crown

VFX-2A

FILTER/CROSSOVER

20046-01

crown

SERIAL NO. _____

ISSUED TO _____

INSTRUCTION MANUAL

VFX-2A

FILTER/CROSSOVER

CROWN INTERNATIONAL INC. BOX 1000 ELKHART, INDIANA 46514

FULL THREE-YEAR WARRANTY

THE WARRANTY

For a period of three years from the date of delivery to the original Purchaser, Crown International, Inc. (hereinafter "Crown") warrants to the original and any subsequent purchaser of each new Crown component (except Crown recorders) that it is free from any substantial defects in materials or workmanship and that it will meet or exceed all advertised specifications for such component.

NOTIFICATION OF CLAIMS

The Purchaser must notify Crown in writing at the address set forth below of any claimed breach of warranty. Such notification shall be delivered to Crown within a reasonable length of time after the discovery of the claimed defect and not later than ninety days after expiration of the warranty period. Within ten business days after receipt of the notification, Crown will request Purchaser to deliver the component to an authorized service agency for repairs or will deliver to Purchaser written authorization to return the component to Crown for factory warranty service. If Crown's (or its authorized service agency's) inspection reveals that there has been a breach of the warranty, Crown (or its authorized service dealer) will initiate corrective repairs within thirty days after receipt of the component. All components must be shipped in original factory pack, which if needed, may be obtained from Crown free of charge. All such repairs, including labor, parts and shipping costs within the United States will be made at Crown's expense. Purchaser must bear the expense of shipping the component between any foreign country and the port of entry in the United States, and all taxes, duties and other custom's for such foreign shipments.

WARRANTY

If the repairs made by Crown or the authorized service dealer are not satisfactory, Purchaser should immediately give written notification to Crown. If the defect or malfunction remains after a reasonable number of attempts by Crown to remedy the defect or malfunction, the Purchaser shall then have the option to elect either a refund for or replacement without charge of, the Crown component. The refund shall be an amount equal to the actual purchase price, not including any interest, insurance, closing costs and other finance charge, minus reasonable depreciation on the component. If a refund is demanded, the Purchaser must make the defective or malfunctioning component available to Crown free and clear of all liens or other encumbrances. Should Crown fail to meet its obligation hereunder, Purchaser may sue Crown to secure its compliance with this warranty. ANY SUIT BY PURCHASER FOR BREACH OF THIS WARRANTY MUST BE FILED WITHIN FOUR (4) YEARS OF THE DATE OF DELIVERY TO THE ORIGINAL PURCHASER.

WARRANTY VIOLATIONS

CROWN SHALL HAVE NO RESPONSIBILITY IF THE COMPONENT HAS BEEN SUBJECT TO MISUSE, ACCIDENT, NEGLECT OR FAILURE TO COMPLY WITH NORMAL MAINTENANCE PROCEDURES OR IF THE SERIAL NUMBER HAS BEEN DEFACED, ALTERED OR REMOVED; NOR WILL CROWN ACCEPT RESPONSIBILITY FOR OR RESULTING FROM IMPROPER ALTERATIONS OR UNAUTHORIZED PARTS OR REPAIRS. THIS WARRANTY DOES NOT COVER ANY DAMAGE TO SPEAKERS OR ANY OTHER CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OF ANY WRITTEN OR IMPLIED WARRANTY.

MODIFICATIONS OF EQUIPMENT

Crown reserves the right to modify or change equipment in whole or part at any time prior to delivery therof, in order to include therein electrical or mechanical improvements deemed appropriate by Crown, but without incurring any liability to modify or change any equipment previously delivered, or to supply new equipment in accordance with any earlier specification.

WARRANTY ALTERATIONS

NO PERSON HAS THE AUTHORITY TO ENLARGE, AMEND OR MODIFY THIS WARRANTY. THE WARRANTY IS NOT EXTENDED BY THE LENGTH OF TIME WHICH THE PURCHASER IS DEPRIVED OF THE USE OF THE COMPONENT. REPAIRS AND REPLACEMENT PARTS PROVIDED PURSUANT TO THIS WARRANTY SHALL CARRY ONLY THE UNEXPIRED PORTION OF THIS WARRANTY.

CROWN INTERNATIONAL, INC.
1718 West Mishawaka Road, Elkhart, Indiana 46514

OWNER _____

ADDRESS _____

THIS STATEMENT OF WARRANTY SUPERSEDES ALL OTHERS CONTAINED IN THIS MANUAL

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VFX-2A

The information furnished in this manual does not include all of the details of design, production, or variation of the equipment. It does not cover all the possible contingencies which may arise during operation, installation, or maintenance. Should special problems arise, or further information be desired, please contact the CROWN International Customer Services Department.

CROWN International
1718 W. Mishawaka Rd.
Elkhart, Indiana 46514
PH: (219) 294-5571

WARNING

TO PREVENT SHOCK OR FIRE HAZARD DO NOT EXPOSE TO RAIN OR MOISTURE!

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SECTION 1
GENERAL INFORMATION

1.1 Introduction

This manual is intended to provide the user necessary technical information required to operate the CROWN VFX-2A Dual-Channel Electronic Filter/Crossover unit properly, and to maintain the unit in optimum operating condition.

The manual is comprehensive, containing a physical description of the VFX-2A electrical and mechanical specifications, complete installation and operating instructions, and a detailed circuit description.

A thorough reading of this manual and strict adherence to the instructions, procedures and cautions will assure many years of professional quality service and listening enjoyment from your CROWN VFX-2A.

1.2 Purpose of Equipment

The CROWN VFX-2A is a Dual-Channel Electronic Filter/Crossover unit specifically designed to provide continuously variable filters to perform either high pass, low pass or band pass functions in professional or commercial sound or home hi-fi applications.

1.3 Units and Accessories Supplied

The VFX-2A unit is supplied with the following:

4 Special mounting screws to mount plastic bubble
1 Plastic bubble front cover
4 Flat washers
4 Thumb nuts
1 Instruction manual
1 Proof of performance sheet
4 Phone to phone patch cords

1.4 Accessories Required, but Not Supplied

In some filter configurations, it may be necessary to have short patch cords (phone to phone) to cascade filter sections.

1.5 Service Policies

Due to the sophisticated circuitry, only a fully-trained competent service technician should be allowed to service the VFX-2A Dual-Channel Crossover/Filter. User servicing should be confined to routine replacement of the fuse on the rear panel. For other service, it is recommended that the unit be returned to the factory or to an authorized CROWN warranty center in the original packing or replacement packing obtained from the CROWN factory. Please read the CROWN Warranty located in the front of this manual. For warranty service the unit must be returned to the factory or approved warranty stations.

Before returning a VFX-2A unit to the factory for service, authorization should be obtained from the service manager. All shipments must be sent by UPS, or truck freight, and should be insured at total value. Shipments should be made at CROWN's expense. The factory will return your serviced unit by UPS or truck freight, prepaid, and will add C.O.D. charges only in the event that the cost is not covered by registered warranty. Rated firms will be billed, otherwise shipments will be C.O.D.

1.6 Glossary of Terms

A-B Test	Evaluating relative performance of two (or more) components or systems by changing quickly from one to the other. Most high fidelity dealers have A-B test facilities.
Acoustic or Mechanical Feedback	An annoying low frequency interference created when vibrations from loudspeakers are picked up by the cartridge and amplified by the sound system. Physically separating loudspeakers and record-playing equipment will solve the problem.
Balanced Input	A three wire input system where the voltages and currents in two of the wires are equal in magnitude but opposite in polarity with respect to ground which is the third wire. The impedance of a balanced input is usually low. (600 ohms or less)
Bandpass Filter	A filter that allows transmission of alternating signals whose frequencies are between given upper and lower cutoff values, while substantially attenuating all frequencies outside this band.
Biamp	The use of independent amplifiers to feed the bass and treble portions of a loudspeaker or loudspeakers with a crossover network. The purpose is to eliminate crossover distortion.
Channel	A channel is a complete sound path. A single channel, or monophonic system, has one channel. A stereophonic system has at least two full channels designated as left (A) and right (B). Monophonic material may be played through a stereo system; both channels will carry the same signal. Stereo material, if played on a monophonic system, mixes and emerges as a monophonic sound.
Corner Frequency	A frequency at which the filter goes from a condition of passing the signal unattenuated to "rolling off" or attenuating the signal according to its frequency. It is sometimes referred to as the "cutoff" frequency or the "break" frequency. It is also defined as 3dB below the maximum output.
Crossover Frequency	The frequency at which a dividing network delivers equal power to the upper and lower frequency channels when both are terminated in specified loads.
Crossover Network	A selective network used to divide the audio frequency output of an amplifier into two or more bands of frequencies. The band below the crossover frequency is fed to the woofer loudspeaker while the high frequency band is fed to the tweeter. Also called dividing network and loudspeaker dividing network.
Crosstalk	Signal leakage from one channel into another.
Damping	Controlling of vibrations, response, or resonances which if unchecked would cause distortion.
Decibel	A numerical expression of acoustic or electrical ratios, such as the relative intensity of a sound or the relative strength of a signal. One to three decibels (dB) is about the smallest change in sound perceptible to the ear.
Distortion	Unwanted noise, or sounds which didn't exist in the studio when the original recording was made. Harmonic distortion disturbs the original relationship between a tone and other tones naturally related to it. Intermodulation distortion (IM) introduces new tones caused by mixing of two or more original tones. Phase distortion, or non-linear phase shift, disturbs the natural timing sequence between a tone and its related overtones. Transient distortion disturbs the precise attack and decay of a musical sound. Harmonic and IM distortion are expressed in percentages; phase distortion in degrees; transient distortion is usually judged from oscilloscope patterns, but is best measured as phase distortion.
Equalization	Frequency manipulation to meet the requirements of recording, and an inverse manipulation on playback to get uniform response. Also known as compensation.
Flutter	Rapid variations in the speed of a turntable or tape transport. When pronounced, flutter causes a wavering of musical pitch.
Hertz	As in cycles-per-second, not rental agency.
IHF Music Power	This rating expresses the ability of an amplifier to handle short duration power peaks, as opposed to sustained power levels. An amplifier may only be capable of putting out 45 watts if that level is continuous, but it may be able to handle 60 watt peaks (such as might occur in a musical passage), if the peaks do not last too long.

IHF Noise Measurement	Any of 3 defined ways to measure noise, each of which uses a different filter, or frequency-weighting method, in making the test; usually the IHF "A" weighting is the reference, since this measurement simulates the Fletcher-Munson and I.S.O. loudness curves, and is therefore less sensitive to high and low frequency noise. This method produces the largest signal-to-noise specification.
Phon	A unit of loudness for steady tones, correlated with the Fletcher-Munson and I.S.O. loudness curves, and referenced to the dB level at 1KHz. 100 phons equals 100dB at 1KHz, while 100 phons at 100 cycles is about 103dB (cf I.S.O. curves shown in discussion of loudness control).
Signal-to-Noise	Often abbreviated as S/N ratio; the proportion of signal to undesired and extraneous noises in any device at its output. The higher the ratio, the better. Expressed in decibels.
Triamp	The use of independent amplifiers to feed the bass, treble and midrange of a loudspeaker or loudspeakers with a crossover network. The purpose is to eliminate crossover distortion.
Wow	Slow variations in the speed of a turntable or tape transport.

1.7 Murphy's Law

Throughout the design, production, and sale of CROWN products, consideration has been given to the effects of one Edsel Murphy. Mr. Murphy (or Murphy's Law) stated that, "If anything can go wrong, it will." This being the broadest scope of Murphy's Law, let's now offer a small sample of the application of the law. (NOTE: CROWN does not adhere to these below mentioned laws!!) Which is the mathematical symbol for "hardly ever."

1. All warranty and guarantee clauses become void upon payment of invoice.
2. Dimensions will always be expressed in the least usable terms. Velocity, for example, will be expressed in furlongs per fortnight.
3. Identical units tested under identical conditions will not be identical in the field.
4. A dropped tool will land where it can do the most damage. (Also known as the law of selective gravitation.)
5. The probability of a dimension being omitted from a plan or drawing is directly proportional to its importance.
6. Interchangeable parts won't.
7. Probability of failure of a component, assembly, subsystem or system is inversely proportional to ease of repair or replacement.
8. If a circuit cannot fail, it will.
9. A fail-safe circuit will destroy others.
10. A transistor protected by a fast-acting fuse will protect the fuse by blowing first.
11. A failure will not appear till a unit has passed final inspection.
12. A purchased component or instrument will meet its specs long enough, and only long enough to pass incoming inspection.
13. Manufacturer's spec sheets will be incorrect by a factor of 0.5 to 2.0, depending on which multiplier gives the most optimistic value. For salesmen's claims these factors will be 0.1 or 10.0.
14. In specifications, Murphy's Law supersedes Ohm's.

SECTION 2
SPECIFICATIONS AND PERFORMANCE

2.1 Specifications

Frequency Response	±0.1dB 20Hz to 20KHz with IHF load Typically ±0.2dB 2Hz to 58KHz with IHF load, ±0.5dB 18Hz to 38KHz with 600 ohm load All tests with filters flat and at rated output. (See graph)
Phase Response	See graph
Output	10V maximum before overload, 2.5V rated 300 ohm output impedance accepts 600 ohm load (typically 6.4V maximum into 600 ohm) All outputs available in normal (non-inverted) and inverted modes, except mono out.
Inputs	Two types per channel: Transformerless bridging input with ¼" phone jack with attenuator, 20K ohm balanced, 10K ohm unbalanced OR Unity gain input ¼" phone jack, 1 meg ohm unbalanced. For balanced input common mode rejection see graph.
Gain	Maximum of 16.9dB from BALANCED input through any output. Unity gain from UNITY GAIN input through any output.
Hum and Noise	More than 100dB below rated output with 0dB gain, 20Hz to 20KHz. All tests with filters flat.
Distortion	IM distortion less than 0.01% at rated output. IHF or 600 ohm with filters flat or set at 20Hz and 20KHz. (See graph)
Cross Talk	See graph.
Filters	Separate 18dB Butterworth highpass with lowpass filters with adjustable corner frequencies. Can be internally cascaded to form bandpass and band reject filters. (See graph)
Power Requirements	2 watts 120 VAC or 240 VAC 50-400Hz
Fusing	For 120 VAC use 3 AG 1/8 Amp 250 VAC fuse (For 240 VAC use AGC 1/16 Amp 250 VAC fuse)
Controls	Range and vernier controls for corner frequencies and power switch are on front panel.
Connectors	Inputs — 3 conductor ¼" phone jack balanced/unbalanced 2 conductor ¼" phone jack unbalanced unity gain Outputs — 2 conductor ¼" phone jack AC line — Three-wire (grounded) male connector on 5 ft. minimum cable.
Chassis Finish	All aluminum black and satinized anodized
Dimensions	19" standard rack mount (W.E. hole spacing), 3½" height, 5¾" maximum depth (from mounting surface).
Weight	6 lbs.

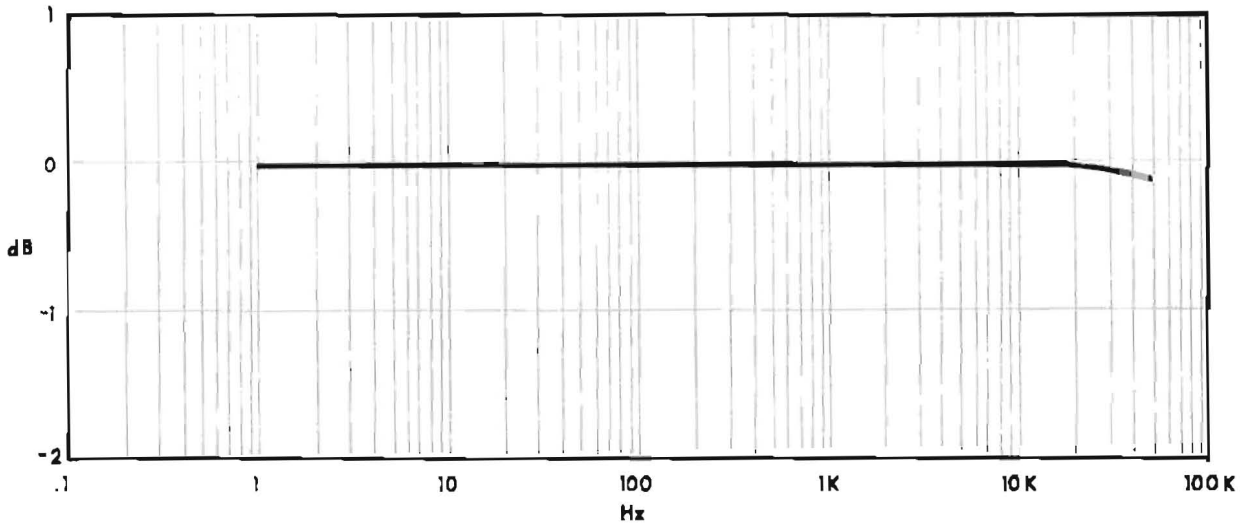


Fig. 2.1 Typical Frequency Response: IHF Load at Rated Output

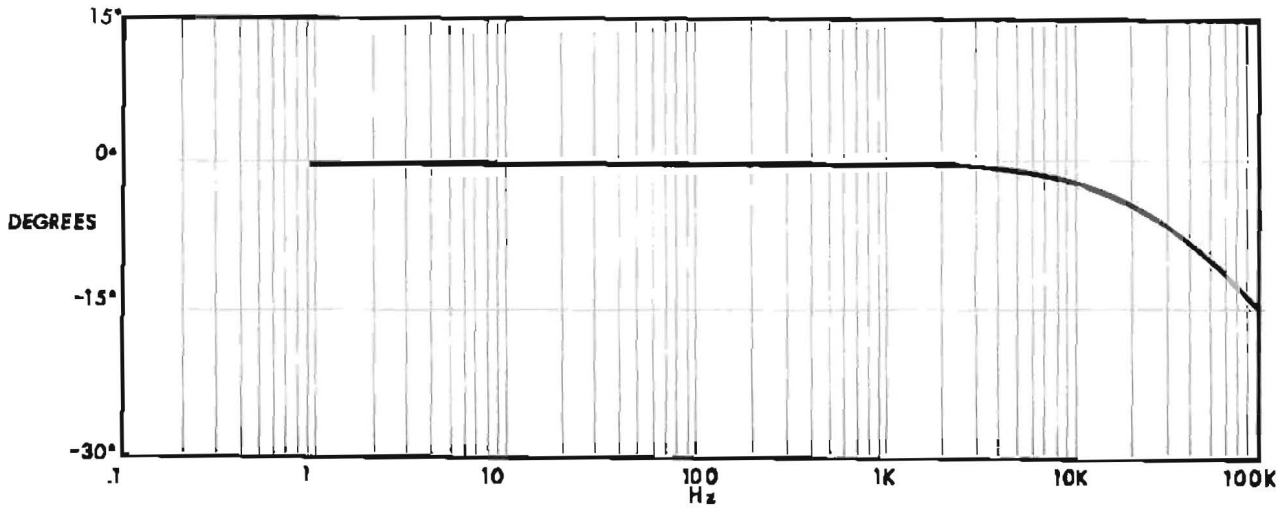


Fig. 2.2 Typical Phase Response: No Filters

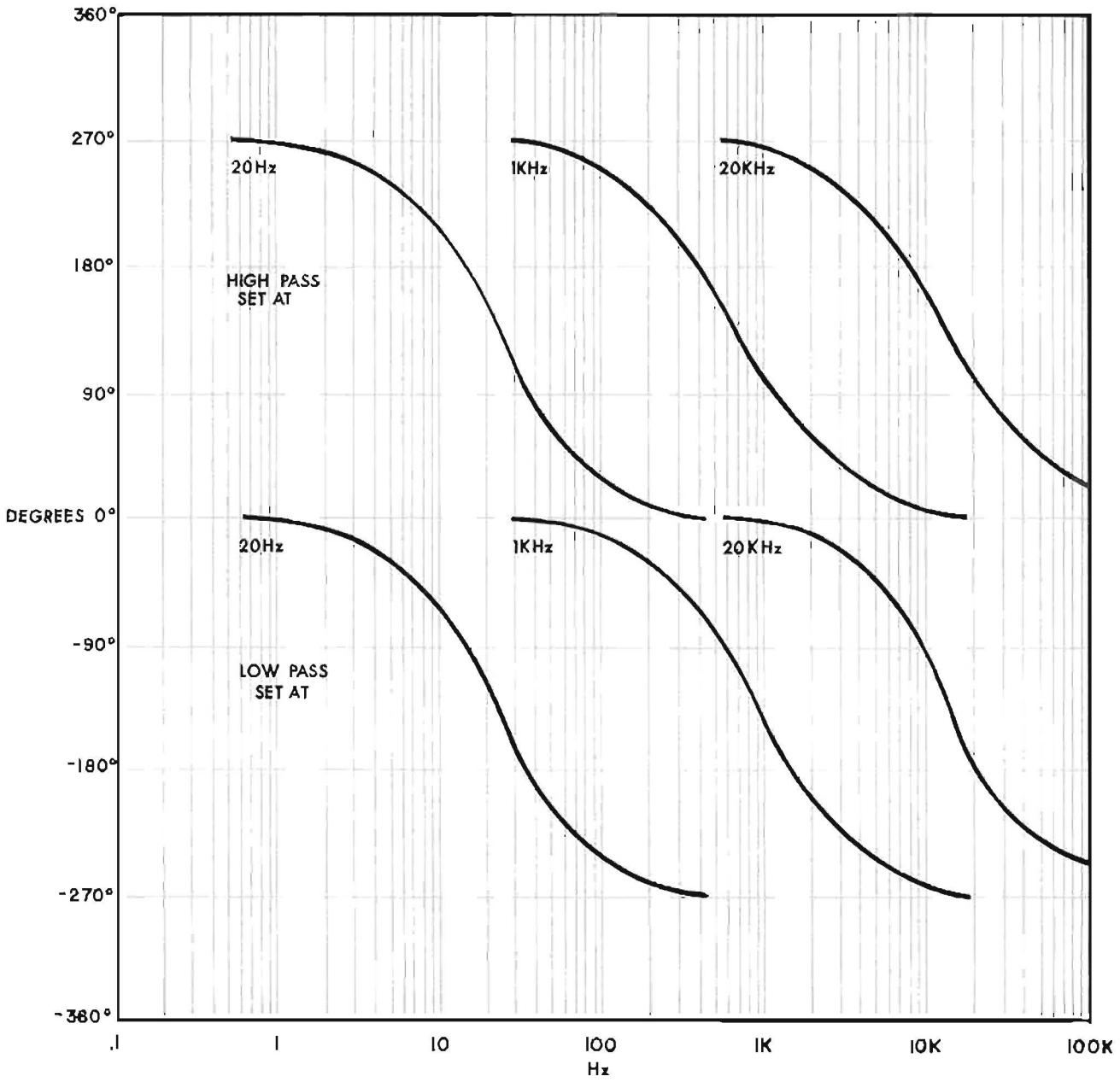


Fig. 2.3 Typical Phase Response: High and Low Filters

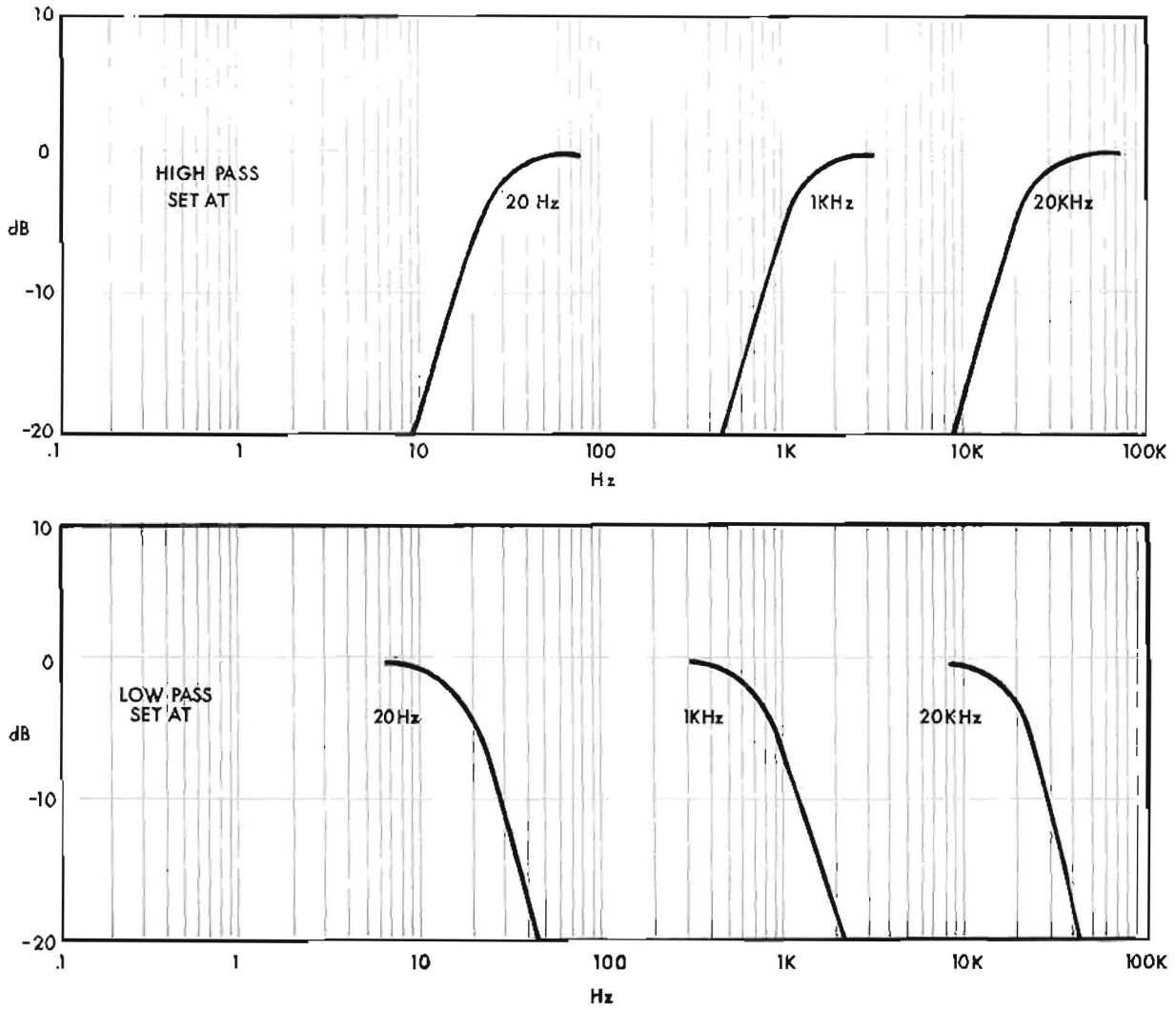


Fig. 2.4 Typical Filter Curves

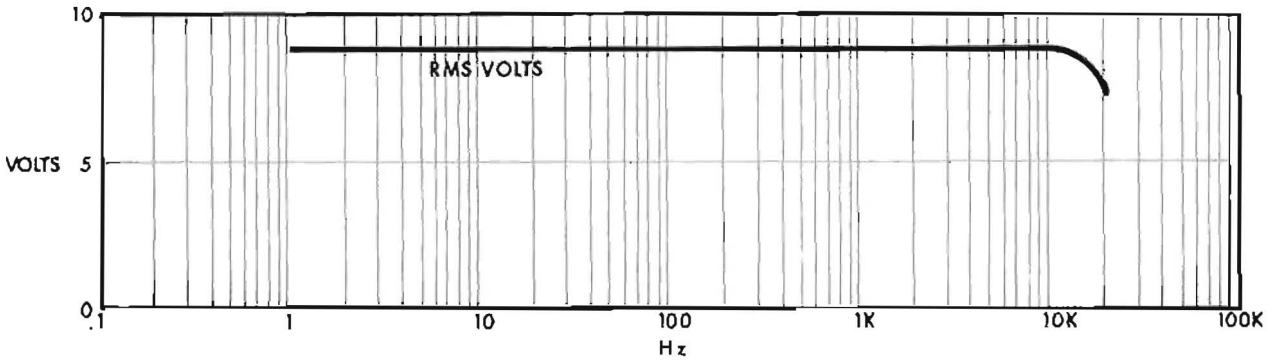


Fig. 2.5 Typical Maximum Output: IHF Load

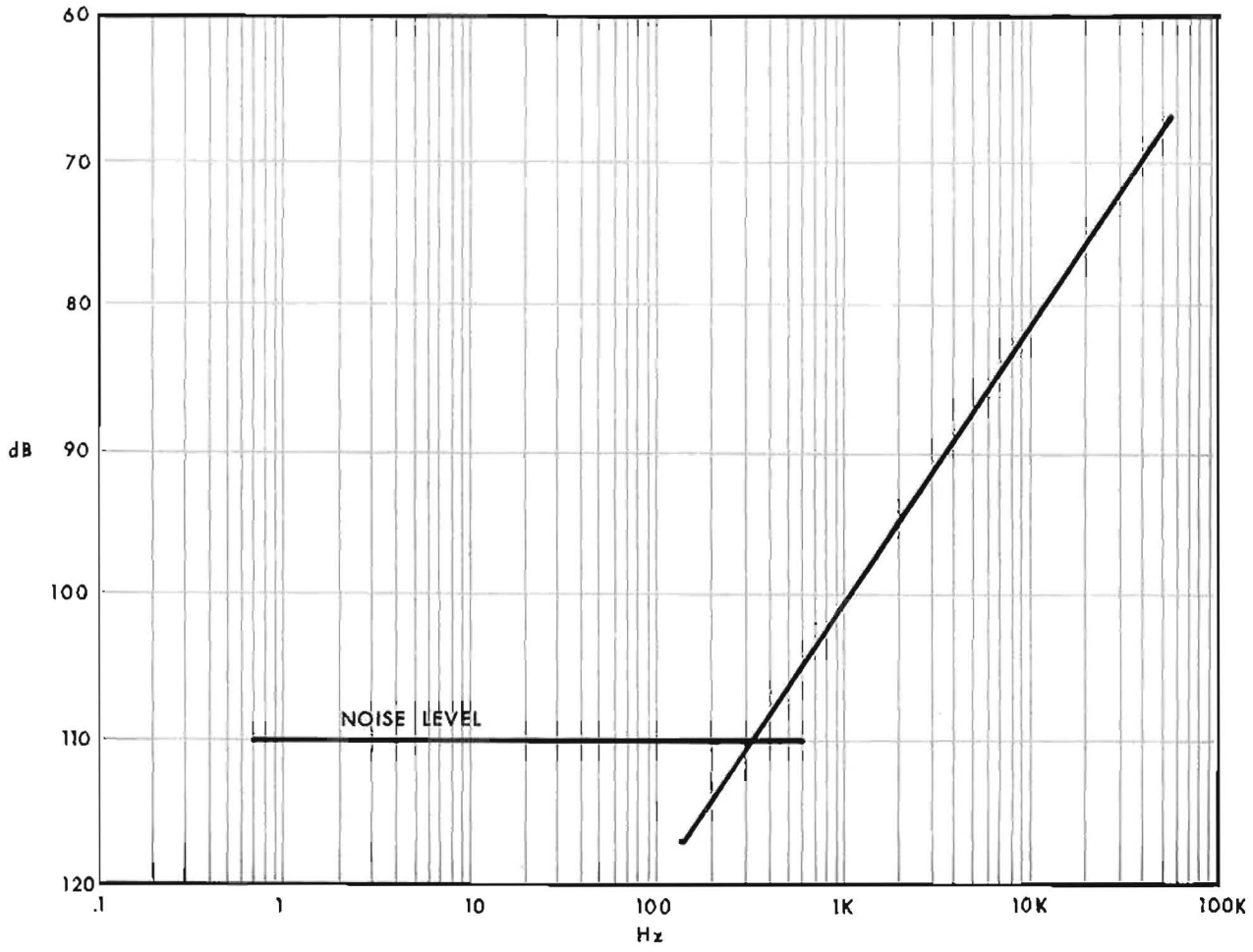


Fig. 2.6 Typical Common Mode Rejection

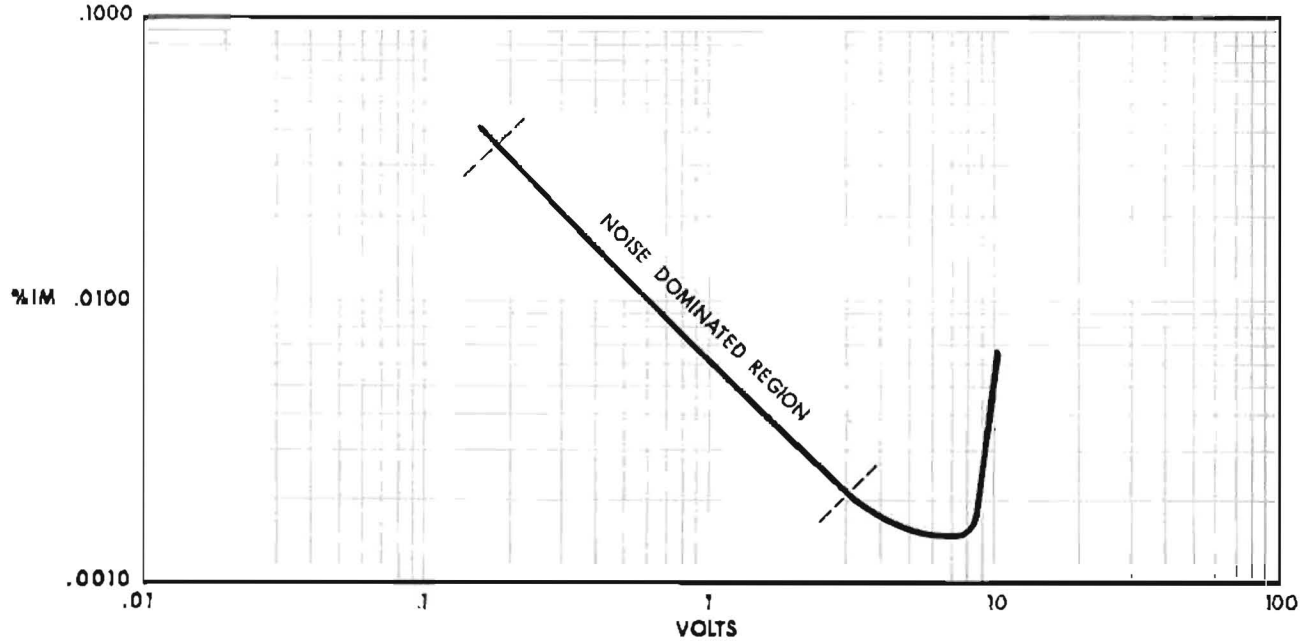


Fig. 2.7 % IM Distortion: All Controls Flat with IHF Load

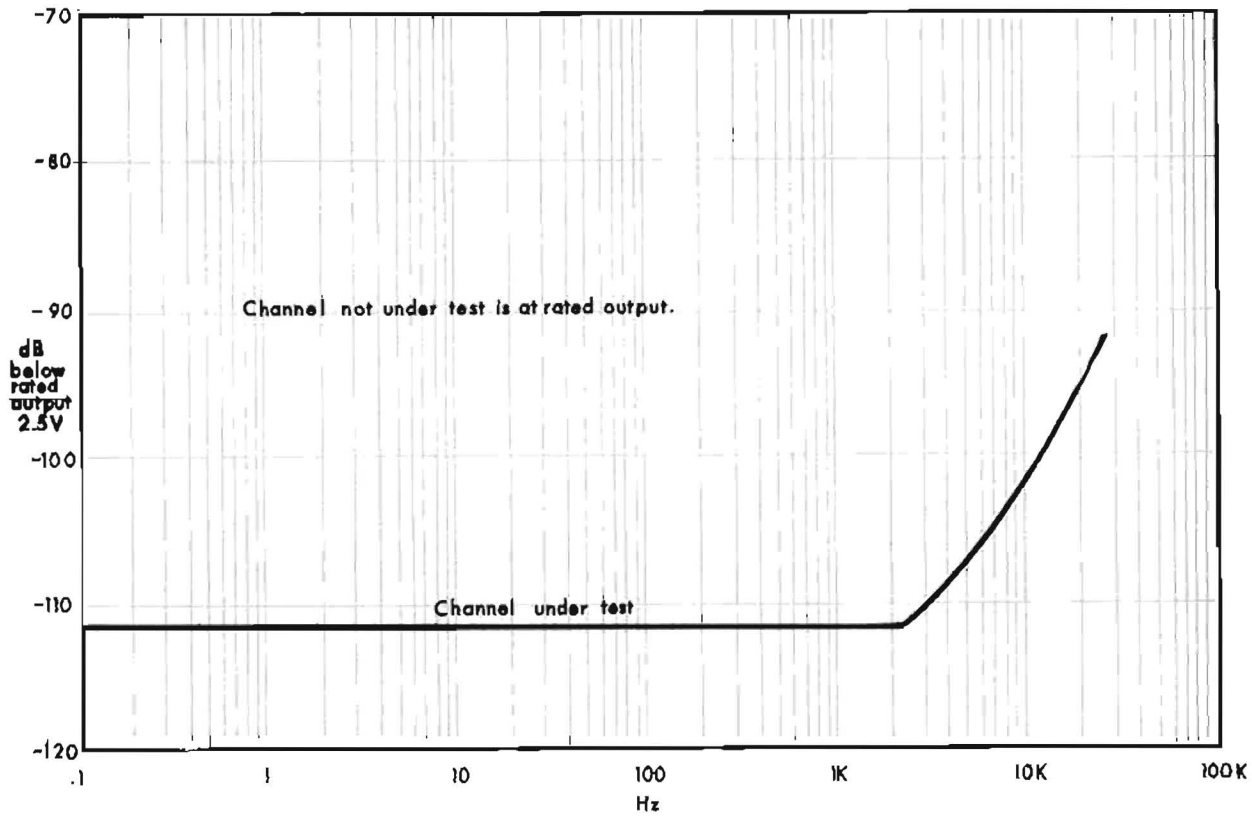


Fig. 2.8 Nominal Crosstalk

SECTION 3
INSTALLATION AND OPERATION

3.1 General

This section contains information for unpacking the unit, reporting procedures for damaged shipments, mounting instruction, cabling diagrams for various operational modes and a description of control functions and settings.

3.2 Unpacking and Inspecting Equipment

Immediately upon receipt of the VFX-2A shipment, inspect the unit for any damage incurred in transit. The unit was carefully inspected and tested and left the factory unmarred. Notify the transportation company immediately if any damage is found. Only the consignee may initiate a claim with the carrier for damage during shipment. However, CROWN will cooperate fully in such an event. Be sure to save the carton as evidence of damage for the shipper's inspection.

CROWN recommends that you save the packing materials, even if the unit arrives in perfect condition. They will prove valuable in preventing damage should there be occasion to transport or ship the unit. Both the carton and internal pack are specifically designed for protection during transit. DO NOT SHIP THE UNIT WITHOUT THIS FACTORY PACK!

3.3 Mounting

The VFX-2A is specifically designed for standard 19" rack mounting, but may be custom mounted if sufficient support is provided. Refer to Fig. 3-1 for mounting dimensions.

Supplied with the VFX-2A is a decorative smoked acrylic overlay. The overlay functions as a protective shield preventing the front panel control settings from being accidentally bumped.

The VFX-2A can be mounted to the rack or cabinet by using the 10-8 adapter stud supplied. The overlay then fits over the stud and is secured by thumb nuts.

3.4 Installation

The following paragraphs describe the most common system configurations for the VFX-2A Dual-Channel Electronic Filter/Crossover, provide cabling diagrams and control settings for these system configurations and detail the various types of inputs and outputs available for use with the VFX-2A.

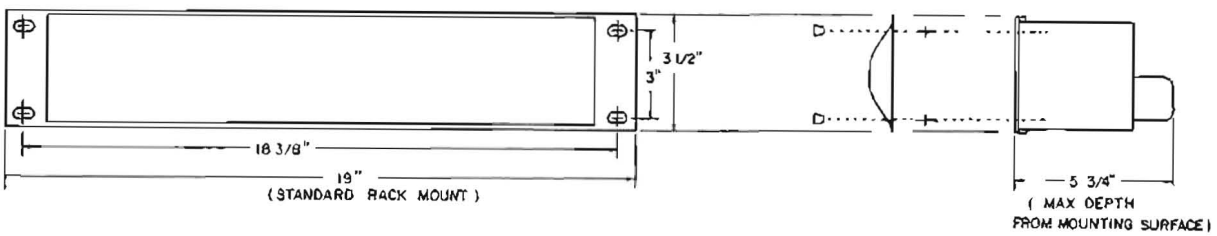


Fig. 3.1 Mounting Dimensions

3.4.1 Input Connections

Three types of inputs (balanced, unbalanced, and a unity gain unbalanced input) may be used with the VFX-2A. Details are shown below.

A. Balanced Input
Refer to Fig. 3-3. To form a balanced input for the VFX-2A, connect one side of a balanced line to the tip of a 3-conductor, ¼" phone plug, connect the second side of the balanced line to the ring of the phone plug and the ground or center tap to the barrel of the phone plug. For standardization, assume tip is in phase (+) with output signal; ring is out of phase (-) with output signal. Insert the phone plug into the (BALANCED) input jack on the rear panel of the VFX-2A (Refer to Fig. 3-6). The gain of the channel is adjustable using the LEVEL (attenuator) control.

B. Unbalanced Input
Refer to Fig. 3-3. To form an unbalanced input for the VFX-2A (with attenuation available), connect the "signal" line to the tip of a 3-conductor, ¼" phone plug, and connect the "ground" line to the barrel of the phone plug. Insert the phone plug into the (BALANCED) input jack on the rear panel of the VFX-2A (Refer to Fig. 3-6). The gain of the channel is adjustable using the LEVEL control.

C Unity Gain Unbalanced Input
Refer to Fig. 3-4. To form a unity gain unbalanced input for the VFX-2A, wire a 2-conductor, ¼" phone plug as described in paragraph b. above. Insert the phone plug into the UNITY GAIN input jack on the rear panel of the VFX-2A. The LEVEL (attenuator) control, adjacent to the UNITY GAIN jack, is inoperative in this application.

3.4.2 Output Connections

Eight outputs (high pass, low pass, and bandpass—both balanced and unbalanced, and two unbalanced mono) are available from the VFX-2A. The two mono outputs are full range, and low pass. Details are described below.

A. Unbalanced High Pass Output
To pick up an unbalanced high pass output from the VFX-2A, insert a 2-conductor, ¼" phone plug wire as shown in Fig. 3-4, into the HIGH PASS NORMAL output jack on the rear panel of the VFX-2A.

B. Balanced High Pass Output
To pick up a balanced high pass output from the VFX-2A, insert a 2-conductor, ¼" phone plug wire as shown in Fig. 3-4, onto both the HIGH PASS NORMAL and the HIGH PASS INVERTED phone jacks. The tips of the two ¼" phone plugs become the two sides of the balanced line. The barrels become the ground or center tap.

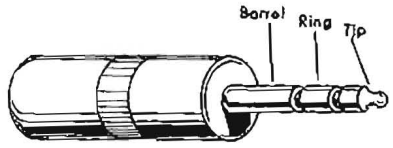


Fig. 3.3 Phone Plug, ¼", 3 Conductor

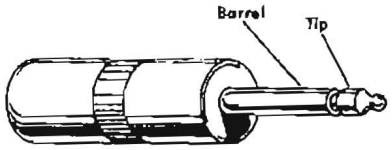


Fig. 3.4 Phone Plug, ¼", 2 Conductor

C. Unbalanced Low Pass Output
To pick up an unbalanced low pass output from the VFX-2A, insert a 2-conductor, ¼" phone plug wired as shown in Fig. 3-4, into the LOW PASS NORMAL output jack on the rear panel of the VFX-2A and set the FILTER/CROSSOVER switch to CROSSOVER (LOW PASS).

D Balanced Low Pass Output
To pick up a balanced low pass output from the VFX-2A, insert a 2-conductor, ¼" phone plug wired as shown in Fig. 3-4 into both the LOW PASS NORMAL and the LOW PASS INVERTED phone jacks on the rear panel of the VFX-2A. The tips of the two ¼" phone plugs become the two sides of the balanced line. The barrels become the ground or center tap. Set the FILTER/CROSSOVER switch to CROSSOVER (LOW PASS).

E. Unbalanced Bandpass Output

To pick up an unbalanced bandpass output from the VFX-2A, insert a 2-conductor, ¼" phone plug wired as shown in Fig. 3-4, into the LOW PASS NORMAL phone jack on the rear panel of the VFX-2A. Set the FILTER/CROSSOVER switch to FILTER (BANDPASS).

F Balanced Bandpass Output
To pick up a balanced bandpass output from the VFX-2A, insert a 2-conductor, ¼" phone plug wired as shown in Fig. 3-4, into both the LOW PASS NORMAL and the LOW PASS INVERTED phone jacks on the rear panel of the VFX-2A. The tips of the two ¼" phone plugs become the two sides of the

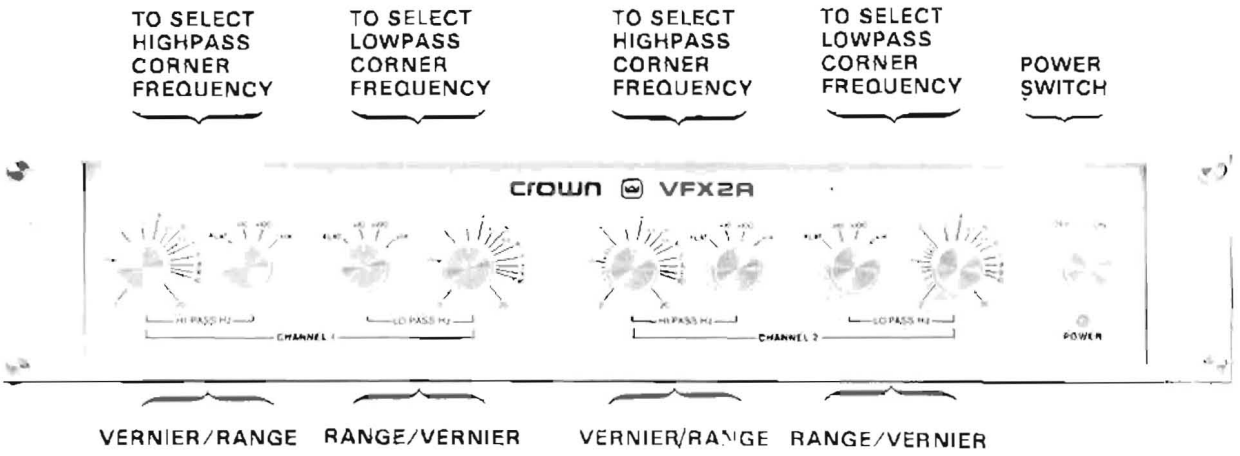


Fig. 3.5 Front Panel Controls

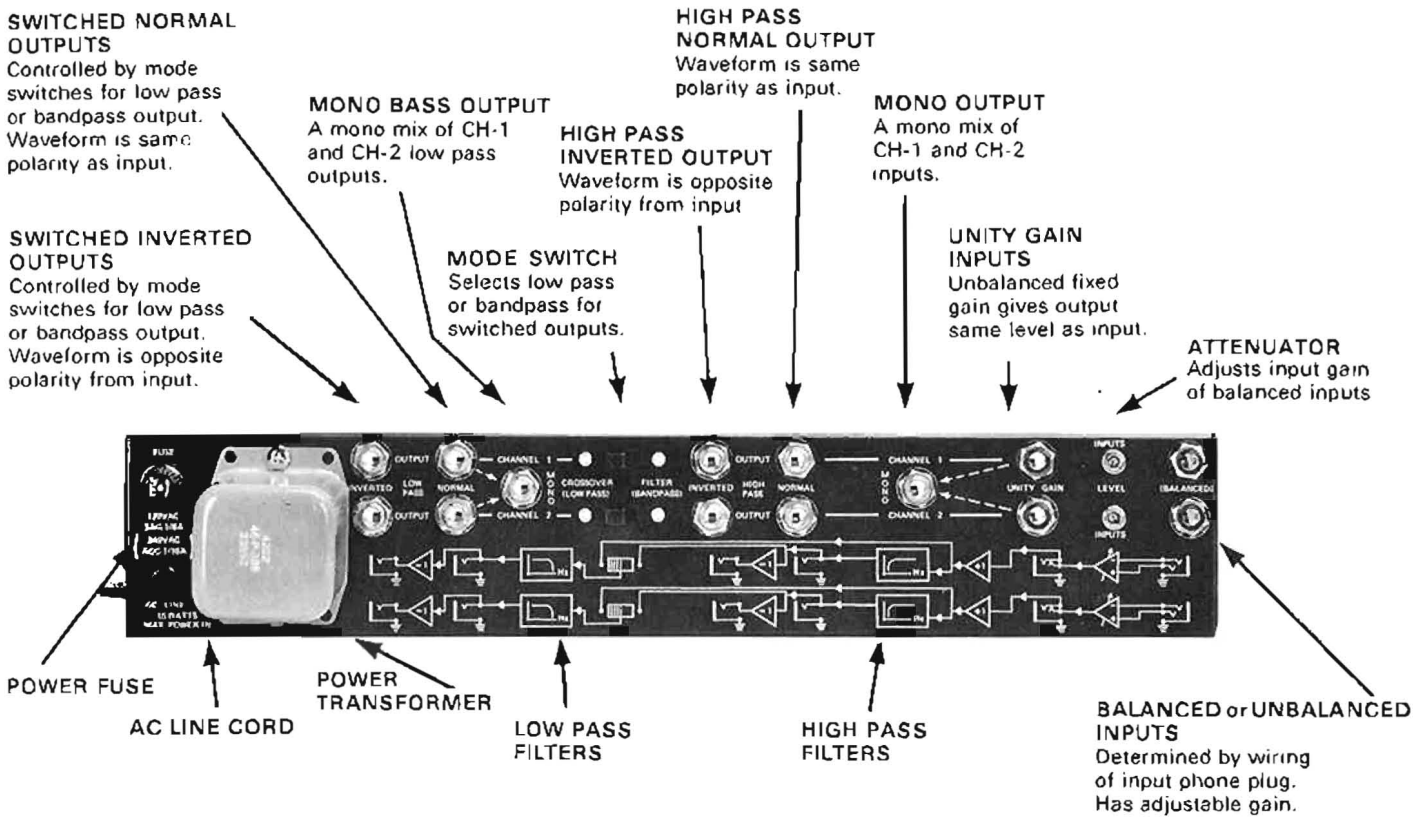


Fig. 3.6 Rear Panel Controls and Connectors

balanced line. The barrels become the ground or center tap. Set the FILTER/CROSSOVER switch to FILTER (BANDPASS).

G. Mono Output (Full Range, Unbalanced)
To pick up an unbalanced full range mono output, insert a 2-conductor, ¼" phone plug wired as shown in Fig. 3-4, into the MONO jack closest to the input jacks on the rear panel. This jack will provide a unity gain mix of the Channel 1 and Channel 2 inputs. See 3.6 for modification of this feature to a mono high pass output.

H. Mono Low Pass Output
To pick up an unbalanced mono low pass output, (mono bass), insert a 2-conductor, ¼" phone plug wired as shown in Fig. 3-4, into the MONO jack between the FILTER/CROSSOVER switches and the LOW PASS NORMAL output jacks. This jack will provide a unity gain mix of the Channel 1 and Channel 2 normal low pass outputs.

3.5 Operation

Most modes of operation depend upon the selection of various input and output combinations which are required by a specific system configuration. The following notes apply to input selection.

A. A balanced input must be inserted into the (BALANCED) INPUTS on the VFX-2A rear panel. See paragraph 3.4.1 a. for wiring a balanced input phone plug. A balanced line input has an adjustable attenuation (LEVEL) potentiometer adjacent to the input jack.

B. An unbalanced input may be inserted in the (BALANCED) INPUTS or the UNITY GAIN INPUTS on the VFX-2A rear panel. See paragraph 3.4.1 b. for wiring an unbalanced input phone plug. An unbalanced input, connected to the (BALANCED) INPUT jacks, has a variable attenuation (LEVEL) potentiometer. When the unbalanced input is connected to the UNITY GAIN INPUT jacks, the variable attenuator (LEVEL) adjustment is removed from the circuit and the line has a fixed unity gain.

3.5.1 Control Functions

Although the uses and possible applications of the VFX-2A are almost unlimited, the operation of the controls is quite simple. In addition to the POWER switch, there are only four types of controls: Attenuator (LEVEL), Mode (FILTER/CROSSOVER), Range and Vernier. One attenuator (screwdriver-adjusted pot) and one mode switch are provided on the rear panel for each channel. One range and one vernier switch for each of the four filters are provided on the front panel. A simplified, functional block diagram is located on the rear panel of the VFX-2A to aid in understanding the operation of the unit. This block diagram is shown in Fig. 3-6.

A. Input Attenuation (LEVEL)
The attenuators are screwdriver adjustments located on the rear panel. Each attenuator controls the gain of the adjacent (BALANCED) input. With the input attenuator fully CW, a maximum gain of 16.9dB is obtained. Minimum gain is 0dB at full attenuation, fully CCW. The input impedance of the (BALANCED) input is independent of the attenuator (LEVEL) setting.

B. Mode Switch (FILTER/CROSSOVER)
Two mode switches, one for each channel, are located in the center of the rear panel. These two-position, slide switches are labeled FILTER (BANDPASS)—CROSSOVER (LOW PASS). This switch determines the source of the input signal for the low pass filter stage. Set to (LOW PASS), the input signal is selected directly from the input. Set to (BANDPASS), the input signal is selected directly after the high pass filter stage. The mode switch affects only the LOW PASS outputs, adjacent to the power transformer on the rear panel.

C. Range and Vernier Controls
Four pairs of controls for the four filter sections are located on the front panel. These include one VERNIER potentiometer, and one RANGE switch for each High Pass and Low Pass filter. The controls are used to set the (3dB) corner frequency for the filters. The VERNIER potentiometer selects the first significant digit (2 to 20) of the selected frequency; the four-position RANGE switch (Flat X10-X100-X1K) selects the appropriate multiplier.

EXAMPLE: Selected frequency = 30Hz
1. Set VERNIER potentiometer to 3
2. Set RANGE switch to X10.

The corner frequency for the filter is now set to 30Hz.

Setting the RANGE switch to the FLAT position removes the related filter section from the circuit, and allows the signal to pass unfiltered.

D. Power Switch
A rotary switch, located on the right side of the front panel, controls power applied to the VFX-2A. The "LED" indicator will glow to indicate "power on."

3.5.2 Setting Hi-Pass Hz Filter Frequency

First, choose the desired (3dB) corner frequency. The high-pass filter will attenuate all signals below this frequency. Example: 30Hz corner frequency.

1. Set the VERNIER potentiometer to 3.
2. Set the RANGE switch to X10.

When the RANGE switch is set to FLAT, the signal will pass through the VFX-2A unfiltered. Use the HIGH PASS OUTPUTS as described in paragraph.3.4.2.

3.5.3 Setting Low-Pass Hz Filter Frequency

First, choose the desired (3dB) corner frequency. The low-pass filter will attenuate all signals above this frequency. Example: 6KHz corner frequency.

1. Set the VERNIER potentiometer to 6.
2. Set the RANGE switch to X1K.

When the RANGE switch is set to FLAT, the signal will pass through the VFX-2A unfiltered. Use the LOW PASS OUTPUTS as described in paragraph 3.4.2.

3.5.4 Setting Controls for Bandpass Filter Operation

First, choose the desired upper and lower (3dB) corner frequencies. Set the lower of the two corner frequencies on the HI-PASS Hz filter controls as shown in paragraph 3.5.2. Set the higher of the two corner frequencies on the LO-PASS Hz filter controls as shown in paragraph 3.5.3. Set the mode switches on the rear panel to FILTER (BANDPASS). Use either the balanced or unbalanced bandpass outputs as described in paragraph 3.4.2 E and F.

3.5.5 Output (Balanced) for Driving A Dual-Channel Amplifier In Mono

Any CROWN amplifier can be used with the VFX-2A for a mono (balanced output) configuration with no physical modification to the amplifier.

1. Select the type of output to be used (high pass, low pass or bandpass).
2. Connect the NORMAL output from the VFX-2A to one amplifier input.
3. Connect the INVERTED output from the VFX-2A to the other amplifier input.

The mono (balanced output) amplifier signal is now available on the two red binding posts (amplifier outputs). Refer to individual amplifier manuals for mono (balanced) output connections.

NOTE: For maximum output, both amplifier level controls should be set at full gain in this configuration.

3.5.6 Mono (Unbalanced) Output Application

The VFX-2A has two unbalanced mono output provisions that allow a full range mono output and a mono low pass filter output mix of both input channels.

Full range mono is a mix of the two input channels. This feature can be altered to a mono high pass filter output by a qualified technician. See Section 3.6.

Mono low pass output is provided for those preferring mono bass and/or a center speaker system with a stereo pair.

3.6 Modifying VFX-2A for Mono High Pass Output

The VFX-2A is wired at the factory for full range mono output and a mono low pass output. The VFX-2A may be modified by a CROWN authorized dealer/service center for a mono high pass and a mono low pass output. Modifications are also available to form a 6dB unity sum crossover.

3.7 Modifying AC Mains Voltage

Fig. 3-7 shows the jumper arrangement for modifying the VFX-2A to operate on 100, 120, 200, 220 and 240 VAC.

* 100 Volt Operation — jumper A and D, B and E and move the orange wire to E.
* 120 Volt Operation — jumper A and D, C and F and move the orange wire to F.
* 200 Volt Operation — jumper B and D and move the orange wire to E.
* 220 Volt Operation — jumper C and D and move the orange wire to E.
* 240 Volt Operation — jumper C and D and

move the orange wire to F.

* Use 1/8 A 3 AG fuse for 100V, 120V line.

* Use 1/16 A AGC fuse for 200V, 220V and 240V line.

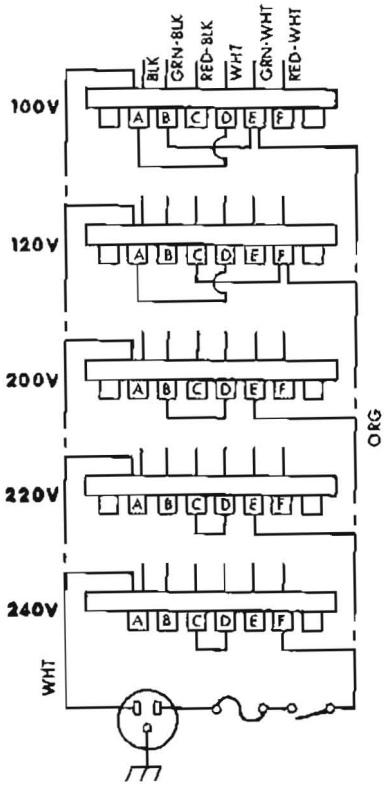


Fig. 3.7 Modifying AC Mains Voltage

3.8 Cabling

Refer to Fig. 3.2

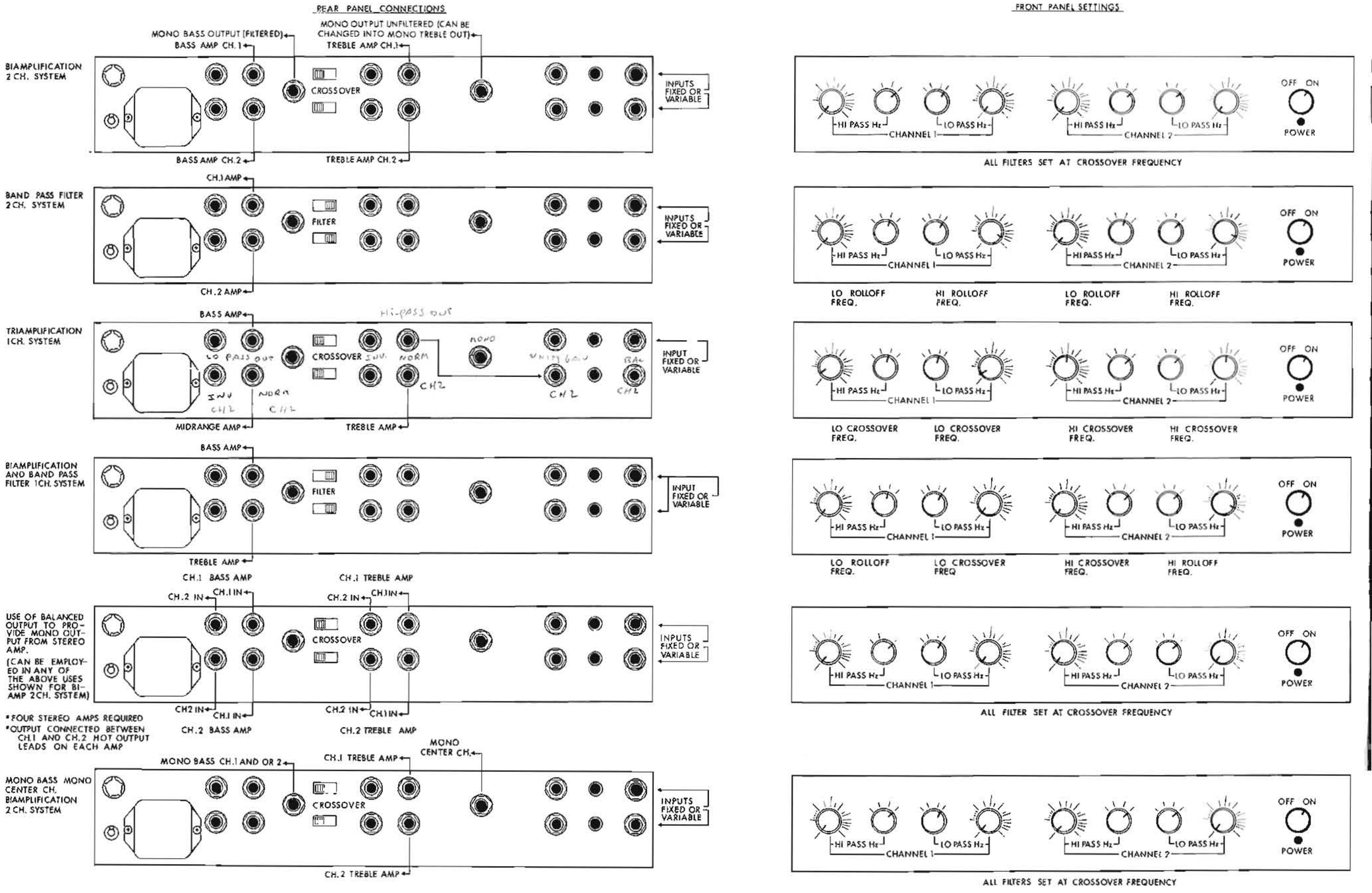


Fig. 3.2 Typical System Configuration and Cables

FRONT PANEL SETTINGS

OUTPUT SPECTRUM

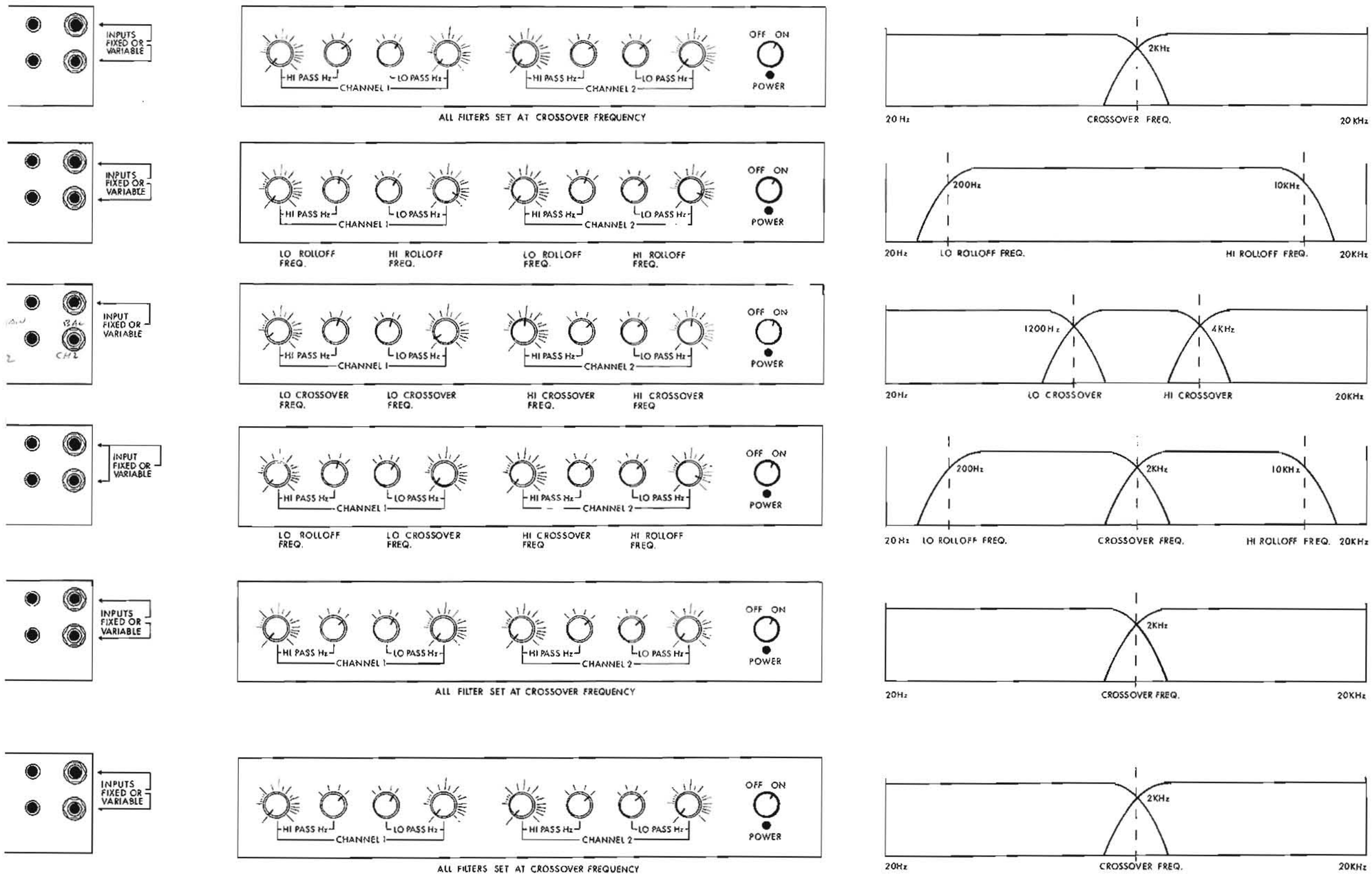


Fig. 3.2 Typical System Configuration and Cables

SECTION 4
THEORY OF OPERATION

4.1 General

This section contains a detailed description of circuitry operation to properly adjust the VFX-2A to optimum operating conditions.

4.2 Principles of the VFX-2A Filter/Crossover

The VFX-2A Dual-Channel Electronic Filter/Crossover consists primarily of two identical channels of active IC operational amplifier tunable filters. Components for each channel are found on a printed circuit board located behind the associated channel front panel controls. The following circuit description applies equally to both channels.

The VFX-2A also contains two separate internal power supplies which generate regulated +18 VDC and -18 VDC for distribution to all operational amplifier IC's.

The VFX-2A requires about 2 watts for normal operation. The power supply can be wired for 100, 120, 200, 220, or 240 VAC line voltage and operates on any frequency from 50Hz to 400Hz

4.3 Block Diagram Circuit Theory

Refer to Fig. 4.2 , VFX-2A Block Diagram (one channel only). A balanced signal input is inserted into the balanced input stage and amplified. The stage gain of the balanced input amplifier may be varied with the controls located on the rear panel. The signal now proceeds to the unbalanced input jack/switch and then is applied to the main input stage.

The output signal of the main input stage is factory wired to the mono/mono hi pass output stage where it is mixed with the other channel's main input stage output. The VFX-2A mono out can be modified for mono hi pass output (See Section 3.6). The signal from the main input stage also goes to the FILTER/CROSSOVER switch.

With the switch in the crossover position, the signal progresses to the high pass filter, then through the high pass output stage to the normal output jack on the rear panel. The signal from the high pass output stage is then fed back into the filter stage to shape it into an 18dB Butterworth response, and is also fed to the inverted output stage for an inverted output.

With the switch in the bandpass position, the signal from the main input stage is applied through the low pass filter to the low pass output stage. This stage feeds the normal low pass output, provides feedback to the low pass filter and also feeds the inverted output stage providing an inverted low pass output.

The signal from the inverted low pass stage is mixed with the similar signal from the other channel to provide a mono low pass output (non-inverted).

It should be noted here that each circuit board contains one mono mix circuit. Therefore, one board mixes the mono (or mono high pass) and the other board mixes the mono low pass.

4.4 Detailed Circuit Theory

The balanced input is applied to IC100B. The IC100B low noise operational amplifier allows use of a transformerless balanced input and provides isolation from the filter loading. R10 a 100K ohm attenuator (LEVEL) potentiometer, enables control of the gain of IC100A up to a maximum of 16.9dB gain. The input impedance of the (BALANCED) INPUT is completely independent of the gain setting of that input.

Inserting an unbalanced input (a 2-conductor ¼" phone plug) into the (BALANCED) INPUT jack unbalances the line by grounding the negative input line.

R100, a 200 ohm trim potentiometer in the positive IC100B input line, is factory adjusted for maximum common mode rejection and in normal applications should not be readjusted.

An unbalanced input may be inserted into the UNITY GAIN INPUT jack. This input is applied directly to operational amplifier IC101C. The variable attenuator (LEVEL) potentiometer, R10 has no effect on this input.

The unity gain output of IC101C is applied to the input circuit of IC100C (HI PASS FILTER) only, or to that circuit plus the input circuit of IC102C (LOW PASS FILTER) depending on the position of the CROSSOVER/FILTER mode switch (SW1). The IC101C output may also bypass the LOW PASS filter or the HIGH PASS filter depending on the position of the RANGE switches. IC101D and IC102A buffer the outputs from the high pass filter and low pass filter respectively and IC101A is the mixing amp for mono output. Circuit operation for all switch combinations is described below.

A. RANGE Switches, FLAT; FILTER/CROSSOVER Switches, either position
With the RANGE switches in FLAT, the unity gain output of IC101C bypasses all filtering circuits and appears as a flat output at the HIGH and LOW PASS OUTPUT jacks. Operational amplifier IC101B creates an inverted output at the HI PASS INVERTED OUTPUT jack and IC102C creates an inverted output at the LOW PASS INVERTED OUTPUT jack.

B. RANGE Switches X10, X100 or X1K; FILTER/CROSSOVER switch in crossover
The range switch determines the appropriate group of 5% matched capacitors to be used in the filter. See Table 4-1.

The HI VERNIER potentiometer (R102, R104, R107) and LO VERNIER potentiometer (R118, R120, R122) consist of matched sets of three 15K-ohm resistive elements used to determine the location of the desired corner frequency of the filter. Refer to paragraph 3.5.1 for the proper method of using the VERNIER/RANGE controls to select the corner frequency for the filters.

The signal from IC-101C is applied through selected RC filter components to dual operational amplifier IC-100C which, along with IC-100D and IC-101D forms a 3-pole, high-pass, 18dB/octave Butterworth filter. This produces the non-inverted HI PASS NORMAL OUTPUT. Operational amplifier IC-101B creates the HI PASS INVERTED OUTPUT.

The HI PASS OUTPUT signal from IC-101D is also applied through the mode switch to the selected RC filter components to dual operational amplifier IC-102D, which, with IC-102B and IC-102A, forms a 3-pole, low-pass, 18dB/octave Butterworth filter. This filter produces the non-inverted LO PASS NORMAL OUTPUT. Operational amplifier IC-102C creates the LO PASS INVERTED OUTPUT.

C. CROSSOVER (LOW PASS)/FILTER (BANDPASS) Switches.
The rear panel mode switches select either a LOW PASS or BANDPASS output at the LOW PASS OUTPUT jacks. With the mode switch in CROSSOVER (LOW PASS), the input, from IC-101C, is tied directly to the LOW PASS filter section; in FILTER (BANDPASS), the output of the HI PASS filter signal, from IC-101D, is tied directly to the LOW PASS filter section.

Power Supply Circuit

AC power is applied to the power transformer, which may be wired for either 100, 120, 200, 220 or 240 VAC operation. The AC input line is fused with a 3AG 1/8 A fuse for 120 VAC or an AGC 1/16 A fuse for 240 VAC. The bridge rectifier, D1-D4, together with C1 and IC1 provides a regulated +18 VDC; the bridge rectifier and C2, and IC2 provide a regulated -18 VDC.

RANGE SW POSITION	HI RANGE		LO RANGE	
X10	C100, C103, C106	.47 mfd	C114, C117, C120	.47 mfd
X100	C101, C104, C107	.047 mfd	C113, C116, C119	.047 mfd
X1K	C102, C105, C108	.0047 mfd	C112, C115, C118	.0047 mfd

Fig. 4.1 Range Switch Capacitor Groups

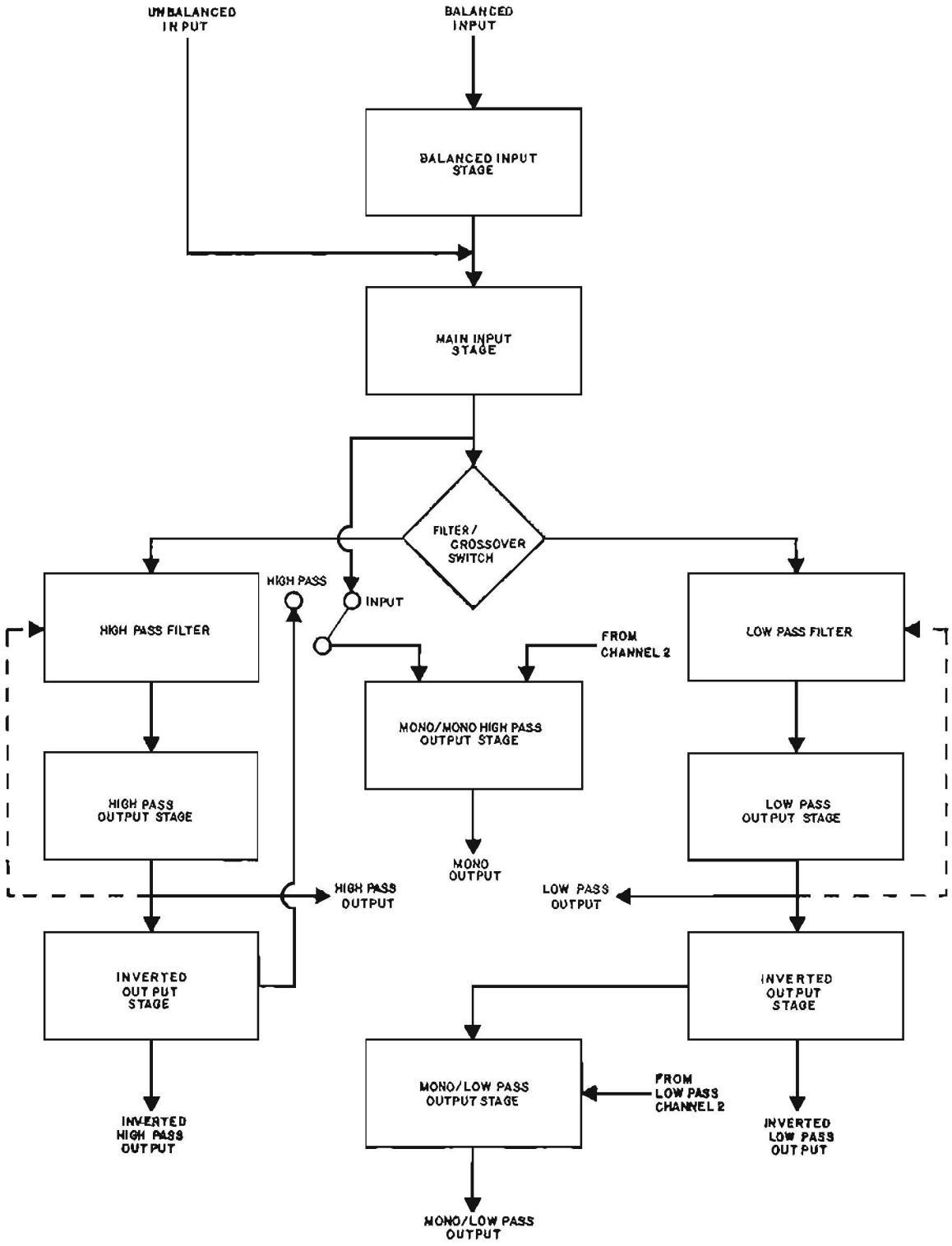


Fig. 4.2 VFX-2A Block Diagram

VFX-2A
PARTS LIST

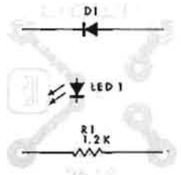
Schematic Designation	Description	CPN	Other Information
	VFX-2A FILTER MODULE	41750	
	VFX-2A Filter P.C. Board	9669	
	Resistors		
R100, R200	200 ohm helipot trim	3683	CMR Adjust
R101, R201, R104, R204, R106, R206, R119, R219, R121, R221, R123, R223	1.6K ohm ¼ watt 5% film	3873	
R102, R202, R103, R203, R107, R207, R118, R218, R120, R220, R122, R222	15K ohm linear pot	3870	Hi-Vernier Lo-Vernier
R105, R205, R124, R224	47 ohm ¼ watt 5%	1011	
R108, R208, R109, R209, R111, R211, R113, R213, R114, R214, R125, R225, R126, R226	10K ohm ½ watt 1% film	2343	
R110, R210, R112, R212, R115, R215, R127, R227, R128, R228	300 ohm ¼ watt 5%	3801	
R116, R216	1K ohm ¼ watt 5% film	2627	
R117, R217	1M ohm ¼ watt 5%	3198	
RN100, RN200	**Resistor Network**	4280	

	Diodes		
D100, D200, D101, D201, D102, D202, D103, D203, D104, D204, D105, D205, D106, D206	1N4148	3181	
	Capacitors		
C100, C200, C103, C203, C106, C206, C114, C214, C117, C217, C120, C220	.47 MF 100V poly	4119	
C101, C201, C104, C204, C107, C207, C113, C213, C116, C216, C119, C219	.047 MF 250V	4404	
C102, C202, C105, C205, C108, C208, C112, C212, C115, C215, C118, C218	.0047 MF 250V poly	4325	
C109, C209, C110, C210, C111, C211, C121, C221, C122, C222	25 MF 15V N-P vertical	3186	
	Switches		
SW100, SW200, SW101, SW201	3P 4 pos. rotary switch	3871	Hi-Range Lo-Range
	Integrated Circuits		
IC100, IC200, IC101, IC201, IC102, IC202	HA-4741 Quad Op Amp	4160	
	Miscellaneous		
	14 pin DIL IC socket	3450	

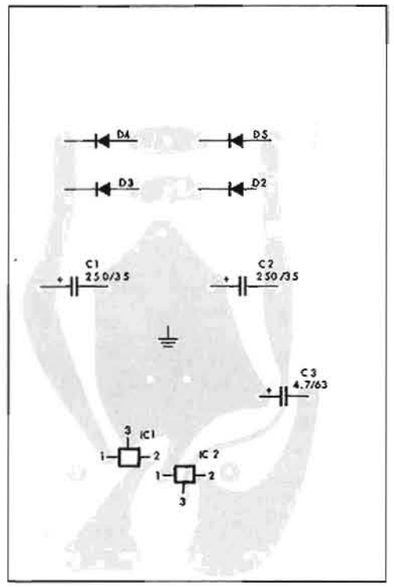
	VFX-2A POWER SUPPLY MODULE	41769	
	VFX-2A Power Supply P.C. Board	9676	
	Capacitors		
C1, C2	250 MF 35V vertical	3787	
C3	4.7 MF 63V vertical	4253	
	Diodes		
D2, D3, D4, D5	1N4148	3181	
	Integrated Circuits		
IC1	MC78L18 +18V regulator	4210	
IC2	MC79L18ACG -18V regulator	4435	
	Miscellaneous		
	Dual TO-92 cooler	3493	Only one half used on IC1
	VFX-2A PILOT LIGHT MODULE		
	VFX-2A Pilot Light P.C. Board	9679	
LED1	MV5153 Amber LED	4342	
D1	1N4003	2851	
R1	1.2K ohm ½ watt 5% film	1045	

crown

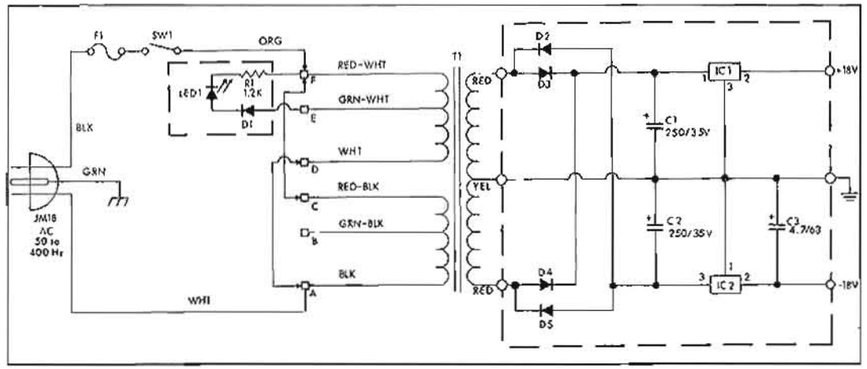
VFX-2A



VFX-2A LED PC Board



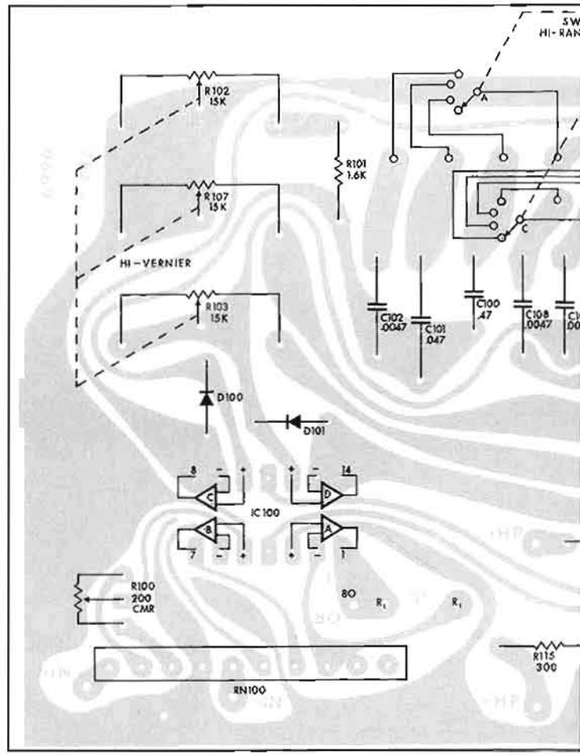
VFX-2A Power Supply PC Board

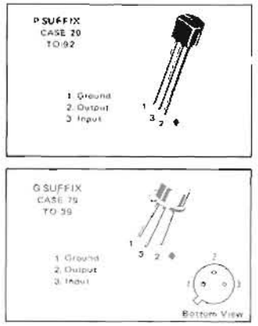


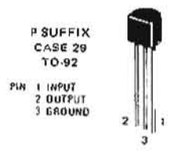
POWER SUPPLY SHOWN WIRED FOR 120 VAC. FOR OPERATION AT ANOTHER LINE VOLTAGE, FOLLOW CONVERSION CHART BELOW. SELECT THE CORRECT VOLTAGE; CAREFULLY IDENTIFY ALL WIRES BEFORE PROCEEDING. THE SIX TRANSFORMER PRIMARY WIRES ARE SOLDERED TO AN ADJACENT TERMINAL STRIP, (A, B, C, D, E, and F). ONLY FOUR WIRES ARE USED IN ANY CONFIGURATION.

NOTE: THE ONLY VARIABLES ARE THE JUMPERS AND THE ORG AC WIRE COMING FROM THE POWER SWITCH.

VOLTAGE	JUMPERS	ORG (AC)
100	A - D B - E	E
120	A - D C - F	F
200	B - D	E
220	C - D	E
240	C - D	F

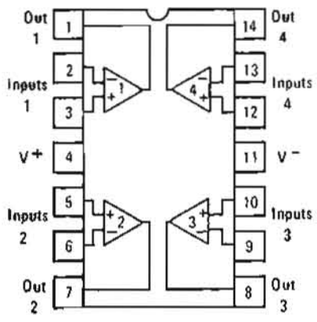






MC78L18AC

PIN OUT



HA-4741

NOTES:

GENERAL

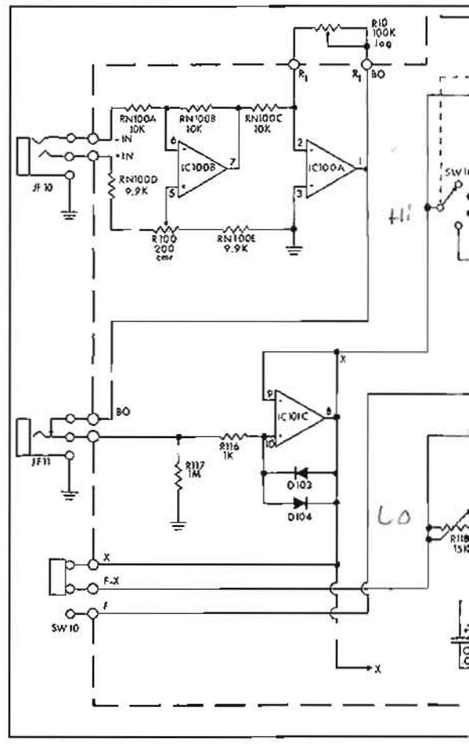
- **SCHEMATIC MI-269 APPLIES ONLY TO PC BOARD 9869. STARTS SN 3000.**
- **ALL RESISTORS IN OHMS, CAPACITORS IN MFD UNLESS OTHERWISE SPECIFIED.**
- **CHANNEL 1 SHOWN. CHANNEL 2 IDENTICAL WITH EXCEPTIONS SHOWN BELOW.**

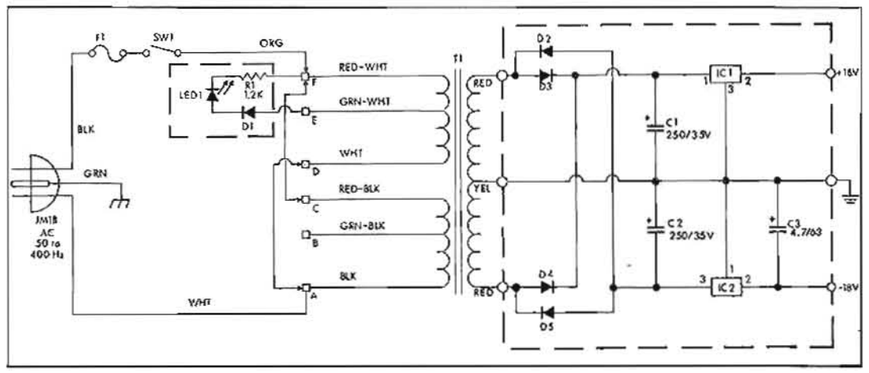
SCHEMATICS

- **WIRE COLOR CODES ARE GIVEN FOR THE POWER SUPPLY.**
- ***CAPACITORS SELECTED TO 5% TOLERANCE.**

PC BOARD LAYOUTS

- **ALL PC BOARDS SHOWN FROM FOIL SIDE. TWO MAIN BOARDS REQUIRED PER UNIT.**
- **INPUT LEVEL CONTROL, R10, CONNECTED BETWEEN POINTS R_1 -R_1.**
- **FILTER-CROSSOVER SWITCH CONNECTED BETWEEN POINTS F-FX-X.**
- **CAPACITORS C100 TO C108, AND C112 TO C120 ARE SUPPLIED IN ONE OF TWO PACKAGES, THUS THE DUAL MOUNTING HOLES.**
- **CHANNEL 1 MAIN BOARD SHOWN. CHANNEL 2 IDENTICAL EXCEPT JUMPER INSTALLED AT B + CPM, INSTEAD OF A-X.**





POWER SUPPLY SHOWN WIRED FOR 120 VAC. FOR OPERATION AT ANOTHER LINE VOLTAGE, FOLLOW CONVERSION CHART BELOW. SELECT THE CORRECT VOLTAGE; CAREFULLY IDENTIFY ALL WIRES BEFORE PROCEEDING. THE SIX TRANSFORMER PRIMARY WIRES ARE SOLDERED TO AN ADJACENT TERMINAL STRIP, (A, B, C, D, E, and F). ONLY FOUR WIRES ARE USED IN ANY CONFIGURATION.

NOTE: THE ONLY VARIABLES ARE THE JUMPERS AND THE ORG AC WIRE COMING FROM THE POWER SWITCH.

VOLTAGE	JUMPERS	ORG (AC)
100	A - D B - E	E
120	A - D C - F	F
200	B - D	E
220	C - D	E
240	C - D	F

9 APPLIES ONLY TO PC BOARD 9669.

OHMS, CAPACITORS IN MFD UNLESS FIED.

WN. CHANNEL 2 IDENTICAL WITH /N BELOW.

S ARE GIVEN FOR THE POWER SUPPLY.

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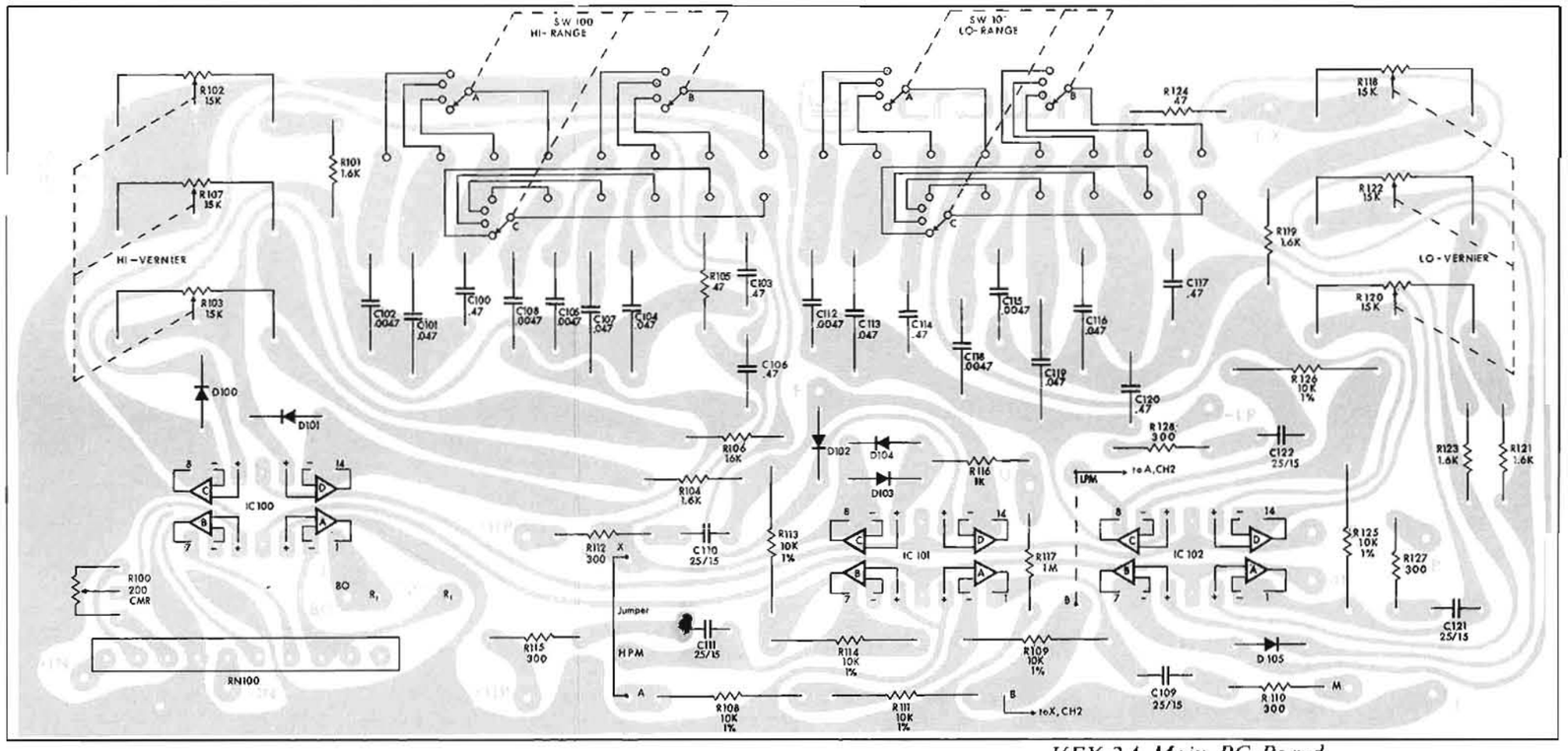
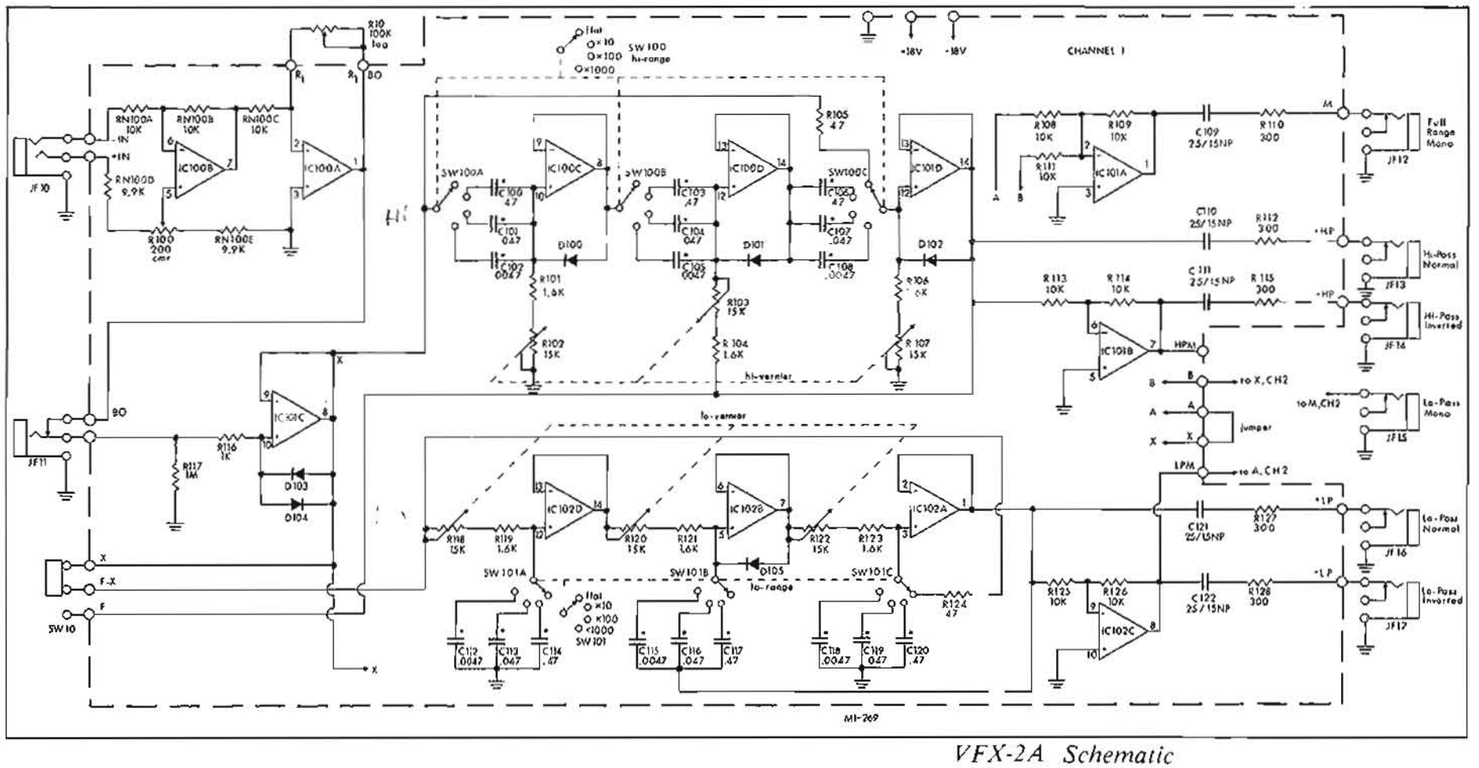
PC BOARD LAYOUTS

- ALL PC BOARDS SHOWN FROM FOIL SIDE. TWO MAIN BOARDS REQUIRED PER UNIT.
- INPUT LEVEL CONTROL, R10, CONNECTED BETWEEN POINTS R_1 -R_1.
- FILTER-CROSSOVER SWITCH CONNECTED BETWEEN POINTS F-FX-X.
- CAPACITORS C100 TO C108, AND C112 TO C120 ARE SUPPLIED IN ONE OF TWO PACKAGES, THUS THE DUAL MOUNTING HOLES.
- CHANNEL 1 MAIN BOARD SHOWN. CHANNEL 2 IDENTICAL EXCEPT JUMPER INSTALLED AT B + CPM, INSTEAD OF A-X.



VFX-2A Main PC Board



VFX-2A Schematic