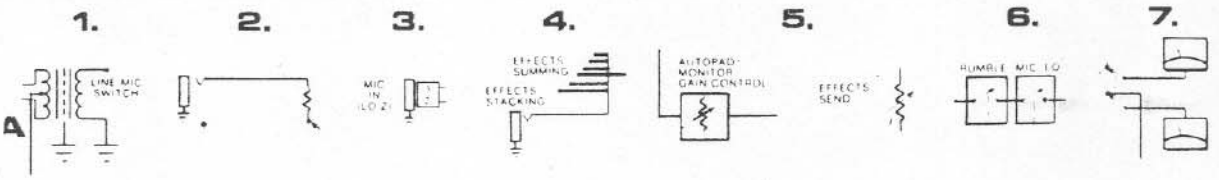
8201B

CAUTION

To prevent electrical shock, do not disassemble. No user-serviceable parts inside; refer servicing to qualified service personnel. Serviceman must disconnect line cord before disassembling

BLOCK DIAGRAM SYMBOLS



1. TRANSFORMER

In this particular case, the input transformer for the 8201B (The XLR connector is connected to the primary, or input, of the transformer. The secondary, or output of the transformer, feeds the input circuitry.) The 8201B transformer is "center tapped" at point A. The center tap of this transformer is used to supply the +48V Phantom power for condenser mics.

2. 1/4" PHONE JACK

This symbol represents a female ¼" phone jack. The example is the line in, located on the rear input panel of each individual channel. These ¼" phone jacks are also used for the main outputs, monitor send, effects returns and sends, etc.

3. XLR CONNECTOR (FEMALE, 3 PIN)

The 6201 has six of these types of connectors for the low impedance balanced mic inputs. These are located on the rear panel input group.

4. SUMMING BUSS

This symbol represents a "mix" point where all the signals from various like functions are brought together. The example shown here represents the Effects mixing circuitry. The summing amp adds, or "sums", the signal from all the Effects controls on the individual channels, as well as signals from the Effects stacking input.

5. AUTOPAD®

This Tapco-engineered feature that allows you to control distortion by simply turning the gain down a little. The example shown here is the monitor gain control (input channel).

This symbol represents a volume control, less Autopad®. Correctly called a "potentiometer", or "pot". The example here is the effects send pot (input channel).

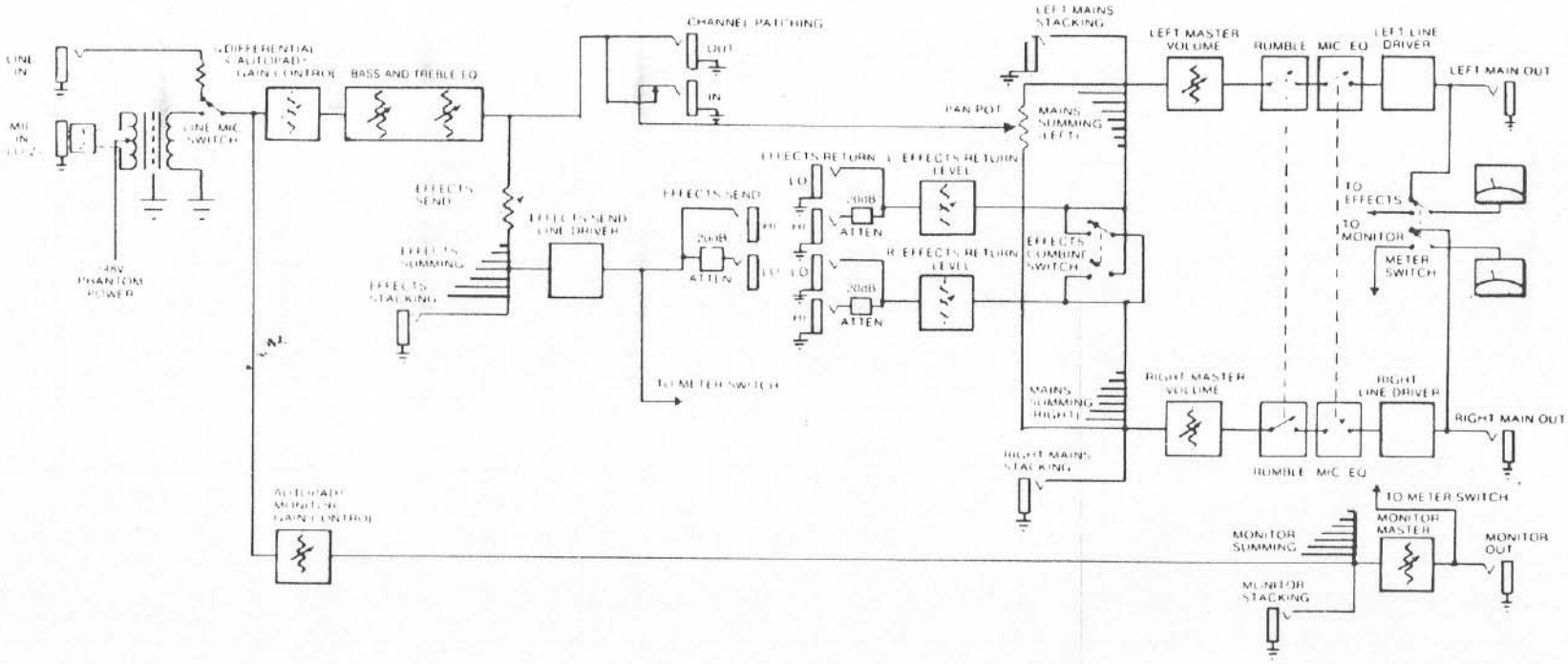
6. SWITCH

This is a "switched" function, in this case, the mic EQ and rumble filter. Shown open, not in use.

7. METER

The VU meters. The example also shows the meter switches that allow you to view the main outputs left and right, or the outputs of the effects and monitors.

CIRCUIT FUNCTION DIAGRAM



CHANNEL GAIN

The Channel Gain control on the 8201B actually adjusts the sensitivity of the input preamp.

Signal from either the Lo-Z mic input or the line input goes to the Gain control stage before being sent to the Bass and Treble EQ stage and the rest of the input preamp signal is taken for the monitor gain control before the Channel Gain control stage and EQ. More about this in a minute.

The Gain control stage on input channels of the 8201B uses an improved version of the TAPCO pioneered AutoPad ®circuitry: new Differential AutoPad®. The Differential AutoPad ®system works just like AutoPad®. If you hear distortion from an input channel, simply turn the gain down a little on that channel 'til the distortion disappears. The improved circuitry of Differential AutoPad ®not only gives the best possible distortion and noise performance, but allows for almost complete attenuation of the input signal.

The normal operating ranges on the Gain control scales serve as guidelines only. Channel Gain settings will vary from source to source. High output microphones can run a bit "hotter" than others, and line input sources can vary greatly in levels.

PAN

Pan pots are used to create the stereo image. Pan is short for panorama. Applied to stereo it's the placement of a sound from one side of the stereo image to the other. A more common control that works like a Pan pot is the balance control on a home stereo. Unlike a home stereo, the Pan pots on the 8201B affect only individual channels, not the main output. The Pan pot takes the signal and positions it in the stereo picture: it can be placed wherever you want it, or "swept" from side to side as a special effect.

Effects and Monitors are not affected by the use of Pan on a channel. Some Pan pots cause an apparent change in loudness when a sound is panned. Not true with the 8201B. These circuits have been carefully designed to do away with fiddling around with levels everytime the Pan pots are used. If you want to change the loudness of a channel when using the Pan control, simply adjust the channel Gain.

BASS AND TREBLE

The Bass and Treble controls can provide up to 18 dB boost or cut in the high and low frequencies.

In reality, 18 dB is a lot of EQ in anyone's book, but for special effects or special jobs, the range is there when you need it. The frequencies affected by the EQ controls and the EQ circuitry itself were designed, and then fine tuned by TAPCO's engineering team to provide the best sound possible from your 8201B. The EQ Section makes it easy to smooth out harsh, raspy vocals or give presence to pianos and other instruments in the main mix.

EFFECTS

The effects control provides a separate mix from the input preamp after, or post, channel gain and EQ.

The Effects Send control feeds a signal to the effects buss. All individual channels and the effects stacking input on the 8201B can feed this system. The signals are summed, and sent to the Effects Send line driver. The signal from the line driver is fed to two 1/4" phone jacks located in the rear output group. Take note of the fact that the two Effects Send jacks are labelled "Hi" and "Lo". Store that in your memory banks, we'll be talking about that more later. The signal from the Effects Send is usually sent to an external "effects" device, like a reverb, tape echo, or digital delay. The signal is processed by the device, then sent back from the output of the effects to the Effects Returns on the mixers.

MONITORS

The Monitor system of the 8201B is actually another mixer within a mixer.

The signal is taken pre channel gain, and EQ. As a result, the signal going to the Monitor gain control is one that's completely independent from the rest of the input preamp. TAPCO's AutoPad® circuitry is employed in the Monitor control. So just like the channel gain, any overload distortion in the monitors can be eliminated by turning the monitor gain control down on the input that's causing the problem.

The overall output level of the Monitor buss is set by the Monitor Master control located in the front panel output section. The output of the monitor mix is taken from a 1/4" phone jack on the rear panel. The beauty of this completely separate monitor mix is that once levels are set for the stage monitors, they won't have to be adjusted when house levels are changed.

MIC/LINE SWITCH

This switch allows you to select either a line level input (switch "in"), or balanced microphone input (switch "out").

SOME ADDITIONAL INPUT ON INPUTS

Here are a couple of things about inputs and input connections that you'll want to know about before we take a look at output controls and connections:

*First of all, the actual input impedance of all TAPCO mixers is such that it will work with any Lo-Z mic, balanced and unbalanced (remember never use unbalanced mics when using Phantom power!).

*Secondly, some condenser mics have hot output levels that may make proper, or more normal, levels difficult to achieve, but you can use a pad to bring things back to a more normal level. A loss pad is inserted between the mic and the mic input on the mixer. It "drops" the signal level a bit without interfering with the actual performance of the mic. These plug-in pads are probably available at your TAPCO dealer.

INPUT CONNECTIONS

The balanced Lo-Z mic input is a three-pin, female XLR connector. The line level input and channel patching/direct outputs are 1/4" phone jacks. The Mic input and the Line level input are "separated" from the input preamp by the mic line switch which is on the front panel. The channel patching/direct output appears after the gain control and EQ sections.

The Mic/Line switch allows you to select either input, mic or line. Because the switch completely shuts off one or the other input source, both can be connected at the same time without worrying about leakage or interference from the input source that has been "disconnected".

The Lo-Z mic input is transformer coupled to the rest of the preamp. Besides providing an almost noiseless increase in gain, along with almost absolute RFI protection, the transformer makes it easy to apply +48V phantom power (via its center tap) to pins 2 and 3 of the female XLR. That's a whole can of worms that deserves a mention and a caution at this point:

1) Never use unbalanced mics when the Phantom power is being used. You can damage the unbalanced mics, and, if you're real lucky, you'll get away just having a lot of distortion and bizarre noises in the mix. You probably won't damage the Phantom power supply in the 8201B, it's protected. But why take a chance on ruining a mic? Be sure all your mics are balanced - have a technician check if you don't know what to look for!

2) Another potential mic-damaging situation is the use of a condenser mic that isn't compatible with +48V Phantom power. Some older condenser mics require much less voltage than that. So check out the manufacturer's specified power requirements before plugging in and turning on. In general, any mic that is defined as "Phantom powerable" will be compatible with the 8201B's Phantom power system (the term "Phantom power" implies +48V).

MASTER GAIN CONTROLS

The Master Gain Controls are located at the bottom of the front panel output group. The separate controls for the right and left mains set the level of the overall mix that appears at the two output jacks on the rear panel.

Signals from all eight input channels, the effects return, and main stacking buss are all summed at the main mix busses. Next, the signals are fed to the master control stages then through the rumble filter and mic EQ to line drivers before going to the main output jacks. Naturally, TAPCO employs AutoPad®

circuitry in the Master Gain Control stage to allow you to control noise and distortion while setting output levels.

The 8201B was designed with two separate controls for main outputs. The Master Gain Controls can regulate output levels for a stereo PA system or stereo recording system, or can be used to control the 8201B as one or two channel mono board.

RUMBLE FILTER

Above the left channel master gain control is the Rumble Filter switch. This filter rolls off the extreme low end(-6 dB at 100 Hz). The signals from the main outputs pass through the Rumble Filter on their way to the main output jacks. There are low end bass noises that are often less than desirable. Vibrations from stage flooring and people keeping time with their feet can be greatly reduced from the main mix by activating the Rumble Filter. This filter is also helpful in taking out excessive bass in the main mix caused by a loud bass amp on stage being picked up by other mics. In a broadcast or mixdown-production application, rumble filtering will remove most turntable rumble and machine noise from tape playback systems. All this can be done while retaining a respectable bass sound in the mix. This filter removes the lower bass while leaving midrange bass and upper bass still intact.

MIC EQ

The Mic EQ switch is located above the right channel gain control. The Mic EQ circuit boosts the extreme high end of the sound spectrum (+9 dB at 20 kHz). This increase can be used to get an overall "brighter" sound from some mics and speakers. Mics that have been dropped or subjected to years of use can lose some of their high end response. While the Mix EQ won't fix them, the added high end boost can make mics like that a little more usable.

EFFECTS RETURNS FUNCTIONAL DESCRIPTION

The Effects Return level controls are located in the front panel output group above the Mic EQ and Rumble Filter switches. In looking at the function of the channel effects controls and effects buss, we said that signals taken from the effects send and fed to a signal processing device were sent back to the mixer's Effect Returns.

The Effects Return jacks are located in the rear panel output group. There are four Effects Return jacks altogether. Two of these jacks are labelled "Hi", two "Lo". The right and left side employ one Hi and one Lo per side.

Confused? O.K., before going any further, we'll explain the difference between the two types of Effects Return jacks. The "Hi" and "Lo" refer to the level of signals being sent to the Effects Return jacks. The "Hi" level Effects Returns are meant to handle line level signals, that have a signal strength of about 500mV or greater. Many active signal processing devices

have this line level output, a digital delay device let's say. The "Lo" Effects Returns are designed to accept a much lower signal strength. This lower level is about 100mV. Most guitar-type or "pedal" effects have this lower level output. The 8201B drops or attenuates the high level signal before passing it along to Effects Return controls. This is a pretty important concept. Because of the lower signal strength, the "Lo" Effects Returns are much more sensitive than the "Hi" level returns (20dB more sensitive). You could use a guitar-type phase shifter into the "Lo" Effects Returns without having to crank up the Effects Return controls past realistic levels. On the other hand, an effects device like a digital delay or other strong signal source can be run into the Effects Return without turning down the Effects Return controls too far. The 20dB attenuation of the "Hi" level return makes it possible in this case to keep controls at reasonable levels. Of course, the Effects Return controls are equipped with AutoPad® to help you control distortion in the Effects Return system.

Well, that isn't the whole deal on Effects Returns. Notice the effects Combine switch (on the front panel, above the Effects Return controls). When this switch is "out", signal from the left and right Effects Return remain independent and are then mixed with signals from the left and right mains. By depressing the switch ("in"), signals from either or both Effects Returns will be routed to the mains in "mono". Bizarre? No! This feature allows an extreme amount of flexibility in using the effects system on the 8201B. When the signals from the effects controls are combined, you still have independent control over each Effects Return level because the "combining" happens after the controls. Simply put, you can run a mono effects mix while the rest of the system is stereo (assuming the effects device you're using has only one output). The processed signals can be mixed using just one Effects Return control. And more importantly, you can run more than one external effects device using both Effects Return level controls and mixing the signals from both devices with the combine switch.

The Effects Send on your 8201B has both high and low level outputs, much the same as the two Effects Returns.

MASTER MONITOR

The Master Monitor control sets the level of the monitor mix in much the same way the Master Gain controls set the level of the main outputs. Like the Master Gain controls, the Master Monitor controls the output level of the summed monitor mix from the individual channel monitor controls and the Monitor Stacking Access Buss. Remember, the monitor mix is completely separate mix from the rest of the system. And, like Master Gain control functions, the monitors system uses AutoPad® to help eliminate distortion. The output from the monitor mix is taken off a 1/4" phone jack on the rear output panel.

PHANTOM POWER ON/OFF SWITCH

Below the Power On/Off switch is the Phantom Power On/Off switch. When the switch is "in", Phantom power is on and the red LED above the switch will glow. The 8201B's Phantom power supply is a ramp on/off power system a lot like the main power supplies. When activated, the Phantom power system slowly builds up to a full, +48V operating level. Phantom power is applied to all of the mic input XLR connectors. But, we've got to say it again: Use caution when using Phantom power! Never use unbalanced mics in conjunction with Phantom power! You can ruin the mics at the drop of a hat doing this, so don't do it!

Also carefully check the needed powering voltages for any condenser mic you plan to use with Phantom power. The +48V supply is a standard operating voltage for most condenser mics, but some mics require much lower voltages: Check the mic manufacturing specs before plugging in and powering on. Mics are an expensive proposition, don't burn them up or damage them with a careless application of Phantom power. BE CAREFUL.

ON/OFF

The Power switch turns the 8201B on or off. But, use caution! The power supply of the 8201B has some safety features that a lot of other mixers and related audio equipment don't have. TAPCO has built into the 8201B a ramp on/off power supply. The power supply gradually comes on when the Power switch is in, and turns off gradually when powered down. If you've accidentally turned on your power amps BEFORE your mixer (WRONG WAY!), this feature MAY save your PA and monitor speakers. A sudden power on condition can cause nasty turn-on "thumps", or transients, from some other equipment even though the 8201B won't. So the best and safest route is mixers, external effects, and other "auxillary" equipment at the board on. THEN power amps on (RIGHT WAY!). This is the only sure way of avoiding turn on/off transients. Another important thing to remember is that even with the ramp on/off power supply, an interruption of power to the system can cause transients that could damage speaker systems. If this occurs, it might be best to "restart" the whole system: Mixers and auxillary equipment at the board with master output controls off, then amps.

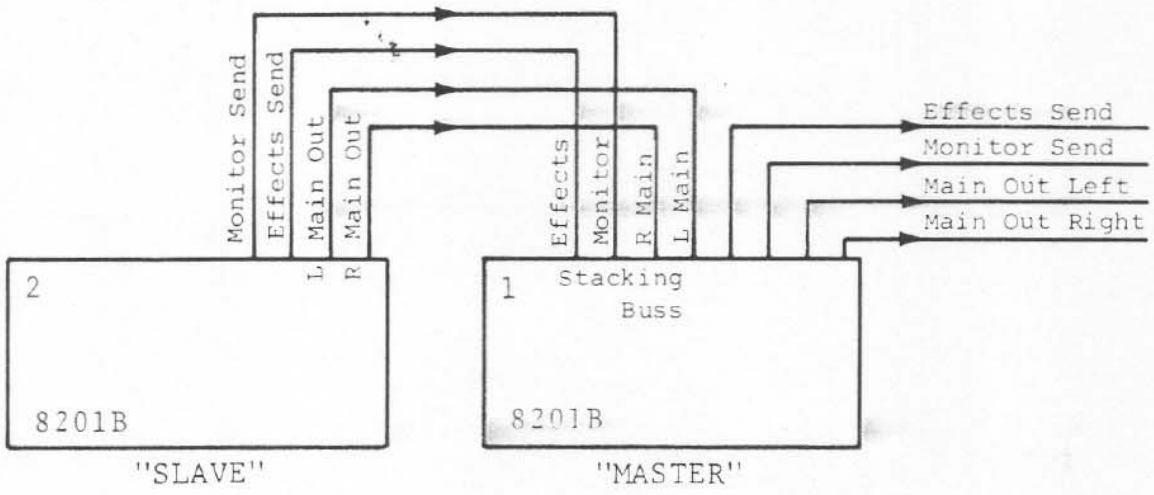
METERING

The output meters on the 8201B are multipurpose. By the use of the Meter select switch, located below the meter, you can look at the outputs of the left and right mains, or the effects and monitor busses. Switch "out" for left/right mains, switch "in" for effects/monitor.

The meters look at either the left and right outputs or the Effects and Monitor outputs. Operating the switch has no effect on the signals from either source, it only determines what the meters see.

STACKING BUSS ACCESS

The signals supplied by the slave unit via the stacking access jacks are summed along with any signals from the individual channels (Left/Right Mains, Effect Send and Monitor Send). The output controls on the first unit then become master controls for signals sent to power amps, external effects devices and the monitor system. The first unit becomes the master unit. To illustrate this wonderfully complex function, look at the example below.



The 8201B is, of course, compatible with another 8201B. This system allows you to "stack" two 8201B's. (Get it? "Stacking" access buss!). You have the advantage of getting 8 more channels without tying up any input channels on the master 8201B.

The Stacking Buss on your 8201B may be compatible with other mixers. Try them out. We can't speak for other mixers' compatibility since we haven't tried them all. Experiment around. But, don't plug the outputs from a power amp or instrument amp into the stacking inputs of the 8201B (or any other input on the 8201B for that matter). Disaster can and will result!

CHANNEL PATCHING/DIRECT OUTPUTS

The Channel Patching/Direct Outputs are post channel gain and EQ. The direct output is just what the name implies: A direct output from that individual channel. If you plugged in a 1/4" phone plug into the direct out, signal would come directly from the channel itself, independent of the output section and other output controls, but subject to the settings of the EQ and variable gain. The direct output is designed not to interfere with the normal operation of the channel. The input jack is, in a sense, a switch. If a 1/4" phone plug is inserted here, the signal flow from the gain and EQ stage of the preamp will be interrupted. O.K., that's how it works, now why?

The Channel Patching/Direct Output functions are truly one of the most versatile features on the 8201B. A signal from the direct output could be sent to a compressor or an equalizer. The signal would be processed by the external device, then returned to the channel via the channel patching return jack. The signal that appears at the channel patching input would then become the signal for that channel in the overall mix. This function provides some flexibility in using effects. In using the effects buss, all channels can be processed by an external effects device. What happens if you need an effect, or some signal processing on one channel? The problem can be solved by using the Channel Patching/Direct Output system. One channel can be worked with individually, or eight channels on an individual basis, while still retaining use of the effect circuit. The channel patching system can also be used for signal sources in multitrack recording!

WARNING:

To prevent electrical shock, do not disassemble. No user-serviceable parts inside; refer servicing to qualified service personnel. Serviceman must disconnect line cord before disassembling.

PHANTOM POWER

All condenser microphones have one thing in common: they all require some kind of electrical power. This power is needed to operate the mic's preamp circuits, and in some cases to charge the capacitive plates that constitute the actual transducer elements. In the newer electret condenser mics the power is used only for the internal preamp because the plates are permanently charged when the mic is built.

Early condenser mics contained tube type preamps. The tubes required an external AC power supply, which was usually connected to the mic through a multi-conductor cable that also house the audio lines. Transistors have now virtually eliminated the use of tubes in condenser mics because they offer lower power consumption, greatly reduced size, and improved noise performance.

The newer, solid state mics get their power from either internal batteries, or an external supply that is fed to the mic via the audio cable. Many of the battery powered mics may also be externally powered - check the manufacturer's literature for specifics. External power may be applied two ways:

1. Phanton or Simplex powering DIN standard 45 596

2. "T" system powering (also called modulation lead powering, or AB powering), DIN standard 45 595

The difference between the two systems is the way the power is applied to the mic, through the audio cable.

Phantom powering imposes a positive voltage on both audio conductors, using the shield for the power ground. The "T" system imposes a positive voltage on one audio lead, using the other as the power ground. In the "T" system the shield functions, as it usually does in a balanced system, only as a shield. THE TWO SYSTEMS ARE NOT COMPATIBLE WITHOUT SPECIAL ADAPTERS.

The term Phantom Power, specifically, means only one thing: +48V dc applied to the microphone on both pins 2 and 3, through some nominal current limiting resistance. The important thing to note is that when the term Phantom Power is used, +48V dc is the voltage standard. All microphones that are labeled as Phantom or Simplex powered will operate from this voltage, regardless of any other voltage mentioned in the microphone manufacturer's literature. This is because any other voltage will only be mentioned as a minimum operating voltage at which the mic will meet its specs.

These microphones are NOT Phantom Power compatible:

Sennheiser:	MKE 201	MKH 110
	MKE 401	MKH 110-1
	MKE 801	MKH series with T suffix
	MKE 10	MKH 435 U
Vega:	S-10	
Neumann:	FET 70 series	KM64
	KTM	KM56
	U series	M series

AKG:	C60, C12, C24	
Beyer:	MC715	
E-V:	PL 76 (battery only)	
Altec:	M50	M20
	M51	M21

If your microphone isn't listed here consult the data sheet or the manufacturer.

CAUTION: A "T" powered mic may be damaged by +48V Phantom powering. Always check manufacturer's specifications before applying power to any microphone.

Some dynamic and ribbon mics may exhibit random noise (crackling, spluttering, or even humming) when used in a Phantom powered system. The problem is that the transformer inside the microphone has developed leakage, from the winding to the microphone case (pin 1). It's the leakage that causes the noise, not the power. There are three solutions:

1. Turn off the Phantom Power.

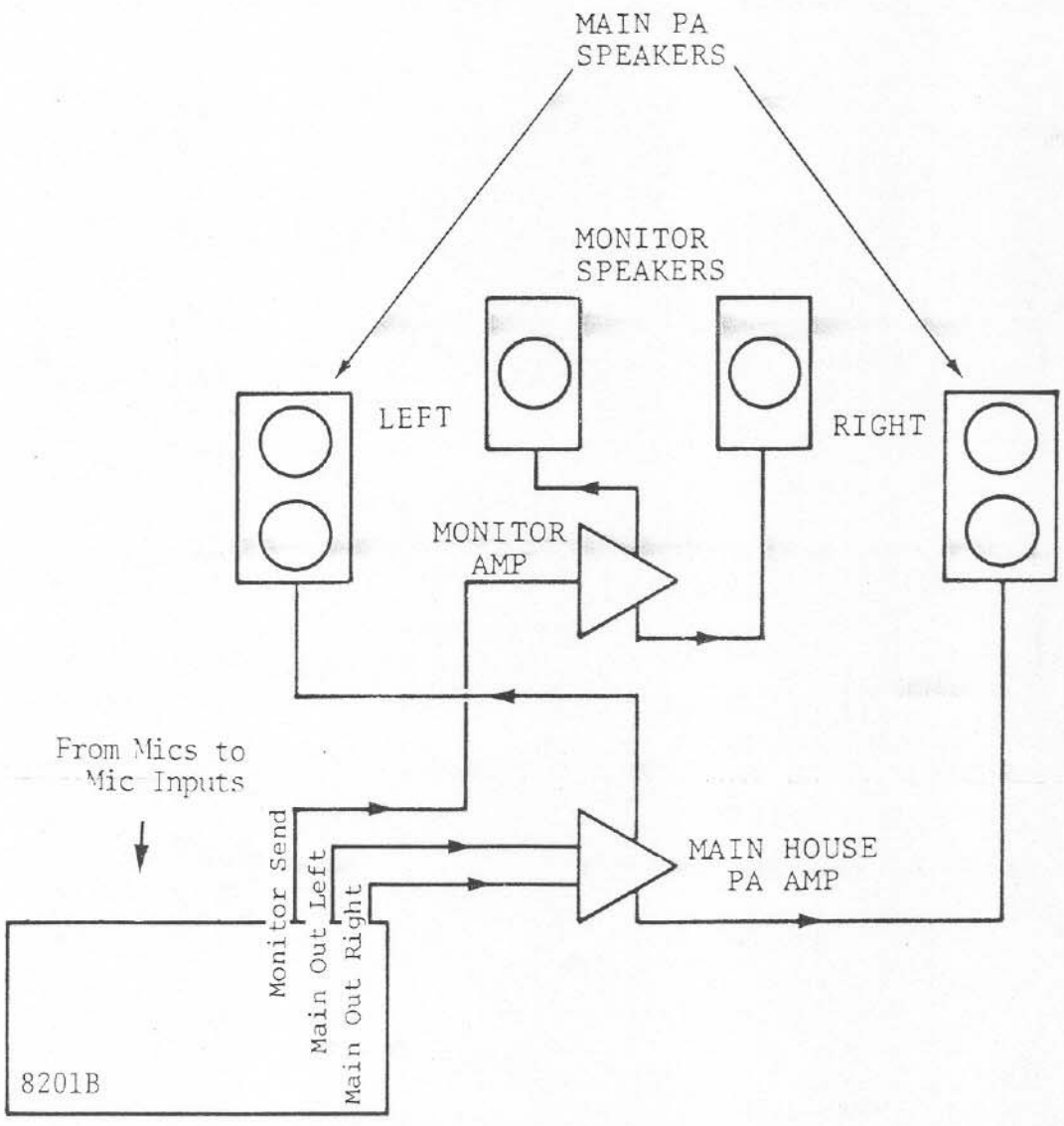
2. Insert a 1:1 isolation transformer in series with the bad mic.

3. Get the mic repaired.

Note: With the exception of "T" powered mics, the mics listed in the table above can be used with your 8201B, but they require their own power supplies to be used. However, still check with us or the mic manufacturer if you aren't sure about a mic.

SOUND REINFORCEMENT WITH STAGE MONITORS

The output from the Left and Right Mains go to either the input of an active cross-over system, or to the input of an amp that powers the house P.A. speakers. The Monitor Send output goes to an amp that runs the stage monitor speakers. Remember! Use caution, never plug the output of an amp into the input or output of the mixer! Disaster will result.



Basic PA SETUP with Stage Monitor.

EFFECTS

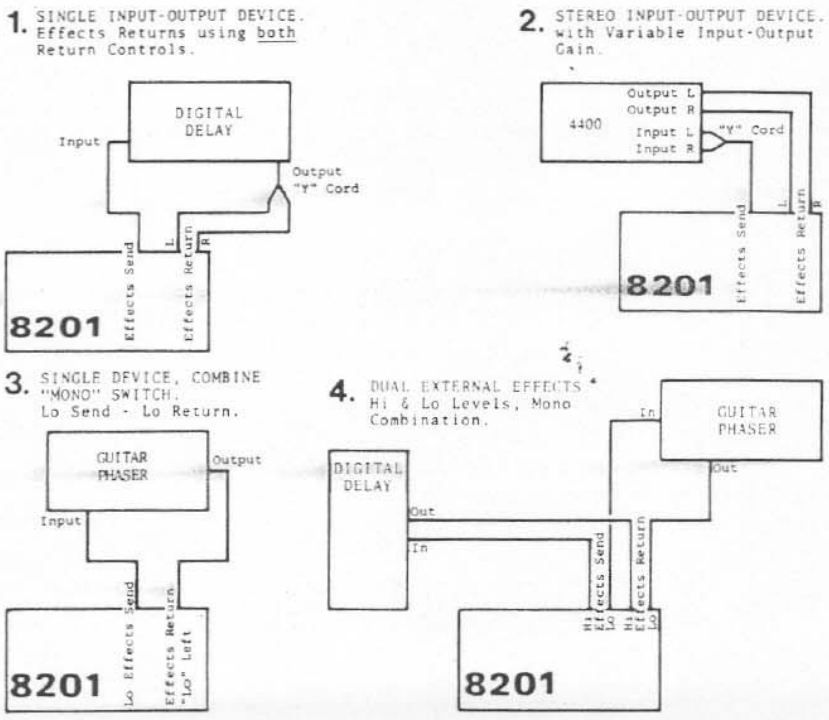
We've included 4 different examples of effects set-ups. Of course, there are more, but we couldn't begin to show you all the different variations available to you on the 8201B.

1. This set-up shows an external effects device, (a digital delay), that has a single input and output. This line level effect would use the "Hi" level Send, and the "Hi" level Effects Return. A "Y" cord could be used so that a signal from the Effects Returns could be separately fed to the Left and Right Main outputs, or a single cord could go to the left or right Effects Return and the Combine switch would feed the signal mono to both main output sides.

2. This set-up is for a device with stereo inputs and outputs, like TAPCO's 4400 reverbration system. A "Y" cord from the "Hi" Effects Send to the left/right inputs of the 4400. The left/right outputs would go to the appropriate Effects Return jacks on the 8201B (Combine switch "out".)

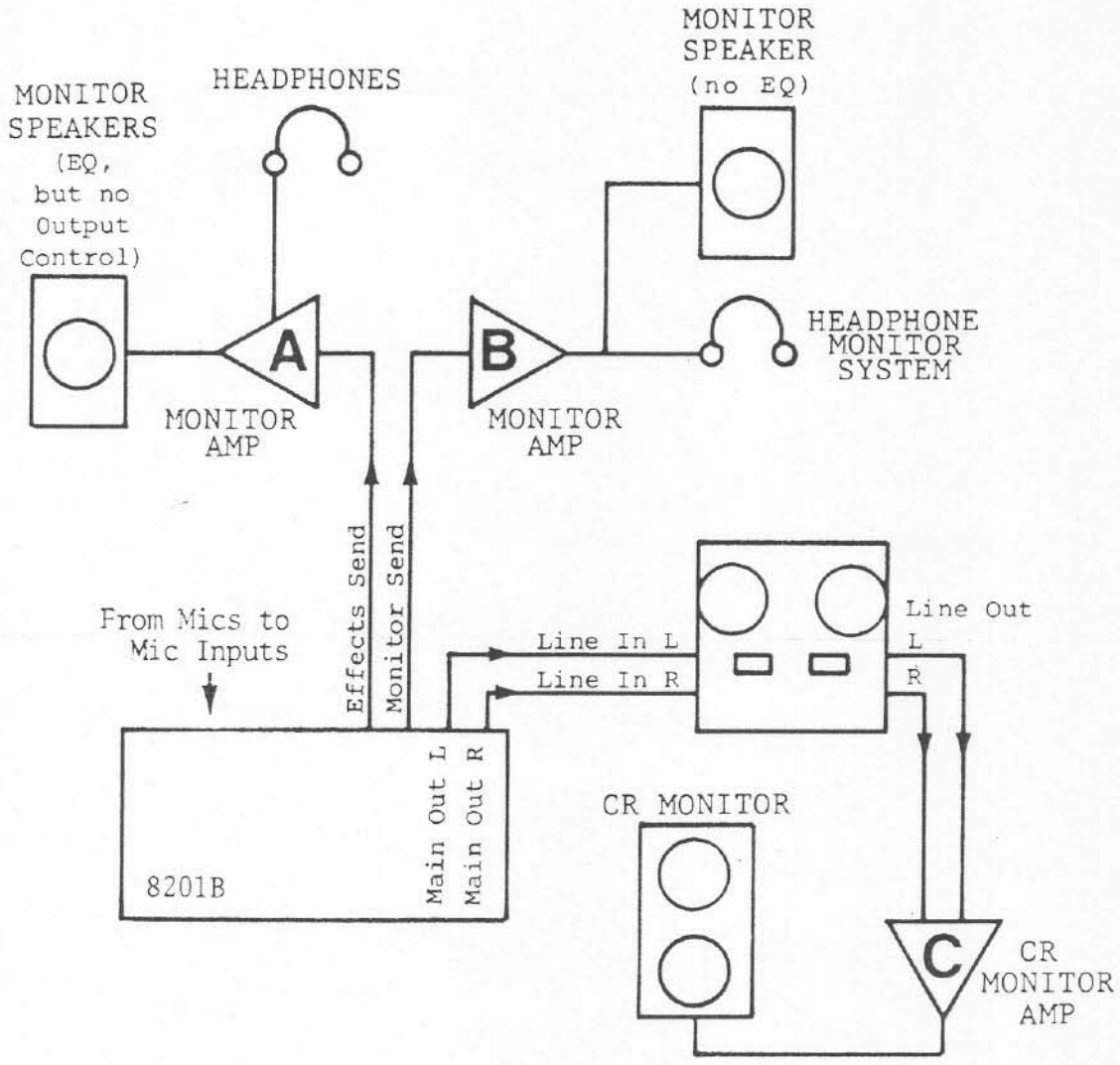
3. This shows a guitar-type phaser connect from the "Lo" level Effects Send to the input of the phaser. The output of the phaser is connected, in our example, to the left, "Lo" level Effects Return. The effects Combine switch can be used to feed this signal both Left and Right Main outputs in mono.

4. The last set-up example for effects used a line level effects device. We've used a digital delay (and the phaser we used in the last example). The devices are connected to their appropriate sends and returns. The effects Combine switch is used to feed the signals in mono to the main mix. The individual Effects Return controls "blend" the desired amount of effects with the mix from either external effects device.



STEREO RECORDING

We've shown you three different ways you can monitor a stereo recording done with the 8201B. The main recording set-up is relatively simple. Take the Main Output Left and Right on the 8201 to the line inputs of the recording deck. This set-up can be monitored directly from the deck, or through an amplified monitor system connected to the tape deck outputs. A system like this could feed a control room monitor, or a headphone monitor system, (example "C"). This same system could also have the monitor system signal sent directly from the Monitor Send on the However, the monitor signal is supplied pre EQ, (example "B"). If you desire EQ in the monitor, you can use the Effects Send. Either "Hi" or "Lo" send depending on the monitor amplification system being used, (example "A").

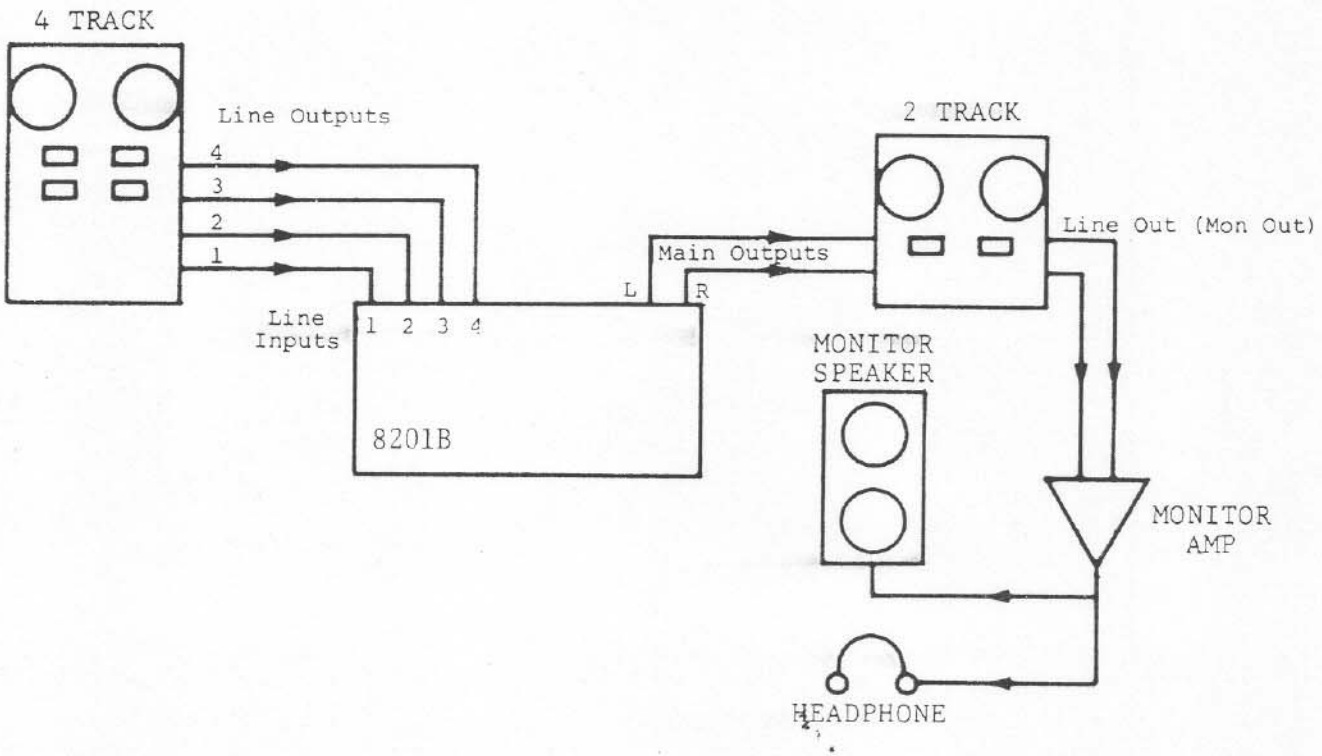


NOTE: Monitor set-up "C" is the only set-up that lets you know what is on the tape.

MULTI-TRACK MIXDOWN

A 4 track recording can be "mixed down" to stereo using the 8201B. The line outputs from the four track tape recorder are fed to four line inputs on the 8201B. The Main outputs Left and Right go to the 2 track tape deck. The various functions, (channel EQ, Effects, Rumble, etc.), can be used to enhance the original recording. Mixing down takes some practice, so don't be afraid to try over and over until you achieve the end results you desire.

Basic 4-track MIXDOWN (4 to 2) with monitor.



8201B SPECIFICATIONS

Frequency response	± 1 dB 20-20 kHz at + 4 dBm mic input to line output ± .5 dB 20-20 kHz at + 4 dBm line input to line output
T.H.D.	Less than .05% T.H.D., 20-20 kHz at + 10 dBm
Intermodulation Distortion (SMPTE method)	.05% at + 4 dBm, typically less than .05% at + 18 dBm
Equivalent input noise	—127 dBV, 20-20 kHz, 150 Ohm source
Maximum mic input level	0 dBV at 1 kHz
Maximum out	+ 18 dBm, 20-20 kHz or 9V, 5k or greater load
Mic EQ	+ 9 dB at 20 kHz
Rumble filter	—6 dB at 100 Hz
Tone controls	± 18 dB at 50 Hz and 20 kHz
Stacking input impedance	91K
Input sensitivity	Channel volume at 10, Master at 10, Pan at Center; Mic: —40 dBu for + 4 dBm out Line: —10dBu for + 4dBm out
Meter sensitivity range	+ 4 dBm to —20 dBm for zero indication — user accessible + 4 dBm calibration at maximum CCW rotation
Phantom power	+ 48 Vdc regulated, foldback current limited 34 mA maximum total of all mics
MONITORS	
Frequency response **T.H.D** **IMD** **EIN**	Same as main outputs
Maximum output	+ 17 dBm
Stacking input impedance	20k
EFFECTS	
Maximum output	Hi + 17 dBm Lo 0 dBV
Effects return, maximum in	+ 32 dBu at Hi + 12 dBu at Lo
Effects return input Z	Hi 51k pot maximum Lo 25k pot maximum
Effects return sensitivity	For + 4 dBm output, Master at 10, Hi + 4 dBu, Lo —16 dBu
Effects stacking input impedance	56k

All product specifications subject to change without notice.

CAUTION

To prevent electrical shock, do not disassemble. No user-serviceable parts inside; refer servicing to qualified service personnel. Serviceman must disconnect line cord before disassembling.