

YAMAHA

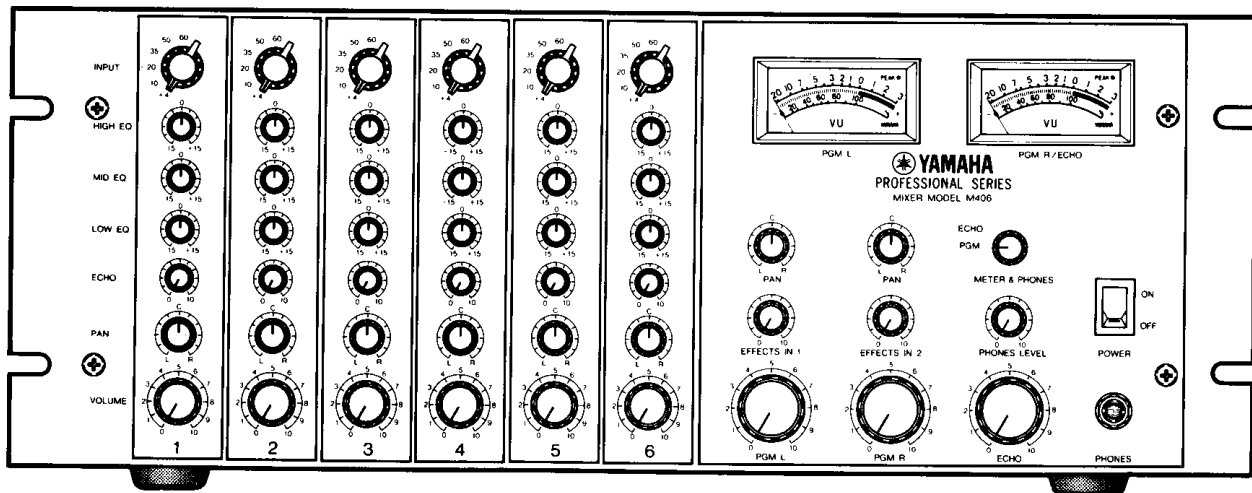
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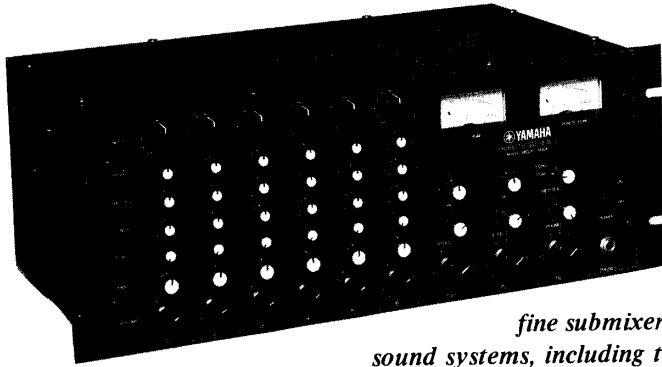
SERIES

MIXER

M406

OWNER'S MANUAL





The Yamaha M406 is a sophisticated six input channel, stereo output sound reinforcement mixer designed for rack mounting in fixed installations or portable cases. It is an excellent choice as the sole mixer in a small club, meeting room, school, church, or similar application. A smoked plexiglas security cover may be installed to prevent unauthorized tampering with control settings. The M406 also makes a

fine submixer to augment larger mixing consoles in more complex sound systems, including the record, broadcast, film and video production environment.

The M406 is brings you the same advanced M-series features and technology found in our PM-2000, but in a compact, portable package. Rugged, internally modular PC board construction ensures ease of servicing and years of reliable operation. There are echo and program bus sub inputs and sub outputs for linking two or more mixers, and a wide range 3-band EQ. Phantom power for condenser microphones is standard, with On/Off switching. Input sensitivity is adjustable for virtually any microphone or line level source by means of a positive, repeatable input level switch on each channel. There's plenty of internal headroom so there is no distortion even during the loudest and most complex of mixing jobs, and +24 dBm 600 ohm balanced output deliver that clean signal to any professional sound equipment. Overall, the M406 has the attractive appearance, smooth control feel and superior sound quality you've grown to expect from Yamaha. To take full advantage of your M406 mixer, please read this manual carefully.

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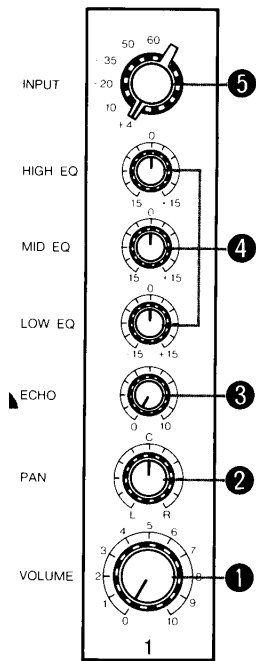
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FRONT PANEL OPERATION

INPUT CHANNELS



1 VOLUME CONTROL

The Volume control continuously varies the channel output level to the stereo (left and right) program mixing bus. The nominal setting at which the level may still be increased yet there is adequate range to "fade out" is at approximately #7 position. Given an input signal of equal level to the setting of the INPUT sensitivity switch, a nominal VOLUME setting applies an optimum level to the mixing busses. (A nominal channel VOLUME and a nominal master PGM L or PGM R setting together produce the nominal +4 dB output).

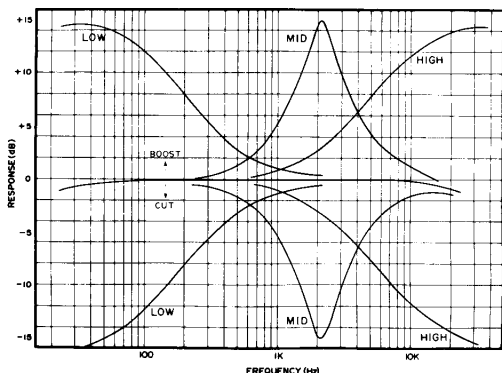
2 PAN POT

This control assigns the channel VOLUME control output to the left and right sides of the stereo program mixing bus. Centering the PAN pot places the signal equally in both busses (sound is centered); at this point, each bus is fed a signal 3 dB below the maximum full-left or full-right panned level. This ensures that the combined stereo output power remains constant as the signal is panned. If desired, one or two mono mixes can be created by treating the left and right busses as independent output mixes, and assigning the channel signals accordingly with the PAN pot.

3 ECHO MIX LEVEL CONTROL

This control adjusts the amount of channel signal applied to the ECHO mixing bus. The M406 is factory wired to derive the echo signal after the channel VOLUME control and EQ so that a channel fade or tone adjustment will also be reflected in the channel's contribution to the echo or reverb system (a pre-Fader echo feed would force the operator to turn down the ECHO control along with channel VOLUME, or else the echo would continue indefinitely after the channel has been faded). If an effects or echo unit is not being used, the ECHO controls can be used to create a monitor mix to feed stage monitor (foldback) speakers or headphones (with the aid of a power amplifier).

■ EQUALIZER RESPONSE



4 LOW EQ, MID EQ, HIGH EQ (EQUALIZER)

The LOW, MID and HIGH EQ controls alter the channel's frequency response with up to 15 dB of boost (clockwise rotation) or cut (counterclockwise rotation). Continuously variable shelving-type equalization is provided at 100 Hz (Low) and 10,000 Hz (High); peaking equalization is provided at 1,000 Hz (Mid). Refer to the illustration. Centering the controls to the detented "0" position ensures flat audio response.

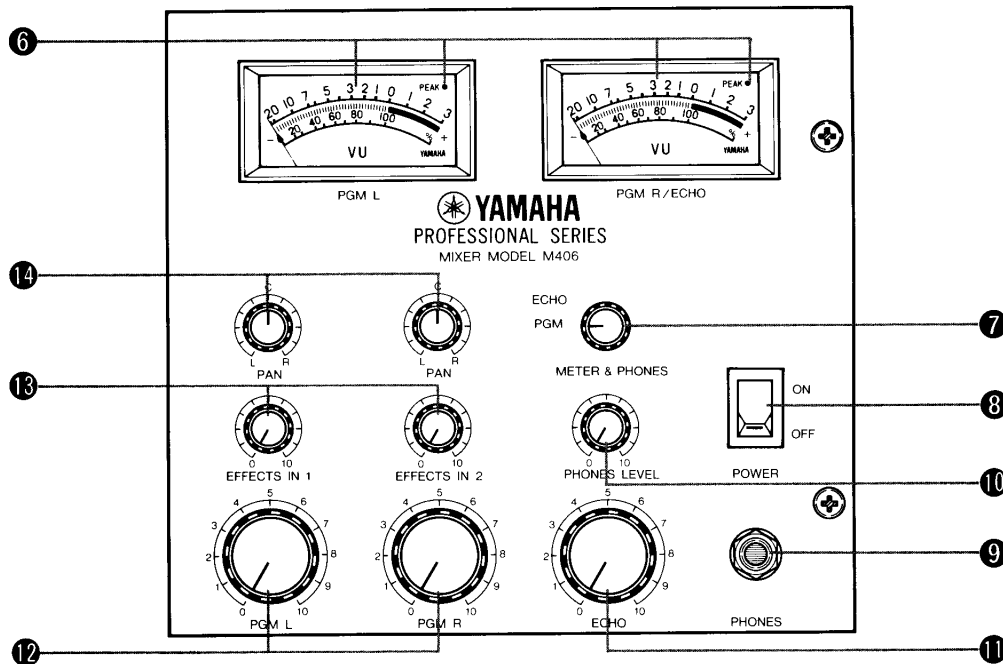
In many mixes, EQ is used to modify tonal characteristics for better separation (i.e., given two similar-sounding instruments, you might boost one with the MID control and boost the other with the HIGH control). EQ can be used to correct certain acoustic imbalances, such as using HIGH boost to liven up a "dead" room, or LOW cut to avoid the boominess in some rooms. Another use of EQ is to avoid leakage and excess noise without significantly changing the sound. For example, if a bass drum is the only sound on a given channel, you might wish to cut the HIGH control and thus eliminate background hiss as well as leakage from strings. Another example — a flute is the only sound on a given channel, so you cut the LOW control and thus eliminate rumble and some wind noises. Since flutes don't produce much bass and bass drums don't produce much high frequency sound, the EQ does not drastically change the instrument sound.

5 INPUT SENSITIVITY SWITCH

The INPUT switch changes the input sensitivity accommodate nominal input levels of -60, -50, -35, -20, -10 or +4 dB, corresponding to low level dynamic or ribbon mics, medium and high level condenser mics, preamplified electric instruments, and low or high line level audio processing or mixing equipment. There is no one "right" setting; to determine the best INPUT setting for a given input source, begin with the switch at +4 dB position (least sensitive), apply a typical input signal. Now move the INPUT switch to more sensitive settings (making the input compatible with lower signal levels) until the sound just begins to sound distorted on the louder peaks due to "excess" input levels. Finally, move the INPUT switch back one step to the next position, lowering the sensitivity. During a sound check, this procedure takes just a moment to establish the optimum sensitivity for keeping the signal above the noise floor and below the point of clipping (distortion). Remember that a microphone may indeed put out -60 dB with someone speaking into it, but that same mic can also put out +4 dB if it is exposed to a very loud sound (e.g., inside a kick drum), so don't assume that the same INPUT setting will always be valid for a given mic, electronic instrument, signal processor, etc.

A major advantage of the M406's INPUT switch is that the need for external attenuation pads is all but eliminated. Conventional input trim controls work by adjusting pre-amplifier gain, which happens after the input transformer and cannot remove distortion caused by transformer saturation. The M406 INPUT switch actually performs several functions; it changes the preamp gain and inserts attenuation before the transformer and/or after the preamp. High line level signals therefore will not saturate the transformer, yet there is plenty of gain to accommodate the lowest level microphones. Equally important, the switch changes the input impedance to ensure proper loading of low impedance microphones for optimum frequency response. A finite number of settings, rather than a continuously variable control, makes it easy to jot down operating notes for fast, accurate setup.

OUTPUT SECTION



6 PGM L AND PGM R VU METERS AND LED PEAK INDICATORS

Two illuminated VU meters indicate the average level of the associated Program or Echo outputs, as selected by the METER & PHONES switch. VU meters respond in much the same way our ears perceive loudness, which is useful for evaluating relative levels but not fast enough to "see" brief signal peaks that can cause distortion. That's why there is a red LED in the corner of each meter. Driven by circuits that are "fast" enough to react to even a brief transient peak, the LEDs turn On whenever 10 dB, or less, headroom remains (i.e., at +14 dB output level). Observing the LEDs and meters gives one an impression of the peak-to-average energy content of the program. Normally, the meters should peak around 0 VU, and the LEDs may flash On once in a while. However, with some types of percussive programs, the LEDs may turn On often or remain On even though the meters seldom go above 0 VU; in this case, turn down the output level so the LEDs do not remain On. On the other hand, if the program is highly compressed or limited, the LEDs may never turn On unless the output level is turned way up and the VU meters are pegged in the red zone.

7 METER & PHONES SELECTOR SWITCH

This 2-position rotary switch selects either the stereo Program mix or the Echo send mix to feed the front panel PHONES jack. The right-hand VU meter also follows the switch, displaying the Right program output level when PGM is selected or the echo output level when ECHO is selected. Most users will prefer to leave the switch in the PGM position except when specifically checking the output to the echo or effects unit.

8 POWER SWITCH

This rocker switch turns the M406 power On and Off. To confirm power is On, check to see that the VU meters are illuminated.

9 PHONES JACK

This standard stereo phone jack accepts one pair of stereo headphones for monitoring the program or echo output. When the METER & PHONES selector switch is in PGM position, the left and right earpieces will carry the Left and Right program mix, subject to the PGM L and PGM R master controls and the PHONES LEVEL control; when the selector is in ECHO position, both sides of the headphones will carry the Echo send mix (center mono), subject to the ECHO master control and the PHONES LEVEL control. Use only one pair of headphones in this jack.

⑩ PHONES LEVEL CONTROL

Given any METER & PHONES selector switch setting, this knob adjusts the level fed to the PHONES jack, but does not affect the corresponding mixer output. That is, if headphones are set to ECHO position, you could turn the PHONES control all the way down without affecting the echo output; only the headphones would be quiet. On the other hand, if you turn down the ECHO master control, the level will drop in the echo output and the headphones.

⑪ ECHO MASTER CONTROL

This master control adjusts the overall level of the ECHO mix bus prior to feeding the ECHO output. In other words, ECHO master adjusts all signals from the channel ECHO controls and from the Echo Sub input jack. Nominal setting is approximately #7, which means that the echo output will be +4 dB at this setting provided one input channel's ECHO and VOLUME controls are set at nominal, and that the signal applied to that channel is at exactly the level set with the channel's INPUT sensitivity switch.

⑫ PGM L AND PGM R MASTER CONTROLS

The PGM L and PGM R masters adjust the overall level of their respective left and right Program mixing busses prior to feeding the Program outputs. In other words, these masters adjust all signals from the channel PAN pots, the EFFECTS PAN pots, and the Program sub inputs. Nominal setting is approximately #7.

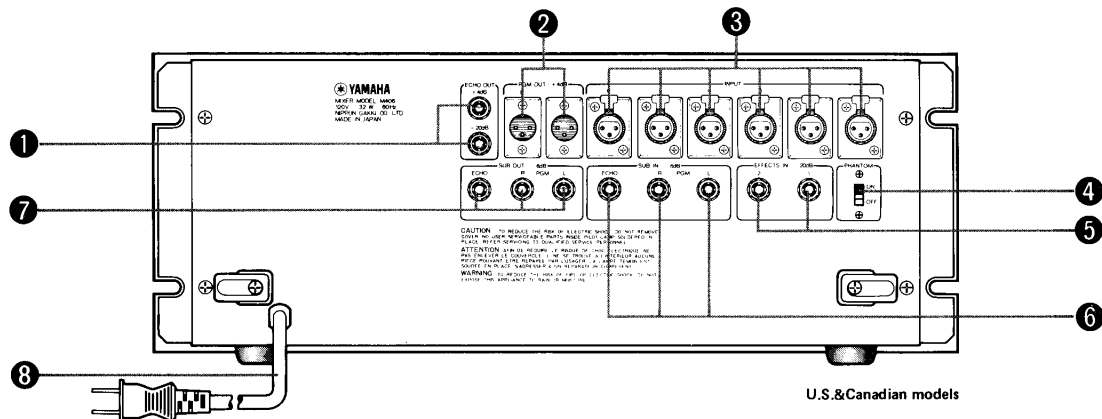
⑬ EFFECTS IN LEVEL CONTROL (TYPICAL OF #1 OR #2)

This knob adjusts the incoming signal level from the correspondingly numbered Effects input jack (1 or 2) before the signal is applied to the program busses. This nominal setting is approximately #7 on the control scale, although this will depend largely on the incoming signal level. Turn the control all the way down if no signal is applied to the input. Typically, the return level from an echo or reverb device could be adjusted here, as could the line level output from a tape recorder that might be connected to the Effects input. If it is desired to "kill" an echo or similar effect, it is better to do it with the EFFECTS IN controls than with the ECHO master control. This is because any residual hiss or noise from the external signal processing equipment will be blocked from the program.

⑭ PAN (ASSOCIATED WITH #1 AND #2 EFFECTS IN LEVEL CONTROLS)

This knob adjusts the placement of the corresponding Effects input signal onto the Left and Right program busses, after the associated EFFECTS IN #1 or #2 level control. If a stereo chamber or tape recorder is connected to the two Effects inputs, pan one fully left and the other fully right for "normal" stereo separation. Less separation is obtained by panning the controls partially toward center. If a single echo or effects device is used in conjunction with a stereo program, the PAN control will normally be centered to feed an equal amount of effect to both the Left and Right outputs.

REAR PANEL FEATURES



NOTE: All XLR connectors in the M406 are wired as follows: pin 2=signal high, pin 3=signal low, pin 1=shield. Conventional XLR type shielded microphone cables may be used. However, when connecting an M406 XLR to an unbalanced circuit (e.g., using an XLR to standard tip/sleeve phone plug adaptor), be sure the M406's XLR pin 2 is connected to the signal "high" rather than the ground.

1 ECHO OUT CONNECTORS (+4 DB AND -20 DB)

These two ECHO OUT phone jacks both carry the same post-ECHO master control signal, but one is at +4 dB (1.23V) nominal level for driving high line level devices, and the other is at -20 dB (78 mV) for driving medium line level devices. The actual source impedance is 150 ohms, and these outputs will drive 600 ohms or higher impedance loads, including virtually all echo and reverb devices (except some accessories designed to plug directly into electric guitars). If echo or other effects are not required, ECHO OUT may be used as a foldback (monitor) send or for making a mono tape recording.

2 PGM OUT CONNECTORS (L, R)

These male XLR outputs carry the signal after the PGM L and PGM R master controls. They are balanced, transformer-isolated (i.e., floating) outputs with +4 dBm (1.23V) nominal level. The actual source impedance is 150 ohms, and the outputs will drive 600 ohms or higher impedance loads, including virtually all professional graphic equalizers, electronic crossovers, power amplifiers, and tape recorders. The advantage to these low impedance, balanced outputs is that they can be used to feed line level signals to power amplifiers or a larger mixer located hundreds of feet from the M406 without significant high frequency losses. This type of output is also less susceptible to hum and noise.

3 INPUT CONNECTORS (TYPICAL 1 THROUGH 6)

These female XLR connectors are balanced transformer isolated inputs that apply nominal -60 dB to +4 dB signals (depending on INPUT sensitivity switch settings) to their respective input channels. The actual input impedance varies from 800 ohms to 4 kohms as the INPUT sensitivity switch is moved from -60 dB to +4 dB position. This combination of impedances and sensitivities interfaces well with almost any input source, from low impedance (nominal 50 to 250 ohms) microphones to 600 ohms line level sources.

4 PHANTOM POWER SWITCH

When On, the switch applies +40V across pins 2 and 3 of the channel input jacks, via a pair of 6.8kohms resistors, for remote powering of condenser microphones through the same cables that carry the audio signal to the M406. (While suitable for nominal 48V microphones, the M406's 40V supply is designed to also satisfy Underwriter's Laboratories safety requirements.) The phantom power will not harm dynamic microphones. However, to avoid hum with certain unbalanced sources, phantom power may be shut Off.

5 EFFECTS IN CONNECTORS (1, 2)

These standard 1/4" (6.3 mm) phone jacks are unbalanced inputs that apply a nominal -20 dB (78 mV) signal to the left and right program mixing busses via their respective EFFECTS IN level controls and PAN pots. Actual input impedance is 10 kohms, and the input is intended for nominal 600 ohms to 2 kohms sources, such as the return from echo or reverb devices, the output of a tape recorder, or the line output of another mixer.

6 SUB IN CONNECTORS (PGM L & R, ECHO)

These standard 1/4" (6.4 mm) phone jacks are unbalanced inputs that apply a nominal -6 dB (388 mV) signal to the respective Program and Echo mix busses, via an internal isolation/attenuation pad. Actual input impedance is 22 kohms, and the input is intended for nominal 600 ohms or higher impedance sources. SUB IN may be used for linking the bus or submixer outputs of another mixer to that of the M406 for expansion of the mixing system, or for applying any suitable line-level source to the mixing busses, subject only the M406 ECHO or PGM L & PGM R master controls. By linking mixers via the SUB IN jacks, rather than input channels, all input channels remain available for microphones and other sources, and the Echo mix remains separate from the Program mix.

7 SUB OUT CONNECTORS (PGM L & R, ECHO)

These standard 1/4" (6.3 mm) phone jacks are unbalanced outputs that carry a nominal -6 dB (388 mV) signal from the respective Program and Echo mix busses, ahead of the master controls (i.e., the masters do not control the SUB OUTs). Actual source impedance is 600 ohms, and the outputs are intended for nominal 10 kohms or higher impedance loads. They may be used for linking the M406 to another mixer (a second M406 or almost any mixer) for expanding the overall mixing system. Alternately, they can be used to drive amplifiers, tape recorders or effects devices so long as these devices have their own input level controls. Because the M406 output line amplifiers and transformers are bypassed, the absolute optimum audio quality thus may be obtained so long as: 1) cables lengths are relatively short (less than 25 feet or 8 meters), and 2) the devices being fed has adequate input sensitivity.

8 AC POWER CORD

This is a 3-wire AC power cord (grounded type). In the U.S. and Canada, the built-in power module is wired for 110 to 120 V AC mains, 50 or 60 Hz, and uses a maximum of 32 Watts. Because the power supply is fully regulated, typical line voltage variations will not adversely affect performance.

INSTALLATION NOTES

PLACEMENT

The M406 is a self-contained mixer built in an all metal, rack-mountable cabinet. It may be permanently mounted for fixed installations in a standard 19" wide equipment rack or wall rack. Alternately, it can be mounted in a portable case for touring applications. The M406 will operate satisfactorily whether the front panel is vertical or horizontal. However, sufficient rear panel clearance should be allowed for the input and output cables. Avoid mounting the M406 next to sources of heat, or, if necessary, provide adequate ventilation. Also, avoid mounting next to sources of strong magnetic fields (e.g., large power transformers).

POWER MAINS

U.S.A. and Canadian and General models are designed to operate from 110 to 240V AC, 50 or 60 Hz power mains. The mixer must be AC grounded for safety and for proper shielding; a 3-wire power cable is provided for this purpose. If a 3-wire outlet is not available, or if there is any chance the outlet may not be grounded, a separate jumper wire must be connected from the mixer chassis to an earth ground. Cold water pipes generally provide good grounds, although if they are insulated by a length of PVC pipe or a water meter, cold water pipes are not good grounds. (An electrical wire bypasses some meters, supplying ground continuity for the cold water pipes.) Avoid hot water pipes and gas pipes. When in doubt, use a length of copper pipe driven into moist, salted earth, burying at least 1.5m (5') of pipe, or one of the newer chemical type ground rods.

Connect the mixer to the power mains **ONLY AFTER CONFIRMING THAT THE VOLTAGE AND LINE FREQUENCY ARE CORRECT.** (By all means, **USE A VOLTMETER...**it can save your equipment and the show.) It is also a good idea to check for proper polarity in the AC outlet. The Power Switch on the mixer should be Off before connecting the mixer to the mains. As a precaution, disconnect the mixer from the mains while audio cables are being installed.

THEORY OF GROUNDING

Careful grounding procedures are essential for proper operation, not only of the M406, but of the entire audio system. Many grounding techniques exist, and certainly there are several ways to achieve a satisfactorily grounded audio system. Several books have been written on the subject.

Ground loops (also called "hum loops"), are often caused by multiple paths from equipment grounds to the AC main ground ("earth" ground). Ground loops tend to induce hum and allow noise to develop in an audio system; in severe instances, equipment may begin to oscillate due to ground loops. This oscillation can cause distortion and even damage to amplifiers and loudspeakers. One way to avoid ground loops is to make sure that there is just one path to the AC ground (earth ground) for the entire audio system. One popular method, though not necessarily the best or only one, is to cut the shield ground of XLR cables at the input side of the cable. Another technique is to ground all shields at one piece of equipment, typically the mixer, and to cut the shields at the other ends of the cables. (With unbalanced phone jack cables, the shield must be connected at both ends.)

AUDIO CONNECTORS AND CABLE TYPES

The M406 mixer is fitted with only four types of audio connectors: 3-pin XLR male, 3-pin XLR female, 2-conductor standard phone jacks and 3-conductor standard phone jack (stereo headphones).

2-conductor (twisted pair) shielded cable is best for all XLR connections. Belden No. 8412, or its equivalent, is an excellent cable due to its heavy construction. This type of cable should be used for all portable application. "Snake" cables containing multiple shielded pairs must be handled very carefully because the leads tend to be fragile, and a broken conductor cannot be repaired.

If low level and high level lines (e.g., microphones and mixer line outputs), or if either of these lines and speaker cables are run parallel for long distances, crosstalk may be significant. In fact, the crosstalk (signal leakage between cables) can cause an electronic feedback loop, oscillation, and possible damage to the equipment. To minimize crosstalk, physically separate low level (microphone) cables from high level (line) cables by the greatest feasible distance. Keep speaker cables away from both low and high level signal cables. At any point where cables meet, run low level cables perpendicular to high level or speaker cables. If low and high level or speaker cables must be run parallel and in close proximity to one another, they should be bundled separately.

WARNING

In any audio system installation, governmental and insurance underwriters' electrical codes must be observed. These codes are based on safety, and may vary in different localities; in all cases, local codes take precedence over any suggestions contained in this manual. As set forth in the Mixer Warranty, Yamaha International Corporation shall not be liable for incidental or consequential damages, including injury to persons or property, resulting from improper, unsafe or illegal installation or use of the M406 Mixer or of any related equipment; neither shall be Corporation be liable for any such damages arising from defects or damage resulting from accident, neglect, misuse, modification, mistreatment, tampering or any act of nature.

TYPICAL APPLICATIONS

The hookups shown in the following drawings are typical, but by no means are they the only ways to use the M406. We encourage you to consult the specifications and M406 block diagram so that you can determine whether a particular setup you have in mind will work. Experimentation is OK, but there are a few things you should not try, as explained below.

PRECAUTIONARY NOTES

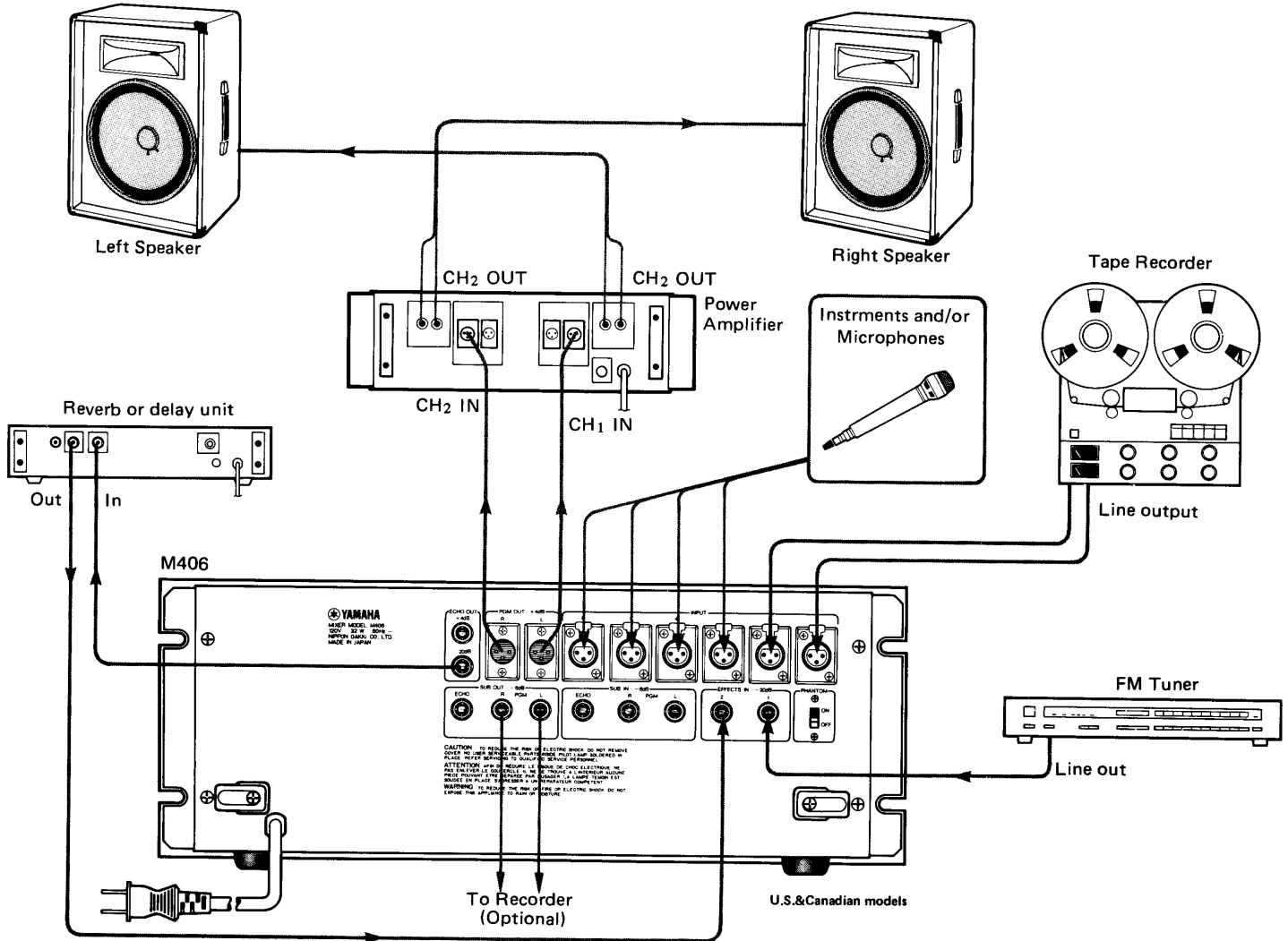
Generally, there is nothing wrong with trying a hookup. However, to avoid feedback, never connect an M406 output directly back to its input unless you are sure the particular input does not feed that output (e.g., it is permissible to connect the ECHO OUT to the EFFECTS IN because effects inputs signals are not routed back to the echo output). Also, do not connect speaker-level signals to the M406 inputs unless you first use a suitable direct box and/or an external attenuation pad. It is OK to use "Y" connectors when splitting one M406 output to feed two different devices, so

long as the combined load of the inputs does not overload the M406 (for example, paralleling two inputs of 10 kohms each constitutes a 5 kohms load: paralleling two 600 ohms inputs constitutes a 300 ohms load). It is NOT permissible, however, to "Y" two M406 outputs together to combine the signals; if you must combine outputs, do it with another mixer, or at least with a resistive combining network. (If you simply need a mono mix, just set all the PAN pots to one side, R or L, and use the corresponding R or L output as the mono feed).

SMALL CLUB SOUND REINFORCEMENT SYSTEM

In the setup shown here, the M406 is used to mix typical sound sources one might find in a small club, a small school theatre, and similar applications. Four of the input channels are used for microphones for live vocal or instrumental pick up. The remaining two input channels are used for playback of a stereo tape recording, such as might be used during intermission, for back-up, for special pre-recorded effects, and so on. The ECHO OUT mix is sent to a reverb or delay line, returned to one of the EFFECTS IN jacks, and mixed into the program which feeds the speaker system. Since the remaining EFFECTS IN is not required for echo return, it is used as an auxiliary line input -- in this case from a radio which may be used for background music when no performance is in progress.

The power amplifier (and any graphic equalizers or electronic cross-overs which may be used) are fed from the PGM OUT connectors. While a stereo "main" system is shown here, it may be desirable to feed the house with a mono mix (PGM R, for example). In this case, the other half of the stereo program (PGM L) can be used for a stage monitor (foldback) mix. The hookup is essentially the same, and the PAN pots determine how much of each channel is fed to the house (pan right) or the monitors (pan left).

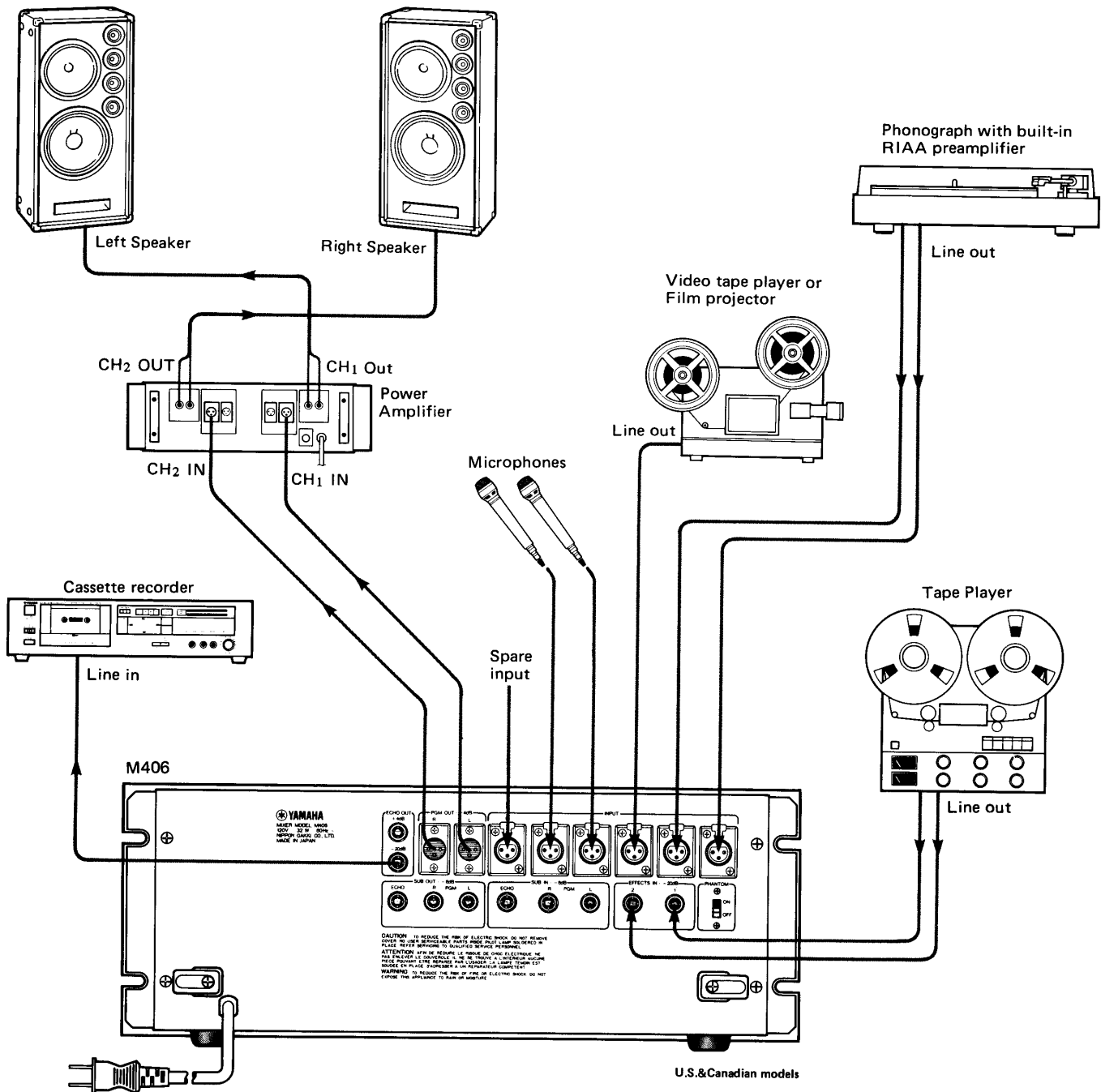


CHURCH, SCHOOL OR MEETING ROOM SOUND REINFORCEMENT SYSTEM

In the setup shown here, the M406 is used to mix typical sound sources one might find in a church, a classroom, a meeting room, and similar applications. Two of the input channels are used for microphones for live vocal or instrumental pick up. Two are used for the line output of a stereo phonograph (it must be RIAA preamplified -- the output directly from the phono cartridge is not compatible with the M406 input). One channel is used for audio from a film projector or video tape player, and one input channel is reserved as a spare. A stereo tape is played back through the EFFECTS IN jacks, since no echo or effects unit is in use. This setup allows the operator to make audio visual presentations, lectures, play background music, and so forth without having to unplug and reconnect equipment in the middle of the presentation. The Echo mix can be used to make up a

mono program which is more-or-less independent of the live presentation which feeds, via the ECHO OUT jack, the speakers; this mix can then be fed to a cassette recorder (for future reference), a lobby or other remote area.

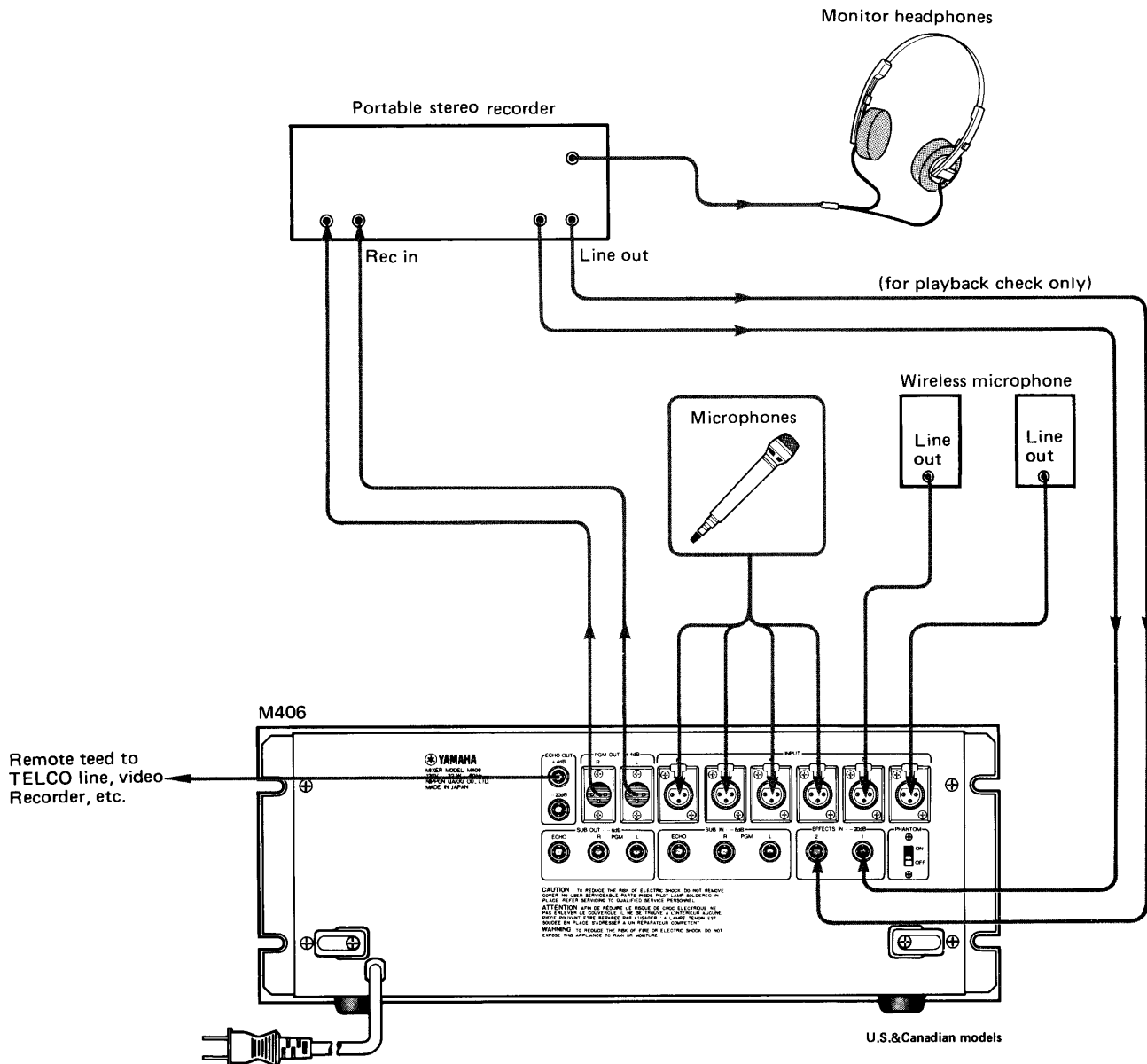
As in the previous application drawing, the power amplifier (and any graphic equalizers or electronic crossovers which may be used) are fed from the PGM OUT connectors. While a stereo "main" system is shown here, it may be desirable to use a mono sound system. Simply use half of the stereo program and one output (PGM R for example). The hookup is essentially the same, except only one PGM output and one speaker are used, and all PAN pots are set fully to one side (right if PGM R is used).



LOCATION RECORDING OR BROADCAST REMOTE MIXING SYSTEM

In the setup shown here, the M406 is used to mix typical sound sources one might find in a location recording or remote broadcast situation -- microphones. In this case, two of the microphones are actually "wireless" radio mics, so the input to the M406 comes from the microphone receivers and is a line-level input. Those two channels' INPUT sensitivity switches will be set to the appropriate line level (probably -20 dB to +4 dB) rather than to mic level. The PGM OUT jacks feed the portable stereo tape recorder (in film or remote recording for subsequent broadcast); if it is a live remote stereo broadcast, PGM OUT can be connected instead to a suitable TELCO (Telephone Company) interface. Echo or reverb may be used, but in this example we have used the Echo mix for something else -- a discrete mono program mix. The Echo mix may be used simply to

check mono broadcast compatibility (turn up all channel ECHO controls and monitor the mix by plugging headphones into the front panel PHONES jack and switching between ECHO & PGM; any out-of-phase condition should then be evident in ECHO position). For normal monitoring, the headphones instead may be plugged into the recorder, a particularly good idea with 3-head recorders that permit off-tape monitoring for verification of proper recording. Alternately, the recorder's line outputs can be plugged into the M406 EFFECT IN jacks for a playback check, but do not turn up EFFECT level while recording, as feedback could result. The mono Echo mix may be used to feed a video tape recorder (for reference) during a film shoot, a live mono TELCO feed, etc.



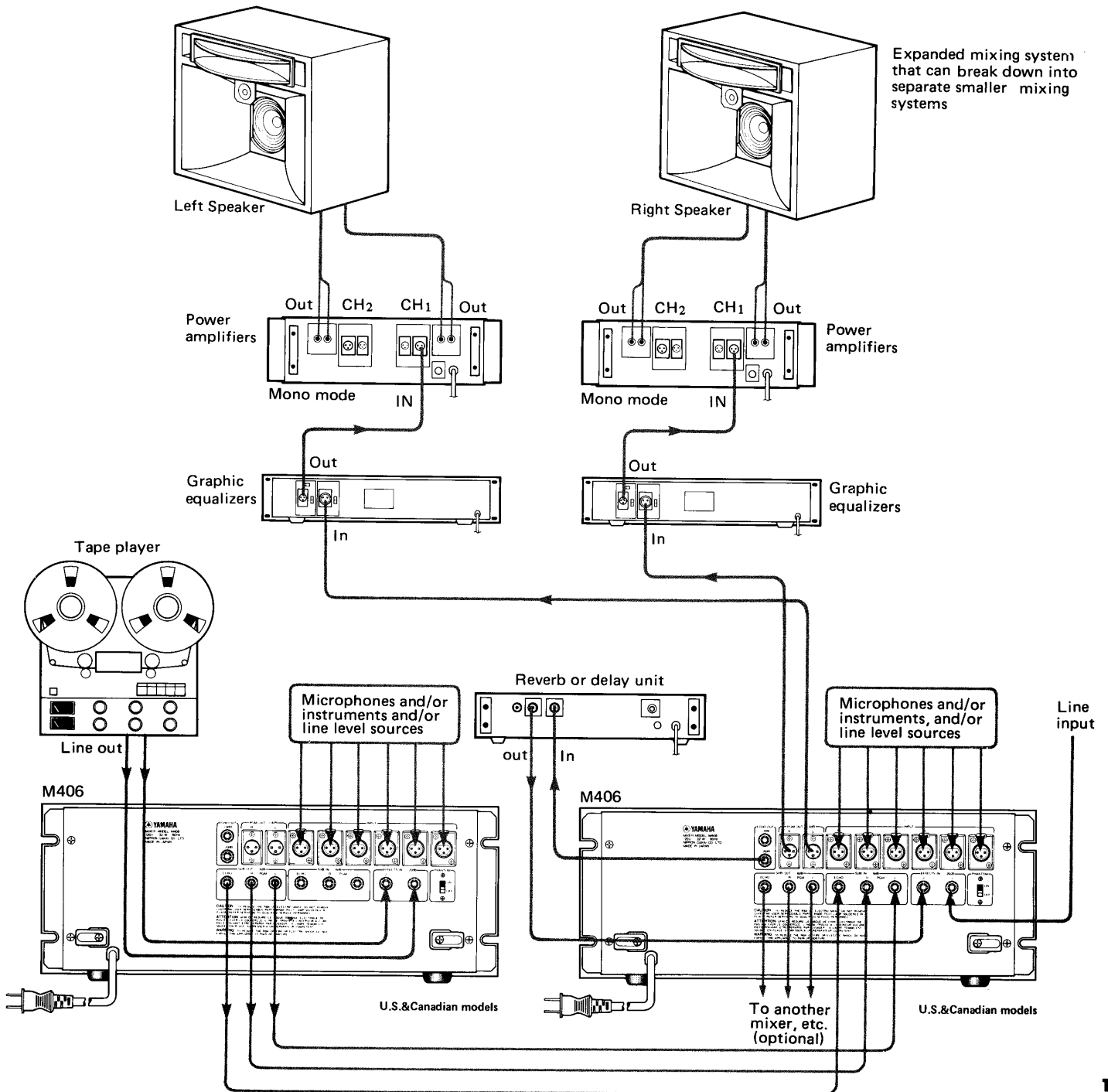
EXPANDED MIXING SYSTEM THAT CAN BREAK DOWN INTO SEPARATE, SMALLER MIXING SYSTEMS

Two M406 mixers are shown here. Their mixing busses are linked via the SUB OUT and SUB IN jacks. (The #2 mixer could be a larger console, too, such as the M916, M1615, PM-2000, etc.) This particular setup provides the potential for 12 full input channels to accommodate microphones, electronic instruments or line-level sources. In addition, there are four "extra" line inputs, actually the EFFECTS IN jacks, two of which are shown here for tape playback, one for a spare line input, and the fourth is actually used for a reverb/delay return. This is a 16 input x stereo output system.

In this setup, the ECHO, PGM L and PGM R master controls of the #1 mixer have no effect, these signals are fed to the #2 mixer ahead

of the #1 masters, and therefore controlled by the #2 mixer's master controls.

Notice that we show two stereo power amplifiers, each used in a monaural configuration. This system would easily "break down" into two separate mixing systems, one with and one without graphic EQ; just add another pair of speakers. If you sometimes need a 16 x 2 system (12 mic/line inputs, 4 line inputs, stereo output), while at other times two smaller systems will suffice, then a pair of M406's is ideal. Additional mixers can be linked; for example this pair of M406's could add to an M916 or an M1516 and create a 28 mic/line input mixing system (with 4 extra line in's counting EFFECTS IN).



GENERAL SPECIFICATIONS, INPUT/OUTPUT SPECIFICATIONS

FREQUENCY RESPONSE	+0, -3dB, 20Hz to 20kHz; +0, -0.5dB, 50Hz to 10kHz.
TOTAL HARMONIC DISTORTION	Less than 0.5% @+10dB, 20Hz to 20kHz; Less than 0.1%, @+20dB, 70Hz to 20kHz, rising to less than 0.5% at 30Hz.
HUM AND NOISE* (20Hz to 20kHz, 150 Ω source, INPUT level set at "-60")	-127dBm Equivalent Input Noise (EIN); -95dB residual output noise with all volume controls at minimum level.
(")	-72dB PROGRAM OUT; Master volume at nominal & all input volume controls at minimum.
(")	-63dB PROGRAM OUT (67dB S/N); Master volume and one Input volume control at nominal level.
(")	-72dB ECHO OUT; Echo master at nominal and all echo mix controls at minimum.
(")	-63dB ECHO OUT (67dB S/N); Echo Master and one ECHO send control at nominal level.
MAXIMUM VOLTAGE GAIN (Input Selectors set at "-60"dB, where applicable)	PROGRAM 84±2dB: Channel In to PGM out. ECHO 94±2dB: Channel In to ECHO out. SUB IN 20±2dB: Sub In to bus master out. EFFECTS 40±2dB: Effects In to PGM out.

EQUALIZATION	LOW ±15dB @100Hz: shelving MID ±15dB @ 2kHz: peaking HIGH ±15dB @10kHz: shelving
CROSSTALK	-60dB @1kHz, adjacent inputs; -60dB @1kHz, input to output.
VU METERS	2 illuminated meters; PGM L and PGM R/ECHO.
PEAK INDICATORS	LED built into each VU meter, turns on at 10dB below clipping
PHANTOM POWER	For remote powering of condenser microphones, +40V DC can be switched on via a rear panel phantom switch; voltage is applied to balanced transformers via a pair of 6.8kΩ isolation/current-limiting resistors.
FINISH	Black, semi-gloss.
DIMENSIONS (WxHxD)	19"x7"x11.6" (480 x 183.5 x 295mm).
WEIGHT	21 lbs (9.2kg).
POWER REQUIREMENTS	120 V AC (nominal) 50 or 60Hz; 105 V AC minimum, 130 V AC maximum.

* Measured with a 6dB/octave filter @12.47kHz; equivalent to a 20kHz filter with infinite dB/octave attenuation.

** In these specifications, 0dB is referenced to 0.775V RMS (0dBm at 600Ω).

*** Nominal level is 6dB below maximum setting.

All specifications subject to change without notice or obligation.

■ INPUT SPECIFICATIONS

CONNECTION	LEVEL SWITCH	ACTUAL LOAD IMPEDANCE	FOR WITH NOMINAL	SENSITIVITY**	INPUT LEVEL		CONNECTOR IN MIXER***
					NOMINAL	MAX BEFORE CLIP	
INPUTS (1-6)	-60dB	800Ω	50Ω to 250Ω mics or 600Ω line level sources	-80dB (0.08mV)	-60dB (0.78mV)	-30dB (25mV)	XLR-3-31
	-50dB	800Ω		-70dB (0.25mV)	-50dB (2.5mV)	-20dB (78mV)	
	-35dB	800Ω		-55dB (1.4mV)	-35dB (14mV)	-5dB (436mV)	
	-20dB	1kΩ		-40dB (7.8mV)	-20dB (78mV)	+10dB (2.45V)	
	-10dB	3kΩ		-30dB (24.5mV)	-10dB (245mV)	+20dB (7.75V)	
	+ 4dB	4kΩ		-16dB (123mV)	+ 4dB (123V)	+24dB (12.3V)	
EFFECTS IN (1, 2)		10kΩ	600Ω lines	-40dB (7.8mV)	-20dB (78mV)	+24dB (12.3V)	Phone jack
SUB IN PGM (L, R) SUB IN ECHO		22kΩ	600Ω lines	-16dB (123mV)	- 6dB (388mV)	+24dB (12.3V)	Phone jack

■ OUTPUT SPECIFICATIONS

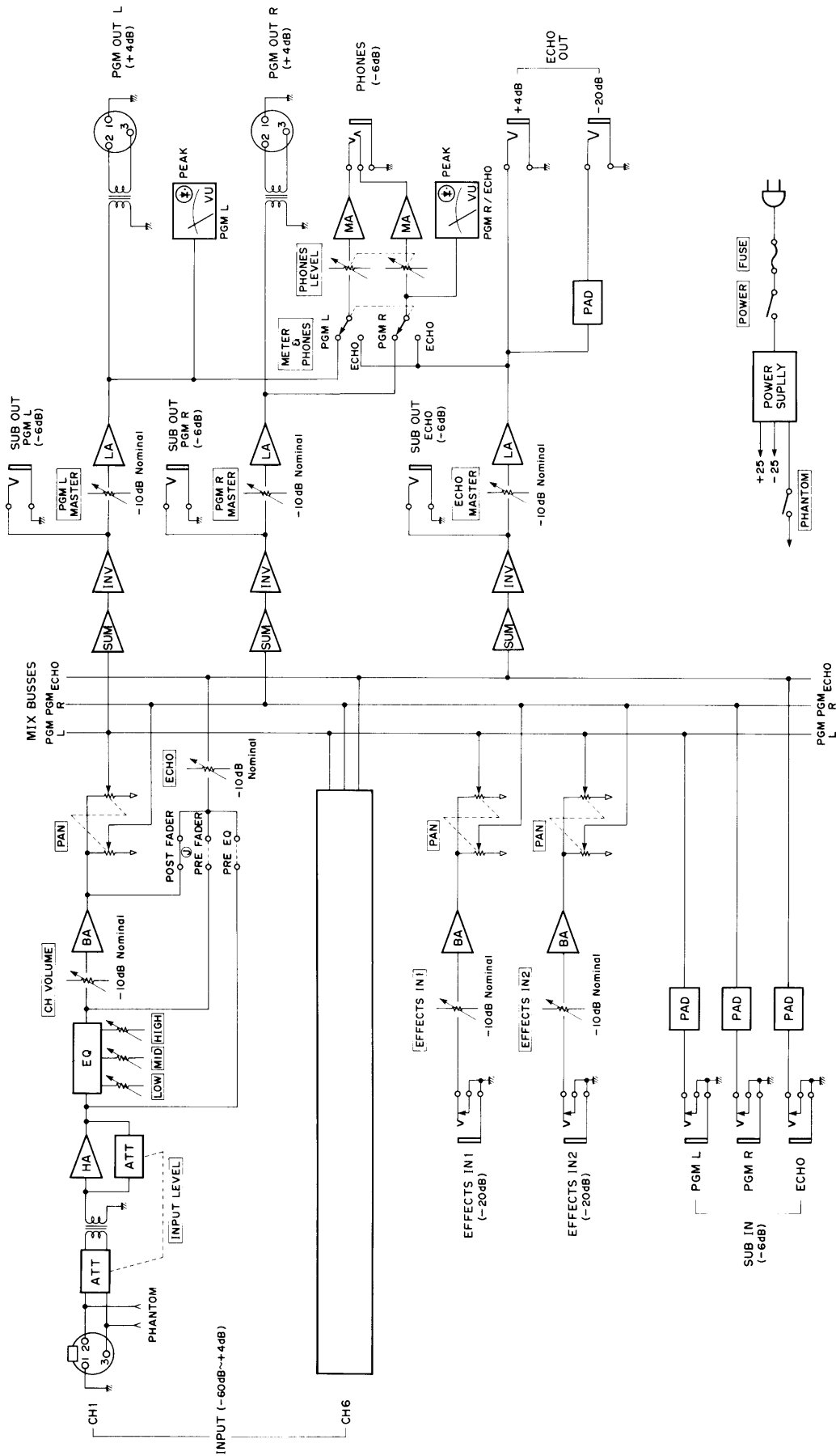
CONNECTION	ACTUAL SOURCE IMPEDANCE	FOR USE WITH NOMINAL	OUTPUT LEVEL		CONNECTOR IN MIXER***
			NOMINAL	MAX. BEFORE CLIP	
PGM OUT (L, R)	150Ω	600Ω lines	+ 4dB (1.23V)	+24dB (12.3V)	XLR3-32
ECHO OUT	150Ω	600Ω lines	+ 4dB (1.23V)	+24dB (12.3V)	Phone jack
			-20dB (78mV)	0dB (0.775V)	Phone jack
PGM SUB OUT ECHO SUB OUT	600Ω	20kΩ lines	- 6dB (388mV)	+24dB (12.3V)	Phone jack

* In these specifications, when dB represents a specific voltage, 0dB is referenced to 0.775V RMS.

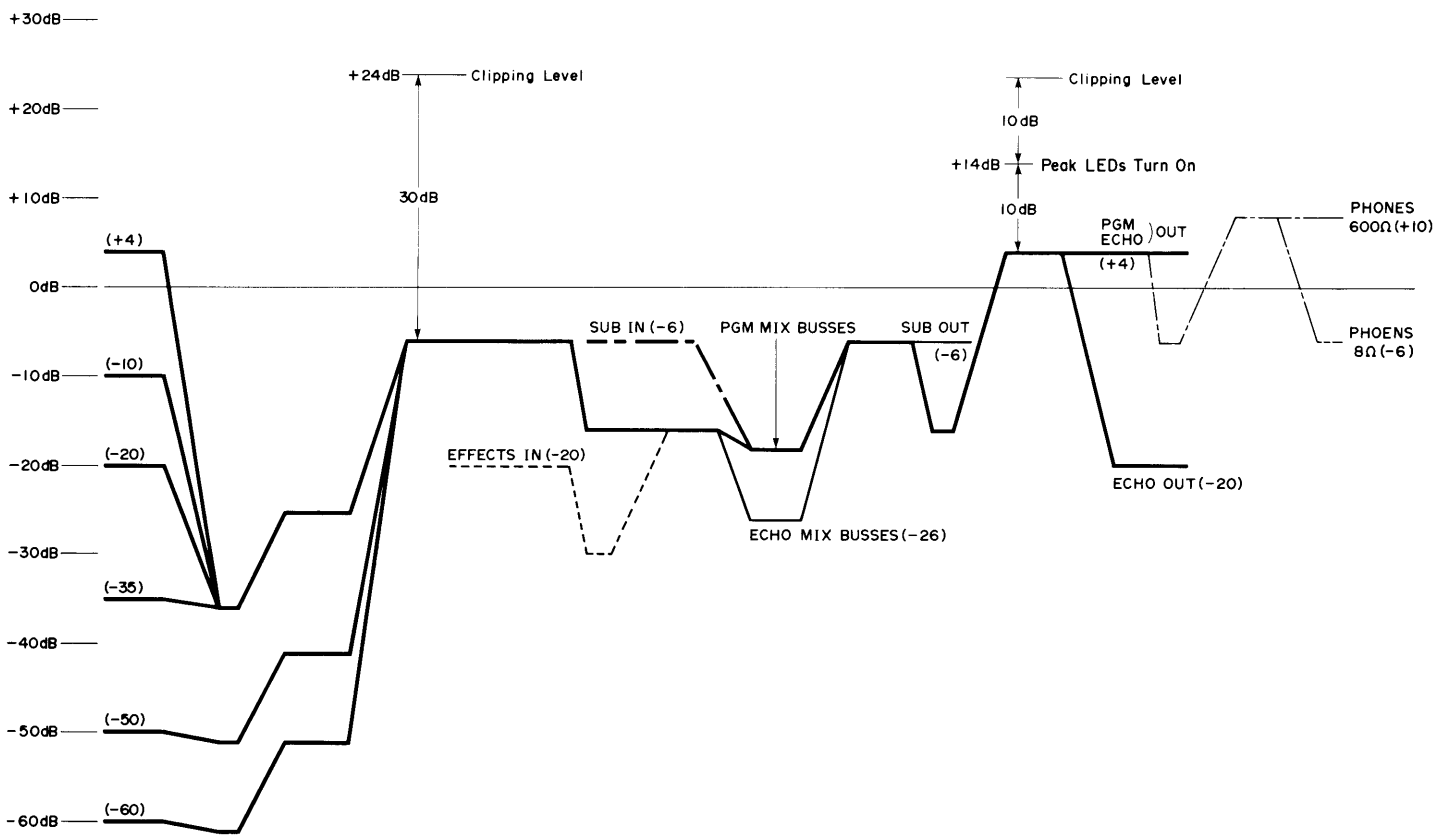
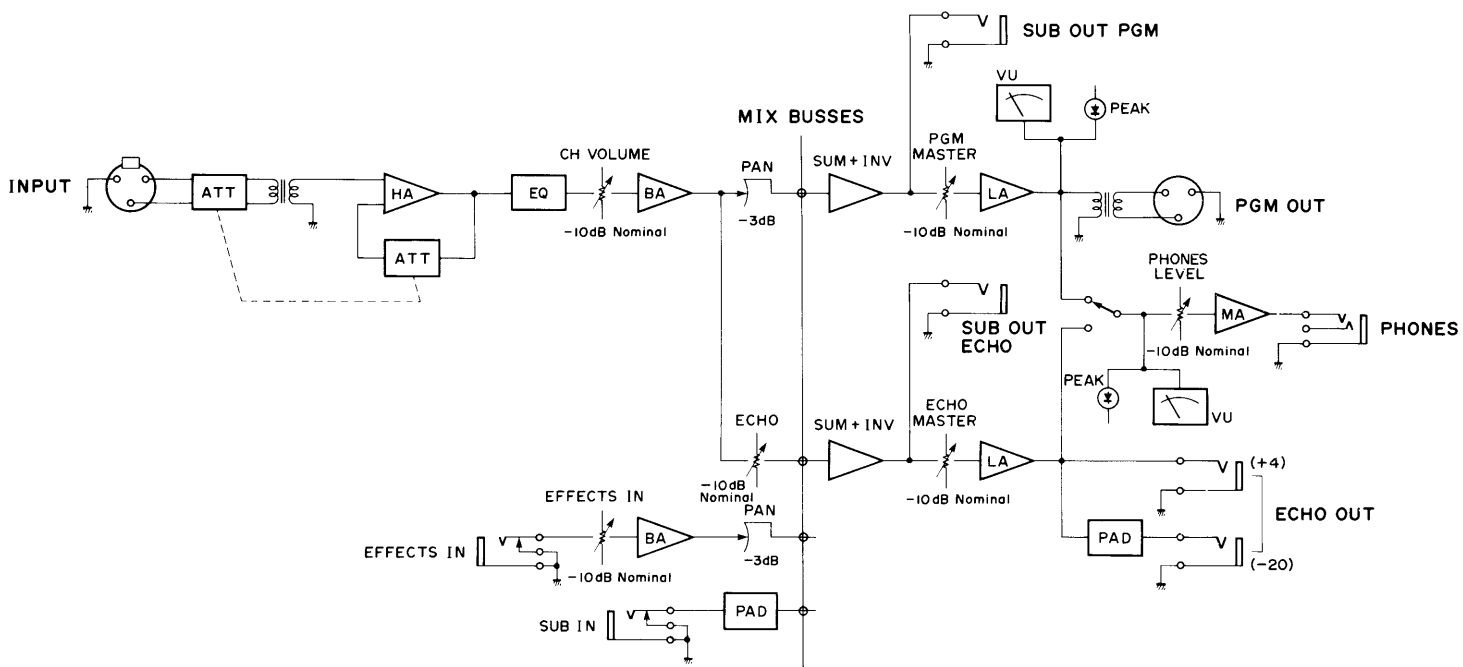
** Sensitivity is the lowest level that will produce an output of +4dB (1.23V), or the nominal output level when the unit is set to maximum gain.

*** All XLR connectors are floating (balanced) and transformer-isolated. Phone jacks are unbalanced.

BLOCK DIAGRAM



LEVEL DIAGRAM



SERVICE

The M series are supported by a worldwide network of factory trained and qualified dealer service personnel. In the event of a problem, contact your nearest M series dealer, or distributor.

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