VFX-2
IM-10
S3P2-10-3

crown

INSTRUCTION MANUAL

SERIAL NO. _____

ISSUED TO: _____

VFX2

DUAL-CHANNEL FILTER/CROSSOVER

CROWN INTERNATIONAL, INC., BOX 1000 ELKHART, INDIANA 46514

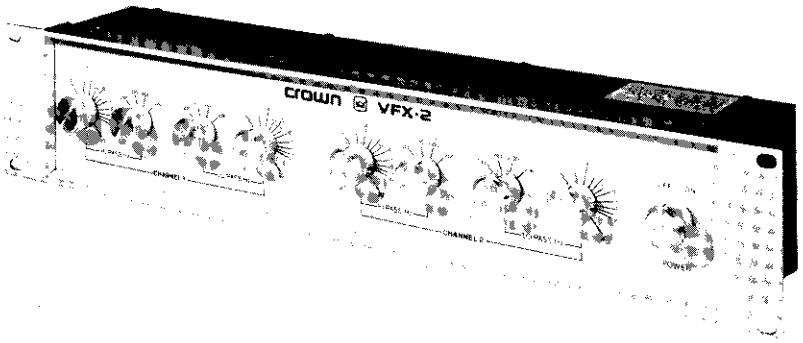
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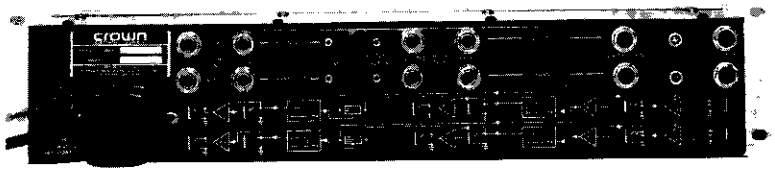
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SECTION 1
INTRODUCTION



FRONT VIEW



REAR VIEW

FIGURE 1-1
VFX2 DUAL-CHANNEL FILTER/CROSSOVER

1.1 SCOPE OF MANUAL

This manual is intended to provide the user necessary technical information required to operate the CROWN VFX2 Dual-channel Filter/Crossover unit properly and to maintain the unit in optimum operating condition.

The manual is comprehensive, containing a physical description of the VFX2, electrical and mechanical specifications, complete installation and operating instructions, a detailed circuit description, test procedures and service policies. Also included are a complete parts list and the associated VFX2 schematic to assist in identification of parts and understanding the functional operation of the VFX2.

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 VFX2 Dual-Channel Filter/Crossover.

1.2 EQUIPMENT DESCRIPTION

The CROWN Model VFX2 is a dual-channel filter/crossover unit specifically designed to provide continuously variable filters to perform either high pass/low pass or bandpass functions in professional or commercial sound, or home "hi-fi" applications.

The VFX2 is a compact, ruggedly constructed unit designed to fit a standard 19" rack mount (W.E. hole spacing) and occupies only 3½" of vertical rack space. Maximum depth from the mounting surface is 5¾". The chassis is all aluminum black and satinized anodized and the entire unit weights only 6 pounds.

Front panel controls are four sets of range/vernier knobs for the **HI** and **LOW PASS Hz** setting of the filters in the two audio channels and a rotary **POWER** ON-OFF switch.

Rear panel controls are a screwdriver-adjustable **LEVEL** (attenuator) control and a mode switch for selecting either **CROSSOVER** (low pass) or **FILTER** (bandpass) outputs for each audio channel.

Rear panel connectors include a variable gain bridging input for each channel in addition to the unity gain unbalanced input. Output connectors, both high pass and low pass, are provided for inverted and non-inverted **(NORMAL)** modes. An AC line fuse to protect the unit and the power transformer are also located on the rear panel.

1.3 SPECIFICATIONS

VFX-2

Dual Channel Variable Electronic Filter-Crossover

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 Ω load All tests with filters flat and at rated output. (See graph)
Phase Response	See graph.
Output	10V Maximum before overload, 2.5V rated 50 Ω output impedance accepts 600 Ω load (typically 6.4V maximum into 600 Ω) All outputs available in normal (non-inverted) and inverted modes.
Inputs	Two types per channel: Transformerless bridging input with ¼" phone jack or attenuator, 20K ohm balanced, 10K ohm unbalanced **OR** Unity gain input ¼" phone jack, 1M ohm unbalanced. For balanced input common mode rejection see graph.
Gain	0-15.5dB from balanced/unbalanced input
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 600Ω with filters flat or set at 20Hz and 20KHz (See graph).
Filters	Separate 18dB Butterworth Highpass and Lowpass Filters with adjustable corner frequencies. Can be internally cascaded to form band pass and band reject filters. (See graph)
Semiconductor Complement	10 integrated circuits (20 operational amplifiers equivalent to 400 transistors and 40 diodes) for a total of 402 transistors, 2 zeners and 56 diodes.
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. Screwdriver-adjustable input attenuator on rear 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.

1.4 WARRANTY

CROWN guarantees this equipment to perform as specified. CROWN also warrants the components and workmanship of this equipment to be free from defects for a period of 3 years from date of purchase.

This warranty does not extend to fuses, and/or component or equipment damage due to negligence, misuse, shipping damage or accident; or if the serial number has been defaced, altered or removed.

A copy of the FULL THREE-YEAR WARRANTY is included with this manual. The WARRANTY is subject to the conditions contained therein. Upon receipt of the registration form, CROWN will issue a WARRANTY TITLE. This title applies to the original end-purchaser as well as subsequent purchasers.

You, the purchaser(s), are responsible for accurate, complete records (sales slips, invoices, etc.) for FULL coverage!

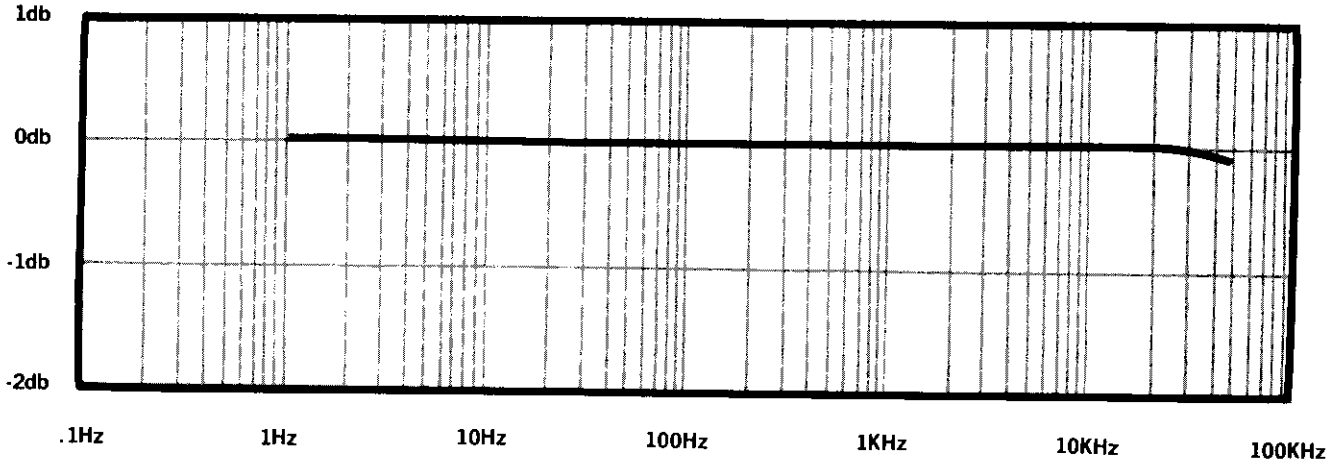


FIGURE 1-2
TYPICAL FREQUENCY RESPONSE: IHF LOAD AT RATED OUTPUT

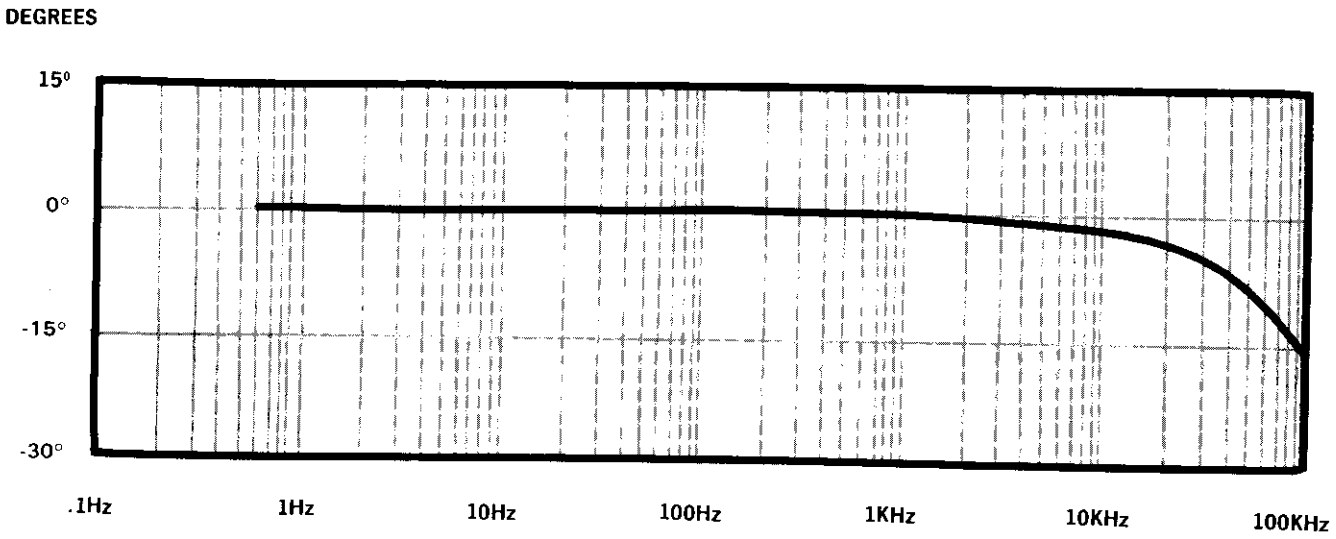


FIGURE 1-3
TYPICAL PHASE RESPONSE: NO FILTERS

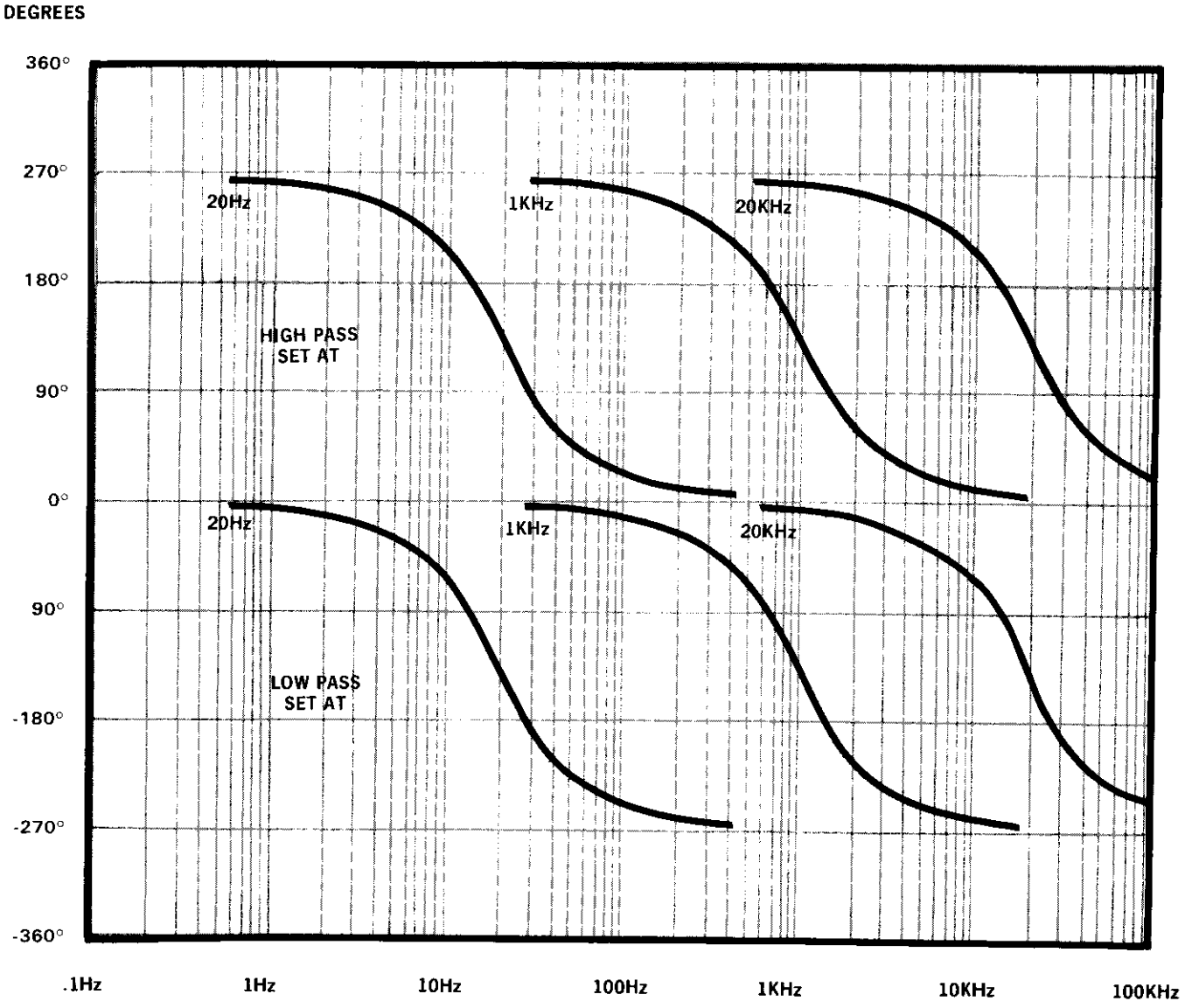


FIGURE 1-4
TYPICAL PHASE RESPONSE: HIGH AND LOW PASS FILTERS

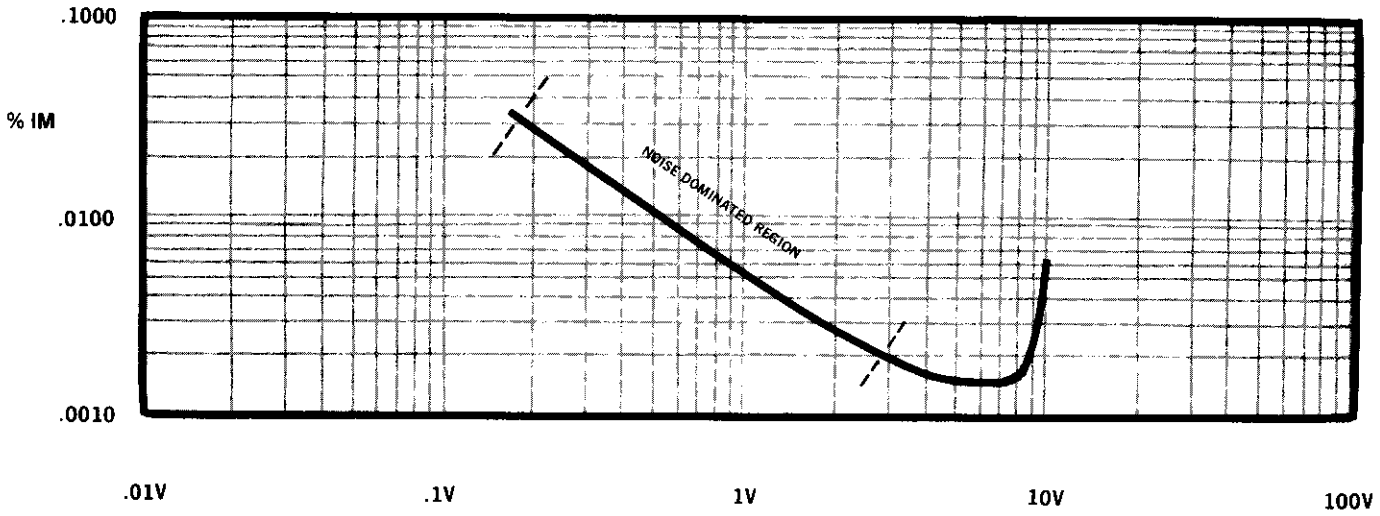
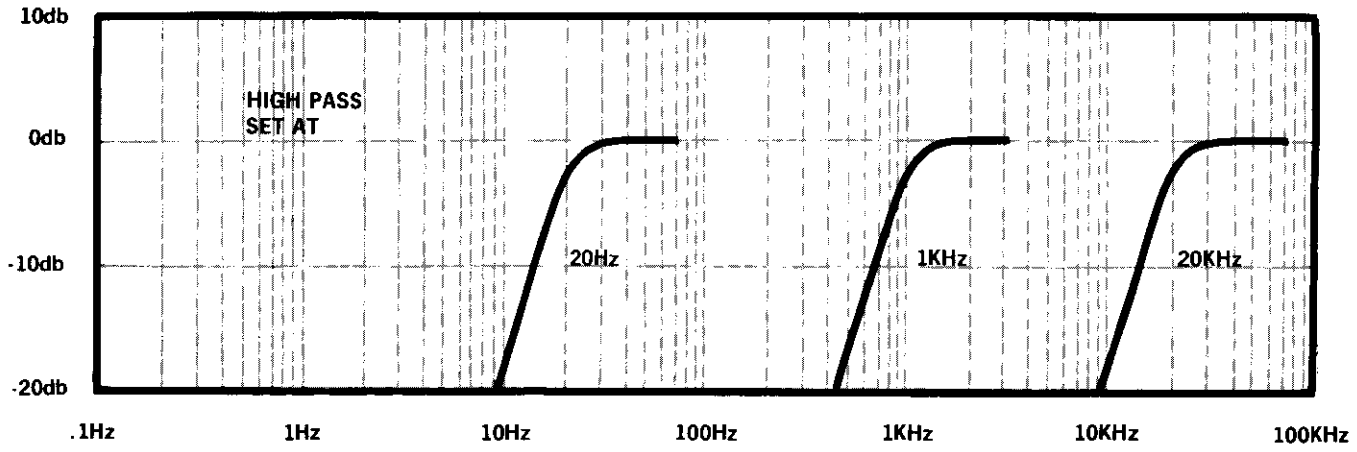


FIGURE 1-5
% IM DISTORTION — ALL CONTROLS FLAT WITH IHF LOAD



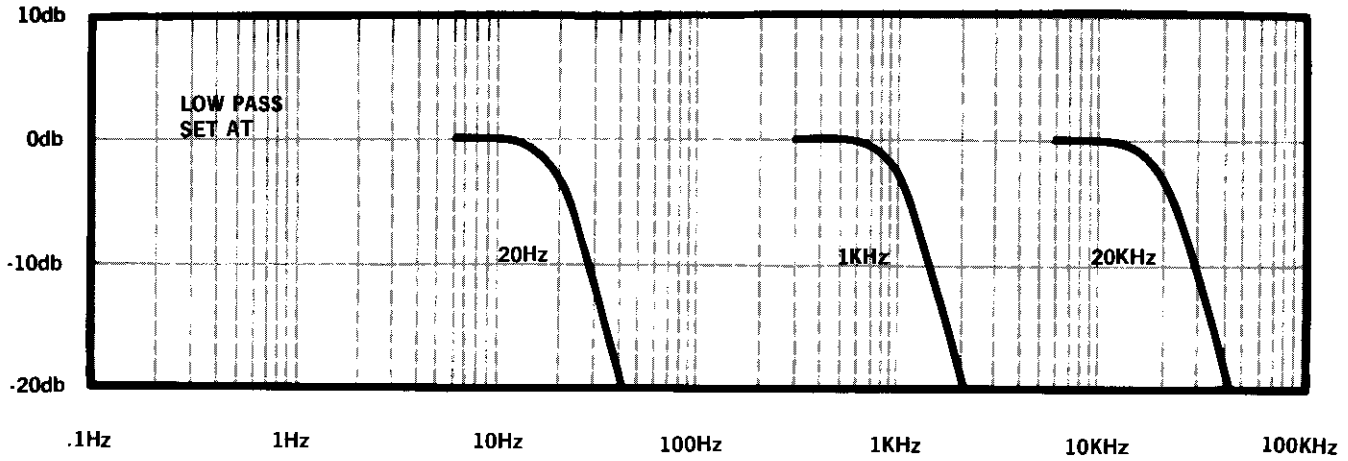


FIGURE 1-6
TYPICAL FILTER CURVES

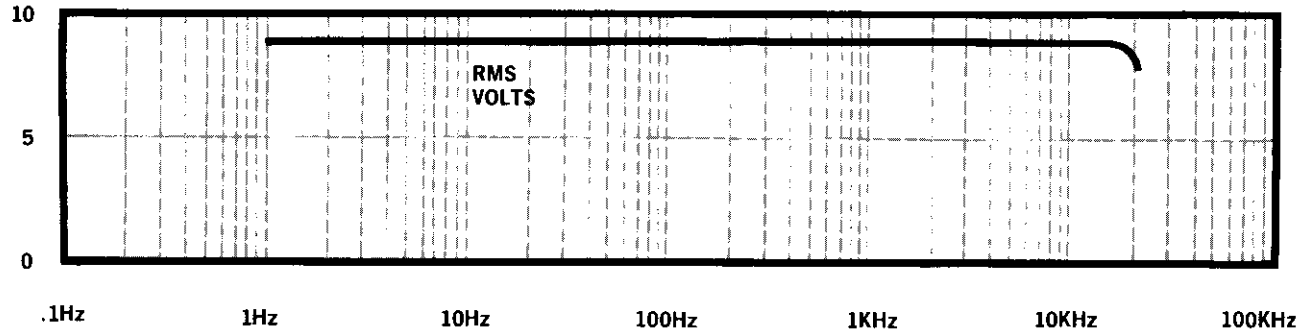


FIGURE 1-7
TYPICAL MAXIMUM OUTPUT; IHF LOAD

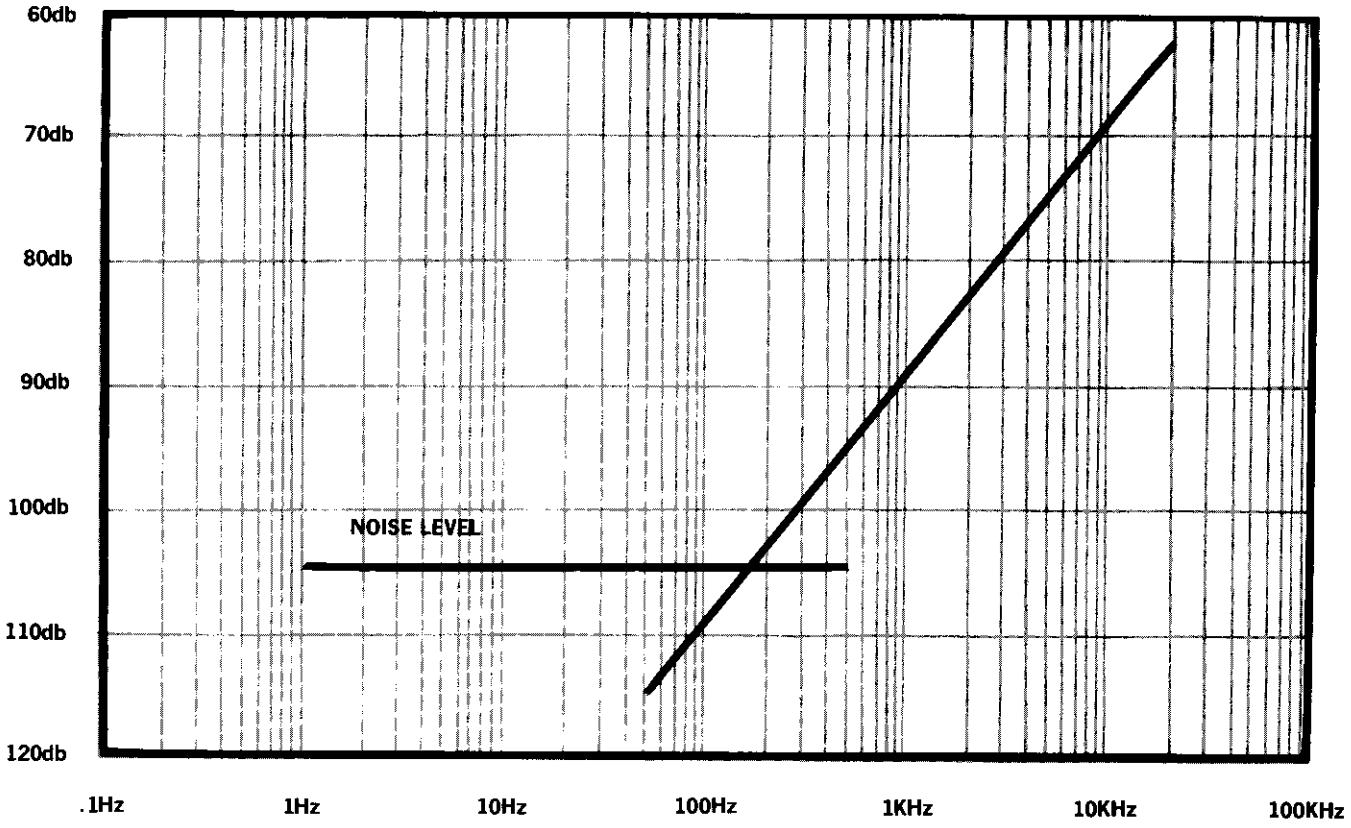


FIGURE 1-8
TYPICAL COMMON MODE REJECTION

SECTION 2
INSTALLATION AND OPERATION

2.1 GENERAL

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

2.2 UNPACKING

Immediately upon receipt of the VFX2 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!**

2.3 MOUNTING

The VFX2 is specifically designed for standard 19" rack mounting, but may be custom mounted if sufficient support is provided. Refer to Figure 2-1 for mounting dimensions.

Supplied with the VFX2 is a decorative smoked acrylic overlay. The overlay functions as a protective shield preventing the front panel control settings from being accidentally bumped.

The VFX2 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 black dress nuts.

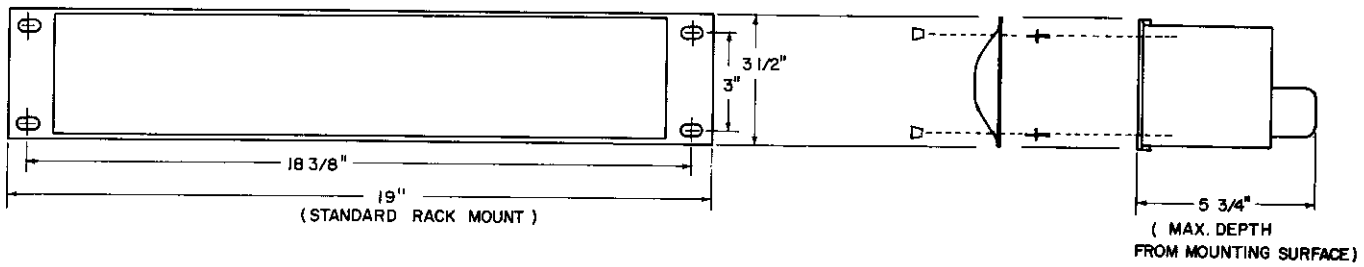
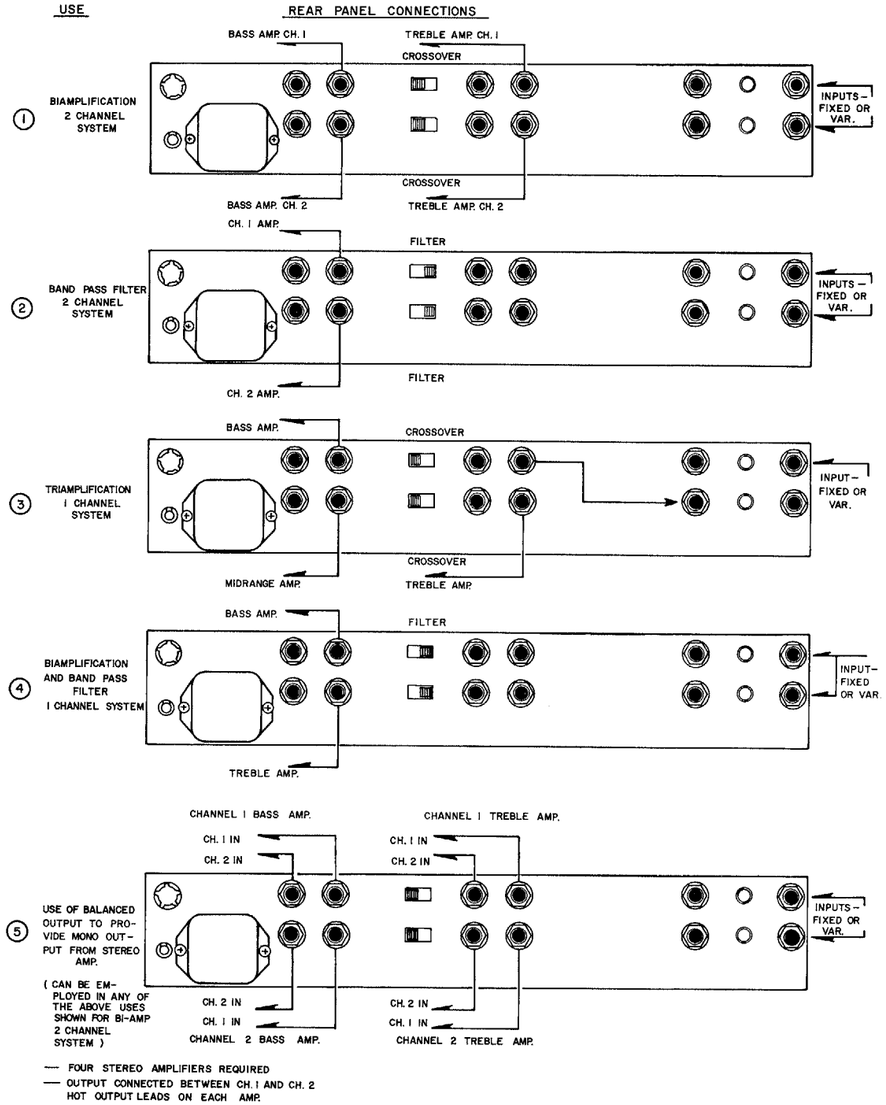


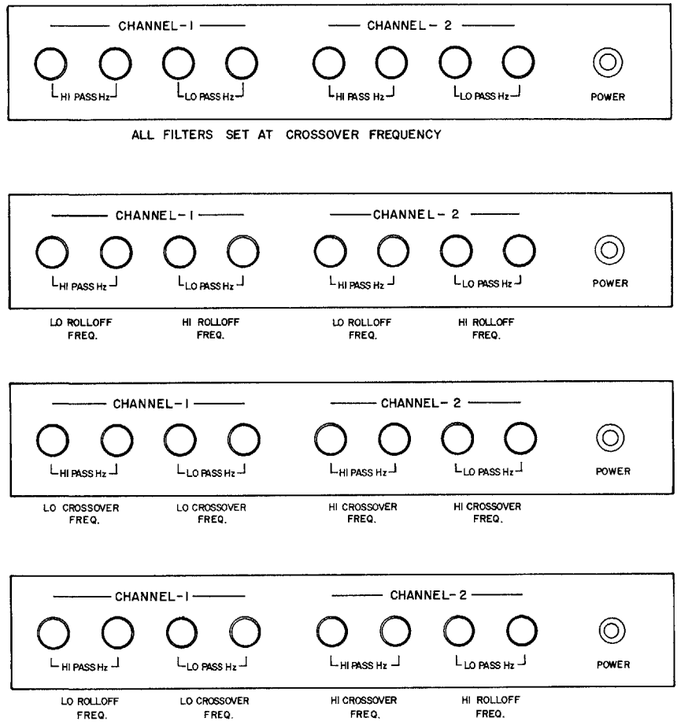
FIGURE 2-1
MOUNTING DIMENSIONS

VFX 2 INPUT — OUTPUT



CONNECTIONS AND CONTROL SETTINGS

FRONT PANEL SETTINGS



OUTPUT SPECTRUM

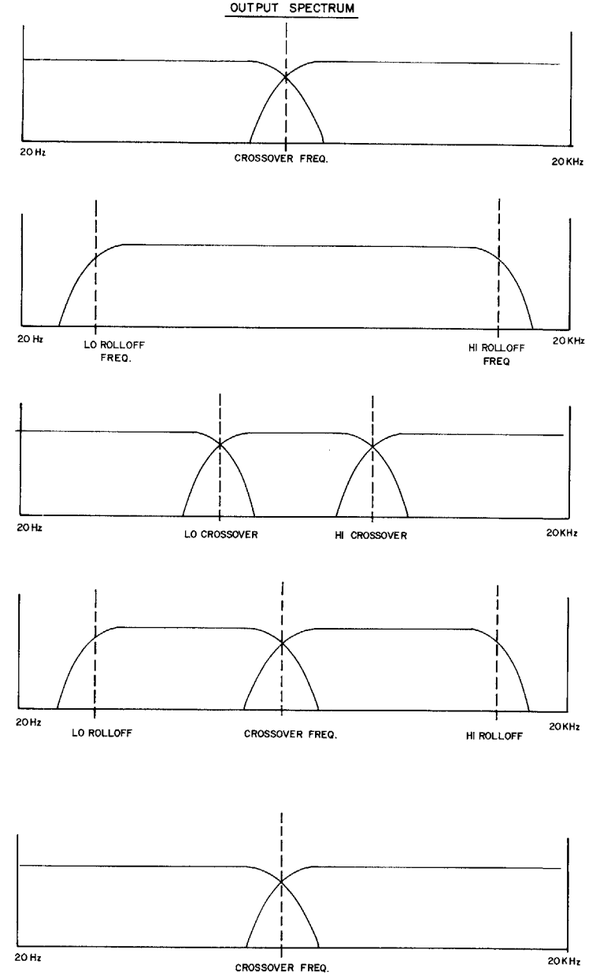


FIGURE 2-2
TYPICAL SYSTEM CONFIGURATION & CABLES

2.4 INSTALLATION

These paragraphs describe the most common system configurations for the VFX2 Dual-Channel Crossover/Filter, provide cabling diagrams and control settings for these system configurations and detail the various types of inputs and outputs available for use with the VFX2.

2.4.1 Cabling

Refer to Figure 2-2.

2.4.2 Input Connections

Three types of inputs, balanced, unbalanced and a unity gain unbalanced input, may be used with the VFX2. Details are shown below.

a. Balanced Input

Refer to Figure 2-3. To form a balanced input for the VFX2, 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 VFX2 (Refer to Figure 2-6). The gain of the channel is adjustable using the **LEVEL** (Attenuator) control.

b. Unbalanced Input

Refer to Figure 2-3. To form an unbalanced input for the VFX2 (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 VFX2 (Refer to Figure 2-6). The gain of the channel is adjustable using the **LEVEL** control.

CAUTION: Be certain that the **ring** of the phone plug is left open. (Do not connect anything to it.) Failure to observe this precaution can cause latch-up of the VFX2 output, with high impedance unbalanced inputs.

c. Unity Gain Unbalanced Input

Refer to Figure 2-4. To form a unity gain unbalanced input for the VFX2, 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 VFX2. The **LEVEL** (attenuator) control, adjacent to the **UNITY GAIN** jack, is inoperative in this application.

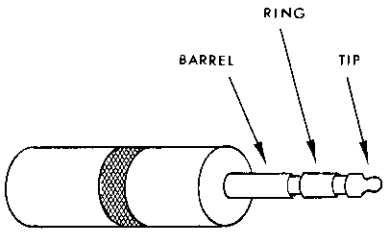


FIGURE 2-3
PHONE PLUG, ¼", 3-CONDUCTOR

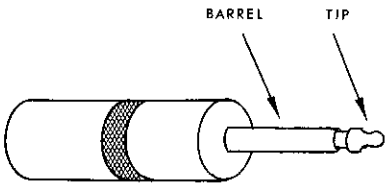


FIGURE 2-4
PHONE PLUG, ¼", 2-CONDUCTOR

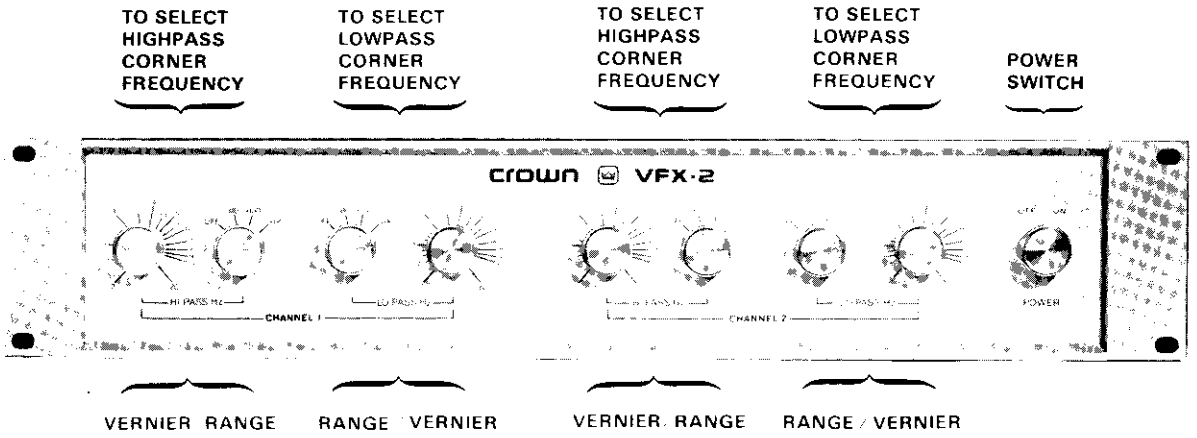


FIGURE 2-5
FRONT PANEL CONTROLS

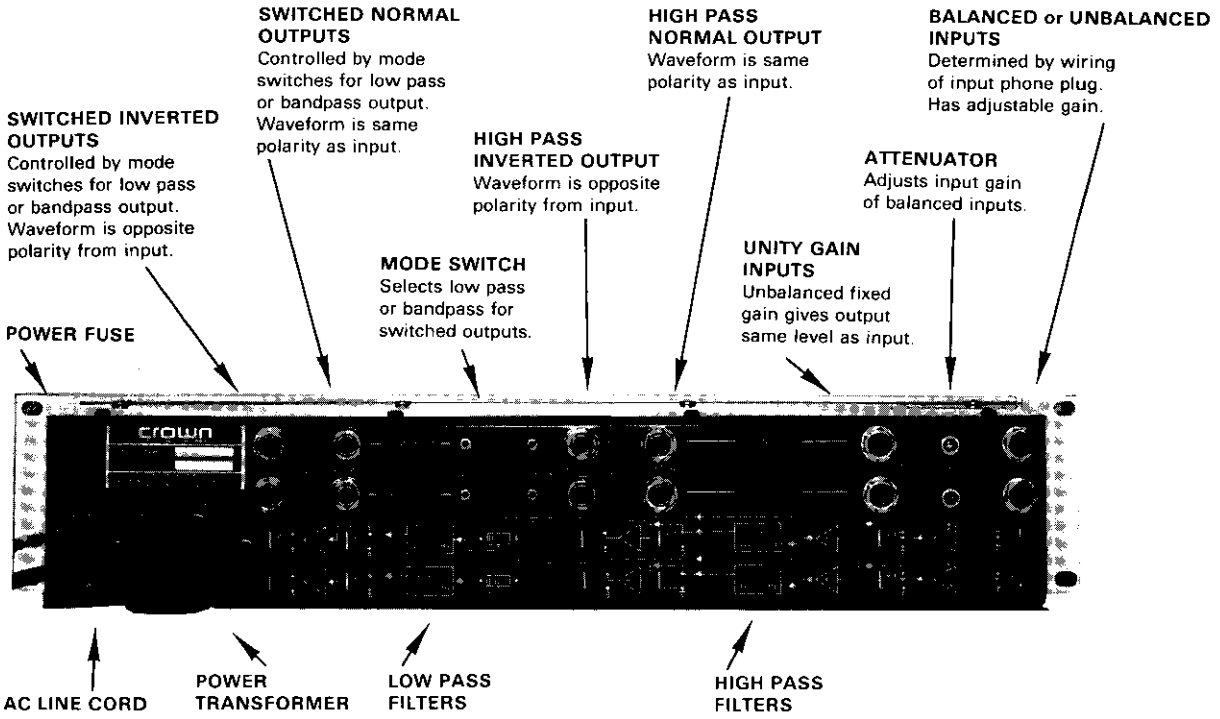


FIGURE 2-6
REAR PANEL CONTROLS AND CONNECTORS

2.4.3 Output Connections

Six outputs (high pass, low pass and bandpass — both balanced and unbalanced) are available from the VFX2. Details are described below.

a. Unbalanced High Pass Output

To pick up an unbalanced high pass output from the VFX2, insert a 2-conductor, ¼" phone plug wired as shown in Figure 2-4, into the **HIGH PASS NORMAL** output jack on the rear panel of the VFX2.

b. Balanced High Pass Output

To pick up a balanced high pass output from the VFX2, insert a 2-conductor, ¼" phone plug wired as shown in Figure 2-4, into 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.

c. Unbalanced Low Pass Output

To pick up an unbalanced low pass output from the VFX2, insert a 2-conductor, ¼" phone plug wired as shown in Figure 2-4, into the **LOW PASS NORMAL** output jack on the rear panel of the VFX2 and set the MODE switch to **CROSSOVER (LOW PASS)**.

d. Balanced Low Pass Output

To pick up a balanced low pass output from the VFX2, insert a 2-conductor, ¼" phone plug wired as shown in Figure 2-4, into both the **LOW PASS NORMAL** and the **LOW PASS INVERTED** phone jacks on the rear panel of the VFX2. 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 MODE switch to **CROSSOVER (LOW PASS).**

e. Unbalanced Bandpass Output

To pick up an unbalanced bandpass output from the VFX2, insert a 2-conductor, ¼" phone plug wired as shown in Figure 2-4, into the **LOW PASS NORMAL** phone jack on the rear panel of the VFX2. Set the MODE switch to **FILTER (BANDPASS)**.

f. Balanced Bandpass Output

To pick up a balanced bandpass output from the VFX2, insert a 2-conductor, ¼" phone plug wired as shown in Figure 2-4, into both the **LOW PASS NORMAL** and the **LOW PASS INVERTED** phone jacks on the rear panel of the VFX2. 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 MODE switch to **FILTER (BANDPASS)**.

2.4.4 Glossary of Filter Terms

a. 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.

b. 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.

c. Bandpass Filter

A filter that transmits alternating signals whose frequencies are between given upper and lower cutoff values, while substantially attenuating all frequencies outside this band.

d. 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 also sometimes referred to as the "cutoff" frequency or the "break" frequency. It is also defined as 3dB below the maximum output.

2.5 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 VFX2 rear panel. See paragraph 2.4.2 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 into the **(BALANCED)** INPUTS or the **UNITY GAIN** INPUTS on the VFX2 rear panel. See paragraph 2.4.2 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.

The use of the VFX2 controls in the different modes of operation available is described in the following paragraphs.

2.5.1 Control Functions

Although the uses and possible applications of the VFX2 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, 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 VFX2 to aid in understanding the operation of the unit. This block diagram is also shown in Figure 2-6.

a. INPUT LEVEL (Attenuator)

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 15.5 dB is obtained. Minimum gain is unity at full attenuation, fully CCW. The input impedance of the **(BALANCED)** input is independent of the attenuator (gain) setting.

b. MODE Switch

Two mode switches, one for each channel, are located in the center of the rear panel. These two-position, slide switches are labeled **LOW PASS — BANDPASS**. 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 (3 dB) 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 (OFF-X10-X100-X1K) selects the appropriate multiplier.

EXAMPLE: Selected frequency = 30 Hz

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

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

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

d. POWER Switch

A pushbutton switch, located on the right side of the front panel, controls power applied to the VFX2. Depress the POWER switch to apply power; it should lock in the depressed position and a green indicator should show that power is applied. To remove power, depress the **POWER** switch; it should return to the original extended position and the green indicator should disappear.

2.5.2 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: 30 Hz corner frequency

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

When the RANGE switch is set to OFF, the signal will pass through the VFX2 unfiltered. Use the **HIGH PASS** OUTPUTS as described in paragraph 2.4.3.

2.5.3 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 OFF, the signal will pass through the VFX2 unfiltered. Use the **LOW PASS** OUTPUTS as described in paragraph 2.4.3.

2.5.4 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 2.5.2. Set the **higher** of the two corner frequencies on the **LO-PASS Hz** filter controls as shown in paragraph 2.5.3. Set the MODE switches on the rear panel to **FILTER (BANDPASS)**. Use either

the balanced or unbalanced bandpass outputs as described in paragraph 2.4.3 e and f.

2.5.5 Mono (Balanced) Output Application

Any CROWN amplifier can be used with the VFX2 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 VFX2 to one amplifier INPUT.
3. Connect the **INVERTED** output from the VFX2 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.

SECTION 3

CIRCUIT DESCRIPTION

3.1 GENERAL

This section contains a detailed description of circuitry operation, test procedures and service information required for a qualified service technician to properly adjust and maintain the VFX2 in optimum operating condition.

3.2 CIRCUIT DESCRIPTION

The VFX2 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. Refer to schematic.

The VFX2 also contains two separate internal power supplies which generate regulated +15 VDC and -15 VDC for distribution to all ten dual operational amplifier IC's.

The VFX2 requires about 2 Watts for normal operation. The power supply can be wired for 120 VAC or 240 VAC line voltage and operates on any frequency from 50 Hz to 400 Hz.

3.2.1 Filtering Circuits

The balanced input, a 3-conductor, ¼" phone jack, is applied to IC1A. The IC1A low noise, dual operational amplifier allows use of a transformerless balanced input and provides isolation from filter loading. R8, a 25K ohm attenuator **(LEVEL)** potentiometer, enables control of the gain of IC1A from unity gain at maximum attenuation to 15.5 dB gain at minimum attenuation. 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.

R4, a 500-ohm trim potentiometer in the positive IC1A 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 1C1B. The variable attenuator **(LEVEL)** potentiometer, R8, has no effect on this input.

The unity gain output of IC1B is applied to the input circuit of IC2A (HI PASS FILTER) only, or to that circuit plus the input circuit of IC4A (LO PASS FILTER) depending on the position of the CROSSOVER/FILTER mode switch. The IC1B output may also go directly to the LOW PASS OUTPUT jack or the HIGH PASS OUTPUT jack depending on the position of the RANGE switches. Circuit operation for all switch combinations is described below:

a. RANGE Switches, OFF — CROSSOVER/FILTER, Either Position

With the RANGE switches in OFF, the unity gain output of IC1B bypasses all filtering circuits and appears as a flat output at the HI and LO PASS OUTPUT jacks. Operational amplifier IC3B creates an inverted output at the HI PASS INVERTED OUTPUT jack and IC5B creates an inverted output at the LO PASS INVERTED OUTPUT jack.

b. RANGE Switches (X10, X100, X1K), Mode Sw in CROSSOVER

The RANGE switch determines the appropriate group of 5% matched capacitors to be used in the filter. See Table 3-1.

TABLE 3-1
RANGE SWITCH CAPACITOR GROUPS

RANGE SW POSITION	HI RANGE		LO RANGE	
X10	C3, C6, C9	.47 mfd	C16, C19, C22	.47 mfd
X100	C4, C7, C10	.047 mfd	C15, C18, C21	.047 mfd
X1K	C5, C8, C11	.0047 mfd	C14, C17, C20	.0047 mfd

The HI VERNIER potentiometer (R14, R16, R18) and LO VERNIER potentiometer (R23, R25, R27) 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 2.5.1 for the proper method of using the VERNIER/RANGE controls to select the corner frequency for the filters.

The signal from IC1B is applied through selected RC filter components to dual operational amplifier IC2A, which, along with IC2B and IC3A, forms a 3-pole, high-pass, 18 dB/octave Butterworth filter. This produces the non-inverted **HI PASS OUTPUT**. Operational amplifier IC3B creates the **HI PASS INVERTED OUTPUT**.

The HI PASS OUTPUT signal from IC3A is also applied through the mode switch to the selected RC filter components to dual operational amplifier IC4A, which, with IC4B and IC5A, forms a 3-pole, low-pass, 18 dB/octave Butterworth filter. This filter produces the non-inverted LO PASS OUTPUT. Operational amplifier IC5B 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 IC1B, is tied directly to the **LOW PASS** filter section; in **FILTER (BANDPASS)**, the output of the **HI PASS** filter signal, from IC3A, is tied directly to the **LOW PASS** filter section.

3.2.2 Power Supply Circuits

AC power is applied to the power transformer, which may be wired for either 120 VAC 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, R1, Q1 and Zener D5 provides a regulated +15VDC; the bridge rectifier and C2, R2, Q2 and Zener D6 provide a regulated -15 VDC. The +15 VDC is applied to pin 8 and the -15 VDC is applied to pin 4 of all dual operational amplifier IC's.

3.3 TEST PROCEDURES

This paragraph lists precautions essential to obtain accurate test measurements when dealing with high-purity filtering equipment such as the VFX2.

1. Use the proper line voltage (120 VAC or 240 VAC) for which the power supply has been wired for normal operation. The line voltage should be measured with a peak reading AC voltmeter and adjusted to the rms equivalent voltage.

2. The input LEVEL controls (attenuators) should be set to maximum for all distortion tests to assure repeatability of all test measurements. Filter settings may greatly change distortion measurements (usually reducing these measurements and many times making them invalid). Most distortion measurements should be made with the RANGE switches set to OFF, for the same reason.

3. When measuring hum and noise, all inputs should be disconnected from the VFX2 and the LEVEL (attenuator) controls set to minimum (or to maximum for certain tests).

4. Always monitor the test oscillator when measuring frequency response. Use a wideband AC voltmeter or use the same meter for both input and output level measurements, if the meter's frequency response is known not to be dependent on attenuator settings.

5. Residual distortion and noise levels should be fully known for all test equipment in order to accurately evaluate the performance of the VFX2.

6. Never measure hum and noise when in the presence of strong magnetic fields. The VFX2 should be at least 4 inches from any large metallic objects or shield plates for a reading to be meaningful.

7. Noise measurement should be taken with the output bandpass filtered for 20Hz - 20KHz. For audio purposes the measurement of noise above 20KHz is meaningless.

3.4 SERVICE POLICIES Due to the sophisticated circuitry, only a fully-trained competent service technician should be allowed to service the VFX2 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. The CROWN warranty is described in paragraph 1.4. For warranty service the unit **must** be returned to the factory or approved warranty stations.

Many parts are standard items stocked by local electronics supply houses. However, some parts which appear to be standard parts are actually selected by CROWN from standard parts. Best results will be obtained with CROWN factory replacement parts, although standard parts may be used in an emergency. A number of the parts are special and are available only from CROWN.

When ordering parts, be sure to give the VFX2 model and serial number as well as the part number and description of the parts ordered. If possible, include schematic "reference designation" of parts ordered.

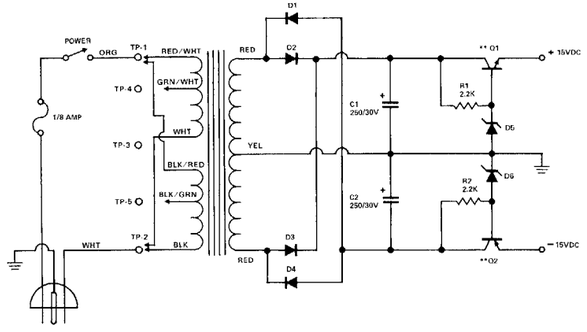
Before returning a VFX2 unit to the factory for service, authorization should be obtained from the service manager. All shipments must be sent by UPS, or truck freight, and should be insured at total value. Shipments should be made at CROWN's expense. The factory will return your serviced unit by UPS 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.

Schematic Designation	Description	Crown Part #	Other Information
	MAIN FILTER MODULE	41670	Two used per unit
	Resistors		
R3	10.2K ¼ watt 1% film	2344	
R4	500 ohm trim pot	3668	
R5, R21, R22, R31, R32	10K ¼ watt 1% film	2343	
R6, R7, R10, R11	4.12K ¼ watt 1% film	3119	
R9	620 ohm ¼ watt 10%	3872	
R12	1M ohm ¼ watt 5%	3198	
R13, R15, R17, R24, R26, R28	1.6K ohm ¼ watt 10%	3873	
R14-16-18 R23-25-27	15K ohm linear pot	3870	3 sections
R19, R20 R29, R30	100 ohm ¼ watt 10%	2872	
R33, R34	47 ohm ¼ watt 5%	1011	
R35	1K ohm ¼ watt 10%	2627	
	Capacitors		
C3, C6, C9 C16, C19, C22	.47 MF 100V poly	4119	Sel. 5%
C4, C7, C10, C15, C18, C21	.047 MF 200V Filmatic mylar	3978	Sel. 5%
C5, C8, C11, C14, C17, C20	.0047 MF 200V poly	3996	Sel. 5%
C12, C13, C23, C24	25 MF 15V NP Vertical	3186	
	Semiconductors		
IC-1,2,3,4,5	RC 4558 Dual op amp	3919	
	Miscellaneous		
	8 pin DIL IC socket	3451	Used to mount all IC's
	3P 4 position Rotary switch	3871	High and Lo range switch
	Blank PC board	9626	All holes drilled
	Diodes		
D7,8,9,10,11,12	1N4148	3181	

Schematic Designation	Description	Crown Part #	Other Information
	POWER SUPPLY BOARD ASSEMBLY	41360	One used per unit
	Resistors		
R1, R2	2.2K ohm ¼ watt 10%	2628	
	Capacitors		
C1, C2	250 MF 35V Vertical	3787	
	Semiconductors		
Q1	Selected 2N3859A	2961	
Q2	MPSA56	3954	
D1, D2, D3, D4	1N4148	3181	
D5, D6	1N966B 16V zener	3533	
	Miscellaneous		
	Dual TO-92 cooler	3493	Mounts over Q1, Q2
	Blank power supply PC board	9515	All holes drilled
	BACK CHASSIS ASSEMBLY	41361	Not available — for reference only
	Resistors		
R8	25K ohm reverse taper pot	4209	Input level controls
	Miscellaneous, Hardware		
	VFX back chassis	9514	
	VFX power cord 3 #18 male	3474	
	Heyco strain relief	2803	Secures power cord
	HTA fuseholder	3256	
	3AG ⅛ amp fuse	3228	
	AGC 1/16 amp fuse	3707	For 240 VAC use
	46P38B power transformer	4202	
	8-32 x 3/8 THP screw	2155	Fastens one side of transformer
	8-32 x ¾ THP screw	2270	Fastens remaining side of transformer
	#8 internal star lockwasher	1951	Used over 2155 & 2270
	Nylon spacer	2762	Used over 2270 to secure power supply board
	8-32 hex nut	1986	Used over 2155 & 2270
	SPDT trigger slide switch	3011	Filter-crossover switch
	2-G-1 terminal strip	1317	Mounts on right side of chassis
	Fish paper insulator	3599	Mounts under 1317
	5/32 steel eyelets	3529	Used to mount 3011 & 1317
	#6 internal star lockwasher	1823	Mounts terminal strip

Schematic Designation	Description	Crown Part #	Other Information
	6-32 x ¼" BHP screw	1954	Mounts terminal strip
	¼" control nut	3040	Used to mount input level controls
	¼" internal star lockwasher	2365	Used to mount input level controls
	112A 2 cond Hi-D jack	3423	Output jacks
	N112B 3 cond Hi-D jack	3507	Balanced input jacks
	N112A 2 cond Hi-D jack	3631	Unity gain input jacks
	3/8" internal star lockwashers	2188	Mount input, output jacks
	Control Bright washer	2189	Mount input, output jacks
	Control Bright nut	1288	Mount input, output jacks
	FRONT PANEL ASSEMBLY	41671	Not available — for reference only
	Miscellaneous, Hardware		
	Front panel	9608	
	16½" Front panel edge	4094	Mounts on top and bottom of front panel
	Carrier strip	3638	Slips into channel in 4094 houses 4 hex nuts
	6-32 hex nuts	1889	4 mount in each carrier strip. Used to secure covers
	Rack mount assembly	41667	Mounts to 4094 at both sides of front panel. Includes 2 stud 10-32 screws
	6-32 x ½ SCP screw	2109 blk	Fasten front panel assy. to front panel edge
	Large washers	1311	Mount over vernier controls
	3/8" internal star washers	2188	Mount over all front panel controls
	Control Bright washers	2189	Fasten PC boards to front panel
	Control Bright nuts	1288	Fasten PC boards to front panel
	10-32 hex nuts	2170	Fasten rack mounts to rear chassis
	Control knob	9641	Used on all front panel controls
	4-40 x ¼" SSET screw	4163	
	1P 1 Pos. rotary power switch	3492	
	Labels, Covers, Misc.		
	Cover caution label	2862	
	Serial number plate	4183	
	Top and bottom cover	9517	
	#8 x 3/8 #6 PHSMT screw	3319 blk	Fastens covers to back chassis

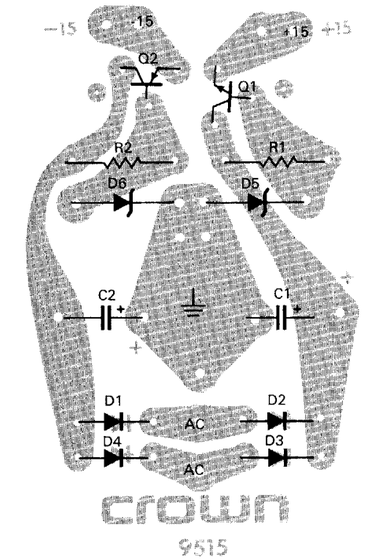
Schematic Designation	Description	Crown Part #	Other Information
	6-32 x 3/16 BHP screw	2008	Fastens covers to front panel carrier strips
	VFX smoked acrylic overlay	9569	Mounts over front panel
	10-32 panel washer-thumbscrew assy.	20032	
	Alternate Method of Mounting:		
	10-32/8-32 adaptor stud	3908	10-32 end mounts VFX-2 to cabinet or rack
	Small panel washer	2101	Mounts over 10-32 end of 3908 stud
	Black hand nuts 8-32	3909	Used to secure the overlay on the 8-32 end of 3908 stud
	VFX shipping carton	3875	
	VFX styrofoam inner pack	3876	
	Rack mount brackets	4095	



POWER SUPPLY SHOWN WIRED FOR 120VAC. FOR OPERATION AT ANOTHER LINE VOLTAGE FOLLOW CONVERSION CHART BELOW. SELECT THE CORRECT VOLTAGE: CAREFULLY IDENTIFY ALL WIRES BEFORE PROCEEDING.

NOTE: ONLY FOUR TRANSFORMER PRIMARY WIRES ARE USED FOR ANY VOLTAGE CONFIGURATION. THESE WIRES ARE SOLDERED TO AN ADJACENT TERMINAL STRIP. (TP-1, TP-2 AND TP-3) THE REMAINING TWO WIRES (UNUSED) ARE SOLDERED TO AN EXTRA TERMINAL STRIP (TP-4 AND TP-5).

VOLTAGE	TP-1	TP-2	TP-3	TP-4	TP-5
100	BLK/GRN, GRN/WHT	WHT, BLK	—	RED/WHT	BLK/RED
120	BLK/RED, RED/WHT	WHT, BLK	—	GRN/WHT	BLK/GRN
200	GRN/WHT	BLK	BLK/GRN, WHT	RED/WHT	BLK/RED
220	RED/WHT	BLK	BLK/GRN, WHT	GRN/WHT	BLK/RED
240	RED/WHT	BLK	BLK/RED, WHT	GRN/WHT	BLK/GRN



NOTES:

GENERAL

— SCHEMATIC MI-258A APPLIES ONLY TO PC BOARD #9626; STARTS S/N 1752.

— ALL RESISTORS IN OHMS, ALL CAPACITORS IN MICRO-FARADS UNLESS OTHERWISE SPECIFIED.

SCHEMATIC

— WIRE COLOR CODES ARE GIVEN FOR THE MAIN POWER SUPPLY.

* CAPACITORS SELECTED TO 5% TOLERANCE.

** TRANSISTORS MOUNTED UNDER A DUAL HEAT SINK CLIP.

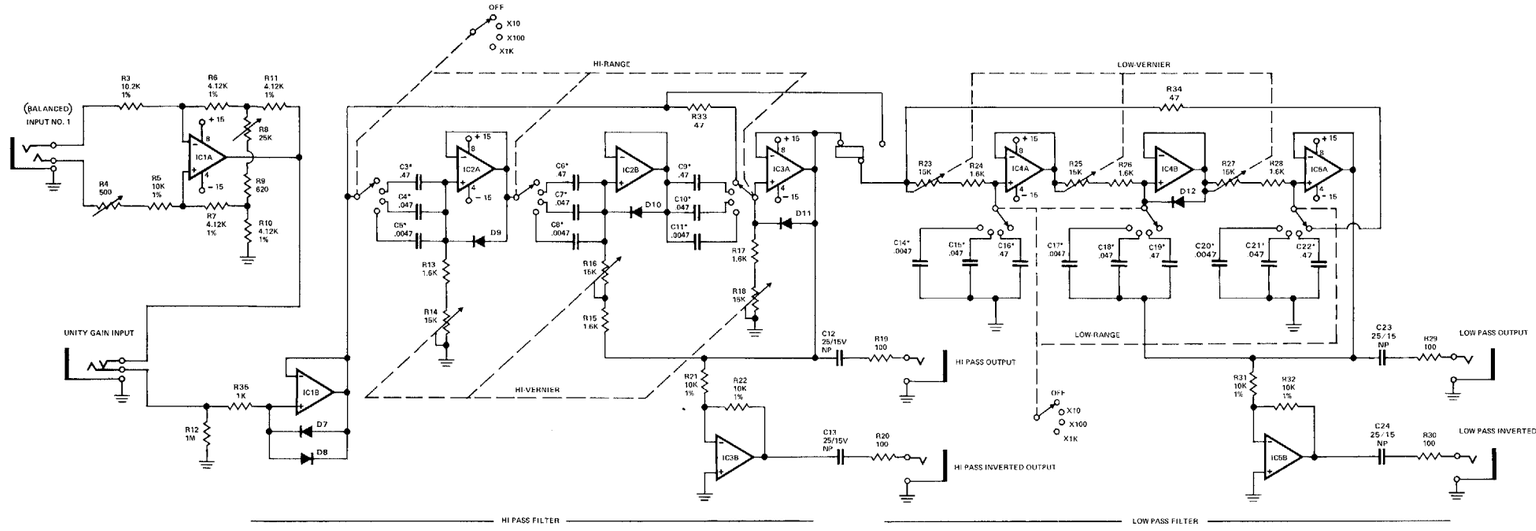
PC BOARD LAYOUTS

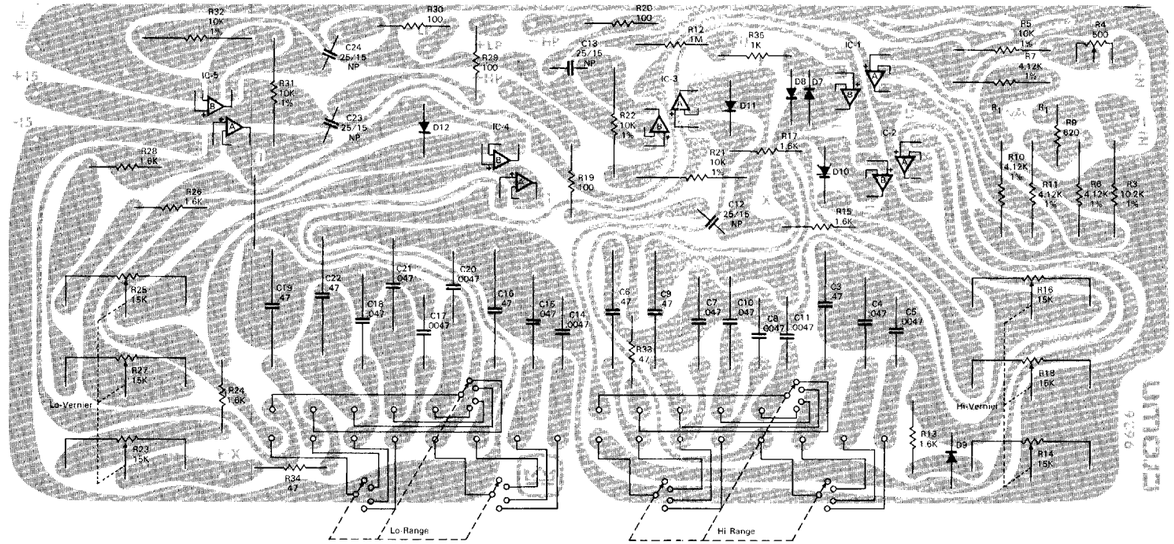
— ALL PC BOARDS SHOWN FROM FOIL SIDE. TWO MAIN BOARDS REQUIRED PER UNIT.

— INPUT LEVEL CONTROL, R8, CONNECTED BETWEEN POINTS R1 - R1.

— FILTER-CROSSOVER SWITCH CONNECTED BETWEEN POINTS F - FX - X.

— CAPACITORS C3 TO C11, AND C14 TO C22 ARE SUPPLIED IN ONE OF TWO PACKAGES, THUS THE DUAL MOUNTING HOLES.





VFX-2

DUAL CHANNEL ELECTRONIC FILTER/CROSSOVER

MI-258A