Fender®

MADE IN U.S.A.

M12 MIXER

OPERATION INSTRUCTION MANUAL

MANUAL NO. 015538

M12
12 CHANNEL MIXER

BY

Fender®
MADE IN U.S.A.

PHYSICAL DIMENSIONS (APPROXIMATE, FOR SHIPPING PURPOSES)

Width —— 31 inches (79 cm)
Depth —— 27 inches (68.6 cm)
Height —— 7 inches (18 cm)
Weight —— 65 pounds (29.5 kg)

P.O. BOX 4137 • 1300 EAST VALENCIA DRIVE • FULLERTON, CALIFORNIA 92634

NOTE: See accompanying limited warranty folder.

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INTRODUCTION

The M12 Mixer System is a 12 input/4 output mixing console. The architecture of the mixer has been specifically optimized for professional sound reinforcement applications.

The unit is constructed using 19 modules and a main chassis. The modules are composed of 12 input channels, two submaster channels, four master (output) channels, and a talkback/earphone amplifier module. The main chassis contains four illuminated VU meters (one for each output channel), a power supply, and all of the input and output connectors. In total, the unit contains 136 rotary controls, 18 slide controls, 73 pushbutton switches, 17 three-conductor XLR type connectors, and 58 phone jacks. Special connectors are also provided for the optional panel lamp and for connection to an additional twelve channel input expander.

The unit has been constructed using heavy gauge aluminum in order to be light in weight and yet rugged enough to sustain the punishment of portable sound reinforcement use. The complete unit is supplied in a substantial tolex-covered wood cabinet which includes a built-in accessory storage compartment.

The electrical design of the M12 makes extensive use of very low noise, high speed operational amplifiers. All line level outputs are capable of driving 600Ω loads. The input transformers have been specially designed, using humbucking construction, to handle high input voltages with a minimum of distortion. The unit has also been provided with extensive input and output patching capabilities, making the M12 one of the most versatile units available.

SYSTEM SET-UP AND OPERATION

As a first step in describing the operation of the M12 Mixer System, a basic sound reinforcement connection (Fig. 1) will be described. Following the basic set-up, a detailed description of all controls and connectors will be presented.

This connection provides four independent mixes of the 12 microphone inputs. One mix, controlled by the channel slide controls, is fed to the main power amplifiers and house speaker systems. The three monitor mixes, independently obtained using the three Monitor send level controls on each input channel, are fed to three separate power amplifiers and their associated stage monitor speaker systems. It is not necessary to use all three monitor mixes if they are not required. Most applications will require only one or two monitor mixes.

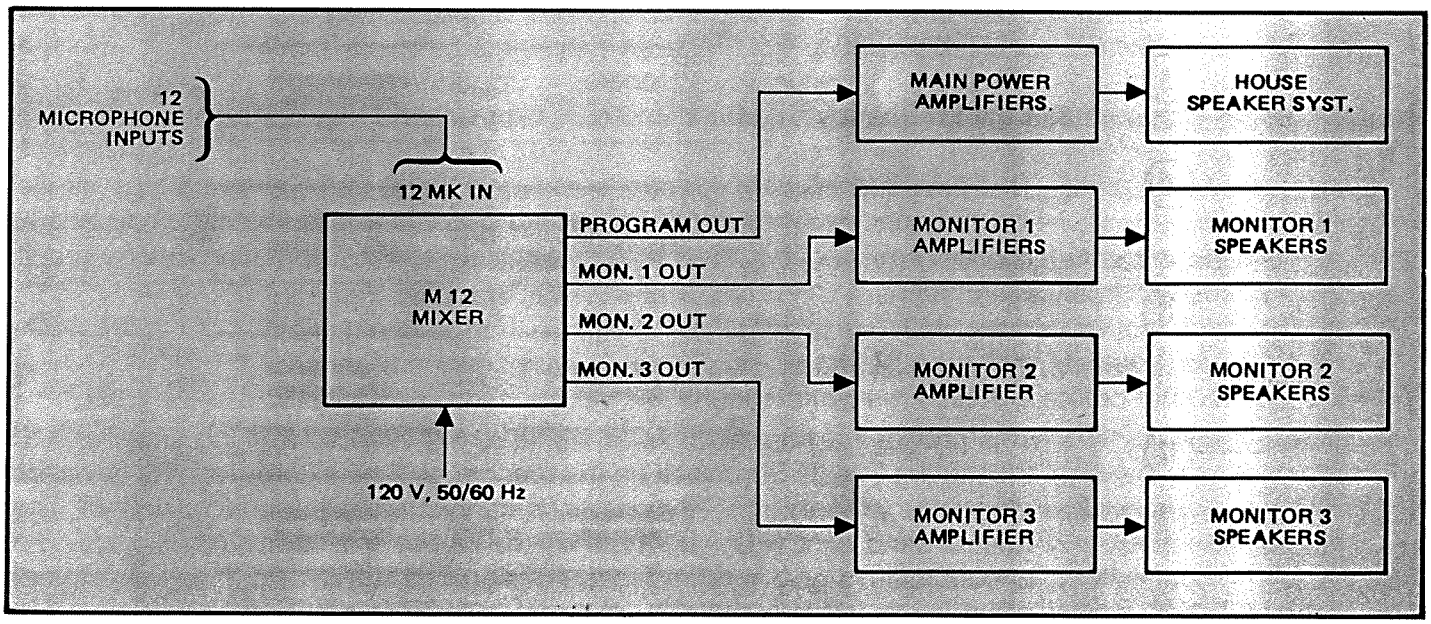
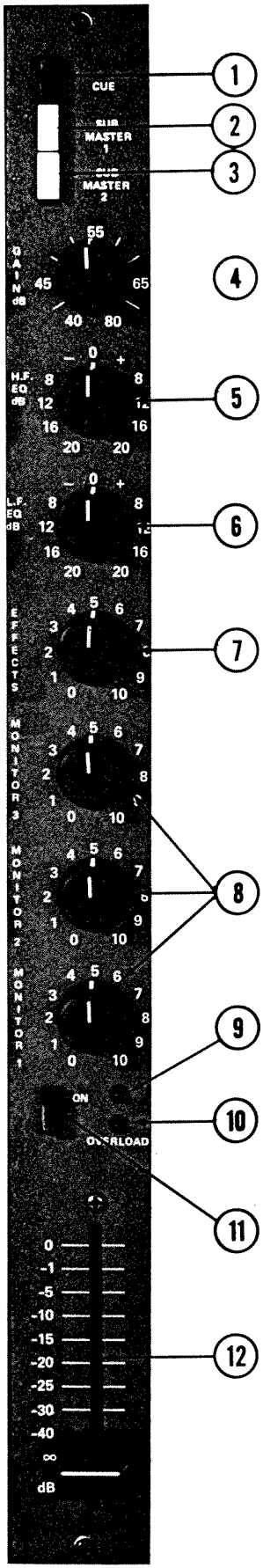


FIGURE 1 — Basic Sound Reinforcement System

DESCRIPTION OF CONTROLS



The following is a module-by-module description of all the operating controls, inputs, and outputs.

MICROPHONE INPUT MODULE (Fig. 2) (Block Diagram, Fig. 22)

1. **Gain Control** (Fig. 2 - Item 4)

   This provides continuous adjustment of the preamplifier voltage gain. The control is marked with overall system gain, in dB, from a 150Ω low impedance source to the balanced 600Ω outputs, with both the channel and master faders at 0 dB attenuation (maximum signal). This control should be adjusted by turning clockwise until the channel overload light (Fig. 2 - Item 10) is illuminated, then counterclockwise until the overload light only occasionally lights on very loud program material. Adjustment of the Channel Gain Control will change the level of this channel's signal into all outputs using the signal.

2. **High Frequency Equalization (H. F. Eq.) Control** (Fig. 2 - Item 5)

   This provides frequency response cut and boost of the shelving type for high frequencies. The maximum cut and boost is approximately 20 dB at 15 kHz. The turnover frequency is approximately 1 kHz. See Figure 18 for a graph of the tone control response.

3. **Low Frequency Equalization (L. F. Eq.) Control** (Fig. 2 - Item 6)

   This provides frequency response cut and boost of the shelving type for the low frequencies. The maximum cut and boost is approximately 20 dB at 100 Hz. The turnover frequency is approximately 1 kHz. See figure 18 for a graph of the tone control response.

4. **Effects Send Control** (Fig. 2 - Item 7)

   This provides a post-fader send signal to the effects summing amplifier and then to the Effects Send jack on the rear panel. If no external effects device is plugged in, the internal reverb unit is connected to the effects system. The Effects Send control does not modify the level of the normal mix signals. The effects return signal is added to the designated output mix. If the entire channel signal is to be processed in an external device (i.e. - a phaser) the High Level Input/Output jacks should be used. This will be explained in more detail in the discussion of these jacks.

FIGURE 2 — Microphone Input Module

5. **Monitor Send Controls** (Fig. 2 - Item 8)

These three controls provide pre-fader (also pre-on/off switch) signals to the Monitor summing busses. The Monitor level controls are used to produce the Monitor signal mixes.

While each monitor mix is pre-fader, it is derived following the channel equalization and gain controls.

6. **Program Fader Control** (Fig. 2 - Item 12)

This slide control provides level control for the program mix. It is calibrated in dB attenuation.

7. **Cue Switch** (Fig. 2 - Item 1)

This push-push switch, when in the down (on) position, connects the channel output to the Cue summing bus. This switching occurs ahead of any channel level controls, but following the equalization and gain controls. The summed cue signal is available at the Cue Output jack on the rear panel and may be monitored by the internal earphone amplifier.

8. **Sub Master 1 Select Switch** (Fig. 2 - Item 2)

This push-push switch, when in the down (on) position, routes the channel program output to Sub Master 1 summing bus and disconnects the channel from the program summing bus. Use of the Sub Master switch does not change the monitor or effects signal routing.

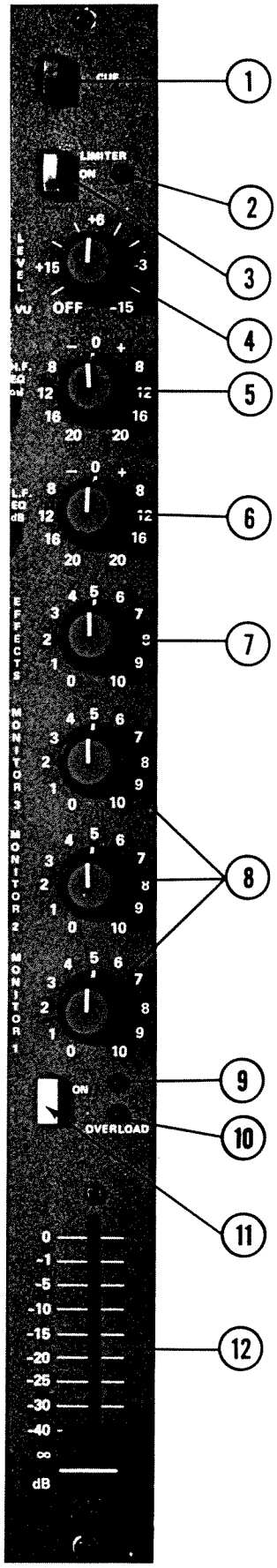
9. **Sub Master 2 Select Switch** (Fig. 2 - Item 3)

This push-push switch, when in the down (on) position, routes the channel program output to Sub Master 2 summing bus and disconnects the channel from the program summing bus. Use of the Sub Master switch does not change the monitor or effects signal routing. If both Sub Master 1 and Sub Master 2 switches are on, the channel program output is routed to both Sub Master summing buses.

10. **Channel On/Off Switch** (Fig. 2 - Item 11)

This push-push switch turns off both the program and effects channel outputs. When the channel is "ON" the green LED (Fig. 2 - Item 9) is lit. The switch does not effect the three monitor outputs.

SUB MASTER MODULE (Fig. 3) (Block Diagram, Fig. 23)



1. Sub Master Program Fader Control (Fig. 3 - Item 12)

This slide control provides level control for the composite sub master signal supplied to the program summing bus. The sub master module acts as a master control for the program output signal sum of the assigned input channels. Use of the Sub Master is discussed in more detail in M12 Mixer Use section.

2. On/Off Switch (Fig. 3 - Item 11)

This push-push switch turns on and off the program and effects output from the module. When the module is on, the green indicator light (Fig. 3 - Item 9) is also on. This switch does not effect the three monitor outputs.

3. Overload Indicator (Fig. 3 - Item 10)

This red LED will turn on when the sub master summing amplifier is approximately 10 dB below clipping. If the light is on frequently, the level settings of the program faders of all the input modules assigned to this Sub Master must be reduced.

4. Monitor Send Controls (Fig. 3 - Item 8)

These three controls provide pre-fader signals to the Monitor summing buses. The controls are used to produce the monitor mix signals. It is important to recognize that when channels are assigned to a Sub Master module, the monitor mix may be derived either independently from the monitor send controls on the assigned input modules or as a composite sum using the sub master monitor controls. If the monitor mix is derived from the sub master, the monitor mix is now a function of the program faders on the assigned input modules, but it is not a function of the sub master program fader.

5. High Frequency Equalization (H. F. Eq.) Control (Fig. 3 - Item 5)

This control performs the same function as the H. F. Eq. Control in each Microphone Input Module.

FIGURE 3 — Sub Master Module

6. **Low Frequency Equalization (L. F. Eq.) Control** (Fig. 3 - Item 6)

This control performs the same function as the L. F. Eq. Control in each Microphone Input Module.

7. **Effects Send Control** (Fig. 3 - Item 7)

This provides a post-fader send signal to the effects summing amplifier and then to the Effects Send jack on the rear panel. If no external effects device is plugged in, the internal reverb unit is connected to the effects system. The Effects Send control does not modify the level of the normal mix signals. The effects return signal is added to the designated output mix. If the entire Sub Master signal is to be processed in an external device (i.e. - a phaser) the High Level Input/Output jacks should be used. This will be explained in more detail in the discussion of these jacks.

8. **Cue Switch** (Fig. 3 - Item 1)

This push-push switch, when in the down (on) position, connects the Sub Master output to the Cue summing bus. This switching occurs ahead of any Sub Master level controls, but following the equalization controls. The summed cue signal is available at the Cue Output jack on the rear panel and may be monitored by the internal earphone amplifier.

9. **Limiter Indicator** (Fig. 3 - Item 2)

This red LED lights when the limiter starts to limit.

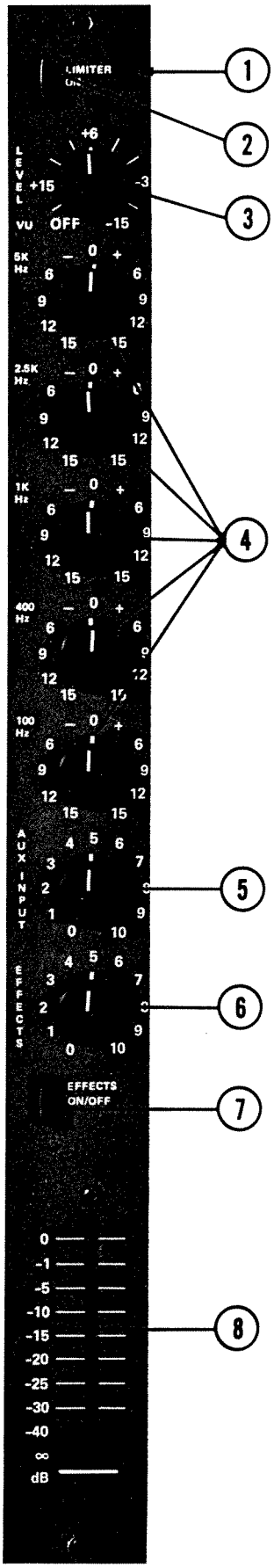
10. **Limiter Level Control** (Fig. 3 - Item 4)

This sets the level at which the limiter starts to operate (threshold level). Clockwise rotation reduces the threshold level. The limiter operates only on the program and effects outputs.

11. **Limiter On/Off Switch** (Fig. 3 - Item 3)

This push-push switch turns the limiter off, or allows the limiter to operate, subject to the Limiter Level (threshold) control.

MASTER MODULE (Fig. 4) (Block Diagram, Figs. 23, 24, 25, 26)



1. Master Fader Control (Fig. 4 - Item 8)

This slide control determines the overall output level of the program or monitor signals. It adjusts the voltage gain of the summing amplifiers, thereby preventing overloading of the summing amplifiers before the maximum console output voltage has been reached.

2. Effects On/Off Switch (Fig. 4 - Item 7)

This push-push switch is "ON" in the down position. It turns the effects return signal on or off.

3. Effects Return Level Control (Fig. 4 - Item 6)

This determines the amount of effects return signal added to the final mix. When an external effects device is used, the output of the device should be connected to the Effects Return jack on the rear panel. When no external device is used, the internal reverb is connected to the effects controls.

4. Auxiliary Input Level Control (Fig. 4 - Item 5)

This determines the amount of auxiliary input signal that is added to the final mix. A detailed description of Auxiliary Input functions will be found in the section on Rear Panel Connections.

5. Equalizer Controls (Fig. 4 - Item 4)

The five equalizer controls provide frequency response cut or boost as indicated in Figure 20. The three center frequency bands (400 Hz, 1 kHz, 2.5 kHz) are of the peaking type with the maximum boost or cut centered at the indicated frequency. The two end controls are of the shelving type and operate below 100 Hz for the low frequency control and above 5 kHz for the high frequency control.

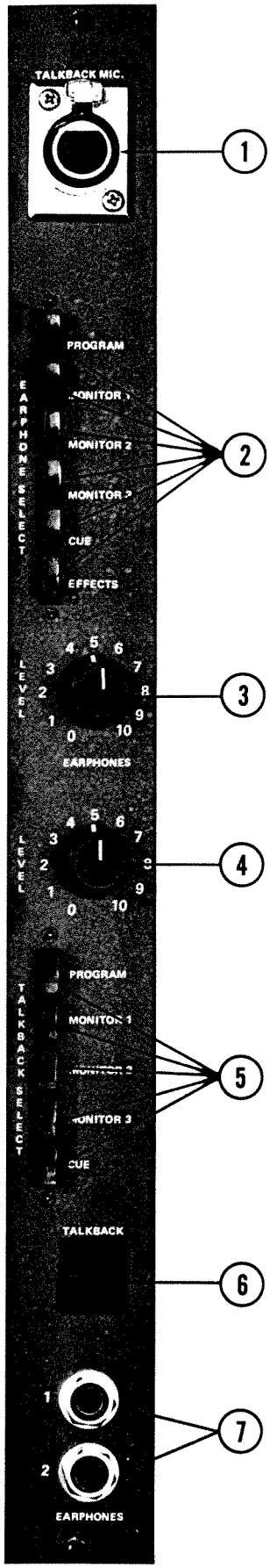
6. Limiter Indicator (Fig. 4 - Item 1)

This red LED indicates that the limiter has been activated by a signal above the threshold set by the Limiter Level control.

7. Limiter Level Control (Fig. 4 - Item 3)

This sets the threshold at which the limiter starts to operate. It is calibrated to correspond to the VU meter when driven from a sine wave signal. Since program material differs significantly from sine waves, the limiter setting should be adjusted on actual program material using the Limiter Indicator. There is a more detailed discussion of the M12 Limiter on page 14.

FIGURE 4 — Master Module



8. Limiter On (Enable) Switch (Fig. 4 - Item 2)

This push-push switch turns the limiter off (out position) or enables the limiter to operate as a function of the Limiter Level (threshold) control.

TALKBACK/EARPHONE MODULE (Fig. 5) (Block Diagram, Fig. 27)

EARPHONE AMPLIFIER

1. Earphone Select Switch (Fig. 5 - Item 2)

This is a six button interlocked switch. The switch selects the signal source for the internal 2 watt audio amplifier. Any of the four main outputs, the effects send, or the cue signals may be selected.

2. Earphone Level Control (Fig. 5 - Item 3)

This is a loudness-compensated volume control for the earphone amplifier.

3. Earphone Jacks (Fig. 5 - Item 7)

These jacks accept standard stereo Hi Fi earphones. Only a stereo plug should be used since the two channels are connected internally to provide a monophonic signal. If a monophonic plug is used, the output of the internal amplifier is shorted. The amplifier can be damaged if the short circuit is maintained for an extended period of time.

TALKBACK AMPLIFIER

1. Talkback Level Control (Fig. 5 - Item 4)

This controls the voltage gain of the talkback microphone preamplifier.

2. Talkback Select Switch (Fig. 5 - Item 5)

This is a five section push-push switch. Each switch operates independently. When a button is down, the talkback microphone signal is connected to the indicated summing bus. Talkback is controlled by the appropriate Master Fader control, the Talkback Select switches, and the Talkback Button.

3. Talkback Button (Fig. 5 - Item 6)

This momentary switch turns on the talkback microphone subject to the level control and the select switches.

4. Talkback Microphone Connector (Fig. 5 - Item 1)

This standard microphone input connector is used to connect a low impedance microphone to the talkback amplifier.

FIGURE 5 — Talkback Earphone Module

REAR PANEL CONNECTORS (Fig. 6)

1. **Low Impedance (LO-Z) Microphone Inputs** (Fig. 6 - Item 6)

   These 12 microphone inputs are standard three pin audio connectors for use with low impedance (50 to 250Ω) microphones. The inputs are floated and transformer coupled. Pins 2 and 3 are the signal lines, Pin1 is chassis ground.

2. **High Impedance (HI-Z) Inputs** (Fig. 6 - Item 7)

   The 12 high impedance inputs are for use with high impedance microphones (50 KΩ) or line level signals from either high impedance or low impedance sources. Use of these standard single conductor phone jacks disconnects any source connected to the low impedance microphone connector for that channel.

3. **High Level Input/Output Jacks** (Fig. 6 - Item 8)

   These 12 stereo phone jacks provide an effects looping capability for the input channels. The jacks can also be used to obtain a pre-fader, post-E.Q., line level output from each input channel. These jacks add significantly to the flexibility of the M12 but can be misused if their function is not understood. The use of these jacks will be discussed more fully in the Console Use section.

4. **Main Outputs** (Fig. 6 - Item 4)

   The four main console outputs (Program, Monitor 1, Monitor 2, Monitor 3) are three-pin male connectors. The outputs are transformer coupled. Pins 2 and 3 are the signal lines, Pin 1 is chassis ground. Each output will drive a 600Ω load to +20 dB_m (+22 dBv).

5. **Unbalanced Outputs** (Fig. 6 - Item 8)

   These four phone jacks provide unbalanced outputs for the four main output signals. These outputs are the signals supplied to the primaries of the four output transformers. These outputs will drive 600Ω loads if the main outputs are not loaded, or have high impedance loads. The mixer can drive a combination load of 600Ω on main and unbalanced outputs.

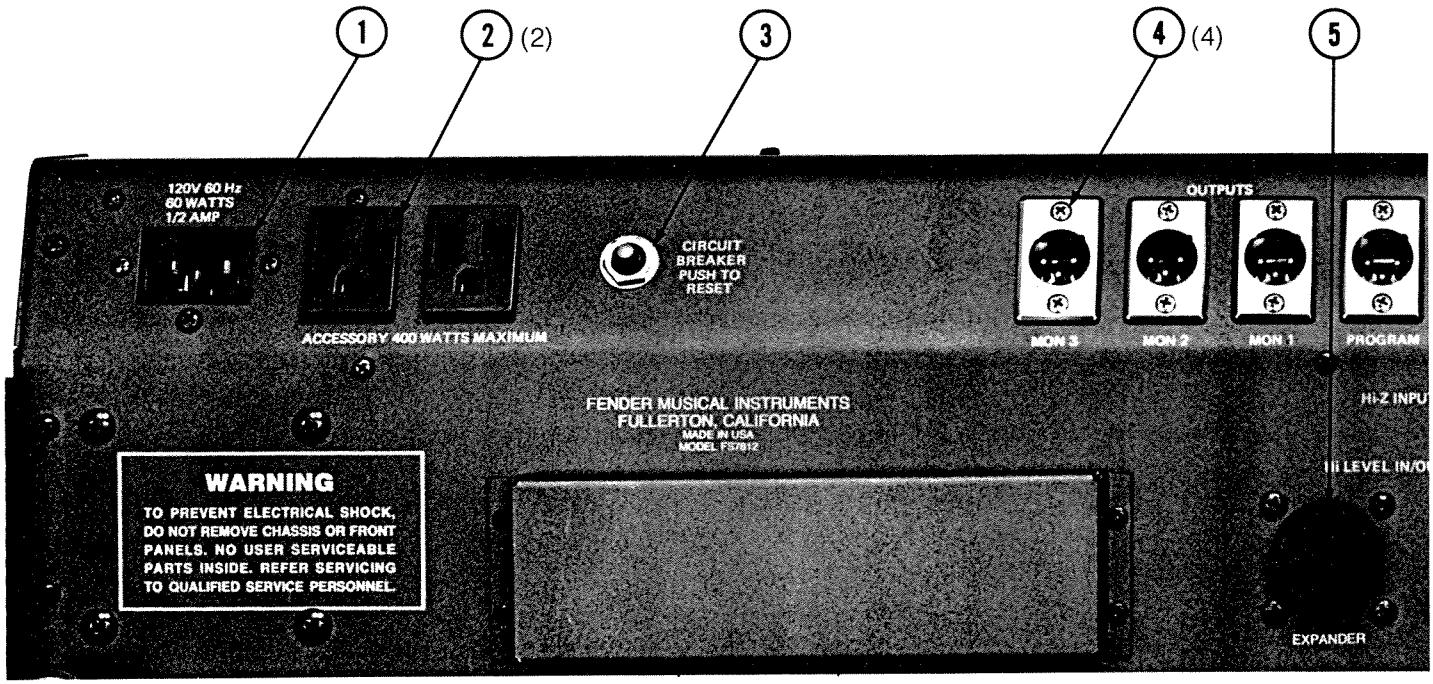


FIGURE 6 — Rear Panel Connectors

6. **Record Outputs** (Fig. 6 - Item 9)

   These four phone jacks provide a buffered unbalanced output for each of the four main output channels. These outputs are also capable of driving 600Ω loads.

7. **Direct Inputs** (Fig. 6 - Item 10)

   These four phone jacks provide high impedance inputs to the Program, Monitor 1, Monitor 2, and Monitor 3 summing amplifiers.

8. **Auxiliary Inputs** (Fig. 6 - Item 11)

   These four phone jacks provide inputs to the Auxiliary Level controls on the four master modules. They can be used as additional line level inputs. The jacks are wired so that a signal connected to the Program Auxiliary Input will also be fed to each of the other three auxiliary inputs if nothing is plugged into them. If the signal is connected to the Monitor 1 jack, it is fed to Monitor 2 and Monitor 3 also, provided the Monitor 2 and 3 jacks are not used. A Monitor 2 input signal is fed to Monitor 3 if the Monitor 3 jack is not used. A Monitor 3 input signal is fed only to Monitor 3.

9. **Sub Master Line Output/Input Jacks** (Fig. 6 - Item 12)

   These two stereo phone jacks function the same as the 12 High Level Input/Output jacks.

10. **Sub Master Direct Inputs** (Fig. 6 - Item 13)

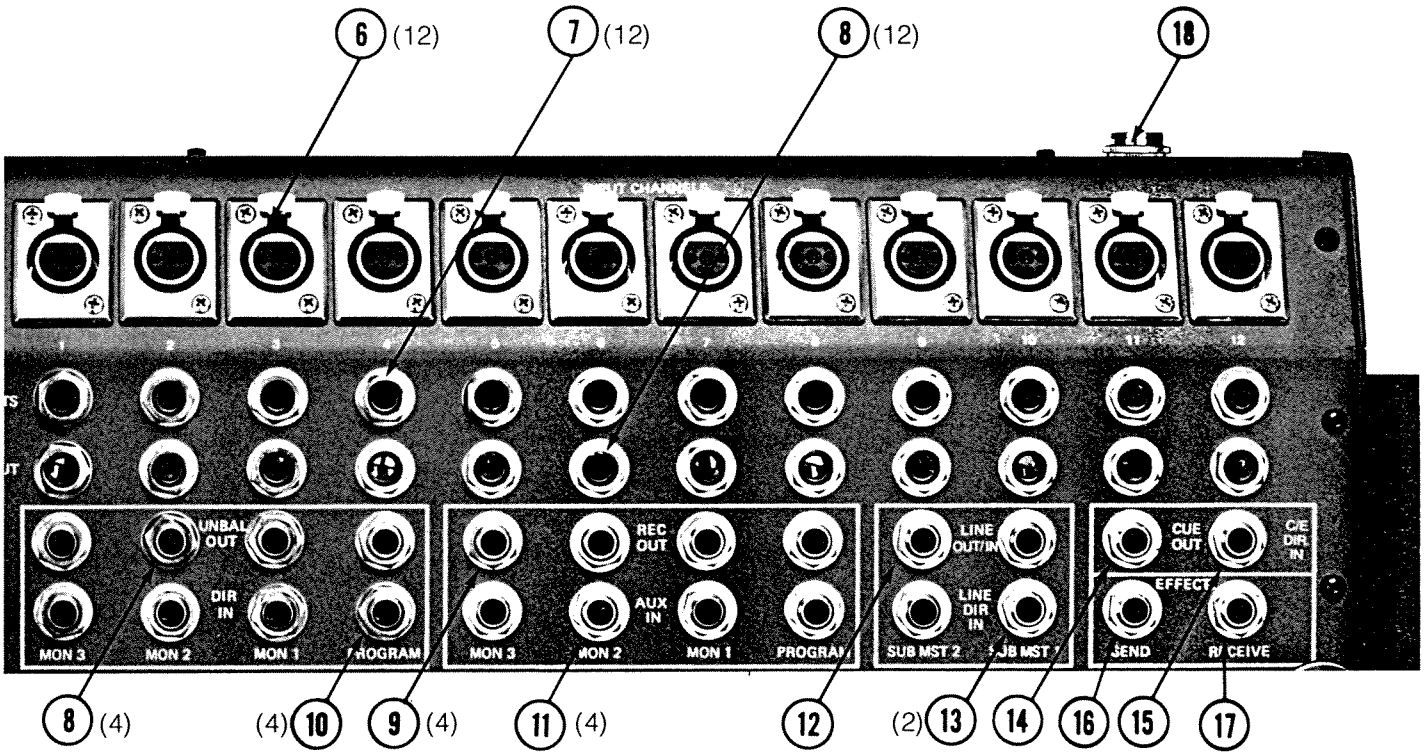
    These two phone jacks provide high impedance inputs to the two Sub Master summing busses.

11. **Cue Out Jack** (Fig. 6 - Item 14)

    This phone jack provides a line level output of the summed cue signal. The output can drive a 600Ω load.

12. **Cue/Effects Direct Input Jack** (Fig. 6 - Item 15)

    This stereo phone jack provides a high impedance input to the cue and the effects summing busses.



13. Effects Send Jack (Fig. 6 - Item 16)

This phone jack provides access to the output of the effects summing amplifier. The signal is used to drive an external effects device. Use of the jack does not disconnect the drive signal sent to the internal reverb unit.

14. Effects Return Jack (Fig. 6 - Item 17)

This phone jack provides a medium-impedance input for a signal returned from an external effects device. The signal is available on the four master modules at the Effects control. Use of this jack disconnects the return signal from the internal reverb.

15. Power Cord Connector (Fig. 6 - Item 1)

This connector accepts the AC power cord provided with the console. M12 consoles delivered in the U.S., CANADA, and JAPAN are supplied with a grounded (3 wire) AC cord for connection to a 120 volt 50/60 Hz power source. The mixer has been designed to operate within specification for input voltages from 90 VAC to 130 VAC. However, brilliance of the lights may vary proportional to input voltage.

M12 consoles delivered outside the U.S., CANADA, and JAPAN are supplied with a grounded AC cord for connection to a 240 volt 50/60 Hz power source. The console will operate from 180 V to 260 V AC.

16. Accessory AC Outlets (Fig. 6 - Item 2)

Two accessory 120 volt outlets are provided on the 120 V model. The outlets are deleted on the 240 V model. The accessory outlets should not be loaded in excess of 400 watts.

17. Circuit Breaker (Fig. 6 - Item 3)

The circuit breaker provides protection for the unit in the event of major power supply failure. The circuit breaker is reset by pushing the red button in. Pushing the button while the unit is operating will interrupt the AC power and cause the system to turn off.

18. Panel Lamp Socket (Fig. 6 - Item 18)

This socket provides 6 VAC power for the optional panel lamp. Recommended Lamp: Fender Part No. 71-2100.

19. On/Off Switch

This illuminated pushbutton is located at the right end of the VU meter panel. It controls all AC power to the console. CAUTION: Always turn on M12 Mixer before Power Amplifier is turned on. Always turn off Power Amplifier before M12 Mixer is turned off.

20. Expander Connector (Fig. 6 - Item 19)

This is used for connection of an optional expander.

USE OF THE M12 MIXER

The information presented in this section is intended to complement and expand upon the description of the module function already presented.

Input Modules

The twelve input modules are the first elements in the mixer signal processing system. Each input module contains an input transformer, a variable gain preamplifier, high frequency and low frequency equalization controls, five output mix controls, and several signal routing switches.

Under normal operating conditions one low impedance microphone is connected to each of the twelve input channels. With a normal input signal present at the microphone, the gain control is adjusted as far clockwise as is possible without lighting the overload indicator. The equalization controls are then adjusted if necessary. Use of the proper microphone and microphone placement will minimize the amount of equalization required and, in most cases, the mix will be better if equalization is minimized. One way to get an initial adjustment of both gain and equalization is to use the headphone amplifier and cue bus. This is accomplished by pushing the cue select button on the input channel, the cue select button on the earphone select switch, and adjusting the earphone volume control for an acceptable monitoring level.

Once the gain and equalization are adjusted, the output mix controls must be adjusted. The signal is added to the program mix by pushing the channel on/off pushbutton down (the green LED should illuminate) and advancing the channel attenuator (adjusting for less attenuation). In order for the module to be connected directly to the program bus the two Sub Master assign buttons must be in the up (off) position.

If the signal from this channel is also to be processed by the internal reverb (or external effects device) the effects control must be advanced. The effects send mix can also be monitored using the earphone amplifier.

Up to three separate monitor (or foldback) mixes can now be constructed using the three monitor send controls. The monitor mixes formed using the input channel monitor controls are independent of the program fader (pre-fader), the channel on/off switch, and the Sub Master assign switches.

High Level Input/Output Jacks

A special feature of the input channels is the high level input/output jacks located on the rear panel. Each jack is a tip-ring-sleeve type stereo phone jack. When a plug is connected to the jack, the normal signal routing in the input module is interrupted. Figure 7 indicates what takes place.

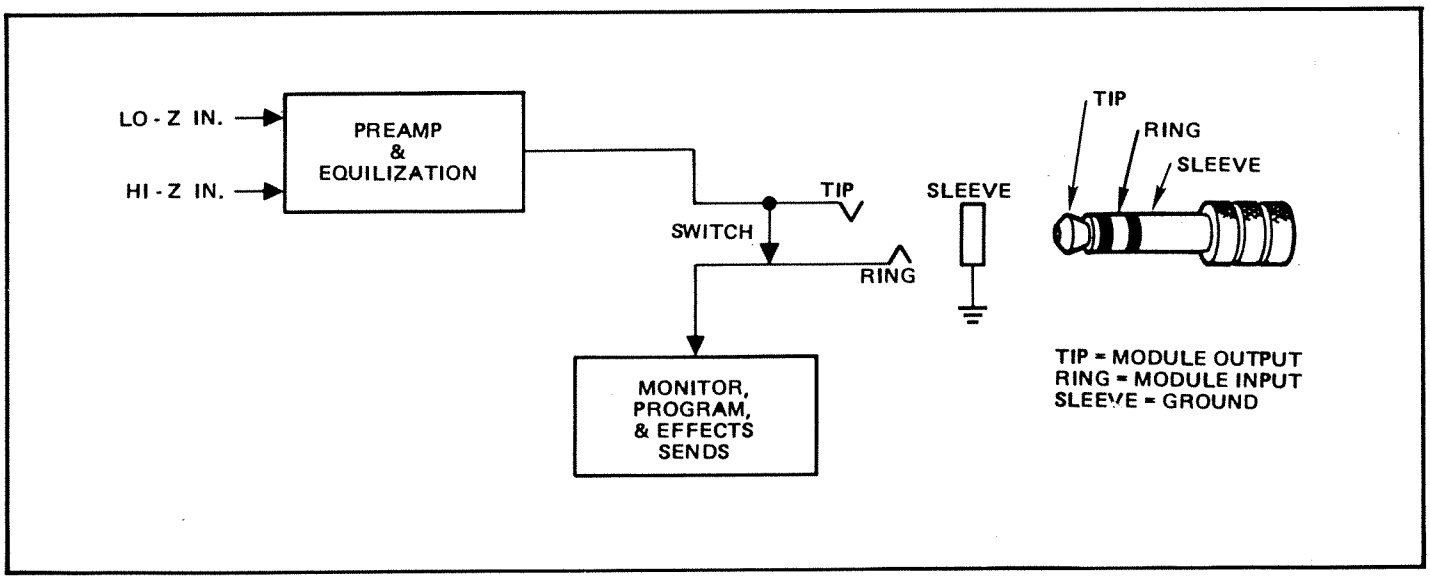


FIGURE 7 — High Level Input/Output Jacks

The tip connection is the module output following the pre-amp and equalization. The ring connection is the module input signal to various output mix controls. The sleeve is ground (or the shield). The switch connecting the tip and ring circuits is opened when a plug is inserted in the jack.

The following examples illustrate possible uses of these jacks:

Channel Accessory Patching

Assume that it is desired to patch an external limiter into the lead vocal audio. The lead vocal for this example is assigned to Channel 6. The Channel 6 high level output is routed to the external limiter input. The limiter output is routed to the Channel 6 high level input. Refer to Figure 8 for a more detailed connection diagram.

Multi-track Recorder Connection

For a second example, assume that an 8 channel multi-track recording is to be made at the same time that the mixer is used for a sound reinforcement send. For the purpose of this example assume the following channel and track assignments.

With the system patched as indicated in Figure 9b, the operation of the console for sound reinforcement is unchanged. The eight recorder feeds are pre-fader and are subject only to gain control and equalization changes on the console. The use of the console for simultaneous multi-track recording will be discussed in more detail in the special patching section.

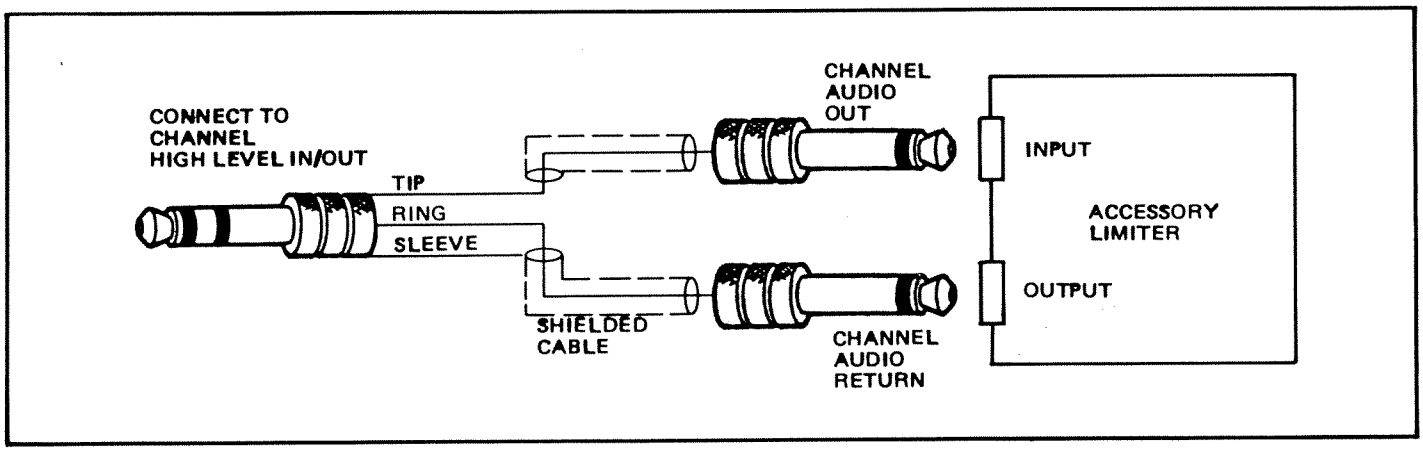


FIGURE 8 — Channel Accessory Patching

CHANNEL #	SIGNAL IDENTIFICATION	RECORD TRACK
1	Lead Vocal	1
2	Lead Guitar	2
3	Back-Up Vocal	3
4	Keyboards	4
5	Bass	5
6	Kick Drum	6
7	Drum Overhead Left	7
8	Drum Overhead Right	8
9		
10	NOT USED	
11		
12		

FIGURE 9a — Multi-Track Recorder Connection

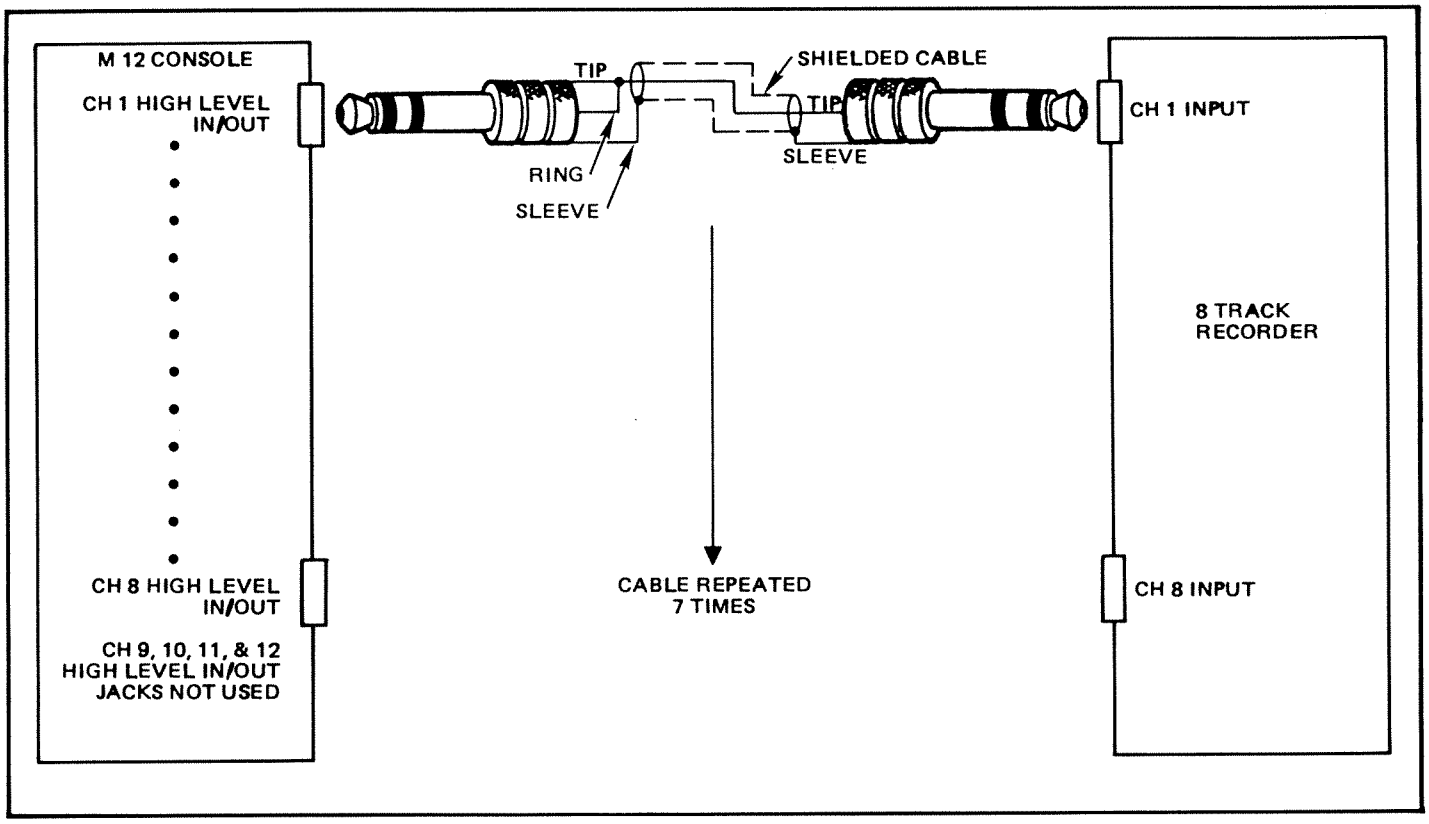


FIGURE 9b — Multi-Track Recorder Connection

Several precautions on the use of the High Level Input/Output jacks must be noted. Since the jacks are of the switching type, insertion of a plug interrupts the normal module signal routing. The signal path must be restored either in an external signal processor (the limiter example) or by a connection in the plug (recorder example). If a standard (mono) phone plug is inserted into the High Level In/Out jack, the module output signal is available at the plug tip. Since the monophonic plug sleeve is ground, it will connect the ring contact of the jack to ground and thus ground the module return signal. Although the input signal, modified by the gain and equalizer controls, is available at the plug tip, the signal is no longer available within the module for routing to any of the mixing busses (except for the cue bus).

Sub Master Modules

Use of the Sub Master Modules is optional as far as the basic mixer signal flow is concerned. These two modules can be used to form two sub groups of signals out of the twelve available input signals. The functioning of the Sub Master is best explained by the use of an example. Consider the sound reinforcement set-up in Figure 10.

Generation of the program mix (house PA feed) would be accomplished in the following manner: The drum microphones are mixed using the channel 1 through 5 program faders. These signals are combined in the Sub Master 1 module and the composite mix is then added to the program mix using the Sub Master 1 program fader. The overall drum mix is controlled by Sub Master 1. The channel 6 through 9 signals are routed directly to the program master by their respective channel program faders. Channels 10 through 12 are assigned to Sub Master 2. The individual background vocals are balanced using the individual channel program faders. The resultant background vocal mix is then added to the program bus using the Sub Master 2 program fader.

CHANNEL #	SIGNAL DESCRIPTION	SIGNAL ROUTING
1	Kick Drum	Sub Master 1
2	Left Drum Overhead	Sub Master 1
3	Left Tom Tom	Sub Master 1
4	Right Drum Overhead	Sub Master 1
5	Right Tom Tom	Sub Master 1
6	Lead Vocal	Normal
7	Lead Guitar	Normal
8	Bass	Normal
9	Rhodes	Normal
10	Vocal 2	Sub Master 2
11	Vocal 3	Sub Master 2
12	Vocal 4	Sub Master 2

FIGURE 10 — Typical Sound Reinforcement Channel Assignment

The monitor mixes for the Sub Master groups can now be generated in either of two ways. The monitor mixes can be generated by using the monitor send controls located on each of the input modules, leaving the monitor send controls on the Sub Master at zero. Alternatively, the monitor signal can be derived using the composite signal on the Sub Master module. If the Sub Master monitor sends are used, the monitor send controls on the input modules which form the sub group should be left at zero (full counterclockwise position). The effects mix will operate in the same way as the monitor mixes.

A unique feature of the Sub Master module is the built-in limiter. The limiters used in the M12 mixer are of the fast attack, slow release type. They operate using a full wave active rectifier and a peak holding detection circuit. The threshold of the detector is adjustable on the front panel and a red LED indicates when the signal has exceeded the threshold and the limiter starts to operate. When the on/off switch is in the up (off) position, the limiter is inhibited from operating.

The limiter is used to prevent short term high level peaks from reaching the output. With proper adjustment, the limiter will prevent over-driving of the power amplifier which in turn will prevent damage to expensive compression drivers.

The Sub Master module is provided with a full set of patching jacks. It has a high level input/output jack which performs the same function as the corresponding jacks on the input modules. A direct input jack is also provided. This high impedance input jack can be used to feed a signal directly into the Sub Master summing amplifier. If no input modules have been assigned to the Sub Master, the module can be used as an additional input channel for a line level signal connected to the direct input jack.

Master Modules

The M12 Mixer system contains four master modules. Each of the modules is assigned to one of the four main output functions (Program, Monitor 1, Monitor 2, Monitor 3). The output assignment is accomplished using PCB mounted DIP switches, preset in the factory at the time the modules are installed in the chassis.

The Master Module contains the bus summing amplifier, effects and auxiliary input controls, a five band frequency response equalizer, and an adjustable limiter. Response curves for the equalizer are given in Figure 18. On this module the master fader is connected so that it controls the gain of the summing amplifier. Since there is voltage gain following the summing amplifier, this arrangement prevents overload of the summing amplifier before output clipping.

The other module functions have been explained in the Control Identification section.

Direct Inputs

The M12 Console is equipped with a high impedance direct input to each of the eight summing amplifiers. These inputs have been provided so that additional mixers can be connected without using one of the M12 input channels. The gain of the direct inputs is controlled only by the master faders for the four main output channels and is a fixed gain for the two Sub Masters, Effects, and Cue. The signal level applied to these inputs should be typically 0 dB_m on the four main channels and approximately -10 dB_m on the other inputs.

Since there is so much equipment of different manufacture and age available, only two very basic examples of the use of the direct inputs will be given.

For the first example, assume that a second mixer is to be added to the M12 to expand the number of available inputs. The second mixer has six input channels, a main output channel and an effects output channel. The connection to the M12 is shown in Figure 11. The accessory mixer will operate directly into the program and effects busses in the M12 console. Since the accessory mixer does not have monitor send controls, the signals from the accessory mixer cannot be added to the M12 monitor system with the connection shown.

For the second example, a more complex second mixer will be used. This mixer has eight inputs, left and right main outputs, a monitor output, and an effects output. The mixer connection is shown in Figure 12. This connection results in the accessory left output assigned to the M12 program output, the right output assigned to Monitor 1, the monitor output assigned to Monitor 2, and the effects assigned to the M12 effects system.

The direct inputs can also be used for feeding any additional line level signals into the mix. However, there should be a level control on the signal being added so that it can be balanced with the internal M12 signals.

The summing amplifier current summing junctions (summing busses) are available at the multipin expander connector. This connection should only be used with the Fender input expander unit. Other commercially available mixers may also be modified to use this interface.

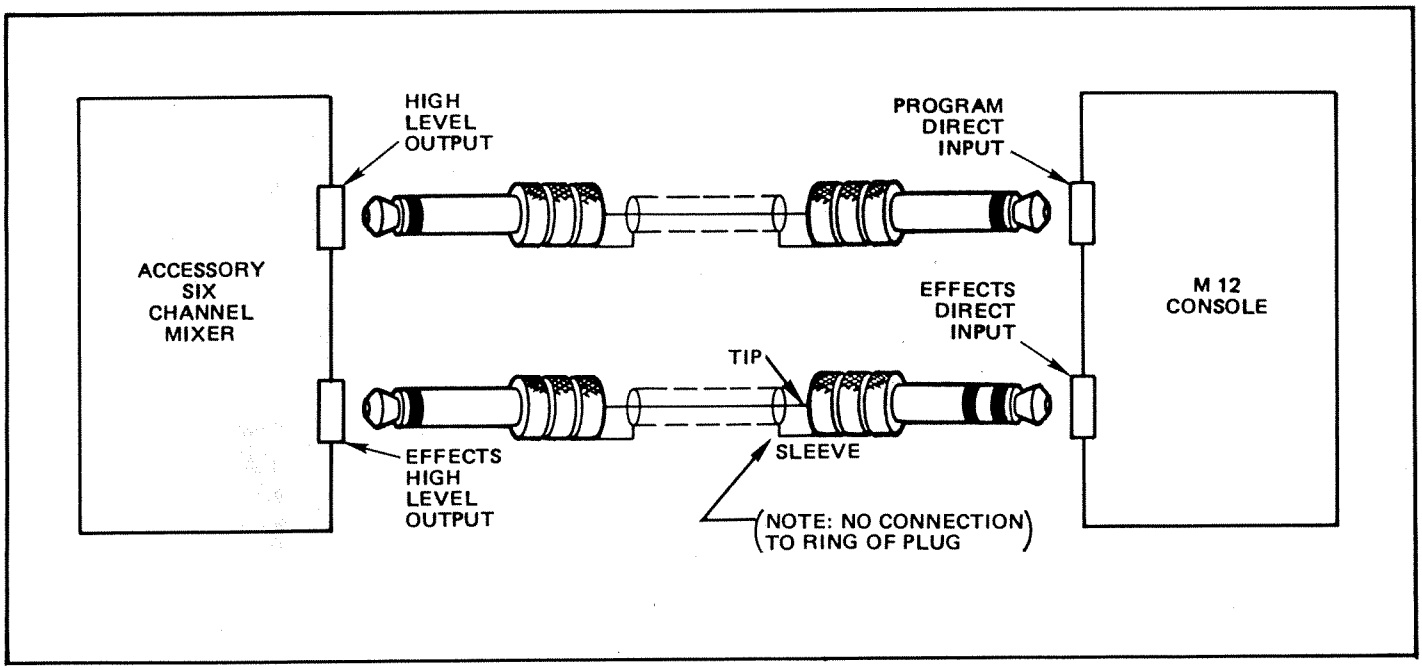


FIGURE 11 — Direct Inputs Example 1

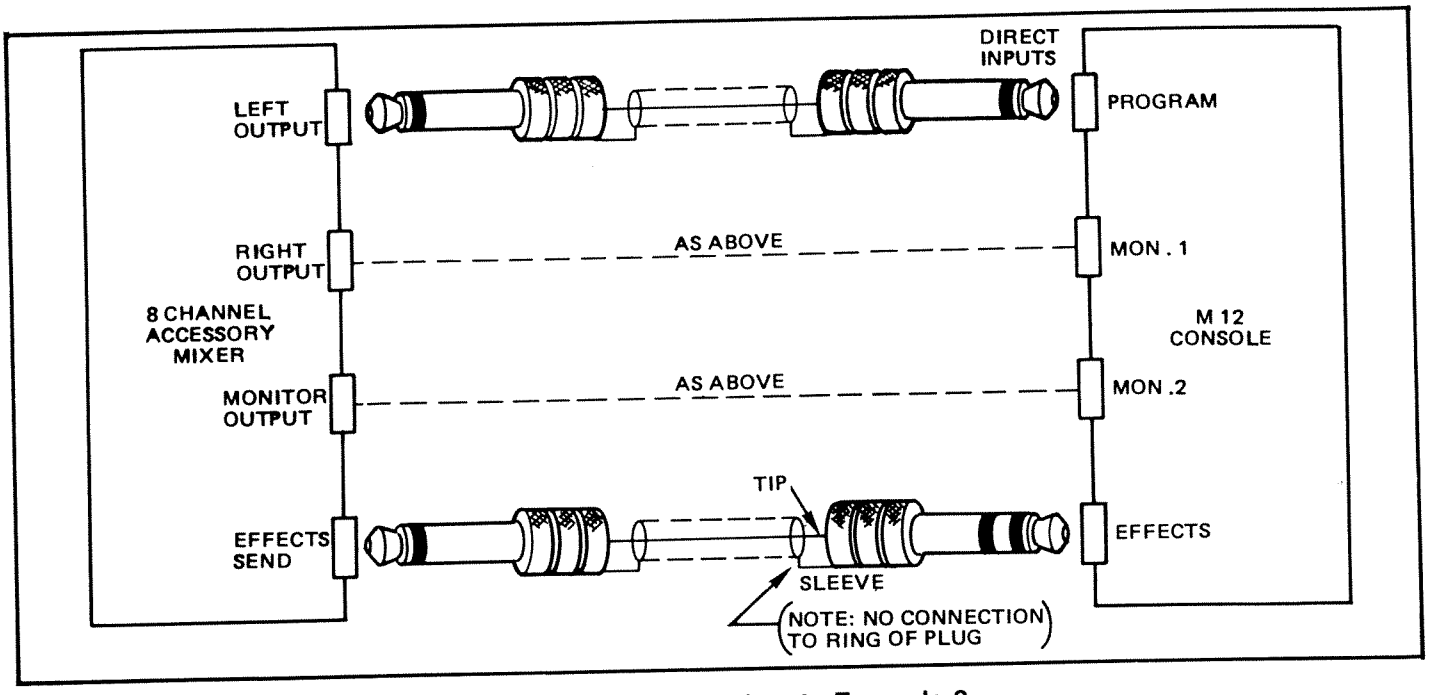


FIGURE 12 — Direct Inputs Example 2

SPECIAL FUNCTION PATCHING

The M12 Console contains 58 phone jacks and 17 three-conductor XLR type audio connectors. With the exception of the Talkback Microphone connector, all of the three-conductor XLR connectors are transformer coupled. The phone jacks are all unbalanced signals. The following examples demonstrate the patching capability built into the M12 Console.

Multi-Track Recording

While the M12 is specifically designed for sound reinforcement applications, the patching capability is well suited to the simultaneous connection of an 8 track recorder. One basic connection has already been presented in the discussion on the use of the high level input/output jacks.

For a more complex example, assume that an 8 channel multi-track recording is to be made while the mixer is used for a live PA feed. The following mixer set-up is being used (Figure 13).

In this example, the house sound reinforcement feed is derived from the Console Program output. Only

CHANNEL #	INPUT SIGNAL	SUB GROUP	RECORDER CHANNEL
1	Kick Drum	—	1
2	Drum Overhead Left	Monitor 2	2
3	Tom Tom Left	Monitor 2	2
4	Drum Overhead Right	Monitor 3	3
5	Tom Tom Right	Monitor 3	3
6	Lead Vocal	—	4
7	Lead Guitar	—	5
8	Bass	—	6
9	Keyboards	—	7
10	Vocal 2	Sub Master 1	8
11	Vocal 3	Sub Master 1	8
12	Vocal 4	Sub Master 1	8

FIGURE 13 — Multi-Track Recording Channel Assignment

one stage monitor mix is used and this is derived from the Monitor 1 console output. For the House and Monitor 1 feeds, all 12 channels and Sub Master 1 are mixed using the program and Monitor 1 faders. Channels 10, 11, and 12 are assigned to Sub Master 1 (Sub Master 2 is not used in this example). Sub Master 1 is used for the back up vocals. The 12 inputs are then grouped into 8 recorder feeds as indicated in the track assignment table. The Monitor 2 and Monitor 3 outputs are used to combine the left and right drum signals so that when the 8 track recording is mixed down, the drum kit can be given a stereo perspective. Three other channels have been combined using Sub Master 1. The patching required is indicated in Figure 14.

The connection requires 6 special patch cords and two standard shielded patch cords. The important thing to remember about the above set-ups is that all the recording signals are pre-fader except for the three inputs which were routed to Sub Master 1. The recording signal is, however, pre-sub master fader.

Many other combinations are also possible. The second sub master can be used as another record send, the effects signal may be used, or the cue bus output may be used. As many inputs as desired can be assigned to the cue bus simultaneously.

Two Effects Devices

Another convenient feature of the M12 will allow for the simultaneous use of the internal reverb and an external effects device. The effects mix that is sent to the two devices is the same and is formed using the Effects Controls on the input modules. The return signal from the two devices is separately adjustable on the master modules. With the patching shown in Figure 15 the Effects Return Control on each Master Module will control the amount of return signal from the internal reverb that is added to the mix. The Auxiliary Input Level Control on each Master Module will control the amount of return signal from the external device that is added to the mix. It should be noted that when a return signal is plugged into the Program Auxiliary Input only, it is also connected internally to the other Master Module Auxiliary Inputs.

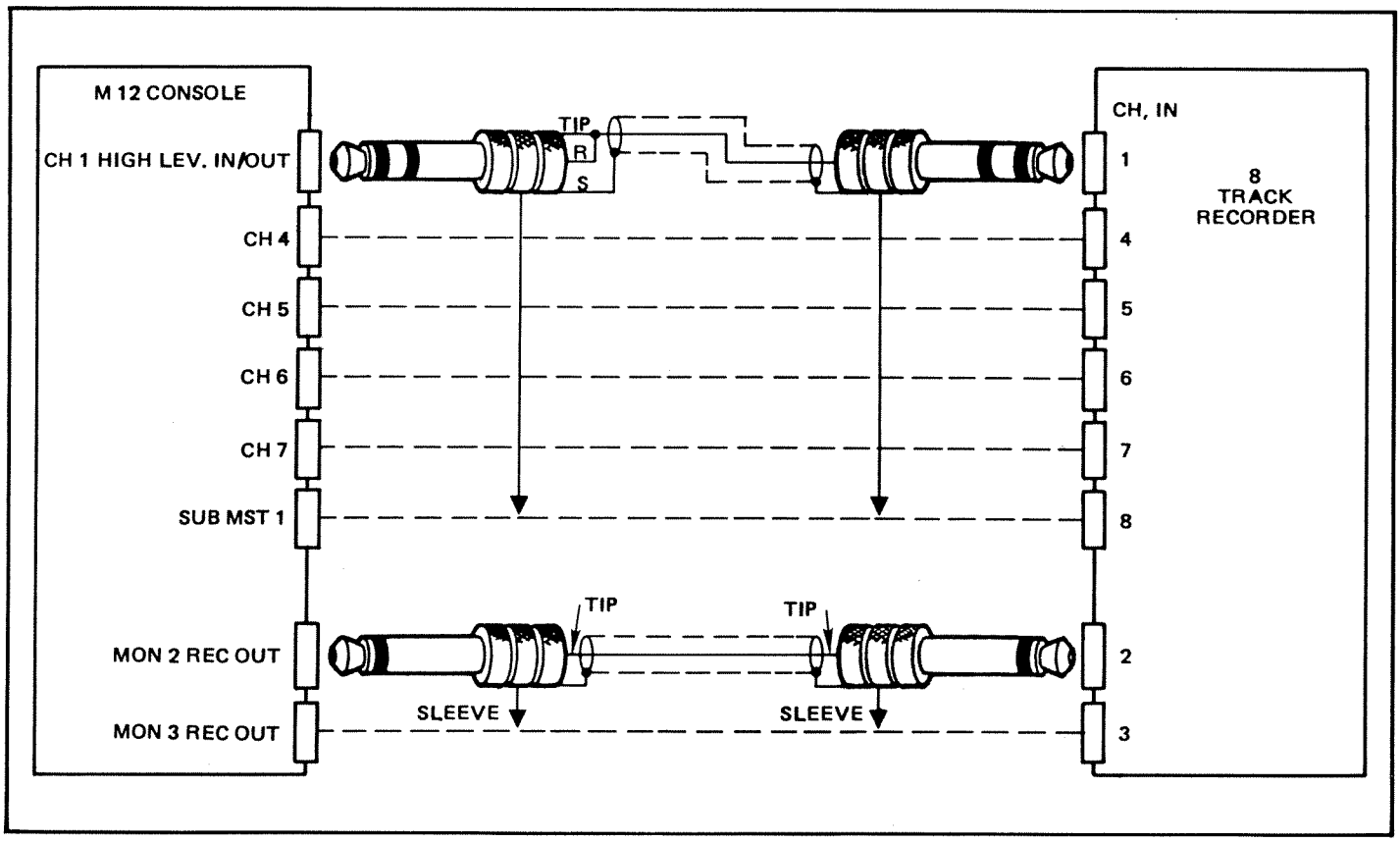


FIGURE 14 — Multi-Track Recording Patching

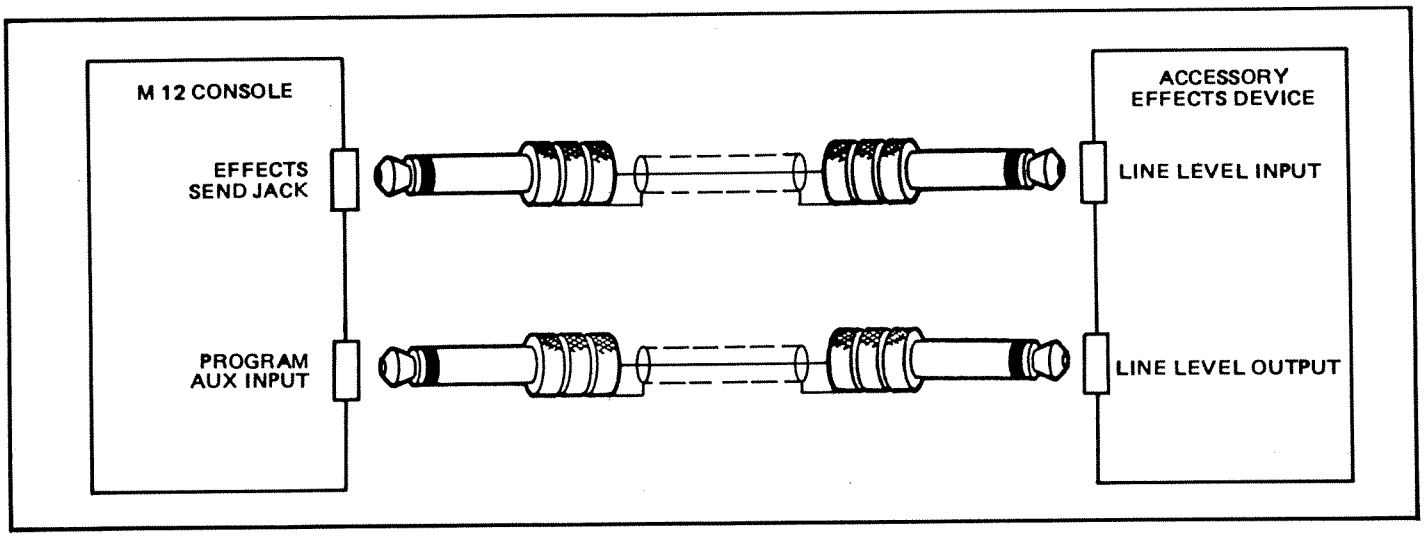


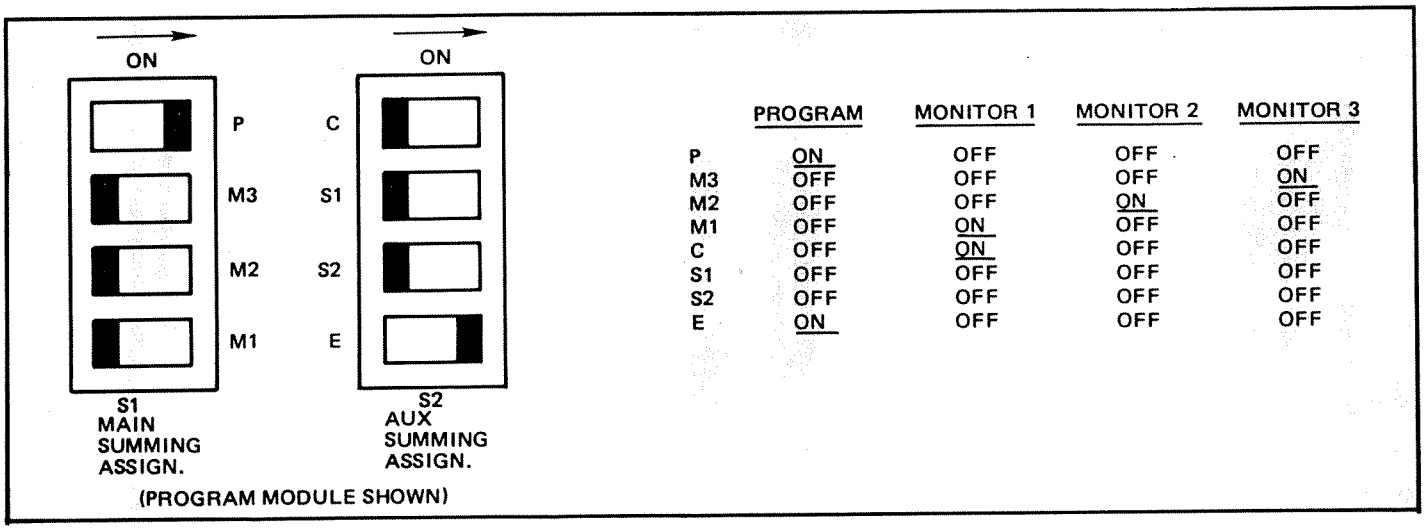
FIGURE 15 — Special Auxiliary Effects Patching

CONSTRUCTION NOTES

A review of the modular type construction of the M12 will be useful. The Console contains 19 front panel modules composed of four different types. Any module may be removed by first disconnecting the module's connecting cables from the inside of the unit and then removing the two phillips head screws which secure the module. The twelve input modules are identical and can be positioned in any one of the twelve input channels. The two Sub Master modules are electrically identical, but have been physically assigned to be Sub Master 1 or Sub Master 2. The assignment has been performed during assembly by the connection of a jumper wire on the module PC Board and the installation of either a white or grey on/off pushbutton. In an emergency, the modules can be reassigned by moving the jumper wire, which uses removable push-on terminal contacts.

Internal Programming.

The four Master Modules are also electrically identical. They are assigned at the time of assembly by the use of PC mounted slide switches (Figs. 16a, 16b). Since each Master Module contains two summing amplifiers, a separate switch is provided for each one. The programming is accomplished as indicated in Fig. 16a. It should be noted that the auxiliary summing amplifiers on Monitor 2 and Monitor 3 Master Modules are not used. Under no circumstances should there be more than one summing amplifier assigned to the same bus.



	PROGRAM	MONITOR 1	MONITOR 2	MONITOR 3
P	ON	OFF	OFF	OFF
M3	OFF	OFF	OFF	ON
M2	OFF	OFF	ON	OFF
M1	OFF	ON	OFF	OFF
C	OFF	ON	OFF	OFF
S1	OFF	OFF	OFF	OFF
S2	OFF	OFF	OFF	OFF
E	ON	OFF	OFF	OFF

FIGURE 16a — Master Module Function Assignment (Internal)

FIGURE 16b — Assignment Switches (Internal)

Trim Controls

The M12 Console contains four internal trim controls, (Fig. 17). These are located on the four Output/Meter Driver PC Boards, one for each main output channel. The controls allow calibration of the VU meters. If the Console is to be operated at a VU reference point other than +4 dB, these controls may be adjusted accordingly.

FIGURE 17 — Trim Controls (Internal)

M12 ELECTRICAL SPECIFICATIONS

LOW IMPEDANCE BALANCED INPUT TO PROGRAM BALANCED OUTPUT

Frequency Response[1]:	+0, −4 dB, 20 Hz to 20 kHz +0, −1.5 dB, 35 Hz to 20 kHz
Total Harmonic Distortion: plus Noise[1]	Less than 0.1%, 40 Hz to 20 kHz Less than 0.2%, 20 Hz to 20 kHz
Hum and Noise[2]:	−128 dB_m maximum equivalent input noise (150Ω source, 600Ω load, maximum gain) −80 dB_m master fader at minimum −70 dB_m master fader at −10, all input faders at minimum −70 dB_m master fader at −10, one channel at −10 with gain set to mid position
Voltage Gain:	83 ±2 dB maximum, LO impedance balanced input to balanced output 600Ω load 60 ±2 dB maximum, LO-Z input to channel line level output 65 ±2 dB maximum, LO-Z input to effects output 61 ±2 dB maximum, high impedance input to main outputs 16 ±2 dB maximum, auxiliary input to main outputs 16 ±2 dB maximum, effects return to main outputs 23 ±2 dB maximum, program direct input to balanced output
Equalization:	±15 dB typical @ 100 Hz, shelving ±15 dB typical @ 10 kHz, shelving
Maximum Input Voltage:	460 MV_{RMS}, LO-Z input (−4.5 dB_m) 4.6 V_{RMS}, HI-Z input (+15.5 dB_m)
Output Voltage:	0 VU = +4 dB_m = 1.23 V_{RMS} (600Ω load), balanced output +19 dB_m maximum, balanced outputs, 600Ω load +20 dB_m maximum, unbalanced outputs, 600Ω load

1. LO impedance balanced input to program balanced output loaded with 600Ω. Gain at mid position. Master at −10, input voltage = 1.5MV_{RMS} output voltage = .775MV_{RMS} (0 dBm). Equalization flat.

2. Band limited at 30 KHz. Equalization flat. 150Ω source, 600Ω load, unless otherwise indicated.

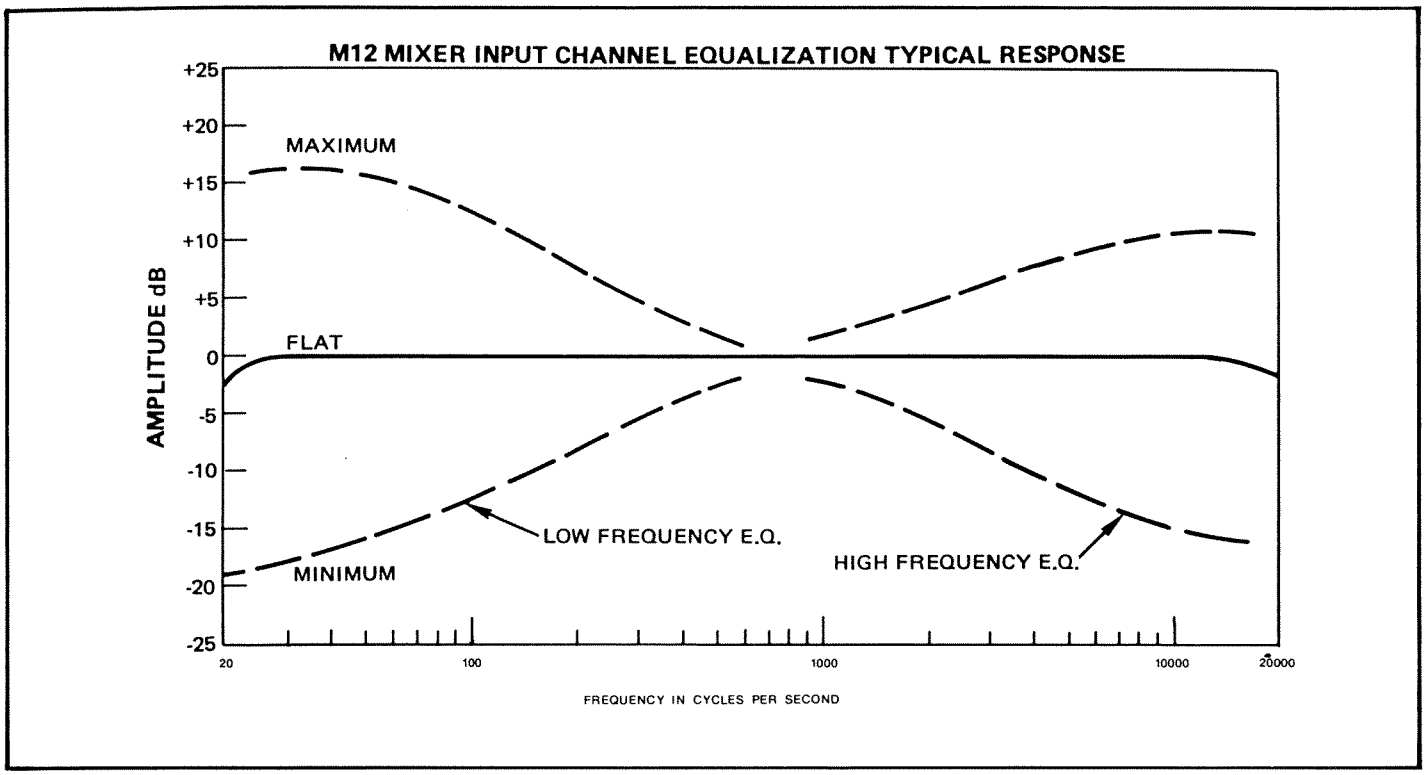


FIGURE 18 — M12 MIXER INPUT CHANNEL EQUALIZATION TYPICAL FREQUENCY RESPONSE

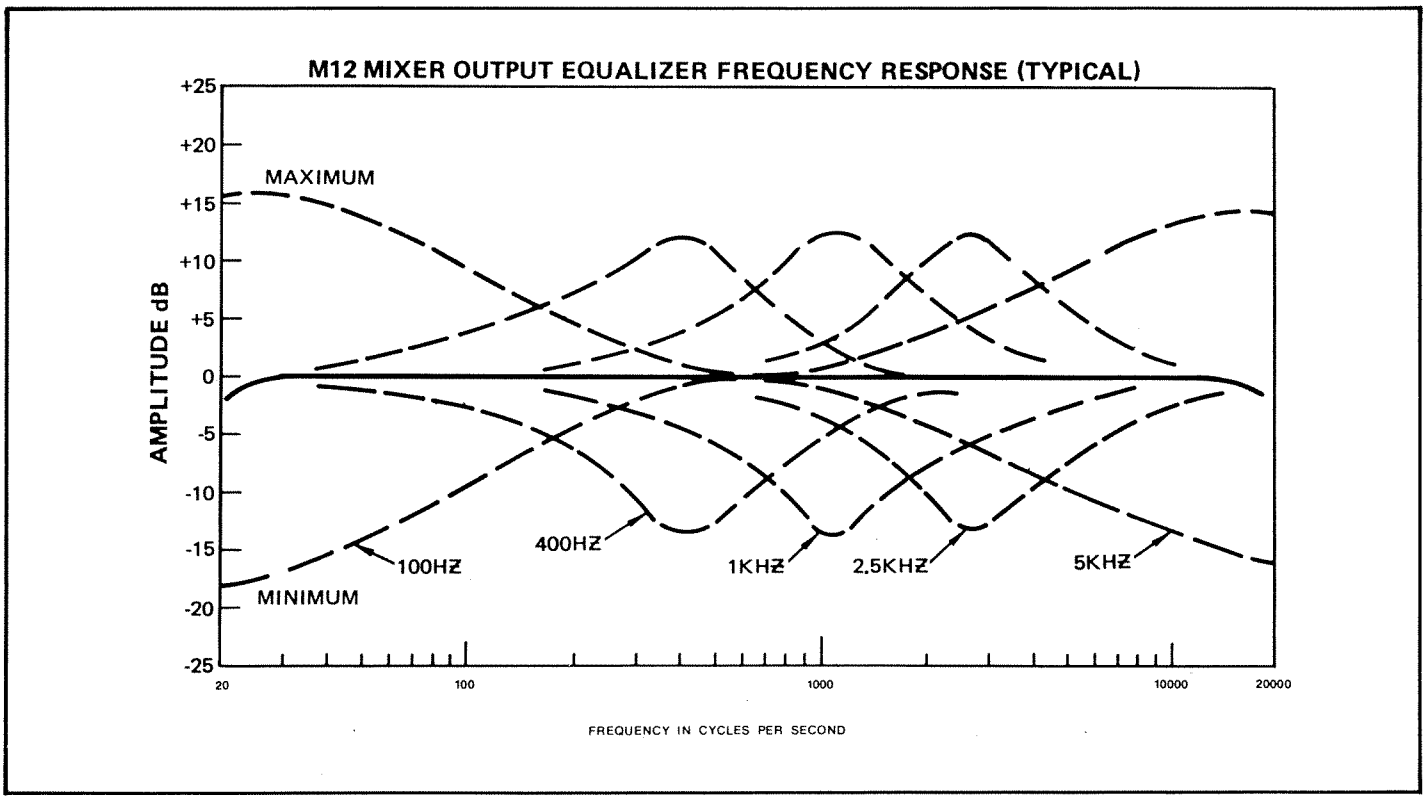


FIGURE 19 — M12 MIXER OUTPUT EQUALIZATION TYPICAL FREQUENCY RESPONSE

Signal (Quantity)	Nominal Source Impedance	Actual Input Impedance @ 1 kHz	Sensitivity At Max. Gain	Nominal Input Level	Maximum Input Before Clip	Console Connector
LO-Z Microphone (12)	150Ω	1KΩ	−79 dB_m (0.11MV)	−34 dB_m (15MV)	−4.5 dB_m (460 MV)	XLR 3 pin
HI-Z Microphone (12)	15KΩ	100KΩ	−57 dB_m	−14 dB_m (150 MV)	+15.5 dB_m (4.6V)	Phone
Auxiliary (4)	600Ω max	25KΩ min	−12 dB_m	0 dB_m	+25 dB_m[1]	Phone
Effects Return (1)	600Ω max	10KΩ min	−12 dB_m	0 dB_m	+25 dB_m[1]	Phone
Summing Direct Inputs Prog., Mon. 1, Mon. 2, Mon. 3	600Ω max	47KΩ 100KΩ	−19 dB_m −19 dB_m	−10 dB_m −10 dB_m	+20 dB_m +20 dB_m	Phone Phone
Channel & Sub Master High Level Input (14)	600Ω max	2.5KΩ	−18 dB_m	−10 dB_m	+20 dB_m	Stereo Phone (ring connection)

1. These inputs are fed directly to a potentiometer so that there is no active element to overdrive. The noted numbers are reasonable maximum values in order to have an acceptable control range.

FIGURE 20 — Console Inputs

Signal (Quantity)	Rated Load Impedance	Actual Source Impedance @ 1 kHz	Nominal Output Level	Maximum Output Level	Console Connector	Notes
Balanced Main Outputs Prog., Mon. 1, Mon. 2, Mon. 3	600Ω minimum	150Ω	+4 dB_m	+19 dB_m	XLR - 3 pin	Transformer Coupled, floating
Unbalanced Main Outputs Prog., Mon. 1, Mon. 2, Mon. 3	600Ω[1] minimum	<0.5Ω	+4 dB_m	+20 dB_m	Phone	
Recording Outputs Prog., Mon. 1, Mon. 2, Mon. 3	600Ω minimum	<0.5Ω	+4 dB_m	+20 dB_m	Phone	Unbalanced
Effects send	600Ω	<0.5Ω	−15 dB_m	+20 dB_m	Phone	Unbalanced
Cue	600Ω	<0.5Ω	−10 dB_m	+20 dB_m	Phone	Unbalanced
Channel & Sub Master High Level Output	600Ω minimum	<0.5Ω	−10 dB_m	+20 dB_m	Stereo Phone	Tip Connection
Earphone	8Ω minimum	<1Ω	$1V_{RMS}$	$4V_{RMS}$	Stereo Phone	2 watts Maximum Output

1. The total load on the Balanced & Unbalanced outputs for a given channel.

FIGURE 21 — Console Outputs

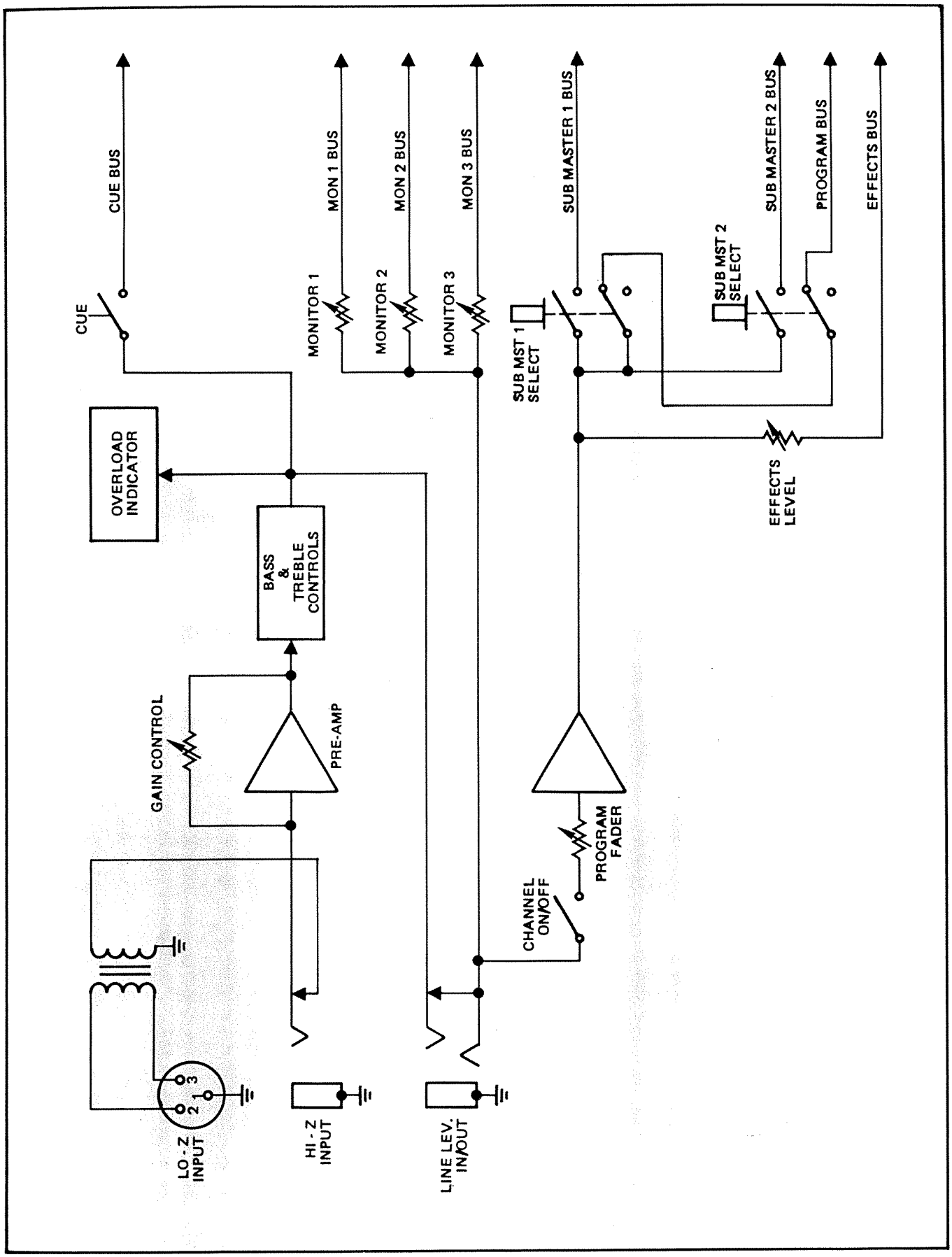


FIGURE 22 — Typical Microphone Input Module Block Diagram

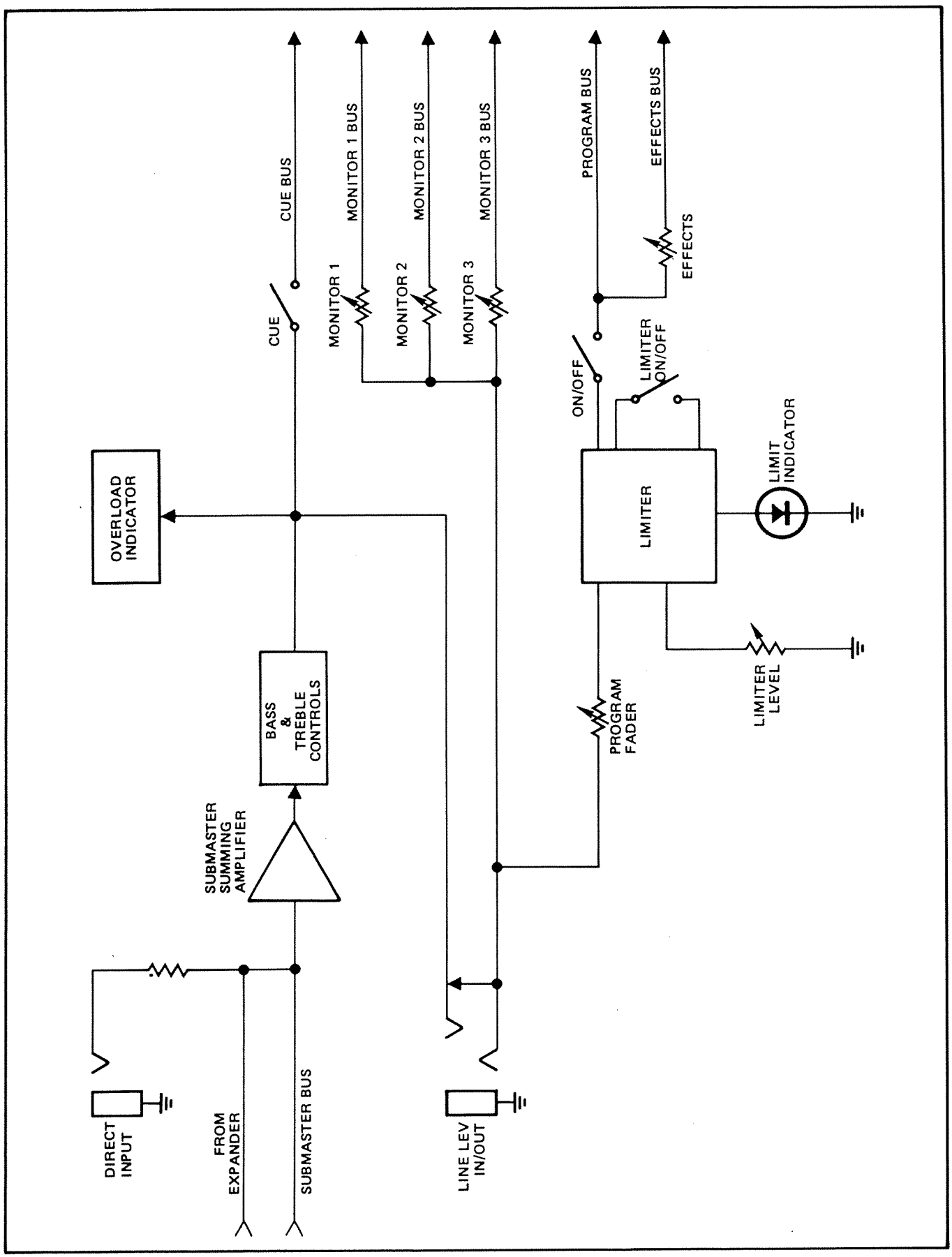


FIGURE 23 — Typical Sub Master Module Block Diagram

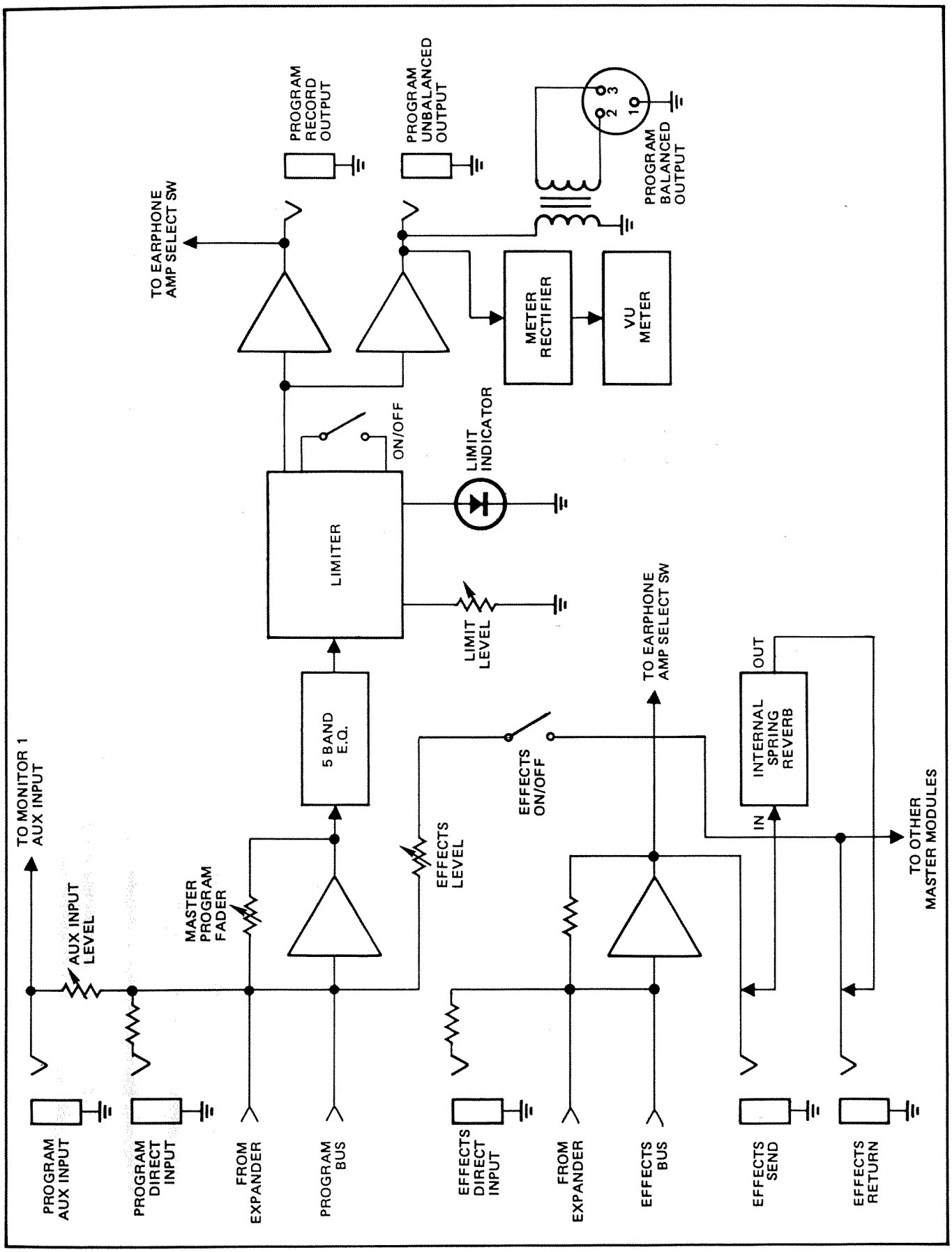


FIGURE 24 — *Program* Master Module and Output Section Block Diagram

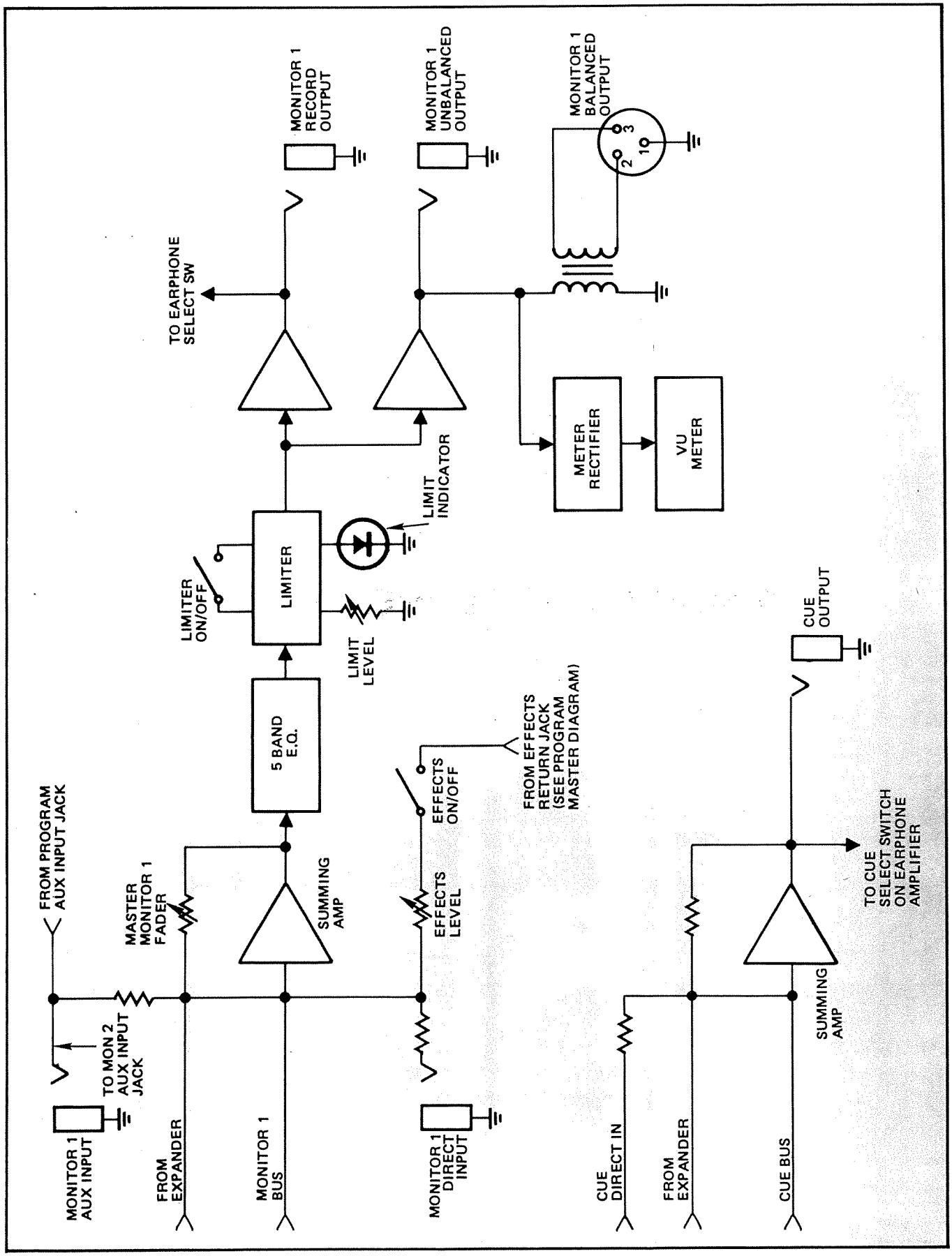


FIGURE 25 — *Monitor 1* Master Module and Output Section Block Diagram

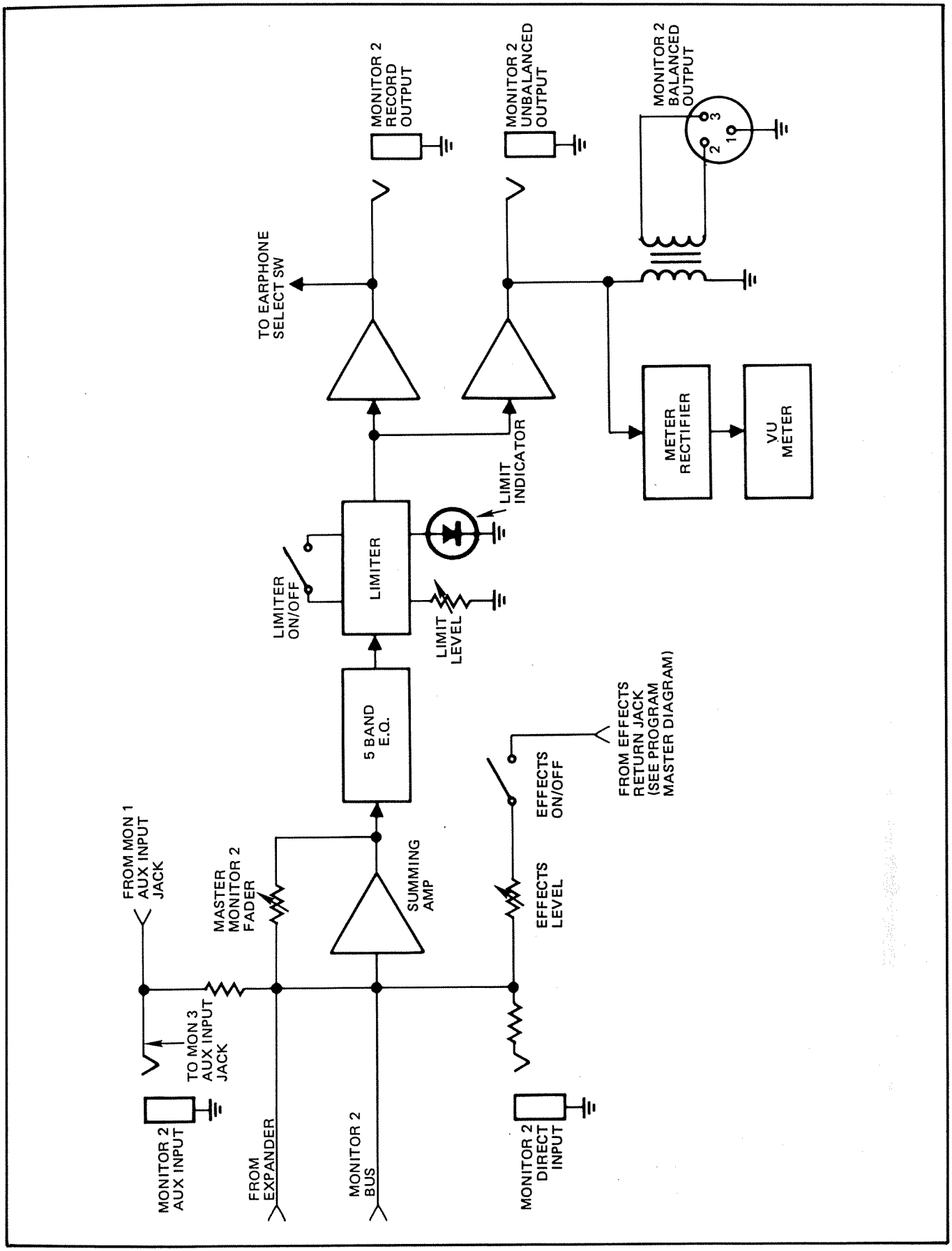


FIGURE 26 — *Monitor 2* Master Module and Output Section Block Diagram

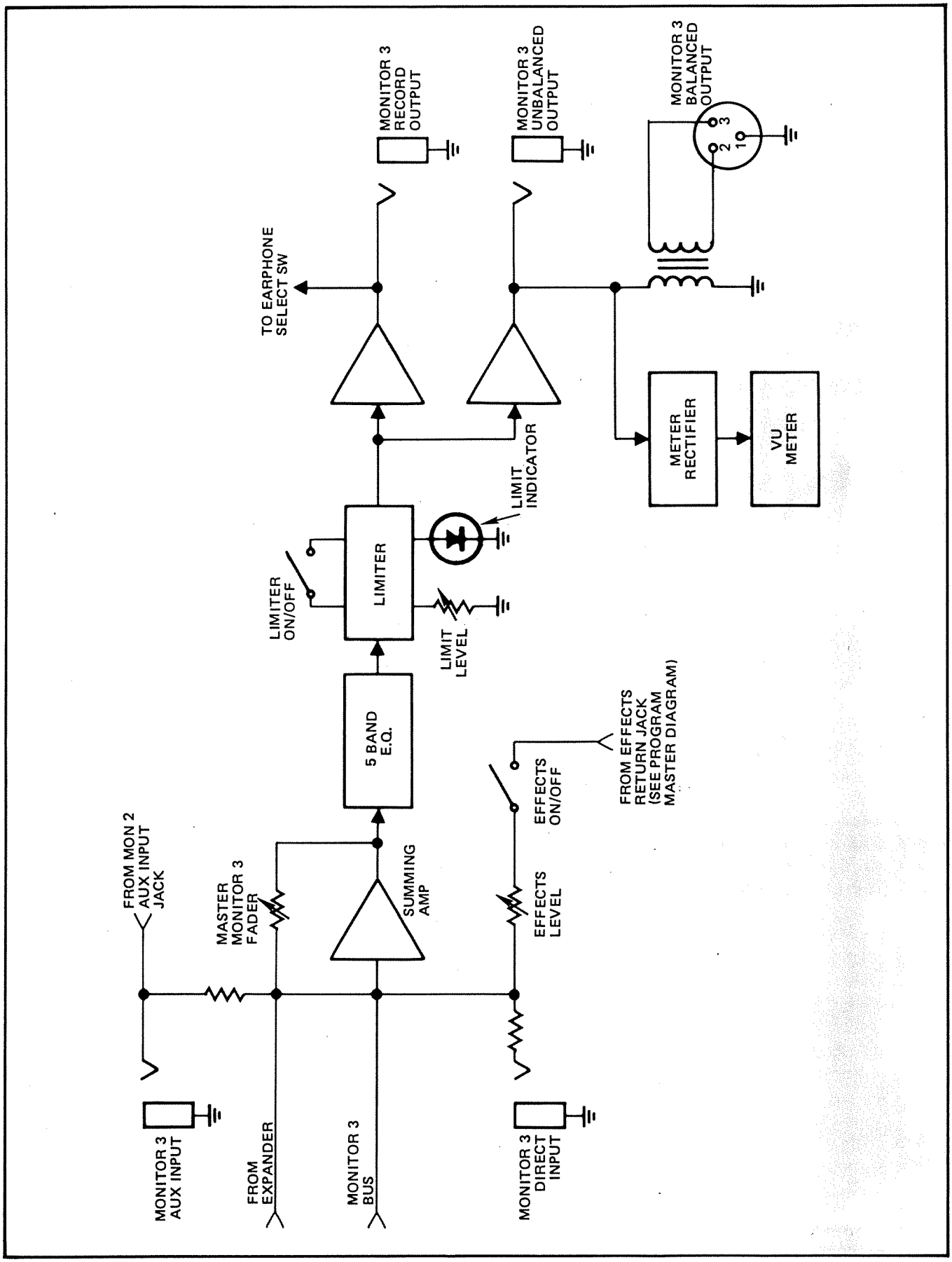


FIGURE 27 — *Monitor* 3 Master Module and Output Section Block Diagram

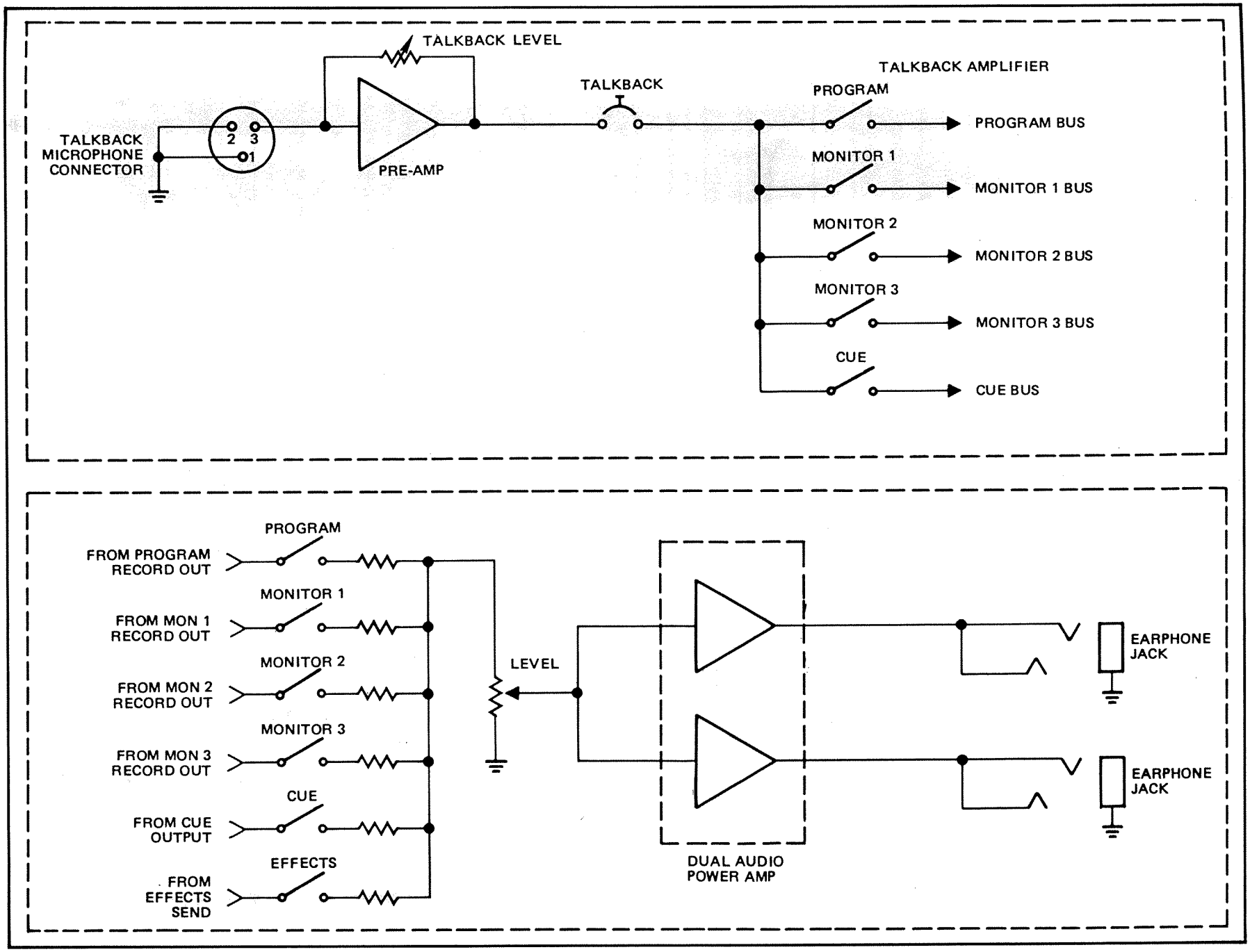


FIGURE 28 — Talkback/Earphone Module Block Diagram

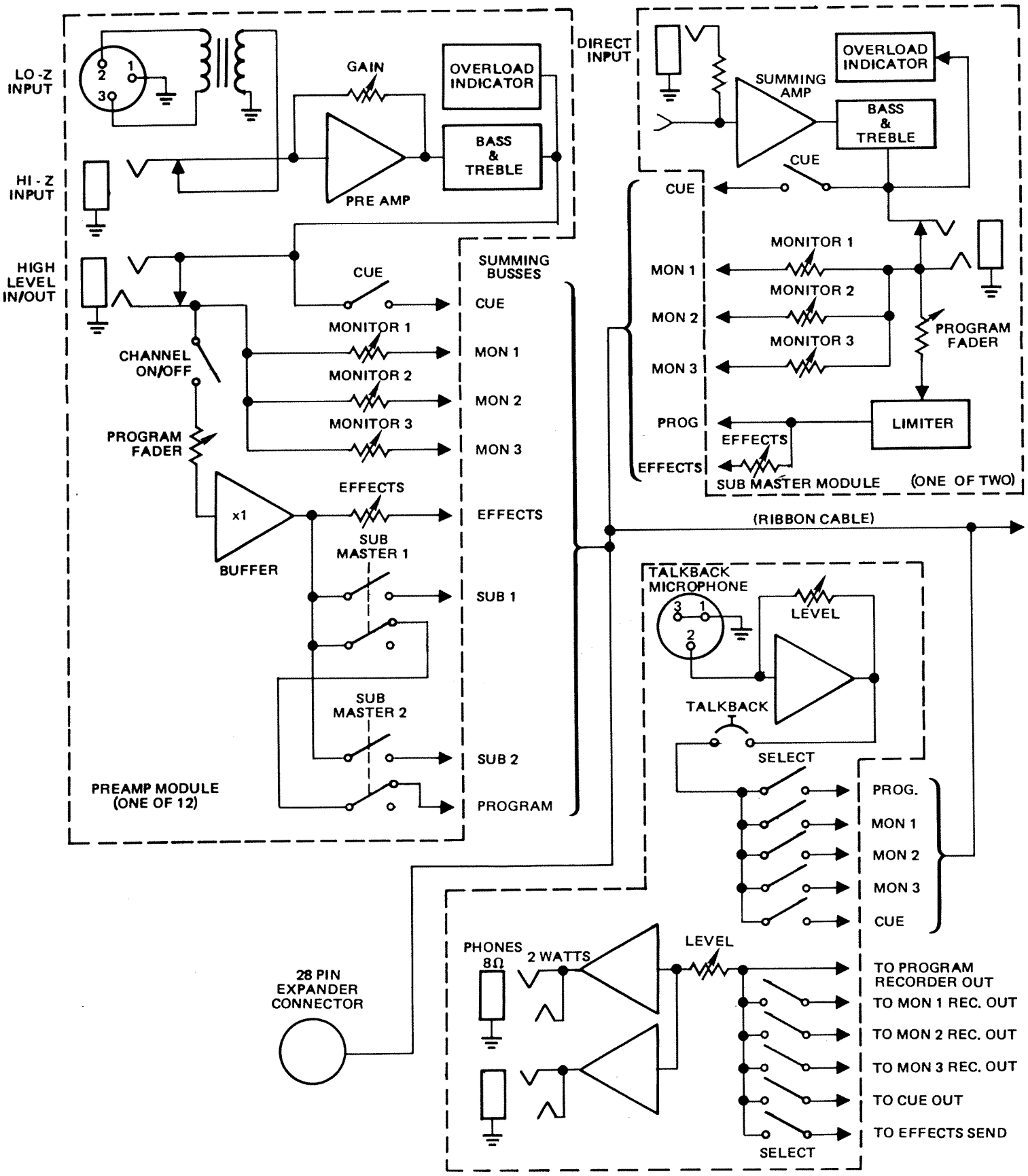
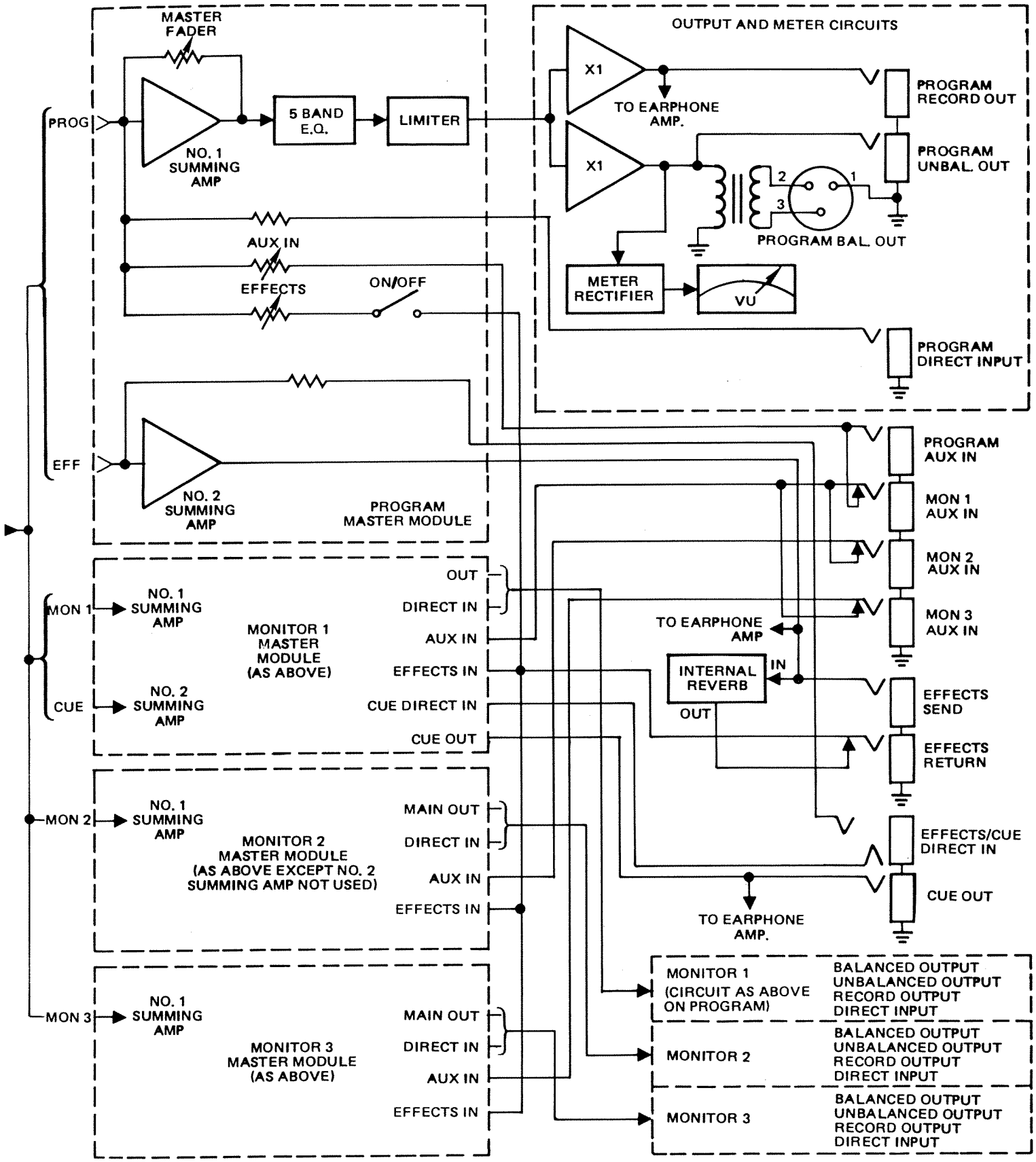


FIGURE 29 — M12 Console Block Diagram


MASTER FADER
PROG
NO. 1 SUMMING AMP
5 BAND E.Q.
LIMITER
AUX IN
EFFECTS
ON/OFF
EFF
NO. 2 SUMMING AMP
PROGRAM MASTER MODULE
OUTPUT AND METER CIRCUITS
X1
TO EARPHONE AMP.
X1
PROGRAM RECORD OUT
PROGRAM UNBAL. OUT
PROGRAM BAL. OUT
METER RECTIFIER
VU
PROGRAM DIRECT INPUT
PROGRAM AUX IN
MON 1 AUX IN
MON 2 AUX IN
MON 3 AUX IN
EFFECTS SEND
EFFECTS RETURN
EFFECTS/CUE DIRECT IN
CUE OUT
MON 1
NO. 1 SUMMING AMP
CUE
NO. 2 SUMMING AMP
MONITOR 1 MASTER MODULE (AS ABOVE)
OUT
DIRECT IN
AUX IN
EFFECTS IN
CUE DIRECT IN
CUE OUT
TO EARPHONE AMP
INTERNAL REVERB
IN
OUT
MON 2
NO. 1 SUMMING AMP
MONITOR 2 MASTER MODULE (AS ABOVE EXCEPT NO. 2 SUMMING AMP NOT USED)
MAIN OUT
DIRECT IN
AUX IN
EFFECTS IN
TO EARPHONE AMP.
MON 3
NO. 1 SUMMING AMP
MONITOR 3 MASTER MODULE (AS ABOVE)
MAIN OUT
DIRECT IN
AUX IN
EFFECTS IN
MONITOR 1 (CIRCUIT AS ABOVE ON PROGRAM)
BALANCED OUTPUT
UNBALANCED OUTPUT
RECORD OUTPUT
DIRECT INPUT
MONITOR 2
BALANCED OUTPUT
UNBALANCED OUTPUT
RECORD OUTPUT
DIRECT INPUT
MONITOR 3
BALANCED OUTPUT
UNBALANCED OUTPUT
RECORD OUTPUT
DIRECT INPUT