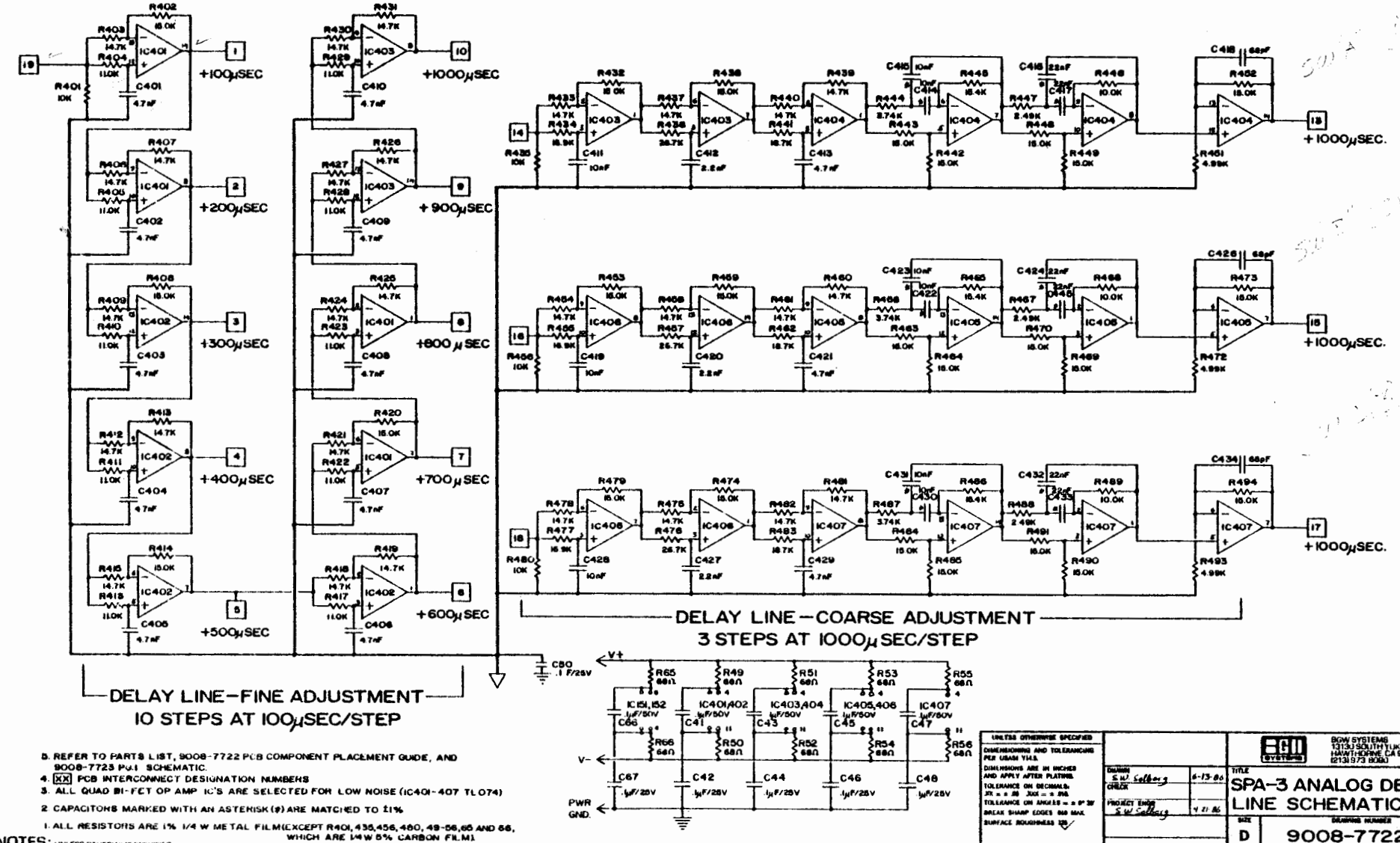
DRAWING NUMBER 9008-7722

REV B

SCALE 2:1

SHEET 3 OF 3


SYSTEM INPUT AMP
NON-INVERTING
INVERTING
INPUT CONNECTOR J170
FROM J1 ON 9008-7724 INPUT CONNECTOR PCB
POWER IN/ GROUND INTERFACE
J10
J11
J12
12VAC IN
DELAY TURN-ON/FAST-OFF
+15V
-15V
PWR GND
INPUT SIG GND
SYSTEM GROUND REF.
60 UTILITY PWR GND
61 UTILITY PWR (15V)
I/O TO 9008-7727 PCB
J502
J501
J503
J401
J402
J403
CH.1
CH.2
CH.3
J150
EXT. I/O CONNECTOR -ASSIGNABLE-
CONFIGURATION 3A: 3-WAY PLUG-IN HEADER STRAPPING
P201
SPA-3 SYSTEM CONFIGURATION PROGRAMMING HEADER SOCKET
J201
CONFIGURATION 3A BLOCK DIAGRAM
CH.1 OUT (LF)
CH.2 OUT (MF)
CH.3 OUT (HF)
UN-STRAPPED BLOCK DIAGRAM
P201-3B 3-WAY
P201 2-WAY HEADER
2A
2B
2C
2D
2E
LINE OUT BUFFERS -ASSIGNABLE-
'A' OUT
'B' OUT
'C' OUT
'D' OUT
'A' IN
'B' IN
'C' IN
'D' IN
REVISIONS
DESCRIPTION
DATE
APPROVED
SPA-3 DELAY-I/O PCB ASSEMBLY SCHEMATIC
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213)973-8090
9008-7722
SIZE D
REV B
SCALE
SHEET 1 OF 2
DO NOT SCALE DRAWING
NOTES: UNLESS OTHERWISE SPECIFIED



REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

NOTES: UNLESS OTHERWISE SPECIFIED

5. REFER TO PARTS LIST, 9008-7722 PCB COMPONENT PLACEMENT GUIDE, AND 9008-7723 PCB SCHEMATIC.
4. [XX] PCB INTERCONNECT DESIGNATION NUMBERS
3. ALL QUAD BI-FET OP AMP IC'S ARE SELECTED FOR LOW NOISE (IC401-407 TL074)
2. CAPACITORS MARKED WITH AN ASTERISK (*) ARE MATCHED TO ±1%
1. ALL RESISTORS ARE 1% 1/4 W METAL FILM (EXCEPT R401, 435, 456, 460, 49-56, 65 AND 66, WHICH ARE 1/4 W 5% CARBON FILM).

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASM Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: .XX = ± .02 .XXX = ± .010.
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

DO NOT SCALE DRAWING

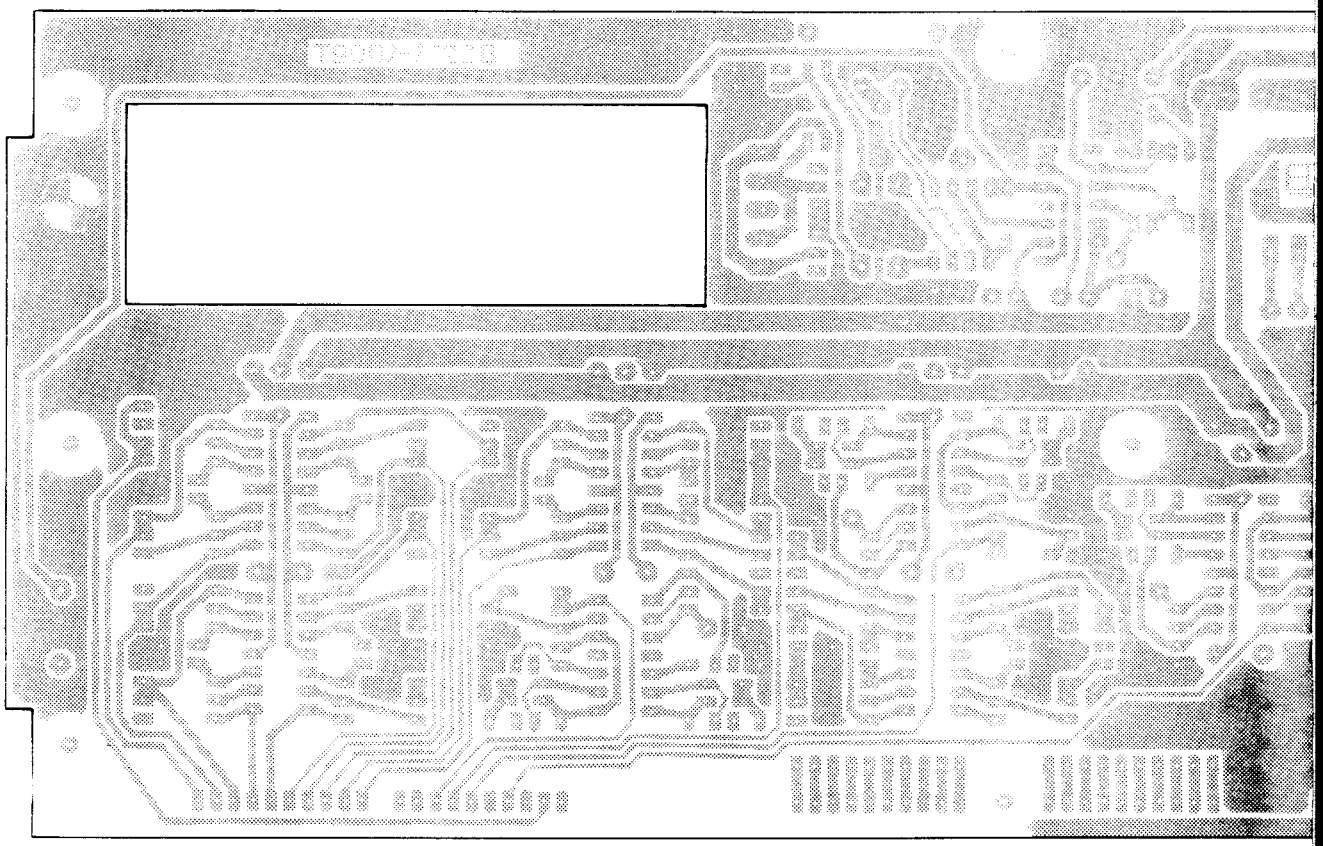
DRAWN S.W. Salsbury 6-13-86
CHECK
PROJECT ENGR S.W. Salsbury 9 21 86

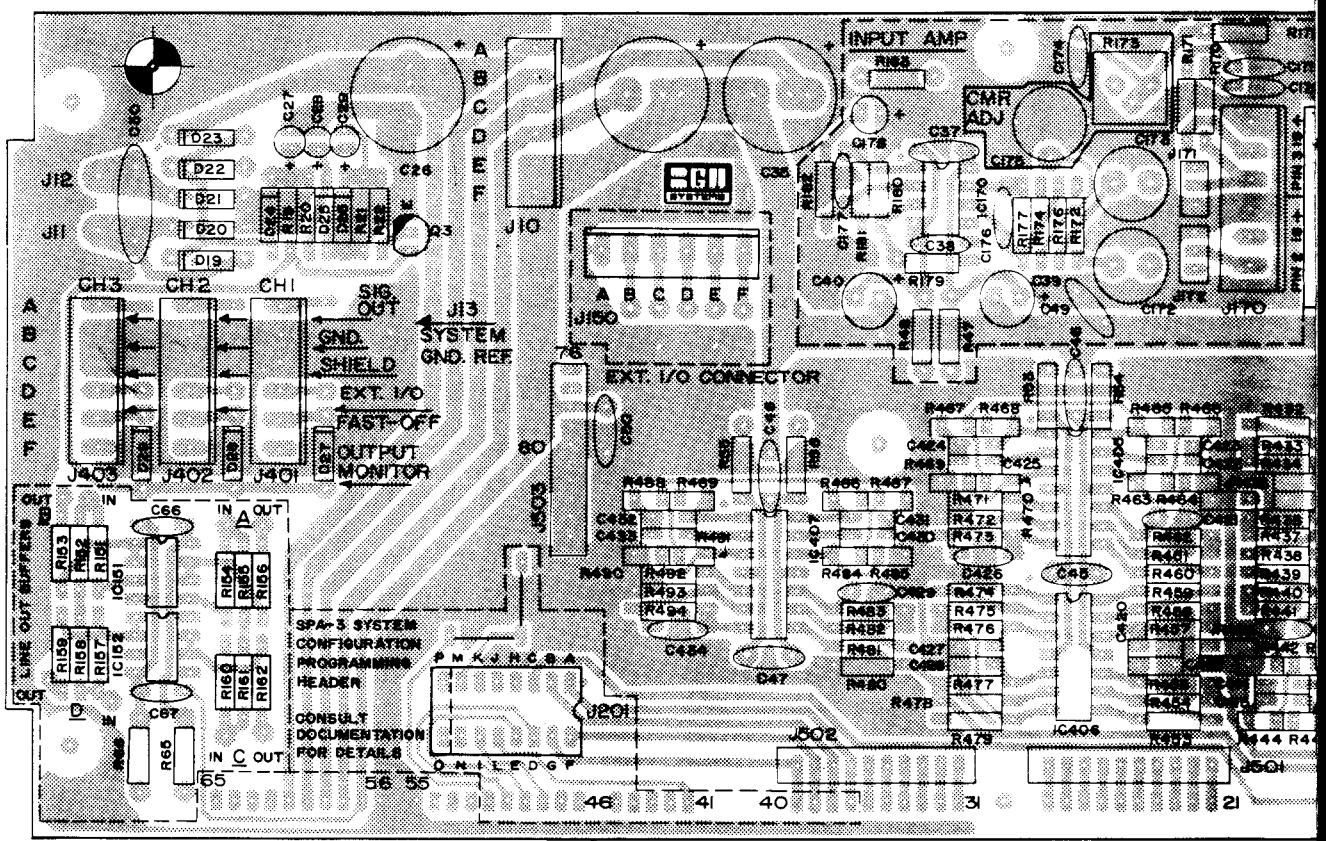
BGW SYSTEMS
13133 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
SPA-3 ANALOG DELAY LINE SCHEMATIC

SIZE D | DRAWING NUMBER 9008-7722 | REV B

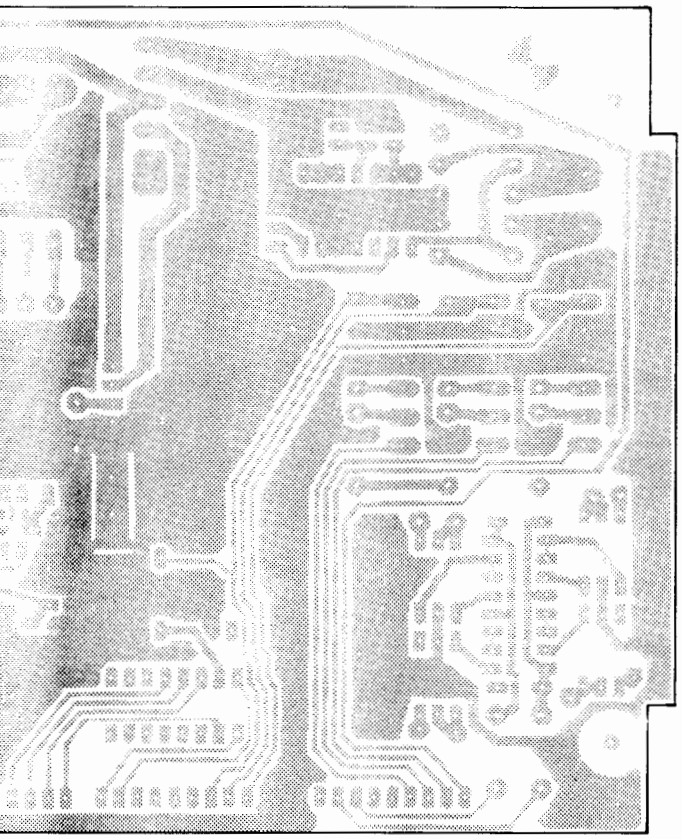
SCALE | SHEET 6 OF 9

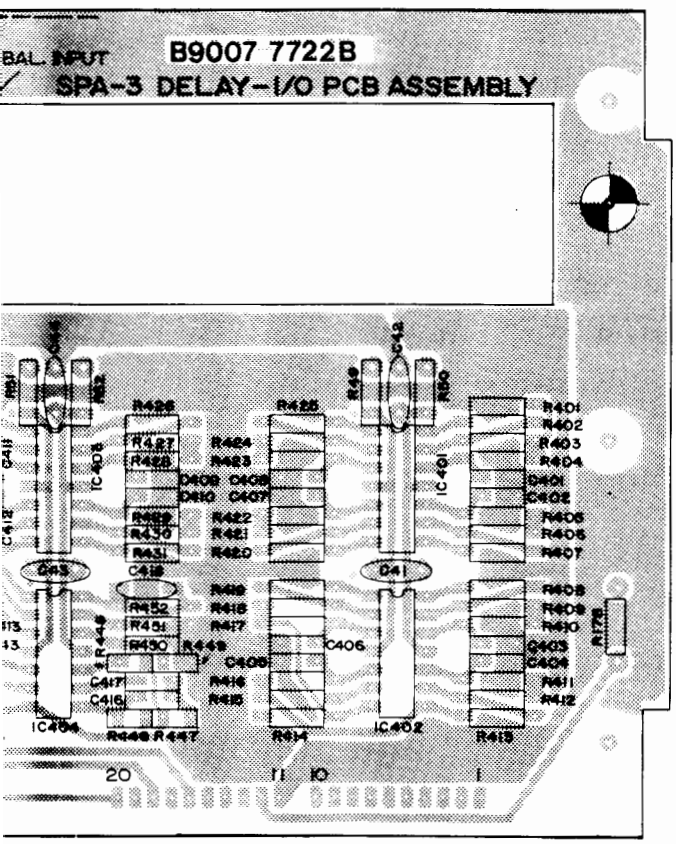




NOTES: UNLESS OTHERWISE SPECIFIED.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





DO NOT SCALE DRAWING

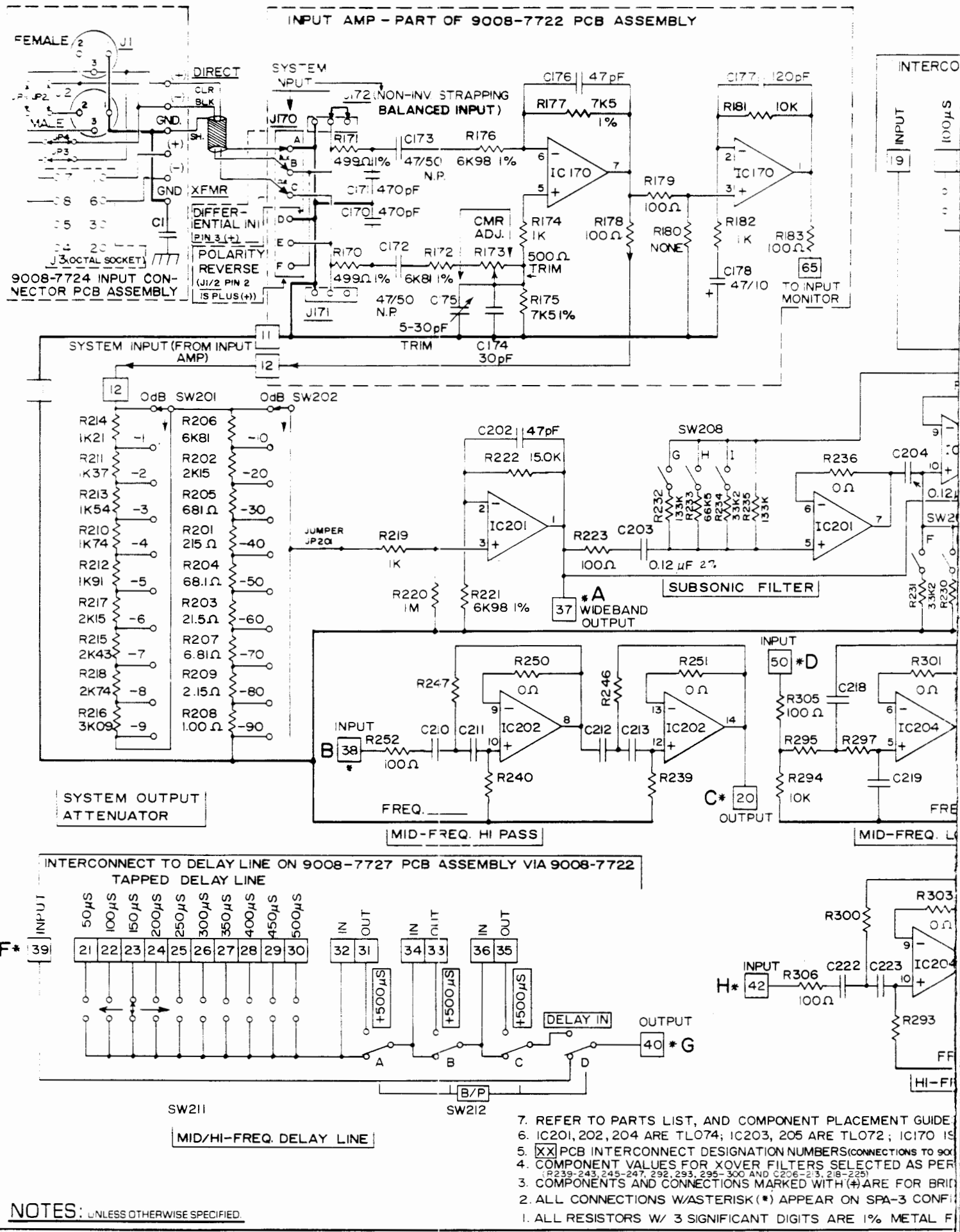
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

DRAWN	S.L.U. Selberg	9-24-87
CHECK		
PROJECT ENGR	S.L.U. Selberg	4-21-86

TITLE
SPA-3 PC BOARD LAYOUT-TOP/BOTTOM

SIZE	DRAWING NUMBER	REV
D	9007-7722	B

SCALE 1:1 SHEET 7 OF 7


INPUT AMP – PART OF 9008-7722 PCB ASSEMBLY
FEMALE
J1
DIRECT
CLR
BLK
GND.
SH.
GND
XFMR
DIFFER-ENTIAL IN
PIN 3 (+)
POLARITY REVERSE
(J1/2 PIN 2 IS PLUS (+))
J3 OCTAL SOCKET
9008-7724 INPUT CONNECTOR PCB ASSEMBLY
SYSTEM INPUT
J172 NON-INV. STRAPPING
BALANCED INPUT)
J170
J171
R171 499Ω 1%
C173 47/50 N.P.
R176 6K98 1%
C176 47pF
R177 7K5 1%
C177 120pF
R181 10K
IC 170
R179 100Ω
R174 1K
R178 100Ω
R180 NONE
R182 1K
R183 100Ω
C178 47/10
65 TO INPUT MONITOR
C171 470pF
C170 470pF
CMR ADJ.
R170 499Ω 1%
C172
R172 6K81 1%
R173 500Ω TRIM
C175 5-30pF TRIM
47/50 N.P.
R175 7K5 1%
C174 30pF
SYSTEM INPUT (FROM INPUT AMP)
11
12
OdB SW201
OdB SW202
R214 1K21 -1
R211 1K37 -2
R213 1K54 -3
R210 1K74 -4
R212 1K91 -5
R217 2K15 -6
R215 2K43 -7
R218 2K74 -8
R216 3K09 -9
R206 6K81 -10
R202 2K15 -20
R205 681Ω -30
R201 215Ω -40
R204 68.1Ω -50
R203 21.5Ω -60
R207 6.81Ω -70
R209 2.15Ω -80
R208 1.00Ω -90
SYSTEM OUTPUT ATTENUATOR
C202 47pF
R222 15.0K
IC201
JUMPER JP20
R219 1K
R223 100Ω
C203 0.12 μF 2%
SW208
R232 133K
R233 66K5
R234 33K2
R235 133K
R236 0Ω
C204
SUBSONIC FILTER
R220 1M
R221 6K98 1%
37 *A WIDEBAND OUTPUT
R231 3.3K2
R230
INPUT B 38 *
R252 100Ω
C210
C211
IC202
R247
R250 0Ω
R246
R251 0Ω
C212
C213
R240
R239
FREQ.
MID-FREQ. HI PASS
INPUT 50 *D
R305 100Ω
C218
R295
R297
R294 10K
C219
R301 0Ω
IC204
C* 20 OUTPUT
MID-FREQ. L
INTERCONNECT TO DELAY LINE ON 9008-7727 PCB ASSEMBLY VIA 9008-7722
TAPPED DELAY LINE
F* INPUT 39
50μS 100μS 150μS 200μS 250μS 300μS 350μS 400μS 450μS 500μS
21 22 23 24 25 26 27 28 29 30
IN OUT
32 31
34 33
36 35
+500μS
DELAY IN
OUTPUT 40 *G
A B C D
B/P
SW211
SW212
MID/HI-FREQ. DELAY LINE
R303 0Ω
R300
INPUT H* 42
R306 100Ω
C222
C223
IC204
R293
HI-FI
7. REFER TO PARTS LIST, AND COMPONENT PLACEMENT GUIDE
6. IC201, 202, 204 ARE TL074; IC203, 205 ARE TL072; IC170 IS
5. XX PCB INTERCONNECT DESIGNATION NUMBERS (CONNECTIONS TO 90
4. COMPONENT VALUES FOR XOVER FILTERS SELECTED AS PER
(R239-243, 245-247, 292, 293, 295-300 AND C206-213, 218-225)
3. COMPONENTS AND CONNECTIONS MARKED WITH (#) ARE FOR BRI
2. ALL CONNECTIONS W/ASTERISK (*) APPEAR ON SPA-3 CONFI
1. ALL RESISTORS W/ 3 SIGNIFICANT DIGITS ARE 1% METAL F
NOTES: UNLESS OTHERWISE SPECIFIED.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
B	ADD JUMPER CONNECTIONS TO INPUTS/OUTPUTS TO DLY #1, PARAMETRIC EQ, LPF FOR ADDITIONAL SIG. ROUTING	8-1-87	SWS

NECT TO DELAY LINE ON 9008-7722 PCB ASSEMBLY

TAPPED DELAY LINE

200µS 300µS 400µS 500µS 600µS 700µS 800µS 900µS 1000µS

2 3 4 5 6 7 8 9 10

IN 14 OUT 13 | IN 16 OUT 15 | IN 18 OUT 17

SW209

+1mS +1mS +1mS

A B C

B/P

DELAY IN

SW210

LO FREQ. DELAY LINE

JP206 JUMPER

LPF IN

DLY1 OUT

D

N 45 *

* 51

DLY1 IN

EQ. OUT JUMPER JP207

70

R245 R241 R244 10K

C206 C207 C208 C209

IC202

R248 0Ω R249 0Ω

R243 R242

FREQ.

LO FREQ LO PASS

R253 7K5 1%

≠ R254 3K74 1% ±(1K69 1%)

CH. 1 OUT

SW207C

JUMPER JP204

M

CH. 1 MUTE

JUMPER JP205

R337 ≠10.0K

R329 ≠10.0K

0Ω (JP210)

IC205

R330 7K5 1%

R331 3K74

R336 3K74

R335 7K5 1%

R334 0Ω

R328 1M (10K)+

R333 1M

R327 1K

JP202 JUMPER

* 52 CH. 1

53 CH. 2

54 CH. 3

OUTPUTS

55

56

R332 1K JUMPER JP203

CH. 2 INPUT

L* 41

CH. 2 OUTPUT ATTENUATOR

0dB SW203 0dB SW204

R269 1K21	-1	R261 6K81	-10
R266 1K37	-2	R257 2K15	-20
R268 1K54	-3	R260 681Ω	-30
R265 1K74	-4	R256 215Ω	-40
R267 1K91	-5	R259 68.1Ω	-50
R272 2K15	-6	R258 21.5Ω	-60
R270 2K43	-7	R262 6.81Ω	-70
R273 2K74	-8	R264 2.15Ω	-80
R271 3K09	-9	R263 1.00Ω	-90

0dB SW205 0dB

R287 1K21	-1	R279 6K81	-10
R284 1K37	-2	R275 2K15	-20
R286 1K54	-3	R278 681Ω	-30
R283 1K74	-4	R274 215Ω	-40
R285 1K91	-5	R277 68.1Ω	-50
R290 2K15	-6	R276 21.5Ω	-60
R288 2K43	-7	R280 6.81Ω	-70
R291 2K74	-8	R282 2.15Ω	-80
R289 3K09	-9	R281 1.00Ω	-90

SW206

SUBSONIC FILTER

J301

INTERCONNECT TO LF PARAMETRIC EQUALIZER 9008-7726 PCB ASSEMBLY

EQ. IN 67 JP208 JUMPER

SW207B

SW208 B/P

SW207A 69

EQ IN

71

B/P

75

R229 133K R225 133K R228 33K2 R227 66K5 R226 133K R224 133K

C205 0.12µF 2%

R238 0Ω

IC201

R302 0Ω

C220

IC204

R307 100Ω

OUTPUT 49 *E

R296 R298

C221

R304 0Ω

R299

C224 C225

R308 100Ω

R292

48 *I OUTPUT

EQ. HI PASS

PASS

C214 47pF

HI FREQ. CONTOUR

R321 10K 1%

IC203

R326 100Ω

K OUTPUT 44 *

CH. 3 INPUT

*J 43 JP209 JUMPER

R309 10K 1%

R320 0Ω +9

R317 487Ω +8

R319 487Ω +7

R316 536Ω +6

R318 619Ω +5

R313 732Ω +4

R311 931Ω +3

R314 1K21 +2

R312 1K54 +1

R315 3K24 0dB

SW213

BOOST LEVEL, dB

R310 9K76

C215 4.7nF

R323 1K47

R324 6K49

R322 1M

C216 2.2nF

R325 0Ω

IC203

10kHz

5kHz

SW207D

C217 2.2nF

CH. 3 OUTPUT ATTENUATOR

9008-7723 PG. 3,4.

NE5532 AN.

-7722,7726,7727).

USER-SPEC. FREQ.

ED-PAIR PWR. AMPS.

URATION HEADER

M

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED

DIMENSIONING AND TOLERANCING PER USASI Y14.5.

DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.

TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.

TOLERANCE ON ANGLES = ± 0° 30'

BREAK SHARP EDGES .010 MAX.

SURFACE ROUGHNESS 125

ALL CIRCUITRY ON 9008-7723 PCB UNLESS OTHERWISE NOTED.

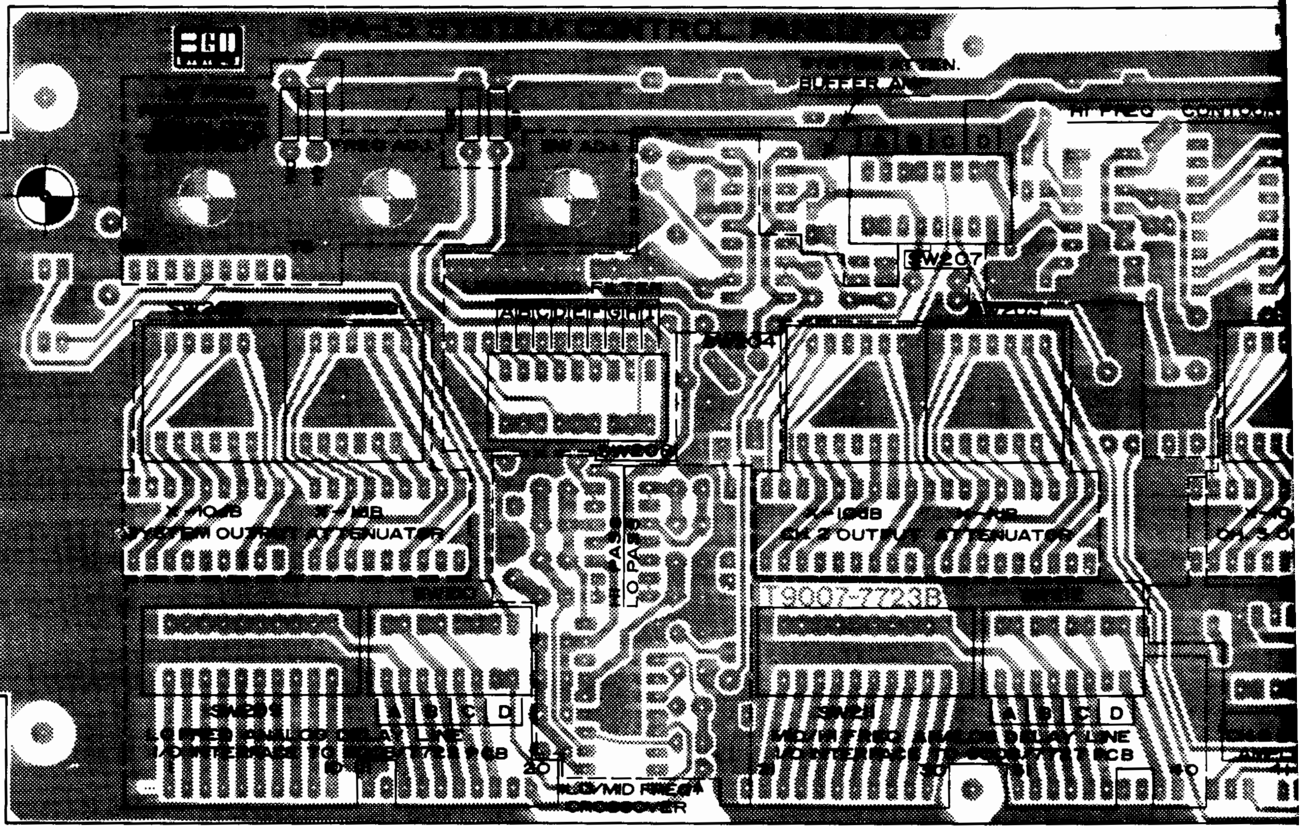
DRAWN	S.W. Selberg	4-27-86
CHECK		
PROJECT ENGR	S.W. Selberg	4-27-86

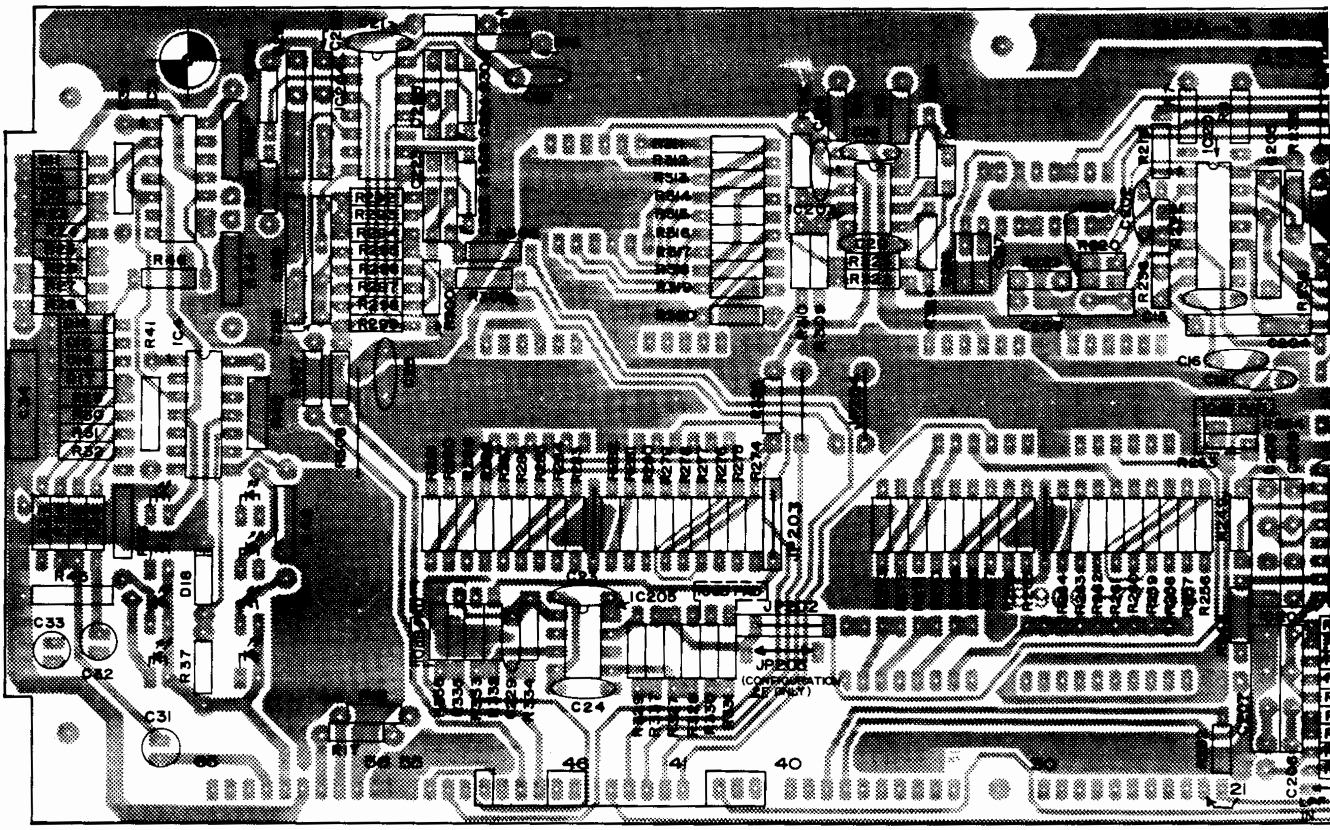
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE: SPA-3 SYSTEM CONTROL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	9008-7723	B

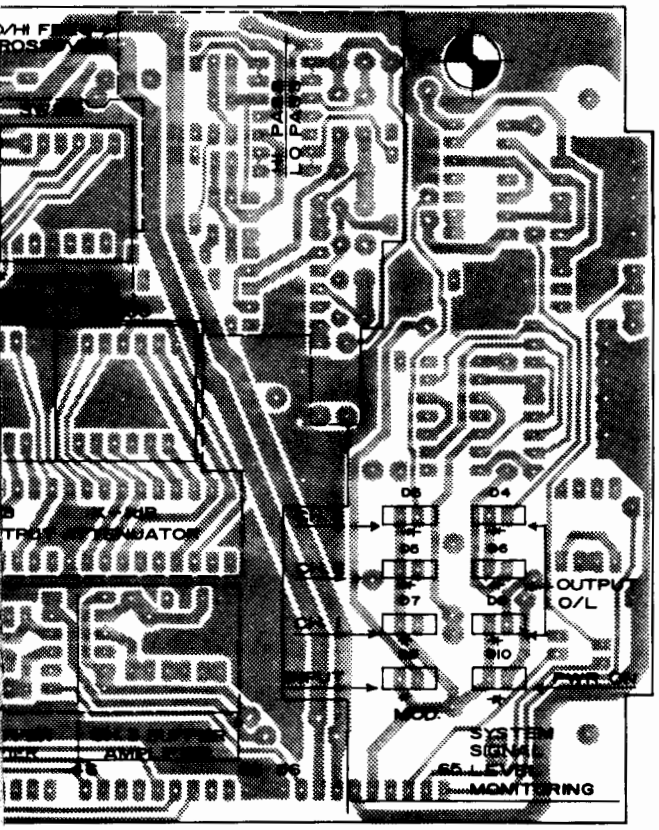
SCALE | SHEET 1 OF 4

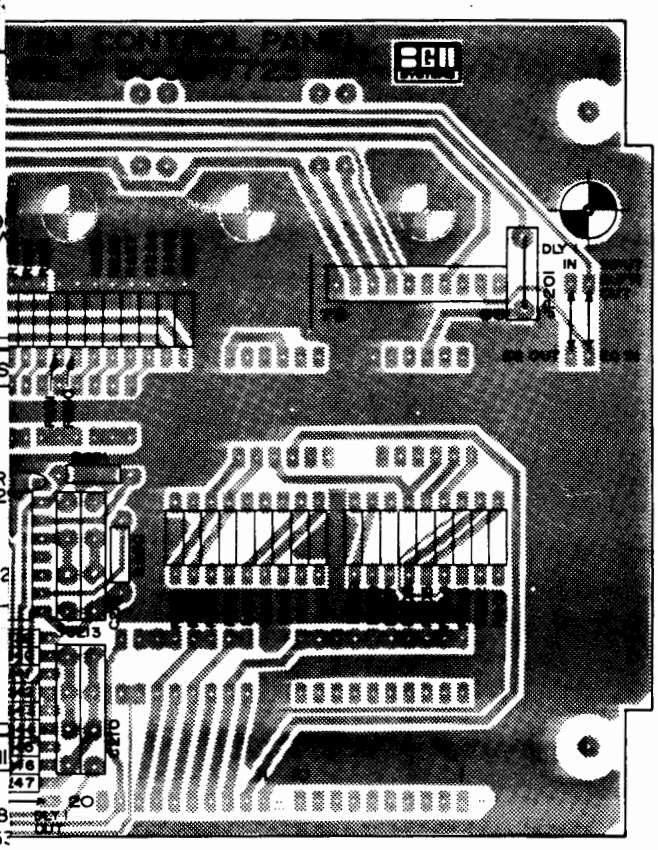




NOTES: UNLESS OTHERWISE SPECIFIED.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





DO NOT SCALE DRAWING

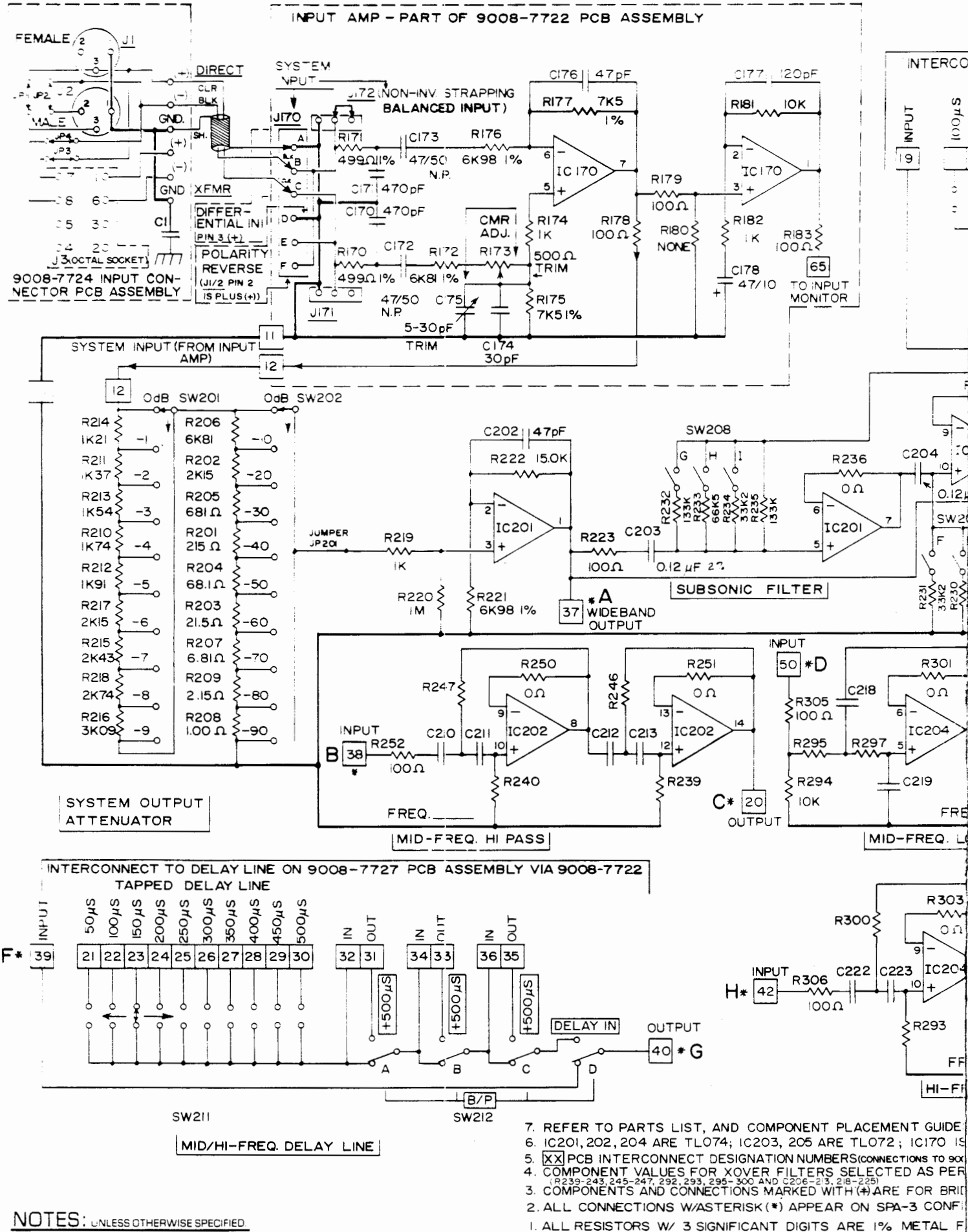
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

DRAWN	S.W. Selberg	9-24-87
CHECK		
PROJECT ENGR	S.W. Selberg	4-21-86

TITLE
SPA-3 PC BOARD LAYOUT-TOP/BOTTOM

SIZE	DRAWING NUMBER	REV
D	9007-7723	B

SCALE 1:1 SHEET 8 OF 8


INPUT AMP - PART OF 9008-7722 PCB ASSEMBLY
FEMALE
J1
DIRECT
CLR
BLK
GND
SH.
(+)
(-)
GND
XFMR
C1
J3 (OCTAL SOCKET)
9008-7724 INPUT CONNECTOR PCB ASSEMBLY
SYSTEM INPUT
J172 (NON-INV. STRAPPING BALANCED INPUT)
J170
J171
DIFFERENTIAL IN
PIN 3 (+)
POLARITY REVERSE (J1/2 PIN 2 IS PLUS (+))
R171 499Ω 1%
C173 47/50 N.P.
R176 6K98 1%
C176 47pF
R177 7K5 1%
IC170
C177 120pF
R181 10K
R179 100Ω
R178 100Ω
R180 NONE
R182 1K
R183 100Ω
C178 47/10
65 TO INPUT MONITOR
C171 470pF
C170 470pF
CMR ADJ.
R174 1K
R173 500Ω TRIM
R170 499Ω 1%
C172 6K81 1%
R172
C175 5-30pF TRIM
C174 30pF
R175 7K51%
47/50 N.P.
SYSTEM INPUT (FROM INPUT AMP)
11
12
0dB SW201
0dB SW202
R214 1K21 -1
R211 1K37 -2
R213 1K54 -3
R210 1K74 -4
R212 1K91 -5
R217 2K15 -6
R215 2K43 -7
R218 2K74 -8
R216 3K09 -9
R206 6K81 -10
R202 2K15 -20
R205 681Ω -30
R201 215Ω -40
R204 68.1Ω -50
R203 21.5Ω -60
R207 6.81Ω -70
R209 2.15Ω -80
R208 1.00Ω -90
SYSTEM OUTPUT ATTENUATOR
C202 47pF
R222 15.0K
IC201
SW208
R232 133K
R233 66K5
R234 33K2
R235 133K
R236 0Ω
C204
JUMPER JP201
R219 1K
R223 100Ω
C203 0.12 μF
SUBSONIC FILTER
R220 1M
R221 6K98 1%
37 *A WIDEBAND OUTPUT
R231 33K2
R230
INPUT
B 38 *
R252 100Ω
C210
C211
IC202
R247
R250 0Ω
R246
R251 0Ω
C212
C213
R240
R239
FREQ.
MID-FREQ. HI PASS
50 *D
R305 100Ω
C218
R301 0Ω
IC204
R295
R297
R294 10K
C219
C* 20 OUTPUT
MID-FREQ. L
INTERCO
INPUT
9
100μS
INTERCONNECT TO DELAY LINE ON 9008-7727 PCB ASSEMBLY VIA 9008-7722
TAPPED DELAY LINE
F* INPUT 39
50μS 100μS 150μS 200μS 250μS 300μS 350μS 400μS 450μS 500μS
21 22 23 24 25 26 27 28 29 30
IN 32 OUT 31
IN 34 OUT 33
IN 36 OUT 35
+500μS
DELAY IN
OUTPUT 40 *G
A B C D
B/P
SW211
SW212
MID/HI-FREQ. DELAY LINE
R300
R303 0Ω
H* INPUT 42
R306 100Ω
C222
C223
IC20
R293
HI-FI
7. REFER TO PARTS LIST, AND COMPONENT PLACEMENT GUIDE
6. IC201, 202, 204 ARE TL074; IC203, 205 ARE TL072; IC170 IS
5. XX PCB INTERCONNECT DESIGNATION NUMBERS (CONNECTIONS TO 900
4. COMPONENT VALUES FOR XOVER FILTERS SELECTED AS PER (R239-243, 245-247, 292, 293, 295-300 AND C206-213, 218-225)
3. COMPONENTS AND CONNECTIONS MARKED WITH (#) ARE FOR BRI
2. ALL CONNECTIONS W/ASTERISK (*) APPEAR ON SPA-3 CONFI
1. ALL RESISTORS W/ 3 SIGNIFICANT DIGITS ARE 1% METAL F
NOTES: UNLESS OTHERWISE SPECIFIED.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
B	ADD JUMPER CONNECTIONS TO INPUTS/OUTPUTS TO ONLY 1 PARAMETRIC EQ, LPF FOR ADDITIONAL S16. ROUTING	8-1-87	SWS

NECT TO DELAY LINE ON 9008-7722 PCB ASSEMBLY

TAPPED DELAY LINE

200µS 300µS 400µS 500µS 600µS 700µS 800µS 900µS 1000µS

2 3 4 5 6 7 8 9 10

SW209

IN OUT IN OUT IN OUT

14 13 16 15 18 17

+1mS +1mS +1mS

A B C

B/P

DELAY IN

LO FREQ. DELAY LINE

SW210

* 51

B/P

D

N 45 *

DLY1 OUT

JP206 JUMPER

LPF IN

R245 R241 R243 R242

C206 C208 C207 C209

R248 0Ω R249 0Ω

IC202

FREQ. ____

LO FREQ LO PASS

R253 7K5 1%

≠ R254 3K74 1% (1K69 1%)

CH. 1 OUT

SW207C

JUMPER JP204

M

* 52 CH. 1

53 CH. 2

54 CH. 3

OUTPUTS

55

56

R337 ≠10.0K

R329 ≠10.0K

0Ω (JP210)

CH. 1 MUTE

JUMPER JP205

IC205

R330 7K5 1%

R331 3K74

R336 3K74

R335 7K5 1%

R334 0Ω

R328 1M (10K)≠

R333 1M

R327 1K

JP202 JUMPER

R332 1K JUMPER JP203

CH. 2 INPUT

L* 41

CH. 2 OUTPUT ATTENUATOR

0dB SW203 0dB SW204

R269 1K21	-1	R261 6K81	-10
R266 1K37	-2	R257 2K15	-20
R268 1K54	-3	R260 681Ω	-30
R265 1K74	-4	R256 215Ω	-40
R267 1K91	-5	R259 68.1Ω	-50
R272 2K15	-6	R258 21.5Ω	-60
R270 2K43	-7	R262 6.81Ω	-70
R273 2K74	-8	R264 2.15Ω	-80
R271 3K09	-9	R263 1.00Ω	-90

0dB SW205 0dB

R287 1K21	-1	R279 6K81	-10
R284 1K37	-2	R275 2K15	-20
R286 1K54	-3	R278 681Ω	-30
R283 1K74	-4	R274 215Ω	-40
R285 1K91	-5	R277 68.1Ω	-50
R290 2K15	-6	R276 21.5Ω	-60
R288 2K43	-7	R280 6.81Ω	-70
R291 2K74	-8	R282 2.15Ω	-80
R289 3K09	-9	R281 1.00Ω	-90

SW206

DLY1 IN JUMPER EQ. OUT JP207

70

SUBSONIC FILTER

J301

INTERCONNECT TO LF PARAMETRIC EQUALIZER 9008-7726 PCB ASSEMBLY

SW207B EQ. IN 67

JP208 JUMPER

SW208 B/P

SW207A 69

EQ IN

71

B/P

75

R229 133K R225 133K R228 33K2 R227 66K5 R226 133K R224 133K

R238 0Ω IC201 C205 0.12µF

R302 0Ω IC204 C220 C221 R296 R298 R307 100Ω

OUTPUT 49 *E

C214 47pF HI FREQ. CONTOUR

R321 10K 1%

IC203

K OUTPUT 44 * R326 100Ω

CH. 3 INPUT *J 43 JP209 JUMPER R309 10K 1%

R325 0Ω IC203 10kHz

R310 9K76 C215 4.7nF R323 1K47 R324 6K49 R322 1M C216 2.2nF 5kHz C217 2.2nF SW207D

R320 0Ω +9 SW213

R317 487Ω +8

R319 487Ω +7

R316 536Ω +6

R318 619Ω +5

R313 732Ω +4

R311 931Ω +3

R314 1K21 +2

R312 1K54 +1

R315 3K24 0dB

BOOST LEVEL, dB

R304 0Ω IC204 C224 C225 R308 100Ω R292 R299

48 *I OUTPUT

CH. 3 OUTPUT ATTENUATOR

PASS

Q. ____

EQ. HI PASS

9008-7723 PG. 3,4.

NE5532 AN.

-7722,7726,7727).

USER-SPEC. FREQ.

ED-PAIR PWR. AMPS.

URATION HEADER

M

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED

DIMENSIONING AND TOLERANCING PER USASI Y14.5.

DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.

TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.

TOLERANCE ON ANGLES = ± 0° 30'

BREAK SHARP EDGES .010 MAX.

SURFACE ROUGHNESS 125

ALL CIRCUITRY ON 9008-7723 PCB UNLESS OTHERWISE NOTED.

DRAWN	S.W. Selberg	4-27-86
CHECK		
PROJECT ENGR	S.W. Selberg	4-27-86

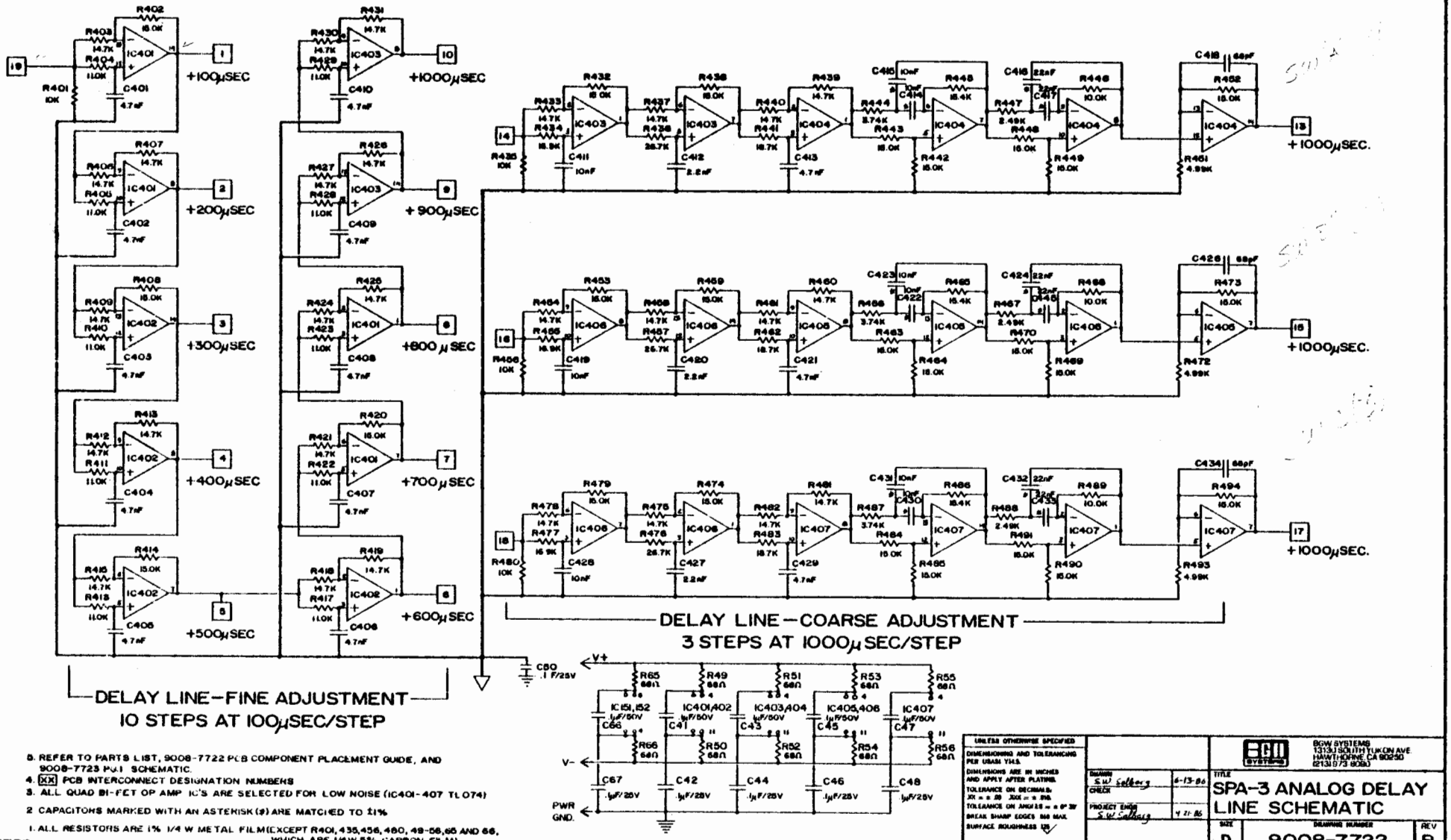
BGW SYSTEMS

BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090

TITLE: SPA-3 SYSTEM CONTROL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	9008-7723	B

SCALE | SHEET 1 OF 4



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE 1% 1/4 W METAL FILM (EXCEPT R401, 435, 456, 480, 49-56, 65 AND 66, WHICH ARE 1/4 W 5% CARBON FILM).
2. CAPACITORS MARKED WITH AN ASTERISK (*) ARE MATCHED TO ±1%.
3. ALL QUAD BI-FET OP AMP IC'S ARE SELECTED FOR LOW NOISE (IC401-407 TL074).
4. XX PCB INTERCONNECT DESIGNATION NUMBERS.
5. REFER TO PARTS LIST, 9008-7722 PCB COMPONENT PLACEMENT GUIDE, AND 9008-7723 P.C.I. SCHEMATIC.

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USAS Y14.5
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125
DO NOT SCALE DRAWING

BGW SYSTEMS
13131 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

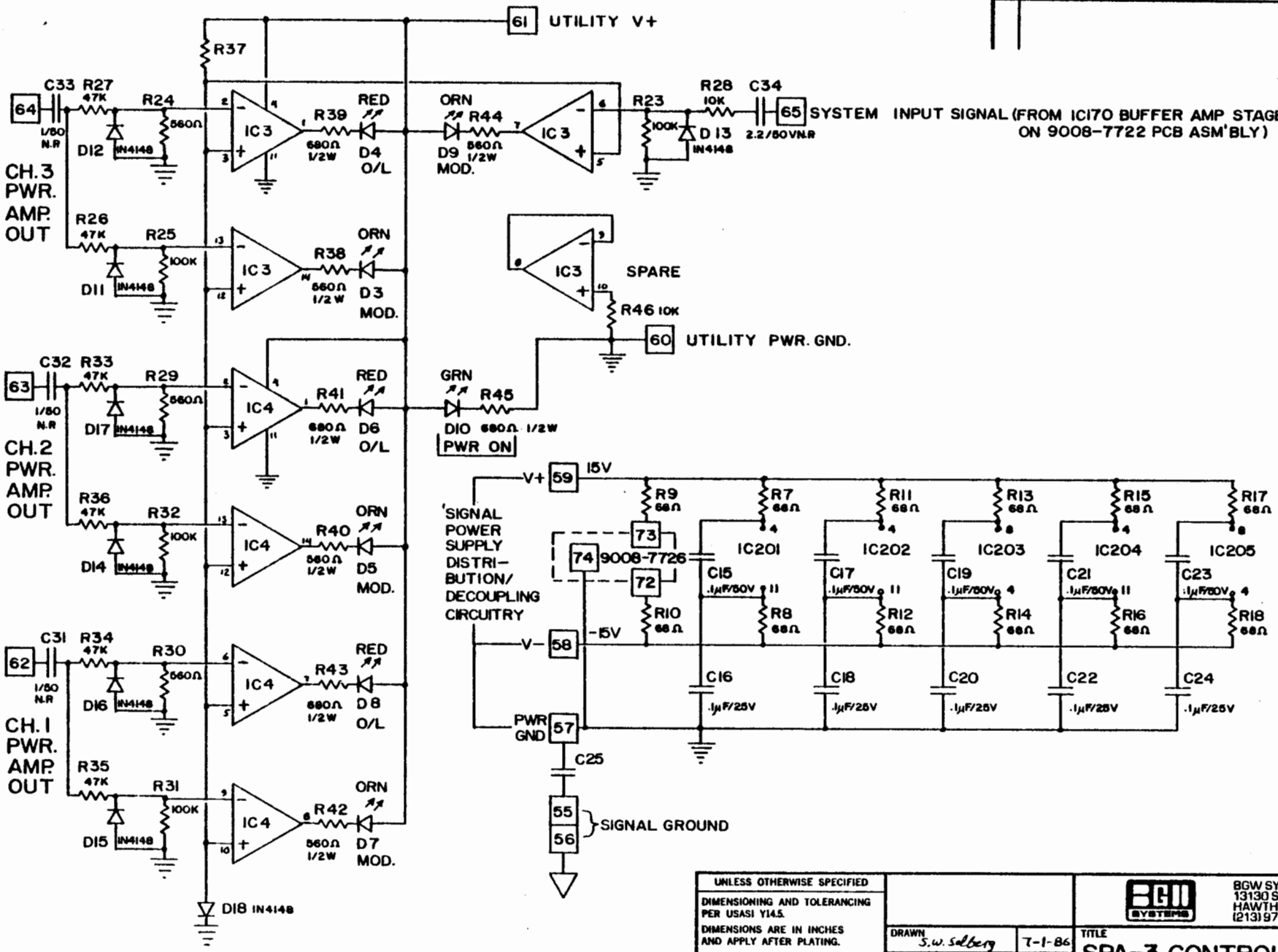
DRAWN S.W. Sellers 6-13-86
CHECK
PROJECT ENGR S.W. Sellers 4-21-86

TITLE: SPA-3 ANALOG DELAY LINE SCHEMATIC

SIZE D | DRAWING NUMBER 9008-7722 | REV B

SCALE | SHEET 2 OF 3

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



6. REFER TO PARTS LIST.
4. [XX] DESIGNATION NUMBERS FOR PCB FLEX CABLE INTERCONNECT. 9007-7723/7722 PERMANENTLY CONNECTED.
3. IC 3,4 ARE LM 324; IC 201, 202, 204 ARE TL074; IC 203, 205 ARE TL072.
2. CAPACITORS MARKED N.R IS NON-POLARIZED ALUMINUM ELECTROLYTIC; μF/V
1. ALL RESISTORS 1/4W (OR 1/2W) 5% CARBON FILM, IN OHMS (Ω).

NOTES: UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

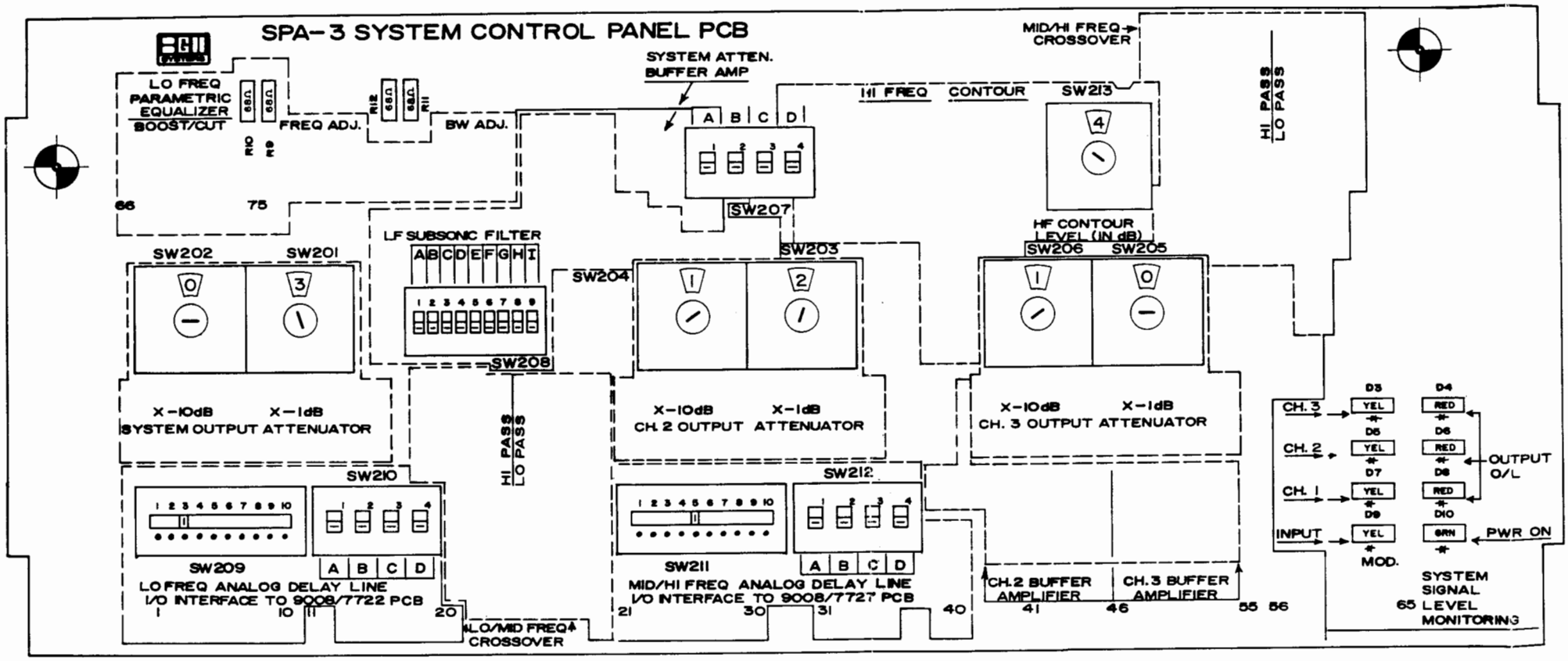
DRAWN	S.W. Salberg	7-1-86
CHECK		
PROJECT ENGR	S.W. Salberg	4-20-86

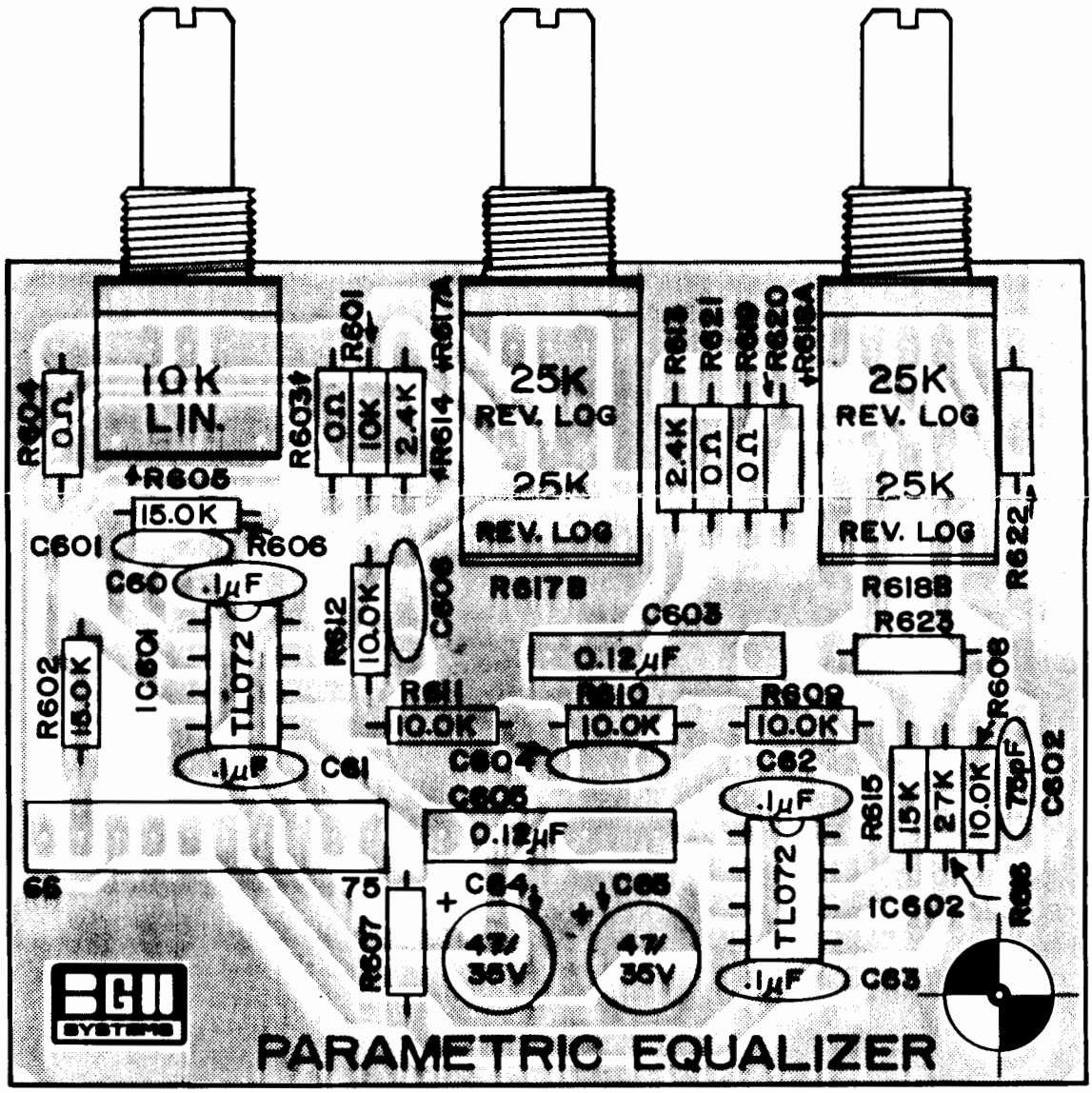
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE: SPA-3 CONTROL PANEL PCB SCHEMATIC: UTILITY CKTS.

SIZE	DRAWING NUMBER	REV
C	9008-7723	B

SCALE —— SHEET 2 OF 4


SPA-3 SYSTEM CONTROL PANEL PCB
LO FREQ PARAMETRIC EQUALIZER BOOST/CUT
FREQ ADJ.
BW ADJ.
SYSTEM ATTEN. BUFFER AMP
MID/HI FREQ CROSSOVER
HI FREQ CONTOUR
SW213
HI PASS
LO PASS
SW207
HF CONTOUR LEVEL (IN dB)
SW206
SW205
LF SUBSONIC FILTER
SW202
SW201
SW203
SW204
SW208
X-10dB X-1dB
SYSTEM OUTPUT ATTENUATOR
X-10dB X-1dB
CH. 2 OUTPUT ATTENUATOR
X-10dB X-1dB
CH. 3 OUTPUT ATTENUATOR
SW210
SW212
SW209
SW211
LO FREQ ANALOG DELAY LINE
I/O INTERFACE TO 9008/7722 PCB
MID/HI FREQ ANALOG DELAY LINE
I/O INTERFACE TO 9008/7727 PCB
LO/MID FREQ CROSSOVER
CH.2 BUFFER AMPLIFIER
CH.3 BUFFER AMPLIFIER
CH. 3
CH. 2
CH. 1
INPUT
MOD.
OUTPUT O/L
PWR ON
SYSTEM SIGNAL LEVEL MONITORING
65
66
75
1
10
11
20
21
30
31
40
41
46
55
56



TOP SIDE

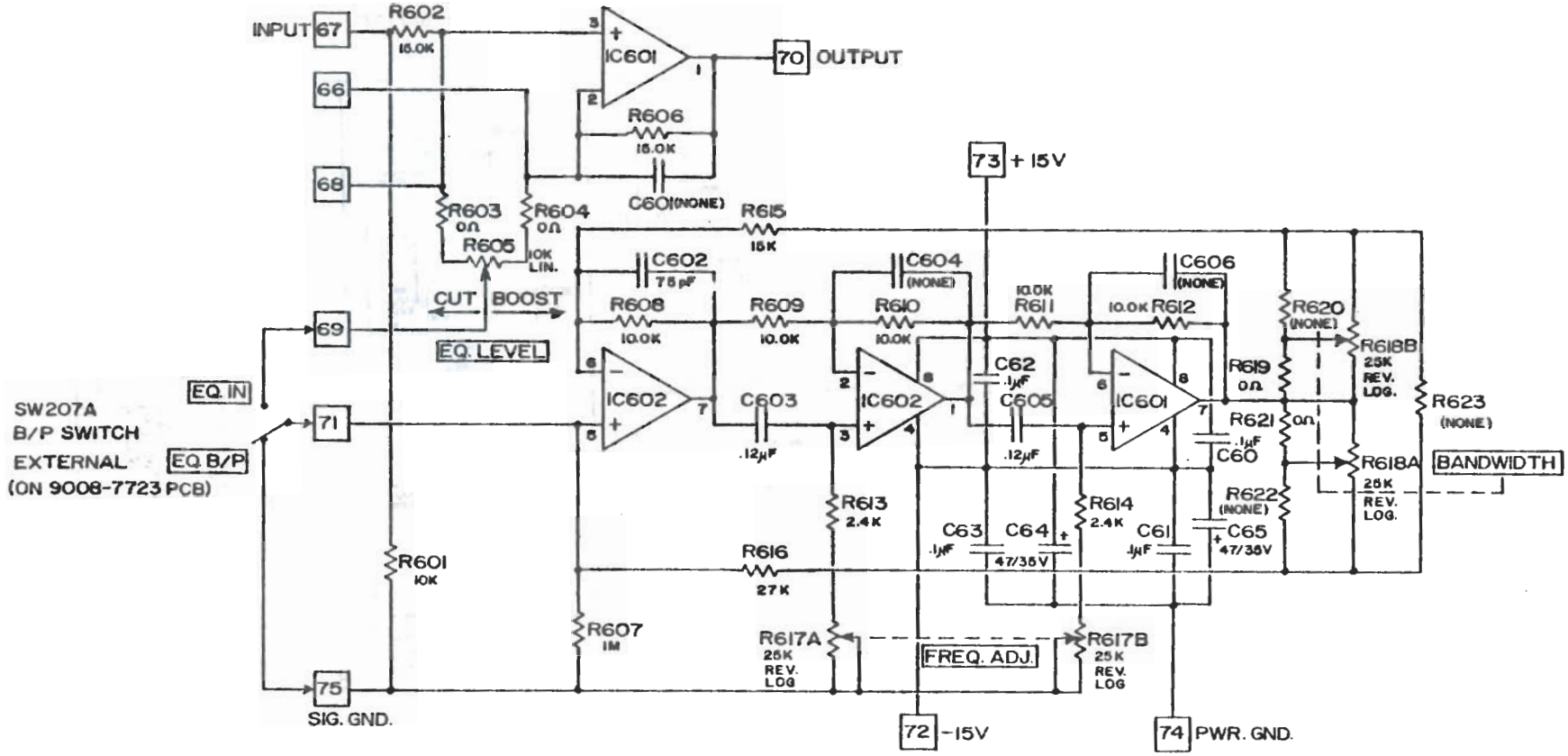
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

DRAWN	S.W. Selberg	8-22-87
CHECK		
PROJECT ENGR	S.W. Selberg	1-8-86

TITLE

COMPONENT PLACEMENT PARAMETRIC EQ. PCB

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



7. REFER TO PARTS LIST.
6. INPUT/OUTPUT/SUPPLY CONNECTIONS VIA 10-COND. FLEX CABLE TO 9008-7723 PCB ASSEMBLY, J301
5. STANDARD FREQ. RANGE IS 50-500Hz; C603,605, R613-616 WILL CHANGE FREQ. RANGE.
4. CAPACITORS IN μF/WORKING VOLTS
3. IC 601, 602 ARE TL072 BI-FET OP AMPS.
2. ALL RESISTORS W/TWO SIGNIFICANT DIGITS (XX K) ARE 5% 1/4W CARBON FILM.
1. ALL RESISTORS W/ THREE SIGNIFICANT DIGITS (XXX K) ARE 1% 1/4W METAL FILM.

NOTES: UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USAS Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

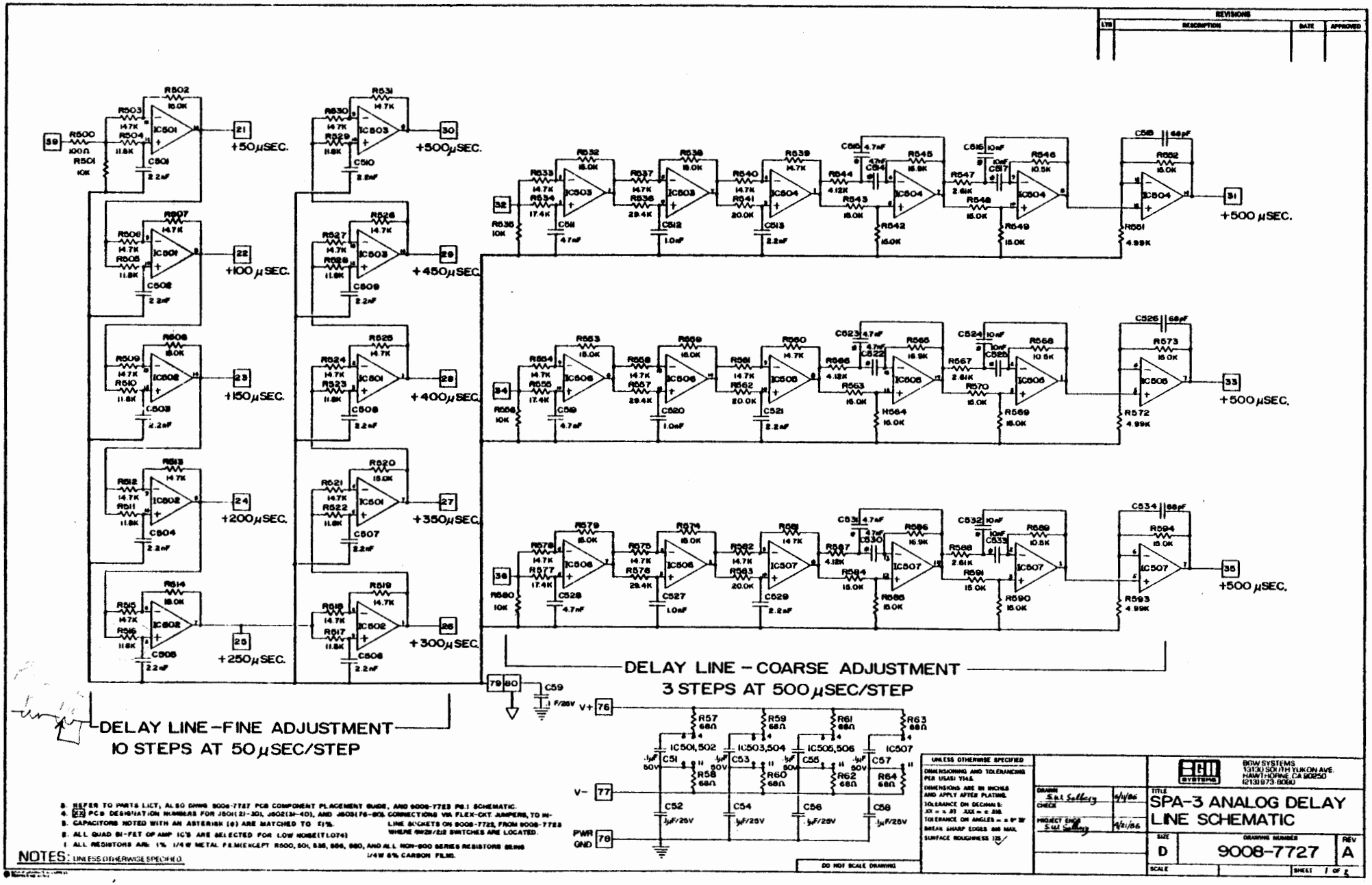
DRAWN	S.W. Selberg	4/24/86
CHECK		
PROJECT ENGR	S.W. Selberg	4/24/86

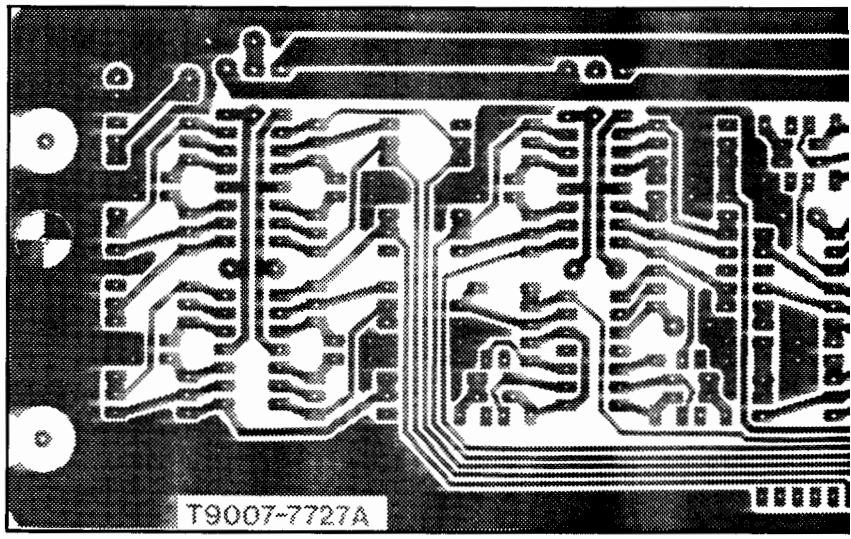
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

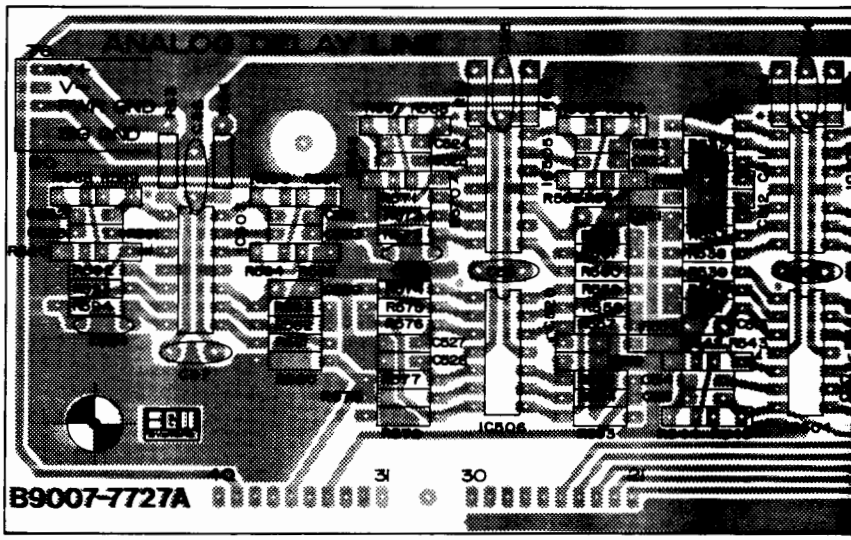
TITLE
SPA-1,3 PARAMETRIC EQUALIZER SCHEMATIC

SIZE	DRAWING NUMBER	REV
C	9008-7726	A

SCALE | SHEET 1 OF 2

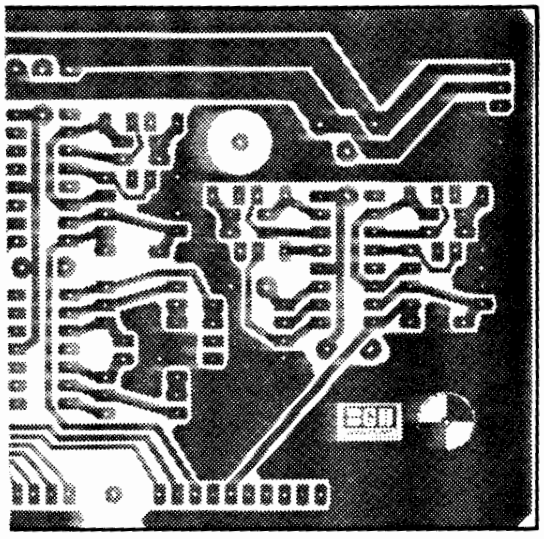

REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
+50 μSEC.
+100 μSEC.
+150 μSEC.
+200 μSEC.
+250 μSEC.
+300 μSEC.
+350 μSEC.
+400 μSEC.
+450 μSEC.
+500 μSEC.
+500 μSEC.
+500 μSEC.
DELAY LINE – FINE ADJUSTMENT
10 STEPS AT 50 μSEC/STEP
DELAY LINE – COARSE ADJUSTMENT
3 STEPS AT 500 μSEC/STEP
V+
V-
PWR GND
IC501,502
IC503,504
IC505,506
IC507
NOTES: UNLESS OTHERWISE SPECIFIED
3. REFER TO PARTS LIST, ALSO DWNG 9008-7727 PCB COMPONENT PLACEMENT GUIDE, AND 9008-7728 PS.1 SCHEMATIC.
4. XX PCB DESIGNATION NUMBERS FOR J501(21-30), J502(31-40), AND J503(76-80) CONNECTIONS VIA FLEX-CKT. JUMPERS, TO IN-LINE SOCKETS ON 9008-7725, FROM 9008-7728 WHERE XX21/212 SWITCHES ARE LOCATED.
5. CAPACITORS NOTED WITH AN ASTERISK (*) ARE MATCHED TO ±1%.
6. ALL QUAD BI-FET OP AMP IC'S ARE SELECTED FOR LOW NOISE(TL074)
7. ALL RESISTORS ARE 1% 1/4W METAL FILM(EXCEPT R500, 501, 535, 536, 560, AND ALL NON-500 SERIES RESISTORS ARE 1/4W 5% CARBON FILM).
UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: .XX ± .03 .XXX ± .005
TOLERANCE ON ANGLES ± 0° 30'
BREAK SHARP EDGES .005 MAX.
SURFACE ROUGHNESS 125
DO NOT SCALE DRAWING
DRAWN S.G. Sellers 4/4/86
CHECK
PROJECT ENGR S.G. Sellers 4/21/86
BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090
TITLE
SPA-3 ANALOG DELAY LINE SCHEMATIC
SIZE D
DRAWING NUMBER 9008-7727
REV A
SCALE
SHEET 1 OF 2

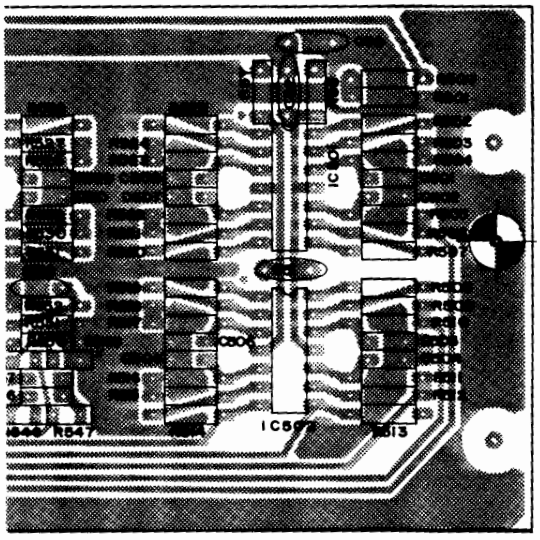




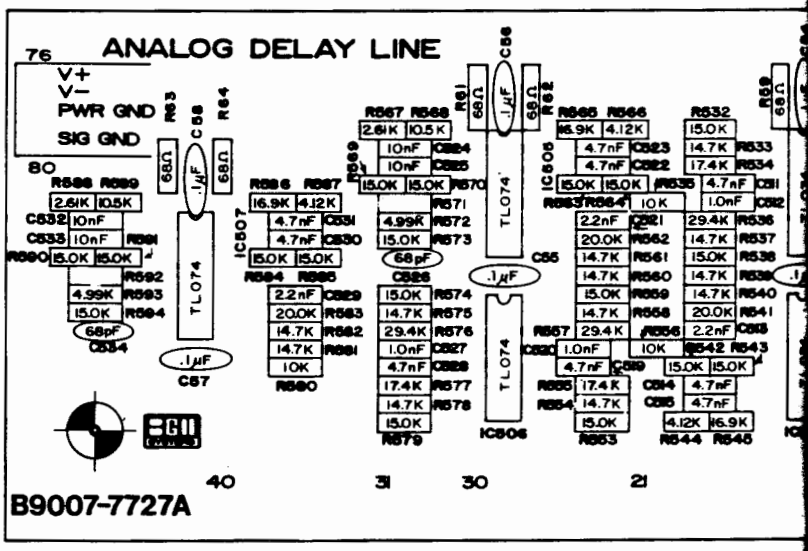
NOTES: UNLESS OTHERWISE SPECIFIED.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





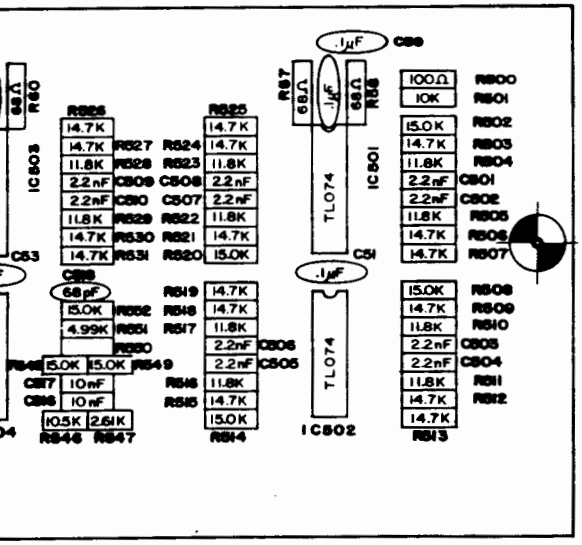
UNLESS OTHERWISE SPECIFIED			
DIMENSIONING AND TOLERANCING PER USASI Y14.5.		BGW SYSTEMS	BGW SYSTEMS 13130 SOUTH YUKON AVE HAWTHORNE, CA 90250 (213) 973-8090
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.	DRAWN S.W. Solberg 9-24-87	TITLE	SPA-3 PC BOARD LAYOUT-TOP/BOTTOM
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.	CHECK		
TOLERANCE ON ANGLES = ± 0° 30'	PROJECT ENGR S.W.S.lberg 4-21-86	SIZE D	DRAWING NUMBER 9007-7727 REV A
BREAK SHARP EDGES .010 MAX.		SCALE 1 : 1	SHEET 7 OF 7
SURFACE ROUGHNESS 125			
DO NOT SCALE DRAWING			



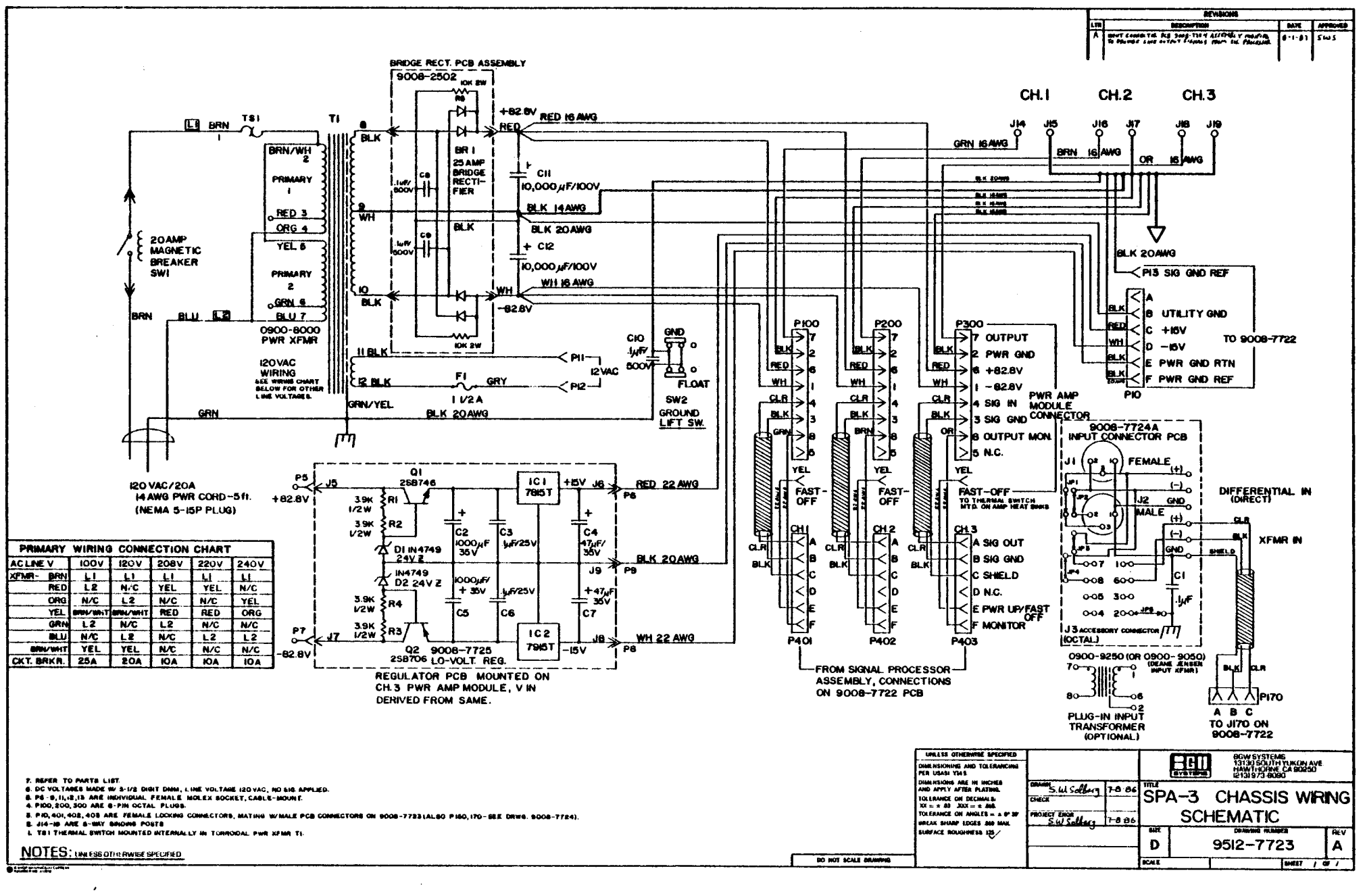
4. CAPACITORS REMAINING IN C500 SERIES ARE 5% WINDOW BATCH-SORTED FROM ± 5% PARTS
3. CAPACITORS C514/15, 516/17, 522/23, 524/25, 530/31, 532/33 ARE 1% MATCHED PAIRS
2. ALL RESISTORS W/TWO SIGNIFICANT DIGITS (XX.Ω) ARE 1/4 W 5% CARBON FILM
1. ALL RESISTORS W/THREE SIGNIFICANT DIGITS (XX.X K) ARE 1% METAL FILM, 1/4W

NOTES: UNLESS OTHERWISE SPECIFIED.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



UNLESS OTHERWISE SPECIFIED			
DIMENSIONING AND TOLERANCING PER USAS! Y14.5.		BGW SYSTEMS	13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.	DRAWN S.W. Salsberg 19-9-87	TITLE	SPA-3 DELAY LINE PCB COMPONENT PLACEMENT
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.	CHECK		
TOLERANCE ON ANGLES = ± 0° 30'	PROJECT ENGR S.W. Salsberg 14-21-86		
BREAK SHARP EDGES .010 MAX.		SIZE D	DRAWING NUMBER 9008-7727 REV A
SURFACE ROUGHNESS 125		SCALE N.T.S.	SHEET 2 OF 2
DO NOT SCALE DRAWING			


REVISIONS
LTR DESCRIPTION DATE APPROVED
A 6-1-87 SWS
BRIDGE RECT. PCB ASSEMBLY
9008-2502
BR1 25 AMP BRIDGE RECTIFIER
+82.8V
-82.8V
RED 16 AWG
WH 16 AWG
BLK 14AWG
BLK 20AWG
C11 10,000µF/100V
C12 10,000µF/100V
C8 .1µF/500V
C9 .1µF/500V
R5 10K 2W
R6 10K 2W
CH.1 CH.2 CH.3
J14 J15 J16 J17 J18 J19
GRN 16AWG
BRN 16AWG
OR 16AWG
BLK 20AWG
P13 SIG GND REF
A
B UTILITY GND
C +15V
D -15V
E PWR GND RTN
F PWR GND REF
P10
TO 9008-7722
20 AMP MAGNETIC BREAKER SW1
L1 BRN
TS1
T1
BRN/WH 2 PRIMARY 1
RED 3
ORG 4
YEL 5
PRIMARY 2
GRN 6
BLU 7
0900-8000 PWR XFMR
L2 BLU
BRN
120VAC WIRING
SEE WIRING CHART BELOW FOR OTHER LINE VOLTAGES.
GRN
GRN/YEL
11 BLK
12 BLK
P11
P12
12VAC
F1 1 1/2A GRY
BLK 20AWG
C10 .1µF/500V
GND
FLOAT
SW2 GROUND LIFT SW.
120VAC/20A 14 AWG PWR CORD-5ft. (NEMA 5-15P PLUG)
P100
P200
P300
P401
P402
P403
PWR AMP MODULE CONNECTOR
7 OUTPUT
2 PWR GND
6 +82.8V
1 -82.8V
4 SIG IN
3 SIG GND
8 OUTPUT MON
5 N.C.
FAST-OFF
FAST-OFF TO THERMAL SWITCH MTD. ON AMP HEAT SINKS
CH1
CH2
CH3
A SIG OUT
B SIG GND
C SHIELD
D N.C.
E PWR UP/FAST OFF
F MONITOR
FROM SIGNAL PROCESSOR ASSEMBLY, CONNECTIONS ON 9008-7722 PCB
9008-7724A INPUT CONNECTOR PCB
J1 FEMALE
J2 MALE
J3 ACCESSORY CONNECTOR (OCTAL)
DIFFERENTIAL IN (DIRECT)
XFMR IN
C1 .1µF
0900-9250 (OR 0900-9050) (DEANE JENSEN INPUT XFMR)
PLUG-IN INPUT TRANSFORMER (OPTIONAL)
P170
A B C
TO J170 ON 9008-7722
P5 +82.8V
P7 -82.8V
J5 J6 J7 J8 J9
Q1 2SB746
Q2 9008-7725 2SB706 LO-VOLT. REG.
IC1 7915T
IC2 7915T
+15V
-15V
R1 3.9K 1/2W
R2 3.9K 1/2W
R3 3.9K 1/2W
R4 3.9K 1/2W
D1 IN4749 24V Z
D2 IN4749 24V Z
C2 1000µF 35V
C3 µF/25V
C4 47µF/35V
C5 1000µF + 35V
C6 µF/25V
C7 +47µF 35V
RED 22 AWG
BLK 20AWG
WH 22 AWG
P6
P9
P8
REGULATOR PCB MOUNTED ON CH.3 PWR AMP MODULE, V IN DERIVED FROM SAME.
PRIMARY WIRING CONNECTION CHART
AC LINE V | 100V | 120V | 208V | 220V | 240V
XFMR- BRN | L1 | L1 | L1 | L1 | L1
RED | L2 | N/C | YEL | YEL | N/C
ORG | N/C | L2 | N/C | N/C | YEL
YEL | BRN/WHT | BRN/WHT | RED | RED | ORG
GRN | L2 | N/C | L2 | N/C | N/C
BLU | N/C | L2 | N/C | L2 | L2
BRN/WHT | YEL | YEL | N/C | N/C | N/C
CKT. BRKR. | 25A | 20A | 10A | 10A | 10A
7. REFER TO PARTS LIST.
6. DC VOLTAGES MADE W/ 3-1/2 DIGIT DMM, LINE VOLTAGE 120 VAC, NO SIG. APPLIED.
5. P6-9, 11, 12, 13 ARE INDIVIDUAL FEMALE MOLEX SOCKET, CABLE-MOUNT.
4. P100, 200, 300 ARE 8-PIN OCTAL PLUGS.
3. P101, 401, 402, 403 ARE FEMALE LOCKING CONNECTORS, MATING W/MALE PCB CONNECTORS ON 9008-7723 (ALSO P150, 170 - SEE DRWG. 9008-7724).
2. J14-19 ARE 8-WAY SINGING POSTS
1. TS1 THERMAL SWITCH MOUNTED INTERNALLY IN TORROIDAL PWR XFMR T1.
NOTES: UNLESS OTHERWISE SPECIFIED
UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: XX = ± .03 XXX = ± .005
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125
DO NOT SCALE DRAWING
DRAWN S.W. Solberg 7-8-86
CHECK
PROJECT ENGR S.W. Solberg 7-8-86
BGW SYSTEMS 13130 SOUTH YUKON AVE HAWTHORNE, CA 90250 (213) 973-8090
TITLE SPA-3 CHASSIS WIRING SCHEMATIC
SIZE D
DRAWING NUMBER 9512-7723
REV A
SCALE
SHEET 1 OF 1

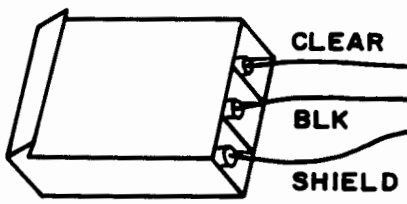
TO J170-A-B-C
(J1-PIN 3 HOT)

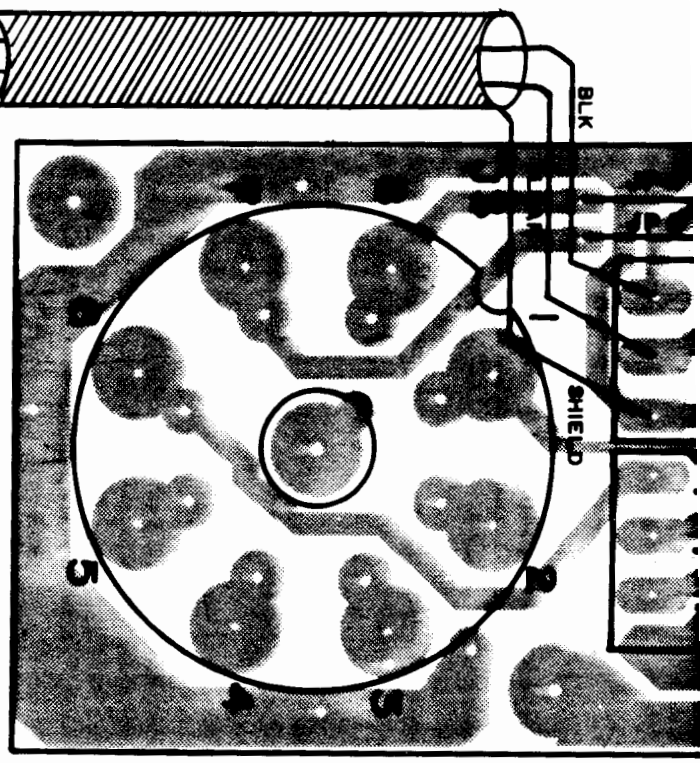
-OR-

FOR PHASE REVERSE

TO J170-D-E-F
(J1-PIN 2 HOT)

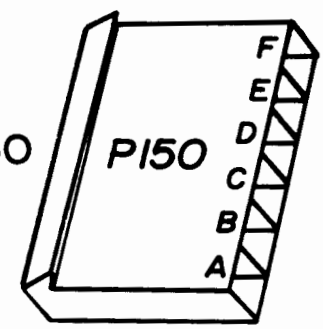
P170





ON 9008-7722B
I/O PCB ASSEMBLY

TO J150



EXT. I/O CONNECTOR (WHEN REQ'D.)

	CONNECTIONS
JP 1	
JP 2	
JP 3	
JP 4	
P150-A	
P150-B	
P150-C	
P150-D	
P150-E	
P150-F	

UNLESS OTHERWISE SPECIFIED

DIMENSIONING AND TOLERANCING PER USASI Y14.5.

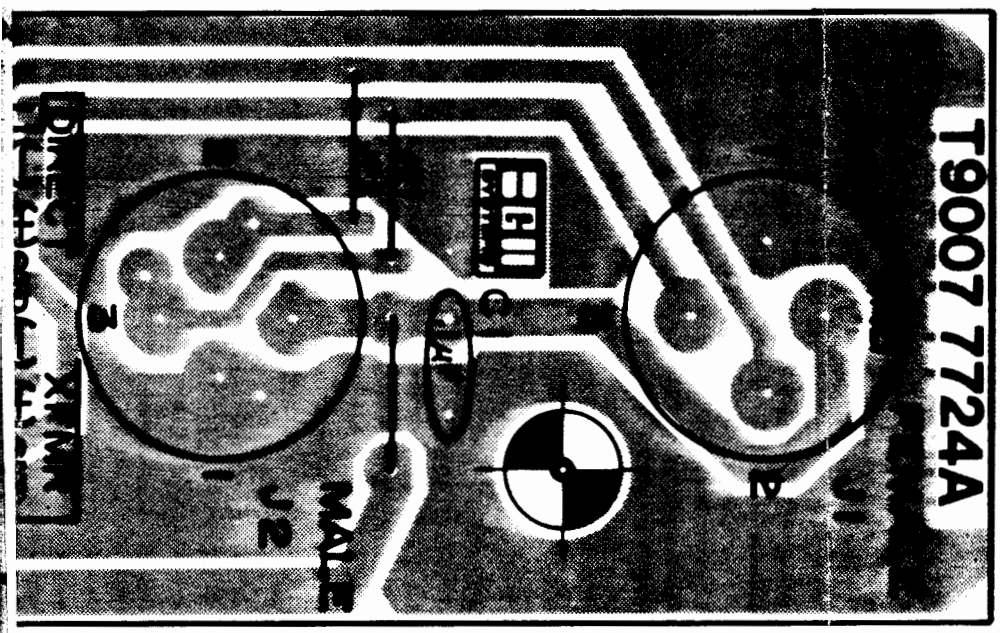
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.

TOLERANCE ON DECIMALS:
.XX = ± .03 .XXX = ± .010.

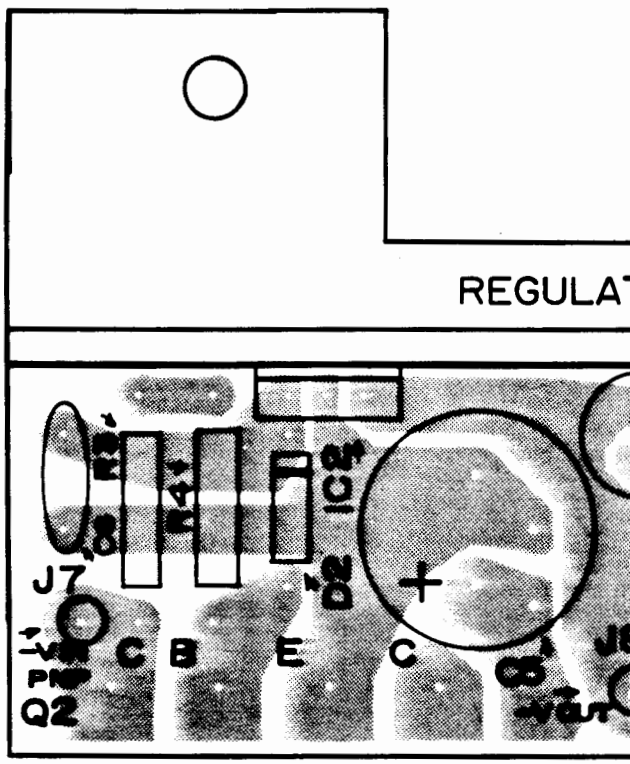
TOLERANCE ON ANGLES = ± 0° 30'

BREAK SHARP EDGES .010 MAX.

SURFACE ROUGHNESS 125



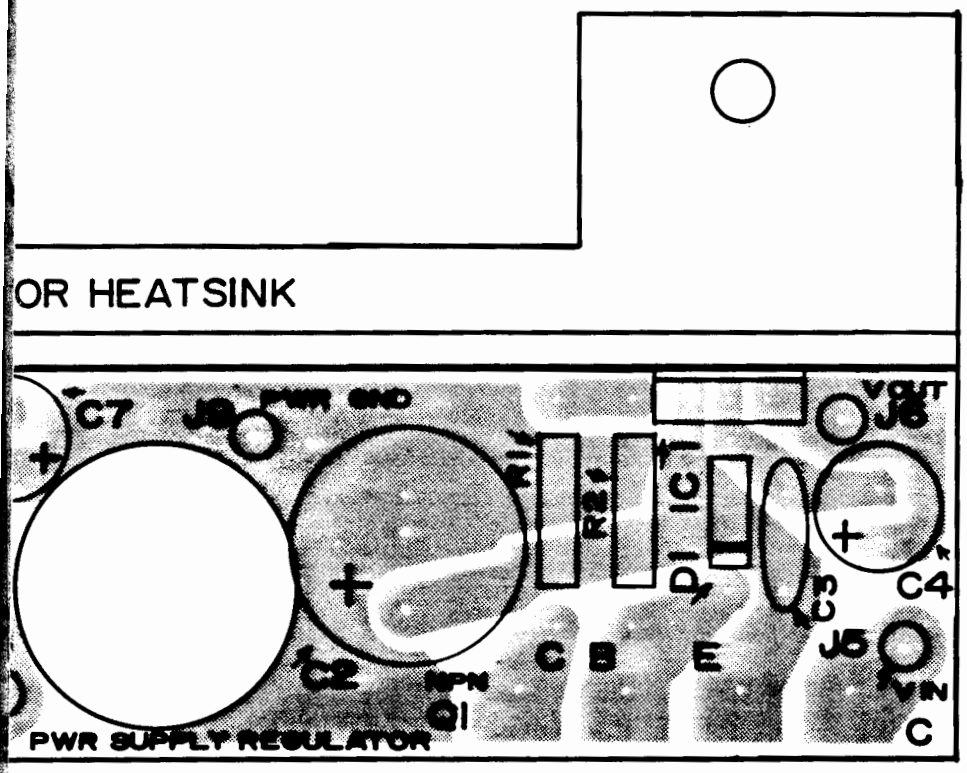
CUSTOMER		BGW SYSTEMS 13130 SOUTH YUKON AVE. HAWTHORNE, CA 90250 (213) 973-8090	
DRAWN S.W. Selberg	9-6-87	TITLE SPA-3 INPUT CONNECTOR PCB ASSEMBLY GUIDE	
CHECK			
PROJECT ENGR S.W. Selberg	4/17/86		
		SIZE	DRAWING NUMBER 9008-7724 / REV A
		SCALE 2:1	SHEET 1 OF 1



UNLESS OTHERWISE SPECIFIED	TOP
DIMENSIONING AND TOLERANCING PER USASI Y14.5.	
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.	DRAWN S.W. Se
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010.	CHECK
TOLERANCE ON ANGLES = ± 0° 30'	PROJECT ENGR S.W. Selbe
BREAK SHARP EDGES .010 MAX.	PART OF I
SURFACE ROUGHNESS 125 ✓	HEATSINK

2. REFER TO PARTS LIST.
1. REFER TO CHASSIS WIRING SCHEMATIC (9512-7723).

DO NOT SCALE DRAWING



SIDE

Uberg	8-22-87
rg	1/7/86

001-7725

ASSEMBLY

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

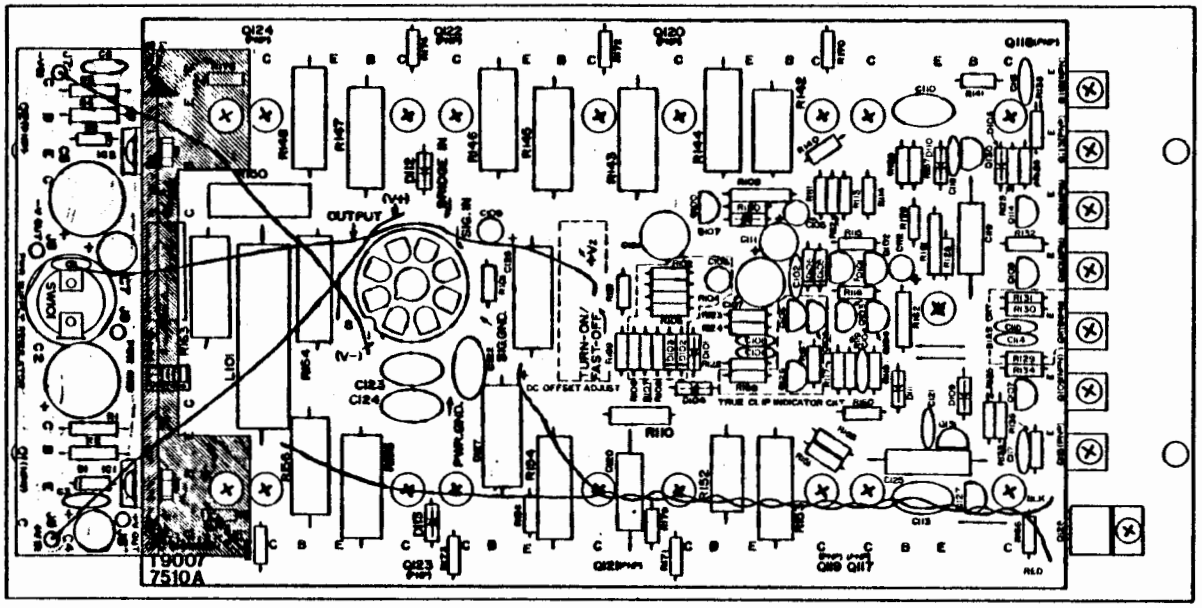
TITLE

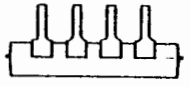
COMPONENT PLACEMENT
SPA-1,3 REGULATOR PCB

SIZE	DRAWING NUMBER	REV
	9008-7725	A

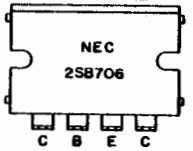
SCALE 2:1 | SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



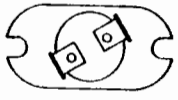


POWER TRANSISTOR
ULTRACASE TM



1853-0706 PNP

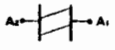
90°C O.O.R.
THERMAL SWITCH



0630-0001

SILICON BILATERAL SWITCH

1884-4992
MBS4992

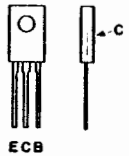


SMALL SIG. TRANSISTOR

EBC

1853-0093	MPS-A93	PNP
1853-4250	PN4250A	
1853-4403	2N4403	
1854-0043	MPS-A43	NPN
1854-4401	2N4401	

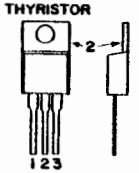
MED. PWR. TRANSISTOR



ECB

1853-2453	PNP
1854-2450	NPN
1854-2452	NPN

THYRISTOR



1 2 3

1854-6346
2N6346

2. REFER TO PARTS LIST.
1. REFER TO SCHEMATIC, DRWG NO. 9008-7510.

NOTES: UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS:
.XX = ± .03 .XXX = ± .005
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

CHANNEL 3

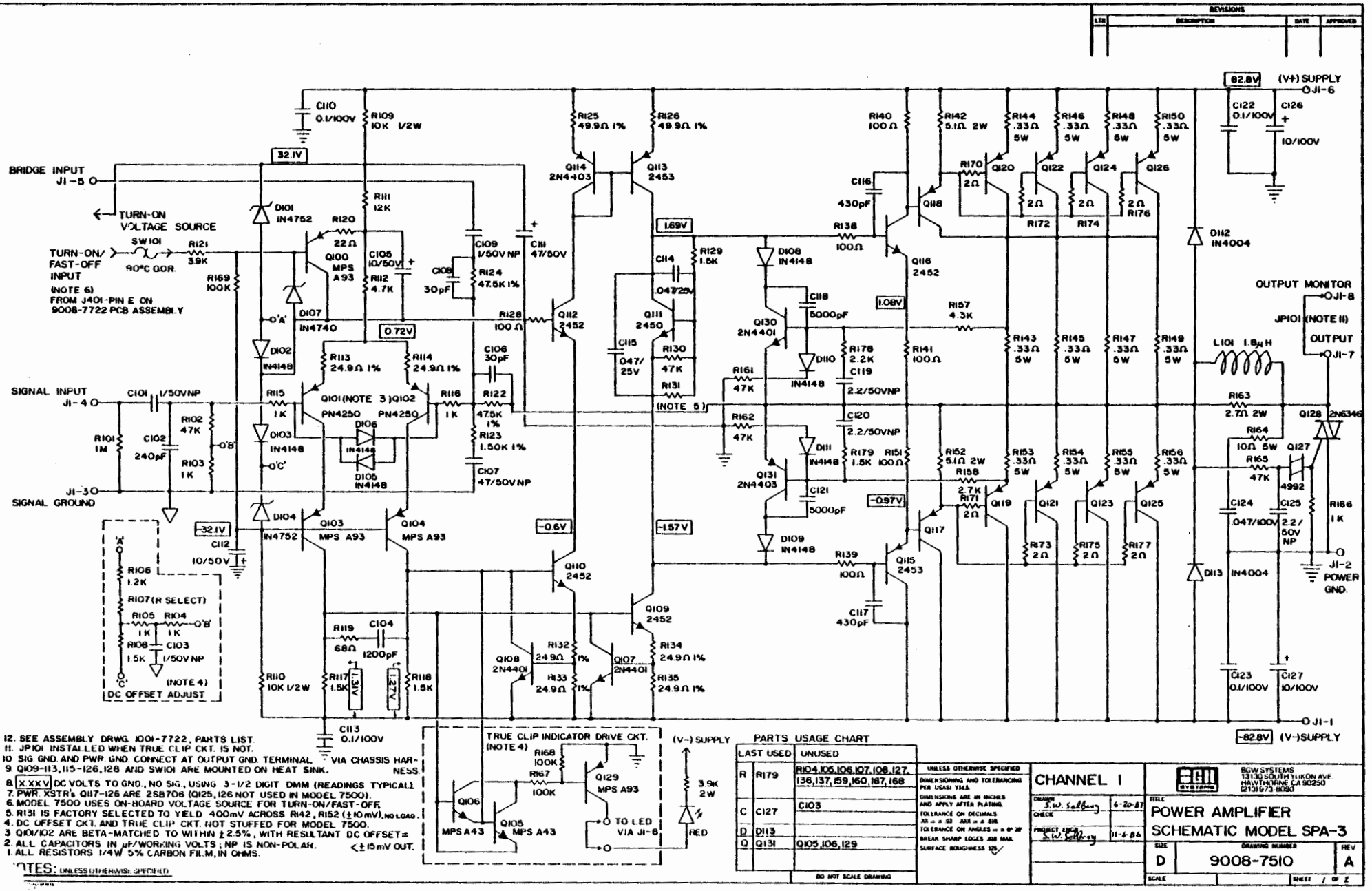
DRAWN S.W. Solberg 9-22-87
CHECK
PROJECT ENGR. S.W. Solberg 11-6-86

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
WIRING AND HEATSINK ASSEMBLY LAYOUT MODEL SPA-3

SIZE D | DRAWING NUMBER 1001-7725 | REV A

SCALE 8:1 | SHEET 1 OF 1



12. SEE ASSEMBLY DRWG. 1001-7722, PARTS LIST.
11. JP101 INSTALLED WHEN TRUE CLIP CKT. IS NOT.
10 SIG GND AND PWR GND. CONNECT AT OUTPUT GND. TERMINAL VIA CHASSIS HARNESS.
9. Q109-113, 115-126, 128 AND SW101 ARE MOUNTED ON HEAT SINK.
8. [X.XXV] DC VOLTS TO GND., NO SIG., USING 3-1/2 DIGIT DMM (READINGS TYPICAL)
7. PWR. XSTR's Q117-126 ARE 2SB706 (Q125, 126 NOT USED IN MODEL 7500).
6. MODEL 7500 USES ON-BOARD VOLTAGE SOURCE FOR TURN-ON/FAST-OFF.
5. R131 IS FACTORY SELECTED TO YIELD 400mV ACROSS R142, R152 (±10mV), NO LOAD.
4. DC OFFSET CKT. AND TRUE CLIP CKT. NOT STUFFED FOR MODEL 7500.
3. Q101/102 ARE BETA-MATCHED TO WITHIN ±2.5%, WITH RESULTANT DC OFFSET = <±15mV OUT.
2. ALL CAPACITORS IN μF/WORKING VOLTS; NP IS NON-POLAR.
1. ALL RESISTORS 1/4W 5% CARBON FILM, IN OHMS.

NOTES: UNLESS OTHERWISE SPECIFIED

PARTS USAGE CHART

	LAST USED	UNUSED
R	R179	R104,105,106,107,108,127, 136,137,159,160,167,168
C	C127	C103
D	D113	
Q	Q131	Q105,106,129

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS .XX ± .03 .XXX ± .010.
TOLERANCE ON ANGLES ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

CHANNEL 1

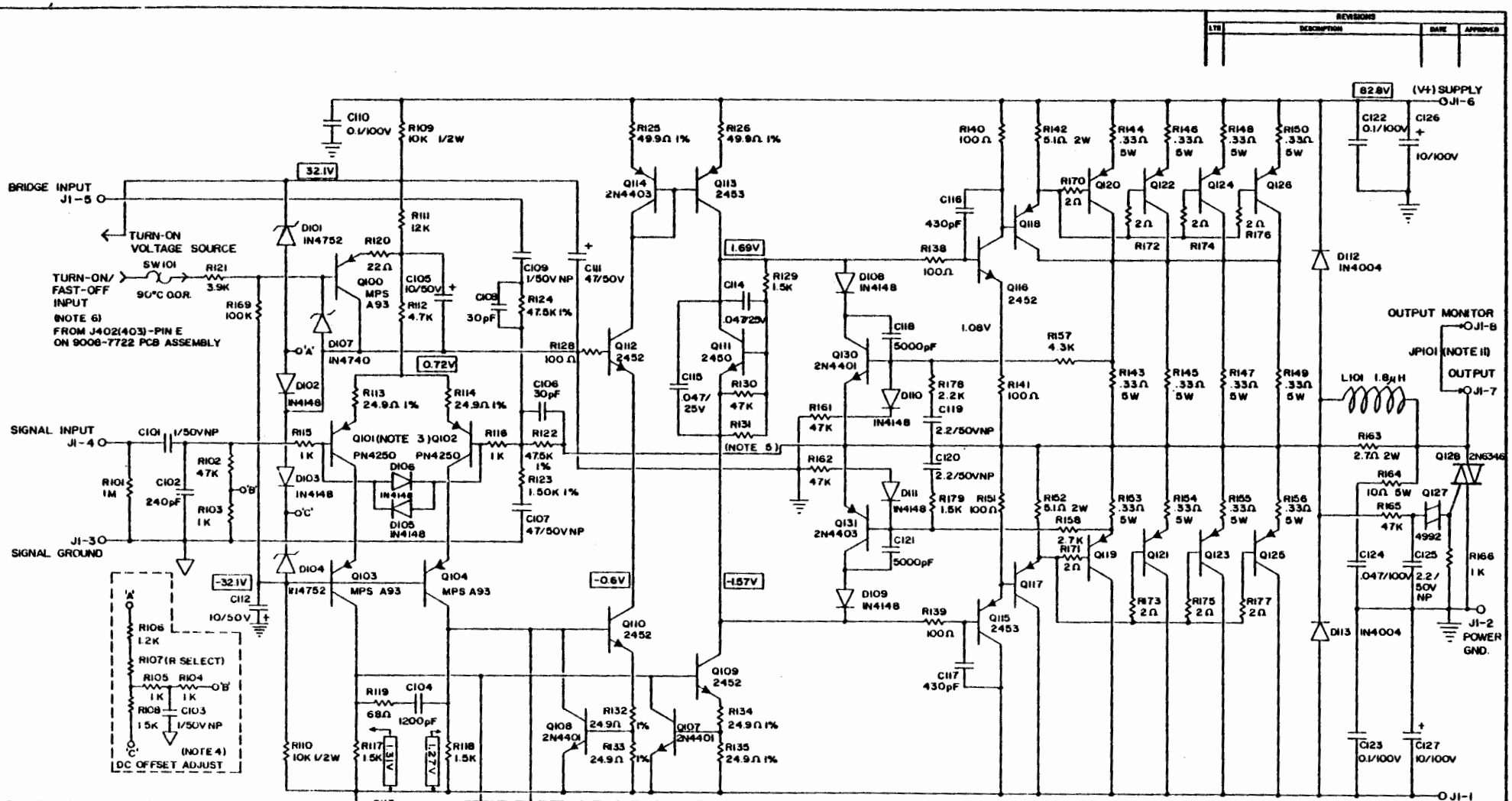
DRAWN S.W. Sallberg 6-20-87
CHECK
PROJECT ENGR S.W. Sallberg 11-6-86

BGW SYSTEMS
13131 SOUTH YUKON AVE
HAWTHORNE CA 90250
(213) 973-8090

TITLE
POWER AMPLIFIER
SCHEMATIC MODEL SPA-3

SIZE D | DRAWING NUMBER 9008-7510 | REV A

SCALE | SHEET 1 OF 2



13. CH.3-SEE ASSEMBLY DRWG. 1001-7725, PARTS LIST.
12. CH.2-SEE ASSEMBLY DRWG. 1001-7510, PARTS LIST.
11. JP101 INSTALLED WHEN TRUE CLIP CKT. IS NOT.
10. SIG. GND. AND PWR. GND. CONNECT AT OUTPUT GND. TERMINAL.
9. Q109-113, 115-126, 128 AND SW101 ARE MOUNTED ON HEAT SINK.
8. [X.XX V] DC VOLTS TO GND., NO SIG., USING 3-1/2 DIGIT DMM (READINGS TYPICAL).
7. PWR XSTR's Q117-126 ARE 2SB706 (Q125, 126 NOT USED IN MODEL 7500).
6. MODEL 7500 USES ON-BOARD VOLTAGE SOURCE FOR TURN-ON/FAST-OFF.
5. R131 IS FACTORY SELECTED TO YIELD 400mV ACROSS R142, R152 (±10mV), NO LOAD.
4. DC OFFSET CKT. AND TRUE CLIP CKT. NOT STUFFED FOR MODEL 7500.
3. Q101/102 ARE BETA-MATCHED TO WITHIN ±2.5%, WITH RESULTANT DC OFFSET = <±15mV OUT.
2. ALL CAPACITORS IN μF/WORKING VOLTS; NP IS NON-POLAR.
1. ALL RESISTORS 1/4W 5% CARBON FILM, IN OHMS.

NOTES: UNLESS OTHERWISE SPECIFIED

PARTS USAGE CHART

LAST USED		UNUSED
R	R179	R104,105,106,107,108,127, 136,137,149,150,156,159, 160,167,168,176,177
C	C127	C103
D	D113	
Q	Q131	Q105,106,125,126,129

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS .XX = ± .01 .XXX = ± .005
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

CHANNEL 2(3)

DRAWN S.W. Sallberg 6-20-81
CHECK
PROJECT ENGR S.W. Sallberg 11-6-84

BGW SYSTEMS
13130 SOUTH YUKON AVE
HAWTHORNE, CA 90250
(213) 973-8090

TITLE
POWER AMPLIFIER
SCHEMATIC MODEL SPA-3

SIZE D | DRAWING NUMBER 9008-7510 | REV A

SCALE | SHEET 2 OF 2