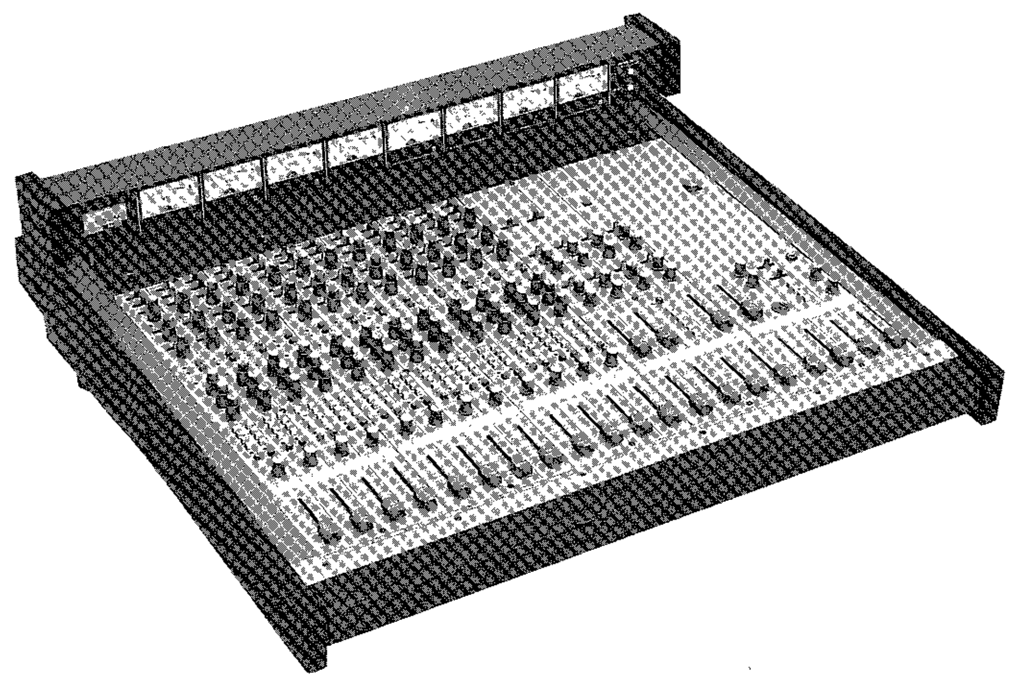
TASCAM
TEAC Production Products

M-50
Mixing Console

Meter Lamp
Pag 128



OPERATION / MAINTENANCE

5700041000

The guarantee of performance that we provide for the M-50 must have several restrictions. We say that the M-50 will perform properly only if it is adjusted properly and the guarantee is that such adjustment will be possible. However, we cannot guarantee your skill in adjustment or your technical comprehension of this manual. Therefore, setup is not covered by the Warranty. If your attempts at internal adjustment are unsuccessful, we must make a service charge to correct your mistakes.

Recording is an art as well as a science. A successful recording is often judged primarily on the quality of sound as art, and we obviously cannot guarantee that. A company that makes paint and brushes for artists cannot say that the paintings made with their products will be well received critically. The art is the province of the artist. TASCAM can make no guarantee that the M-50 in itself will assure the quality of the recordings you make.

Your skill as a technician and your abilities as an artist will be significant factors in the results you achieve.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

This apparatus has a serial number located on the rear panel. Please record the model number and serial number and retain them for your records.

Model number ______________________

Serial number ______________________

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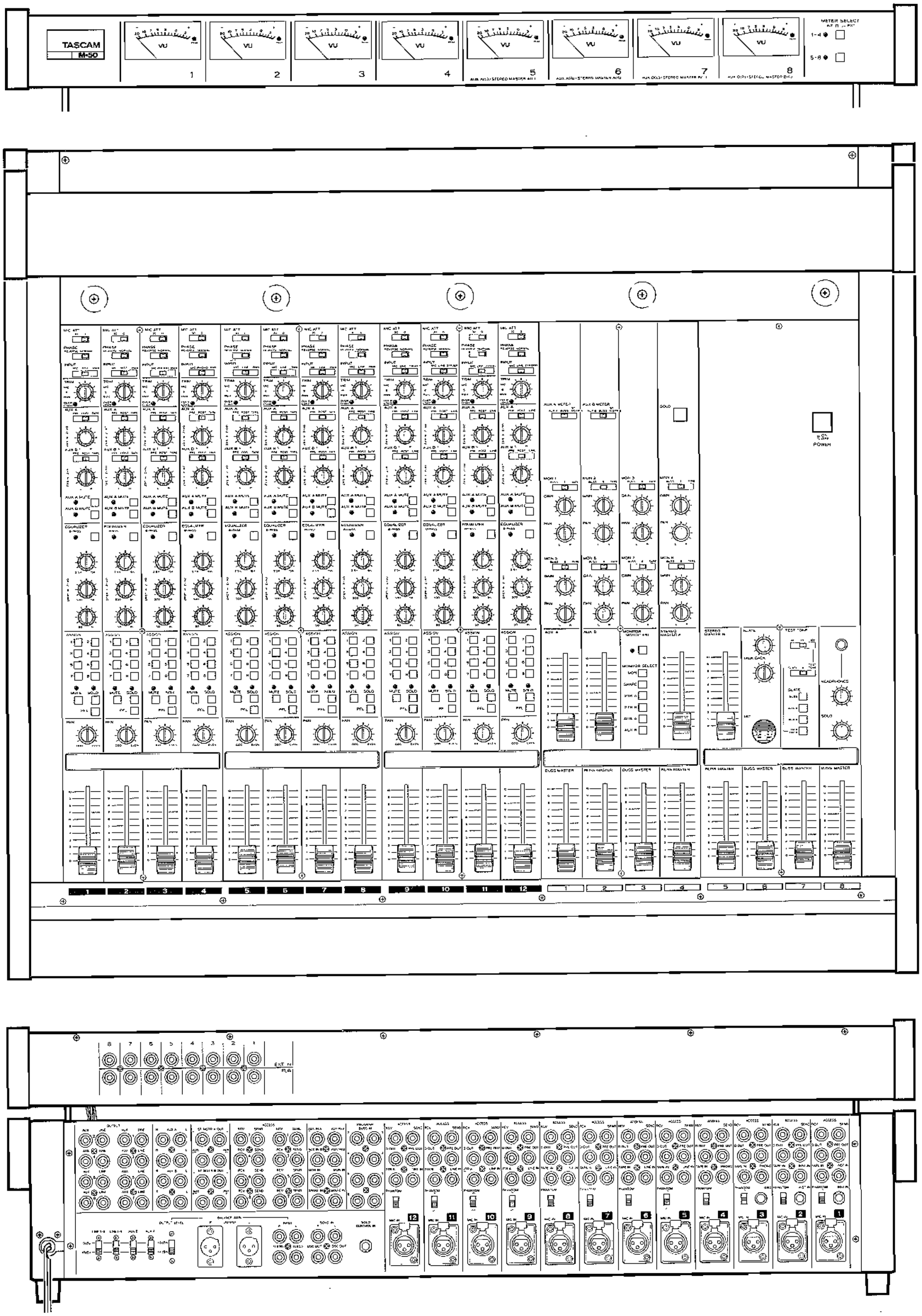
Note:
If you notice any differences, either on the outside or the inside of the unit from the illustrations and descriptions in this manual, talk to your dealer. He may have revision sheets that will show manufacturing changes, or notifications of how to deal with any changes in set-up or maintenance procedures.
Save this manual, refer to it when necessary, and good luck with your M-50.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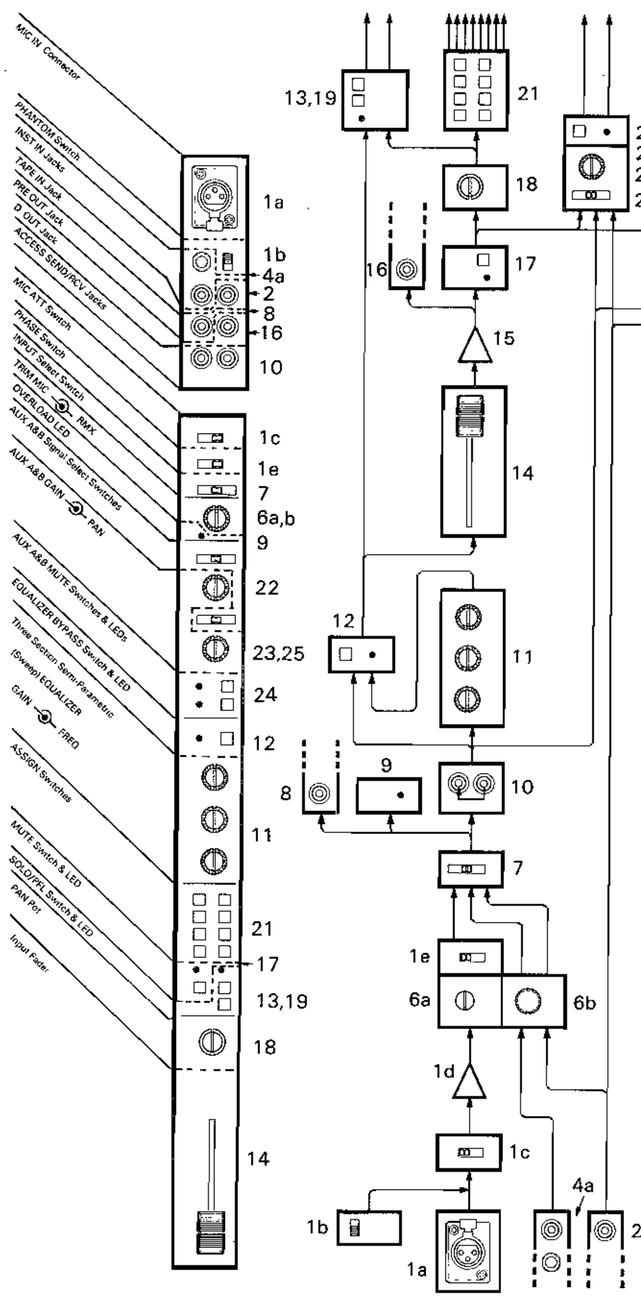
INTRODUCTION TO THE MANUAL, AND HOW TO USE IT

The Model 50 Mixing Console has been designed to satisfy the requirements of the modern multichannel recording process. In addition to the eight channels of switchable control room monitor, two auxiliary mixing systems are "built in." These *Submix* sections, AUX A and AUX B, can be assigned and rerouted to do more than one task. Complete and convenient multitrack operation can usually be accomplished directly from the top panel without re-patching.

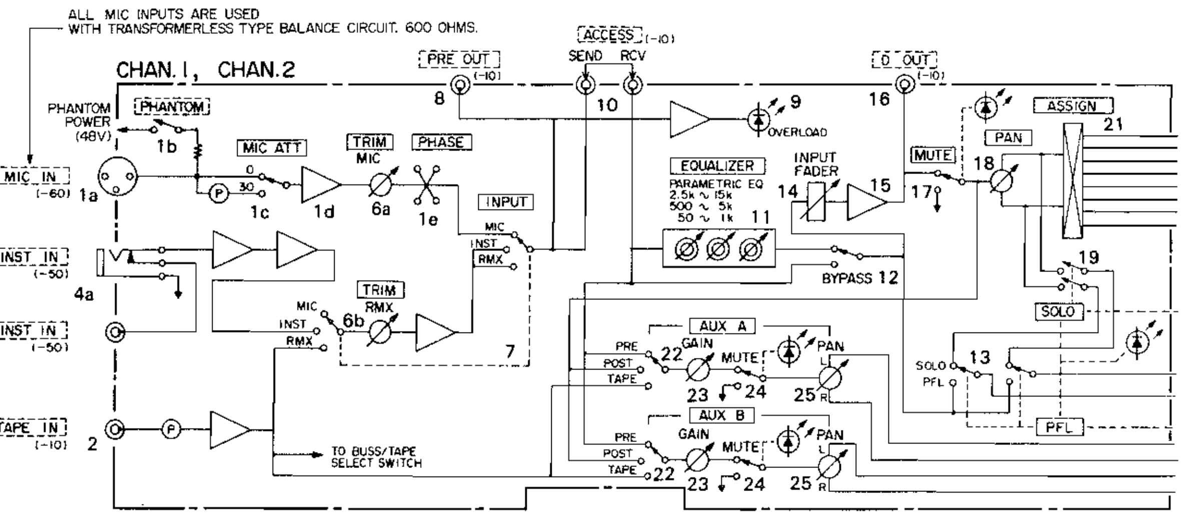
However, the process of multitrack recording is constantly changing, growing more complex as an art with each advance of technology. No matter how many inputs, outputs and special functions that we provide, no console can ever be built so large that it will be capable of coping with all of the switching and routing problems with a "one button" top panel solution. Someone will always be able to come up with that unique situation requiring *just one more mix.*

The design of the Model 50 recognizes the fact that your signal processing needs may require a unique arrangement of subsystems. In order to cope with these changing needs, patch points are provided throughout all signal pathways of the M-50. As our mixing console becomes more flexible, the amount of time needed to understand the available functions increases. The main signal path from "mic in" to "line out" is still fairly straightfoward as the requirements have not changed much since the days of "mono," but the routing for effects sends, cue feeds, and stereo monitoring can be hard to visualize. It's often possible to overlook the significance of unfamiliar connections that are immediately obvious to the experienced recording engineer.

If you expect to find that "extra mix" quickly, you must be prepared to study the layout of the M-50 thoroughly. In most instances, the physical arrangement of the controls on the top panel has very little to do with the sequence of electronic parts inside. The actual "wiring order" will determine what goes where and how, so this is the information you need in order to use the M-50 successfully. As an example, if the controls on an *Input Channel* were actually placed in the sequence of the signal flow, the top panel would look like this. We'll include the patch points from the back panel in their wiring order as well as the faders and switches. Here's the comparison:



While this arrangement of controls might help the first time user to understand the flow of signals in an *Input Channel*, it would be very inconvenient to operate. Still, the wiring sequence must be understood before the more complex functions of the M-50 can be used, so along with the documentation you will need for service (schematic diagrams, mother board layouts, and mechanical disassembly information), we include a simplified electrical sequence chart called a *Block Diagram*.



This drawing shows all the controls, switches, amplifying stages, and connectors in their actual sequence. Learning to read it will provide the answers to any questions concerning "what comes where" on the inside. Things like "does the DIRECT OUT jack come before the EQ circuit or after it?", can be answered quickly. Yes, the DIRECT OUT jack is shown connected after the EQ section, so you will have EQ on any signal derived from that point.

If you have no prior experience in reading block diagrams, you can use the three illustrations we have provided here as a translator. Compare the reconstructed (as wired) *Input Channel* with legend to find out what each symbol represents. Even though the block diagram can indicate what is available in the way of extra circuit flexibility, it can't explain *why* a connection or switch has been included, or suggest a standard layout for your initial setup.

In the following sections of this manual, we do our best to describe the individual functions and controls of the M-50 and how they can be arranged in more than one sequence. In the final analysis, your mixing needs may be best served by an arrangement of inputs and subsystems that you work out for yourself.
Some reference to the scientific terms used by our engineers will be necessary. The M-50 does nothing useful unless it is connected properly to quite a lot of sophisticated equipment. Mics, tape recorders, power amps, and loudspeakers all play a part in the process of mixing/recording and each piece of equipment has its own technical vocabulary. We have tried to make this reference manual as simple as technology will allow. Each section and topic will give you some basic instruction in the terminology as well as a list of "what plug" goes into "which jack".

Even though there is a substantial amount of information available to the recording engineer, much of it assumes that the reader already has an engineering or scientific background and is comfortable with *"The Math."*
Practical rules of thumb are not generally available, and in fact, to operate a mixer no degree in science is necessary. You don't have to build a mixer "from scratch", you just need to know how to find the right control function to get the job done.

To begin our manual, we'll start with some basic information about *Sound* and the numbering systems used to describe energy levels in and out of the systems. *Impedance*, what the term means and how to deal with the details when you must connect the M-50 to other equipment. Many aspects of scientific terminology will be discussed in the most basic terms we can. Whenever possible, the scientific terms will be related to understandable common references. Understanding what is going on inside your equipment will help improve your sound. Think of this manual as a reference handbook. You won't need all of what is here to begin, and it is certainly not necessary to memorize it, but do try to find the time to read it thoroughly at least once. That way you will be familiar with its contents and if you need the numbers they will be here waiting.
Good luck with your sound.

THE DB; WHO, WHAT, WHY

No matter what happens to the signal while it is being processed, it will eventually be heard once again by a human ear. So the process of converting a sound to an electrical quantity and back to sound again must follow the logic of human hearing.

The first group of scientists and engineers to deal with the problems of understanding how the ear works were telephone company researchers, and the results of their investigations form the foundation of all the measurement systems we use in audio today. The folks at Bell Laboratories get the credit for finding out how we judge sound power, how quiet a sound an average person can hear, and almost all of the many other details about sound you must know before you can work with it successfully.

From this basic research, Bell Labs developed a system of units that could be applied to all phases of the system. Sound traveling on wires as electrical energy, sound on tape as magnetic energy, sound in air; anyplace that sound is, or has been stored as energy until some future time when it will again be sound, can be described by using the human ear-related system of numbers called "bels" in honor of Alexander Graham Bell, the inventor of the telephone.

What is a bel and what does it stand for?

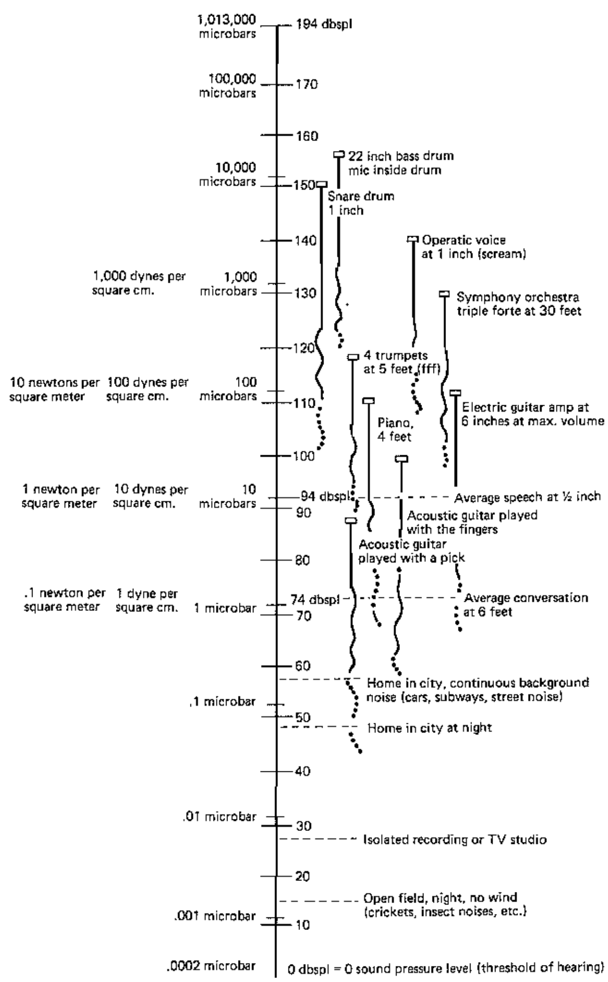
It means, very simply, twice as loud to the human ear. Twice as loud as what? An obvious question. The bel is always a comparison between two things. No matter what system of units of measure you are working with at the time, you must always state a value as a reference before you can compare another value to it by using bels, volts, dynes, webers – it doesn't matter, a bel, or ear-related statement of "twice as loud" is always a ratio, not an absolute number. Unless a zero, or "no difference" point is placed somewhere, no comparison is possible.

There are many positive and definite statements of reference in use today. But before we go over them, we should divide the "bel" into smaller units. "Twice as loud" will be a little crude to be used all the time. How about one tenth of a bel? Okay, the decibel it is, and 0 means "no difference, same as the reference".

It seldom means "nothing". Now, if you double the power, is that twice as loud? No, it is only 3 dB more sound. If you double an electrical voltage, is it twice as loud? No, it is only 6 dB more sound. The unit quantities must follow nonlinear progressions to satisfy the ears' demand.

Remember, decibels follow the ears. All other quantities of measure must be increased in whatever units necessary to satisfy the human requirements, and may not be easy to visualize. Sound in air, our beginning reference, is the least sound the human ear (young men) can detect at 1000 to 4000 Hz. Bell Labs measured this value to be .0002 microbar, so we say 0 dB = .0002 microbars and work our way up from the bottom, or "no perceivable sound to humans" point. Here is a chart of sounds and their ratings in dB, using .0002 microbar pressure change in air as our reference for 0 dB spl (Sound Pressure Level).

Sound and Music Reference



Since the reference is assumed to be the lowest possible audible value, dB spl is almost always positive, and correctly written should have a + sign in front of the number. But it is frequently omitted. Negative dB spl would indicate so low an energy value as to be of interest to a scientist trying to record one cricket at l,000 yds. distance, and is of no significance to the multichannel recordist. Far more to the point is the question "What is a microbar?" It is a unit of measurement related to atmospheric pressure and although it is extremely small, it must be divided down quite a lot before it will indicate the minimum pressure change in air that we consider minimum audible sound. This will give you a better idea of the sensitivity of the human ear.

One whole atmosphere, 14.70 pounds per square inch, equals 1.01325 bars. So one whole atmosphere in microbars comes out to be 1,013,250. One microbar of pressure change is slightly less than one millionth of an atmosphere, and you can find it on our chart as 74 dB spl. It is not terribly loud, but it is certainly not hard to hear. As a matter of fact, it represents the average power of conversational speech at 6 feet. This level is also used by the phone company to define normal earpiece volume on a standard telephone. Now think about that minimum audible threshhold again:

0.0002 microbar.

That's two ten thousandths of a millionth part of one atmosphere!

This breakdown of one reference is not given just to amaze you, or even to provide a feel for the quantity of power that moderate levels of sound represent. Rather it is intended to explain the reason we are saddled with a ratio/logarithm measurement system for audio. Adding and subtracting multi-digit numbers might be easy in this age of pocket calculators, but in the 1920's when the phone company began its research into sound and the human ear, a more easily handled system of numbers became an absolute necessity. Convenience for the scientist and practical engineer, however, has left us with a system that requires a great deal of complex explanation before you can read and correctly interpret a "spec sheet" for almost any piece of gear.

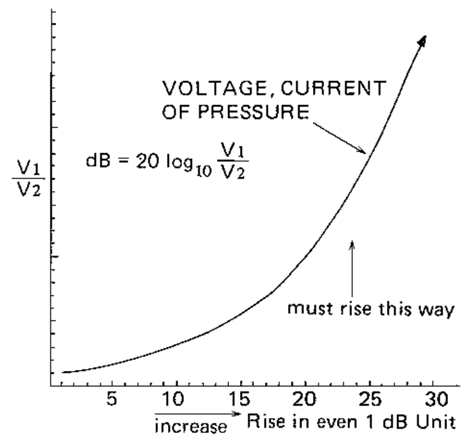
Here are the formulae for unit increment, but they are necessary only for designers. And unless you build your own gear, you won't have to deal with them. For power (watts) increase or loss, calculate by the following equation:

$$10\ LOG_{10} \frac{P2}{P1} = N\ (dB)$$

For voltage, current or pressure calculations:

$$20\ LOG_{10} \frac{V2}{V1} = N\ (dB)$$

Once we have this chart, we can see the difference between the way humans perceive sound and the amount of force it takes to change air pressure. Unfortunately, the result is not a simple "twice as much pressure" of sound to be heard as "twice as loud". If you plot decibels as the even divisions on a graph, the unit increase you need is a very funny curve.



This is how the ear works, and we must adapt our system to it. We have no choice if we expect our loudspeaker to produce a sound that resembles the original sound we begin with. The high sensitivity to sound of the human ear produces a strong "energy" illusion that has confused listeners since early times. How powerful are the loudest sounds of music in real power? Can sound be used as a source of energy to do useful work, such as operating a car? For any normally "loud" sound, the answer is, regrettably, no! Perhaps not so regrettably, consider what would happen if one pound of pressure was applied not to your head, but directly to your inner ear. One pound of air pressure variation is 170 dB spl! This amount of "power" might do some useful work – but not much, it's still only one pound and to make use of it you will have to stand one mile away or you will go deaf immediately.

If we reduce our sound power to realistic musical values, we will not be injured, but we will have almost nothing (in real power terms) to run the mic with! This low available energy is the reason that high gain amplifiers are required for microphones.

When we take a microphone and "pick up" the sound, we do have some leeway in deciding how much energy we must have in order to operate the electrical part of our system. If we can decide that we don't have to truly hear the signal while we are processing it from point to point and we can wait until the electronic devices have done all their routing and switching before we need audible sound, we can lower the power of the signal. What is a good value for a reference here? Well, we need to have enough energy so that the signal is not obscured by hiss, hum, buzz or other unpleasant things we don't want, but not so high that it costs a fortune in "juice" or electrical power. This was a big consideration for the telephone company.

They now have the world's biggest audio mixing system, and even when they started out, electricity was not free. They set their electrical power signal reference as low as was practical at the time, and it has lowered over the years as electronic equipment has gotten better. In 1939 the telephone company, radio broadcasting, and recording industry got together and standardized 1 milliwatt of power as 0 dBm, and this is still the standard of related industries. Thus, a 0 dBm signal at a 600 ohm line impedance will present a voltage of 0.775 volts.

Once again, we owe you an explanation. Why does it say *ZERO* on the meter? What is an ohm? Why 600 of them and not some other value? What's a volt? Let's look at one thing at a time.

1. The logic of *ZERO* on the meter is another hangover from the telephone company practice. When you start a phone call in California, the significant information to a telephone company technician in Boston is – did the signal level drop? If so, how much? When the meter says *ZERO* it indicates (to the phone company) that there has been no loss in the transmission, and all is well. The reference level is one milli-watt of power, but the gain or loss is in the information the meter was supposed to display, so the logic of *ZERO* made good sense, and that's what they put on the dial. We still use it even though it's not logical for anything else, and the idea of a reference level described as a "no loss" *ZERO*, no matter what actual power is being measured is so firmly set in the minds of everyone in the audio world that it is probably never going to change.

2. One ohm is a unit of resistance to the passage of electrical energy. The exact reasons for the choice of 600 ohms as a standard are connected to the demands of the circuits used for long distance transmission and are not simple or easy to explain. Suffice it to say that the worst possible thing you can do to a piece of electronic equipment is to lower the resistance it is expected to work into (the load). The lower the number of ohms, the harder it is to design a stable circuit. When you think about "load", the truth is just the opposite of what you might expect! 0 ohms is a "short circuit", no resistance to the passage of signal. If this condition occurs before your signal gets from California to Boston, you won't be able to talk – the circuit didn't "get there", it "shorted out". Once again, telephone company logic has entered the language on a permanent basis. Unless the value for ohms is infinity (no contact, no possible energy flow) you will be better off with a higher value, and many working electronic devices have input numbers in the millions or billions of ohms.

3. A volt is a unit of electrical pressure, and by itself is not enough to describe the electrical power available. To give you an analogy – that may help, you can think of water in a hose. The pressure is not the amount of water, and fast flow will depend upon the size of the hose (impedance or resistance) as well. Increase the size of the pipe (lower the resistance, or Z) and pressure (volts) will drop unless you make more water (current) available to keep up the demand. This analogy works fairly well for DC current and voltage, but alternating current asks you to

imagine the water running in and out of the nozzle at whatever frequency your "circuit" is working at, and is harder to use a mental aid. Water has never been known to flow out of a pipe at 10,000 cycles per second.

This reference level for a starting point has been used by radio, television, and many other groups in audio because the telephone company was the largest buyer for audio equipment. Most of the companies that built the gear started out working for the phone company and new audio industries, as they came along, found it economical to use as much of the ready-to-hand stuff as they could, even though they were not routing signals from one end of the world to the other.

Must we use this telephone standard for recording? Its use in audio has been so widespread that many people have assumed that it was the only choice for quality audio. Not so.

A 600 ohm, 3-wire transformer-isolated circuit is a necessity for the telephone company, but the primary reason it is used has nothing to do with audio quality. It is noise, hum and buzz rejection in really long line operation (hundreds and hundreds of miles).

Quality audio does not demand 600 ohm, 3-wire circuitry. In fact, when shielding and isolation are not the major consideration, there are big advantages in using the 2-wire system that go well beyond cost reduction. It is, as a system, inherently capable of much better performance than 3-wire transformer-isolated circuits.

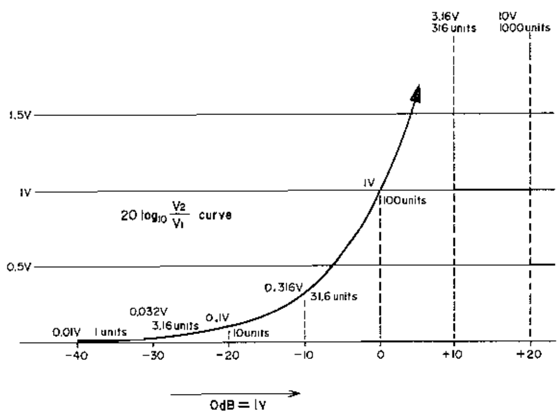
Since TASCAM M-50 mixer is designed to route a signal from a mic to a recorder, we think that the 2-wire system is a wise choice. The internationally accepted standard (IEC) for electronics of this kind uses a voltage reference without specifying the exact load it is expected to drive. The reference is this:

$$0 = 1 \text{ volt}$$

This is now the preferred reference for all electronic work except for the telephone company and some parts of the radio and television business. Long distance electronic transmission still is in need of the 600-ohm standard.

If your test gear has provision for inserting a 600 ohm load, be sure the load is not used when working on TASCAM equipment.

Now that we have given a reference for our "0" point, we can print the funny curve again, with numbers on it, and you can read voltages to go along with the changes in dB.



SIMPLIFY THE DB AND ITS MANY VARIATIONS

When it comes to describing the level of audio signal in a circuit, the whole issue of "dB's" may seem very complicated to anyone but a mathematically skilled engineer. However, by comparing audio signals to water flowing through a pipe (a "circuit"), we can simplify the concept of dB and audio level so that it is less "magic" and more understandable (we hope).
First, let's define our terms for this comparison:

VOLTAGE:

It is similar to *WATER PRESSURE*. If voltage were truly water pressure, we would express it in pounds per square inch. Actually, another term for voltage is "EMF," which stands for "electromotive force," which really is the pressure on the electrons which causes them to flow through a circuit.

IMPEDANCE:

It is similar to the *RESISTANCE OF THE WATER PIPE TO THE FLOW OF WATER.* Electrically, impedance "impedes" or works against the flow of electrons in an AC circuit, so the restriction to water flow caused by the pipe's diameter and internal surface friction is like impedance. Electrical "resistance," while similar to impedance, applies to DC current. A speaker, for example, may have a 3 ohm DC resistance, but an 8 ohm impedance at 1 kHz.

POWER:

It is similar to the *AMOUNT OF WATER THAT FLOWS THROUGH THE PIPE.* If we were actually measuring water level, we might use a unit of volume such as liters, milliliters, gallons, quarts, ounces, etc. With electrical circuits, we use a unit of power – the watt, 1/1000 watt (the milliwatt).

We can consider the pipe to be the electrical input or output circuit. The pipe's *diameter* determines its *resistance to water flow*; a smaller diameter pipe (wire) has a higher resistance (analogous to impedance) because it makes it more difficult for the water (electrons) to flow.

If we aim the pipe up in the air and measure the height of water column that emerges from the end of the pipe, we have a level (power). With a pipe of a given diameter (impedance), the amount of water flowing is proportional to the water pressure (voltage). If you increase the pressure, you increase the height of the water stream emerging from the pipe.

Look at Figure 1. Note that a 0.775 volt "pump pressure" pushing water through a 600 ohm "pipe" causes the water "level" to reach 1 milliwatt in height. We'll call that level of water (1 milliwatt of power) a level of 0 dBm.

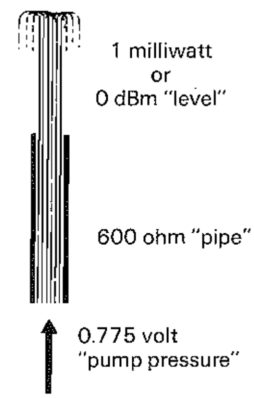


Figure 1.

AN ESSENTIAL POINT TO REMEMBER: 0 dBm IS ALWAYS EQUAL TO ONE MILLIWATT. It doesn't matter how much water pressure (voltage) it took to achieve that level, or what pipe diameter (impedance) the water had to flow through ... if the water level reaches 1 milliwatt, the level is 0 dBm. Any other dBm value is merely a relative power level expressed in reference to the 1 mW level.

Look at Figure 2. Here the same 0.775 volt "pump pressure" is pushing water through a pipe of 1200 ohm impedance. Since less water can flow through the smaller pipe, the water level emerging from the pipe is cut in half: 1/2 milliwatt – half the power. Since, with regard to power, half the level is a decrease of 3 dB, the level is now –3 dBm, not 0 dBm. As you can see, *WHEN YOU INCREASE THE IMPEDANCE WITHOUT CHANGING THE VOLTAGE, YOU GET LESS POWER* (fewer dBm). Conversely, if you decrease the impedance (large pipe), you'll increase the power (more dBm).

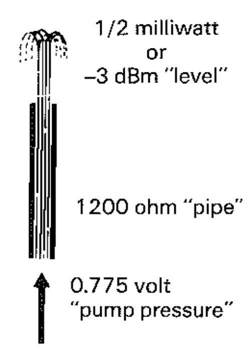


Figure 2.

FORGET THE NOTION THAT dBm REQUIRES A 600 OHM "PIPE". While dBm results from a combination of impedance and voltage, it refers only the end result ... The power (water column height).

Look at Figure 3. Notice that we can obtain a "level" of 0 dBm with a 1200 ohm pipe ... it simply takes more pump pressure than with a 600 ohm pipe. Since we doubled the impedance relative to Figure 1 (from 600 to 1200 ohms), we also have to increase the voltage to 1.1 volts (multiplying 0.775 V by 1.414, which is the square root of 2). The end result is the same, 1 milliwatt of power (water), which is 0 dBm.

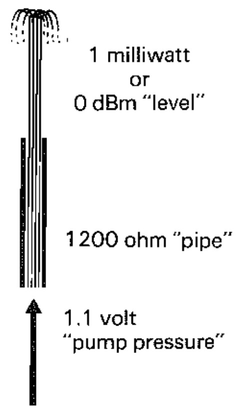


Figure 3.

It should now be clear that defining a level in *dBm* only defines the *power*. If you want to use dBm to describe a *voltage*, you'll have to specify a particular impedance or resistance (pipe), which is *typically given as 600 ohms, but could be any impedance or resistance*. *IF YOU HAVE A CIRCUIT WHICH DOES NOT USE MUCH POWER, BUT IS INSTEAD SENSITIVE TO VOLTAGE, EXPRESSING LEVEL IN dBm IS NOT PARTICULARLY USEFUL.* For this reason, other "dB" terms have been devised.

A high impedance input will not draw much power from a circuit unless the voltage is increased to a very high level. Why? Remember that the greater the impedance or resistance (the smaller the pipe), the less current can flow. Today, most mixers, power amplifiers, and other signal processors are no longer designed for 600 ohm input impedance. Instead, they have high impedance inputs which are sensitive to the voltage (pressure) of the input signal, not the power (water level).

When you double the level voltage-wise, you increase it 6 dB, whereas if you double the level power-wise, you increase it by 3 dB. The reason for this apparent discrepancy is not all that complex, but it involves some mathematics that we'll omit here to avoid getting too technical. Suffice it to say that the difference has to do with the fact that power is proportional to voltage squared, and "dB" is a logarithmic quantity. To keep the terms and numbers more appropriate to a voltage sensitive circuit, not a power sensitive one, a "dB" term which refers to voltage was developed – "dBV." The "V" in "dBV" denotes "voltage." (The "m" in "dBm" denotes "milliwatt.")

The 0 dBV reference is 1 volt. It was chosen because it's easier to work with than 0.775 volts when manipulating equations. 0 dB*V* is always associated with 1 volt, regardless of the impedance. It so happens that 0 dB*V* (voltage) will produce 0 dB*m* (power) only in a circuit with 1,000 ohms impedance (assuming voltage and current are in phase). Refer to Figure 4.

NOTE: The "purist" engineers among you will recognize the fact that all dB numbers always refer to a power level, but in practical terms, dBV is used to describe voltages, regardless of the actual circuit impedance.

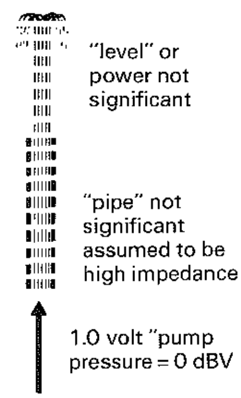


Figure 4.

TASCAM input and output levels have traditionally been rated in dBV because the equipment has high impedance circuitry which senses voltage, not power. There's only one slight complication in our practice of using dBV values, and it comes up when you interface a piece of TASCAM equipment to equipment which another manufacturer rated using an assumed 600 ohms impedance. The equipment will usually work properly, but the level calibration may be slightly inaccurate due to the differences between the dBm and dBV "0 dB" references.

Let's look at a practical example.

Refer to Figure 5. Suppose the TASCAM output is rated at 0 dBV, and the other equipment's input to which the TASCAM output is connected is rated at 0 dBm. Guess what happens. The 0 dBV output (1 volt), upon encountering a lower impedance (600 ohms rather than 1,000 ohms), causes more power to flow ... +2.2 dBm instead of 0 dBm. It's not a big difference, and it can usually be adjusted with a level control – assuming the output circuit is capable of driving 600 ohms (which may or may not be the case). However, the level which causes a "0" indication on the TASCAM output meter will drive the input meter to "+2.2" since it is calibrated based on a 0.775 volt "zero" into 600 ohms assumed impedance.

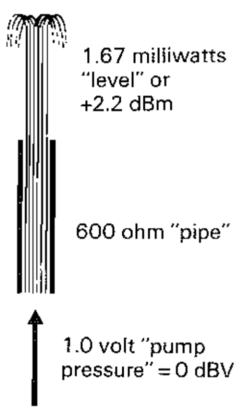


Figure 5.

Look at Figure 6. To avoid the possible error of 2.2 dB, the term "dBv" was introduced. Like "dBV", "dBv" is used to describe voltage, not power, but 0.775 volts is the "0 dBv" reference. The only difficulty with "dBv" was that many people ignore capitalization and confuse dB "big V" with dB "small v," so the 2.2 dB error persists. For this reason, we are now changing to "dBu" instead of "dBv." They're the same term (0 dBu = 0.775 volts), but hopefully people won't confuse a "u" with a "V".

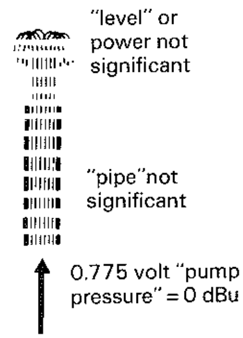


Figure 6.

If a TASCAM output is rated at 0 dBu, it means it puts out 0.775 volts into a high impedance (it may also do so into a low impedance, if so specified). Connect a 0 dBu output to a 0 dBm nominal input, and the meters should match one another.

Different correction factors:

0 dBV = 1V	Voltage	0 dBm = 0.775V/ 600 Ω 0 dBu = 0.775 V/ higher than 600 Ω
+6 dB	2V	+8.2dB
+1.78 dB	1.22 V	+4 dB
0 dB	1V	+2.2 dB
−2.2 dB	0.775 V	0 dB
−6 dB	0.5 V	−3.8 dB
−8.2 dB	0.388 V	−6 dB
−10 dB	0.316V	−7.8 dB
−12 dB	0.250 V	−9.8 dB
−12.2 dB	0.245V	−10 dB
−20 dB	0.1 V	−17.8 dB

Note:
The "u" in "0 dBu" stands for "unloaded".

IMPEDANCE MATCHING AND LINE LEVELS

All electronic parts, including cables and non-powered devices (mics, passive mixers and such), have impedance, measurable in ohms (symbol Ω or Z). Impedance is the total opposition a part presents to the flow of signal, and it's important to understand some things about this value when you are making connections in your mixing system. The outputs of circuits have an impedance rating and so do inputs. What's good? What values are best? It depends on the direction of signal flow, and in theory, it looks like this:

OUTPUTS ——— **plug into** ——— **INPUTS**

It is generally said that the output impedance (Z) should be as low as possible. 100 ohms, 10 ohms. The lower, the better, in theory. A circuit with a low output impedance will offer a low resistance to the passage of signal, and thus will be able to supply many multiple connections without a loss in performance or a voltage drop in any part of the total signal pathway. Low impedance values can be achieved economically by using transistors and integrated circuits, but other considerations are still a problem in practice, such as:

1. The practical power supply is not infinitely large. At some point, even if the circuit is capable of supplying more energy you will run out of "juice".

2. Long before this happens, you may burn out other parts of the circuit. The output impedance may be close to the theoretically ideal "ohms" but many parts in the practical circuit are not. Passing energy through a resistance generates heat and too much current will literally burn parts right off the circuit card if steps are not taken to prevent catastrophic failure.

3. Even if the circuit does not destroy itself, too high a demand for current may seriously affect the quality of the audio. Distortion will rise, frequency response will suffer, and you will get poor results.

Inputs should have very high impedance numbers, as high as possible (100,000 ohms, 1 million ohms, or more if it can be arranged).

A high resistance to the flow of signal at first sounds bad, but you are not going to build the gear. If the designer tells you his input will work properly and has no need for a large amount of signal, you can assume that he means what he says. For you, a high input impedance is an unalloyed virtue. It means that the circuit will do its job with a minimum of electrical energy as a beginning. The most "economical" electronic devices in use today have input impedances of many millions of ohms, test gear for example, voltmeters of good quality must not draw signal away from what they are measuring, or they will disturb the proper operation of the circuit. A design engineer needs to see what is going on in his design without destroying it, so he must have an "efficient" device to measure with.

SOURCE (output) ——— **plugs into** ——— **LOAD (input)**

The classic procedure for measuring output impedance is to reduce the load's impedance until the output voltage drops 6 dB (half the original power) and note what the load value is. In theory, you now have a load impedance that is equal to the output impedance. If you gradually reduce the load (increase the input impedance), the dB reading will return slowly to its original value. How much drop is acceptable? What load will be left when an acceptable drop is read on the meter?

Traditionally, when the load value (input Z) is approximately seven times the output impedance, the needle is still a little more than 1 dB lower than the original reading.

Most technicians say, "1 dB, not bad, that's acceptable." We at TASCAM must say that we do not agree. We think that a seven-to-one ratio of input (7) to output (1) is not a high enough ratio, and here's why:

1. The measurement is usually made at a midrange frequency and does not show true loss at the frequency extremes. What about the drop at 20 Hz or 30 kHz?

2. All outputs are not measured at the same time. Most people don't have twenty meters, we do. Remember, everybody plays together when you record and the circuit demands, in practice, are simultaneous. All draw power at the same time.

Because of this widely misunderstood rule of thumb – the seven-to-one ratio, we will give you the values for output impedance.

True Output Impedance
Even though the true output impedance may be low, say 100 ohms, it takes a lab to check the rule of thumb, so for the practical reasons we have explained, the use of the ratio method of impedance calculation must be changed to a higher ratio. We prefer 100:1 if possible and we consider 50:1 to be the minimum ratio that we think safe. Because of this, we will give you a number for ohms that you can match, Minimum Load Impedance. No calculations, we have made them already.

Minimum Load Impedance
MAKE CERTAIN THAT YOU CONNECT NO TOTAL LOAD IMPEDANCE LOWER (numerically) THAN THESE FIGURES.

Line Output/AUX A/B Output	2k ohms
Monitor Output (ST MSTR A/B)	2k ohms
Monitor Output (Balance type)	600 ohms
Direct Output	2k ohms
Access Send Output	2k ohms
Pre Output	2k ohms

Nominal Load Impedance
Our specifications usually show 10,000 ohms as a Norminal Load Impedance. This load will assure optimum performance. Remember, any Impedance lower than 10,000 ohms is more load.

Input Impedance
Input impedance is more straightfoward and require only one number. Here are the values for the M-50:

Mic Input	600 ohms
Instrument Input	100k ohms
Tape [2TR A/B (L/R)] Input	47k ohms
Phono Input	47k ohms
Line Input	22k ohms
Program Buss Input	22k ohms
Aux Buss Input	22k ohms
Solo Buss Input	22k ohms
Monitor Input	22k ohms
Access Receive Input	10k ohms
Spare Input	100k ohms

If one output is to be "Y" connected to two inputs the total impedance of the two inputs must not be lower than the minimum load impedance, mentioned above, and if it becomes necessary to increase the number of inputs with slight reduction of the load specifications, you must check for a drop in level, a loss of headroom, low frequency response, or else suffer from a bad recording. If one input is 10,000 ohms, another of the same 10,000 ohms will give you a total input impedance (load) of 5,000 ohms. To avoid calculations you can do the following when you have two inputs to connect to one output.

Take the lower value of the two input impedances and divide it in half. If the number you have is greater than the minimum load impedance, you can connect both at the same time. Remember, we are not using the true output impedance we are using the adjusted number, the minimum, output load impedance.

If you must have exact values here is the formula for dissimilar 2 loads or inputs:

$$RX = \frac{R1 \times R2}{R1 + R2}$$

When you have more than two loads (inputs), just dividing the lowest impedance by the number of inputs will not be accurate unless they are all the same size. But if you still get a safe load then the minimum load impedance by this method, you can connect without worry.

If you must have exact values, here is the formula for more than 2 loads or inputs:

$$RX = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \cdots + \frac{1}{Rn}}$$

RX = Value of Total Load

Finding Impedance Values on Other Brands of Equipment

When you are reading an output impedance specification, you will occasionally see this kind of statement:

Minimum load impedance = X ohms

or

Maximum load impedance = X ohms

These two statements are trying to say the same thing, and can be very confusing. The minimum load impedance says: Please don't make the *NUMBER* of ohms you connect to this output any lower than X ohms. That's the lowest *NUMBER*. The second statement changes the logic, but says the exact same thing.

Maximum load impedance refers to the idea of the *LOAD* instead of the number, and says: please don't make the *LOAD* any heavier. How do you increse the load? Make the number lower for ohms. Maximum load means minimum ohms, so read carefully.

When the minimum/maximum statement is made, you can safely assume that the manufacturer has already done his calculations, and the number given in ohms does not have to be multiplied. You can *MATCH* the value of your input to this number of ohms successfully; but as always, higher ohms will be okay (less load).

Occasionally, a manufacturer will want to show you that 7 times the output Z is not quite the right idea and will give the output impedance and the correct load this way, they will call the output impedance the True Output Impedance and then will give the recommended minimum *LOAD* impedance. It may be a higher or lower ratio than 7 times and will be whatever the specific circuit in question requires.

REFERENCE LEVELS

We should talk about one more reference, a practical one.

Anyone who has ever watched a VU meter bounce around while recording knows that "real sound" is not a fixed value of energy. It varies with time and can range from "no reading" to "good grief" in less time than it takes to blink. In order to give you the numbers for gain, headroom and noise in the M-50, we must use a steady signal that will not jump around. We use a tone of 1,000 cycles and start it out at a level of –60 dB at the mic input, out beginning reference level. All levels after the mic input will be higher than this, showing that they have been amplified, and eventually we will come to the last output of the M-50 – the line-out and the reference signal there will be –10 dB, our "line level" reference.

From this you can see that if your sound is louder than 94 dB spl, or your mic will produce more electricity from a sound of 94 dB spl than –60 dB, all these numbers will be changed. We have set this reference for mic level fairly low. If you examine the sound power or sound pressure level (spl) chart on page 8 you will see that most musical instruments are louder on the average than 94 dB spl, and most commercial mics will produce more electricity than the –60 dB for a sound pressure of 94 dB, so you should have no problems getting up of "0 VU" on your recorder.

We should also make a point of mentioning that the maximum number on this chart represents "peak power" and not average power. The reason? Consider if even some momentary part of your recording is distorted, it will force a re-recording and it is wisest to be prepared for the highest values and pressure even if they only happen "once in a while". On this point, statistics are not going to be useful, the average sound pressure is not the whole story. The words themselves can be used as an example. Say the word "statistics" close to the mic while watching the meters and the peak LED level detector. Then say the word "average". What you are likely to see are two good examples of the problems encountered in the "real world" of recording. The strong peaks in the "s" and "t" sounds will probably cause the LED's to flash long before the VU meter reads anywhere near "zero" while the vowel sounds that make up the word "average" will cause no such drastic action.

To allow peaks to pass undistorted through a chain of audio parts, the individual gain stages must all have a large reserve capability. If the average is X then X, + 20 dB is usually safe for speech, but extremely percussive sounds may require as much as 40 dB of "reserve" to insure good results. Woodblocks, castanets, latin percussion (guido, afuche) are good examples of this short term violence that will show a large difference between "LED flash" and actual meter movement. When you are dealing with this kind of sound, believe the LED, it is telling you the truth.

If you are going to record very loud sounds you may produce more electrical power from the mic than the M-50 can handle as an input. How can you estimate this in advance? Well, the spl chart and the mic sensitivity are tied together on a one-to-one basis. If 94 dB spl gives −60 dB (1 mV) out, 104 dB spl will give you −50 dB out, and so forth. Use the number, on our chart for sound power together with your mic sensitivity ratings to find out how much level, then check that against the maximum input levels for the various jacks on the M-50. If your mic is in fact producing −10 dB or line level, there is nothing wrong with plugging it into the line level connections on the mixer. You will need an adaptor, but after that it will work!

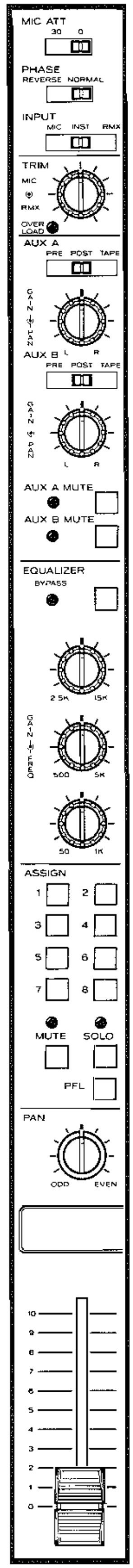
Most mic manufacturers give the output of their mics as a minus-so-many-dB number, but they don't give the loudness of the test sound in dB, it's stated as a pressure reference (usually 10 microbars of pressure). This reference can be found on our sound chart. It is 94 dB spl, 10 microbars, 10 dynes per cm^2 or 1 Newton per square meter. For mics, the reference "0" is 1 volt (dB). So, if the sound is 94 dB spl, the electrical output of the mic is given as −60 dB, meaning so many dB less than the reference 0 = 1 volt. In practice, you will see levels of −60 dB for low level dynamics, up to about −40 dB or slightly higher for the better grade of condenser mics available today. TASCAM recorders and mixer work at a level of −10 dB referenced to 1 volt (0.3 volt) so, for 94 dB spl, a mic with a reference output of −60 dB will need 50 dB of amplification from your M-50 or recorder in order to see "0 VU" (−10 dB) on your meter. Now, if the sound you want to record is louder than 94 dB spl, the output from the mic will be more powerful and you will need less amplification from your M-50 to make the needles on your recorder read "0 VU".

THE BLOCK DIAGRAM AND GAIN BLOCK DIAGRAM

Before you begin reading the next section of this manual, flip out the extra fold on page 63, 64. On this page, we have printed the block diagram. It shows the signal flow through the M-50 and it represents in simple form, the actual electronic arrangement of all the jacks, controls and gain stages from *mic-in* to *line-out.*

The diagram on page 65 ~ 70 indicates the gain of a reference signal, the noise level, and the available reserve gain or headroom at any point in the signal chain. An experienced audio engineer would be able to operate the M-50 successfully with just these diagrams and a list of input and output specifications.

Any question about function or gain can be answered by studying the drawings. Will the accessory send signal change in level if the input fader is moved? No, the signal is shown leaving the main line before the input fader. You read both diagrams from left to right, input to output.



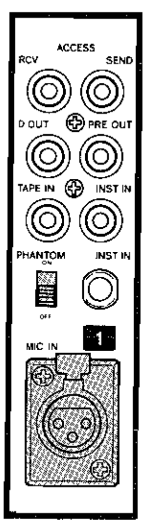
INPUT SECTION

In multitrack recording consoles, a description of signal "sequence" or flow is made more confusing by the multiple uses of the same circuit, depending on what point in the process you are considering. Broadly speaking, multitrack recording has three stages: *Basic tracking* – recording the initial track or tracks; *Overdubbing* – adding more to the *"Basic"* and finally, when all recording is complete, *Remixing* to the desired final format, stereo, mono, etc. Obviously, there is no real need to duplicate functions that can use the same parts at a later stage in the process. For example, you don't need a separate EQ section for the LINE IN or TAPE IN function, a simple re-routing switch to select the input signal, MIC, LINE, or REMIX (TAPE) will be all that is necessary. If we were to ignore the logic of the recording process, this description of signal flow in the M-50 would be much easier for us and we could disregard the extremely large number of different possibilities. So that you will understand why a specific jack or function was incorporated we'll tell you what we had in mind when we built the M-50.

To save space, we use the wiring sequence as our logical "guide" to organize this manual and we'll describe the signal flow "options" as we come to them on a "once through" basis, which means that the wiring description will be logical, but the benefit or purpose of the feature may not be in the logical sequence of multitrack work. Because the M-50 will use many of the same circuits more than once in the 3 step multitrack process, we will have to talk about overdub or mixdown related features at the beginning of this section before we have completed one complete signal path through the mixer to the recorder!

This manual presumes nothing about your past experience with the multichannel process except a willingness to learn. An expert in the field might see the significance of a control or jack with just a simple statement of its location, but in this manual we will point out "the obvious".

The terms that we use in the Index may not relate the use of the Model 50 to the field that you already know. For example, a musician will call the beginning of the tape the "top", because it relates to the top of a piece of music paper. An Audio-Visual producer would refer to the beginning of the program as "home" as in "return home" when thinking of the rewind function. This variation in the "jargon" makes the use of a conventional Index or Table of Contents difficult, and you have no guarantee of finding the help you need easily. Our job related sequence of instruction is self indexing to a much larger extent. It is likely that more than one person will be involved in the recording process sooner or later, but we have written this manual with the assumption that the first time user will start all alone. If you can comprehend the "solo" use of the M-50 you should have no troubles converting the logic of the unit to accommodate extra "studio staff".



There are a total of 36 basic signal input connectors on the twelve *Input Channels*: 12 MIC INS, 8 MULTI–PURPOSE TAPE INS, 4 INPUTS (2TR A&B, L/R), 8 SECONDARY INPUTS, and 4 SECONDARY MULTI-PURPOSE INPUTS.

1. Mic Input Section:

There is one MIC IN on each of the 12 *Input Channels*.

a. MIC IN Connector

A balanced three conductor transformerless microphone input circuit is provided. Any mic with an output impedance from 50 to 600 ohms will work.

b. PHANTOM Power On/Off Switch

The phantom power supply in the M-50 conforms to the DIN standard #45 596, 48 volts DC applied to *both* pins 2 and 3 simultaneously through a pair of current limiting resistors (6.8k ohms). Since there are many other methods that are referred to as "phantom" that require a different voltage, or a different method of applying the voltage to the pins of the MIC IN connector, we strongly recommend that you check the manuals for the mics that you plan on using. Make sure that this phantom method is correct before you plug in. For some examples that may help you "cross reference", this 48V duplex phantom power circuit is correct for:

NEUMANN 80 series, such as km84, U87, 89.
SONY mics that use 48V (some useless, but will work on 48V without causing problems).
This method WILL NOT operate condenser mics with AB standard such as the Sennheiser 405, 406 or 416; AKG condenser microphones except those with EB after the model number.

Caution: Some other phantom power microphones will ground one side of the common 48V line we provide and your 48V mics will all turn off! You *must* isolate the input that has the other standard connected!

Even though duplex 48V phantom is safe for dynamic mics in theory, in practice, your mic cables may not allow exactly 48V to get all the way up to the mic. If there is any difference in the voltage supplied to pins 2 and 3 *at the mic end of the cable* you will have some voltage offset in the dynamic mic that can cause *damage to the sound, or damage to the mic!*
TURN OFF the *phantom power ON/OFF switch* (on the back panel) on all the inputs that don't need it!

c. MIC ATT Switch
Two positions are provided.
1) Set center, there is no effect.
2) Set fully left, a 30dB pad is inserted (the signal is reduced by 30dB). Switch in this pad when counterclockwise rotation of the MIC TRIM (full attenuation) cannot correct an overload condition originating at the MIC IN.

d. Differential Microphone Amplifier
This transformer substitute circuit does not show on the outside, but its contribution to the system is considerable. The low power signal that the mic generates must often be protected and isolated from other low power signals in the real world. Radio, power line hum, buzz, crackles, and switching noise when motors start up. (Do you have an air conditioner on you AC line)? — all these unwanted signals must be kept out of the very high gain amplifiers that are needed to raise the mic signal to a working level. The balanced or three-wire circuit and input isolation transformer becomes one way to deal with the problem. A circuit using a single *Differential* amplifier can do the same thing as a transformer, cancel any signal that is the *Same* on both incoming lines. A difference in signal on the two inputs is amplified, a common signal (anything that is the same on both pins), is *not passed,* and you get only the signal provided by the mic.

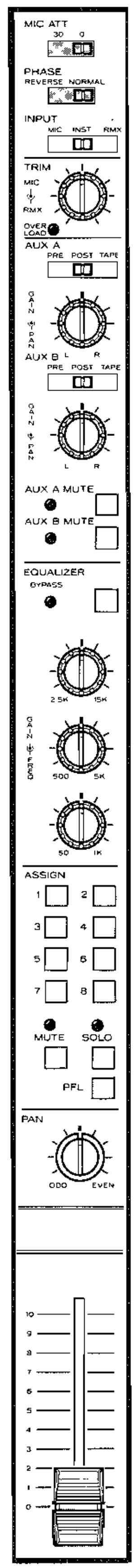
e. PHASE Reverse Switch
Since the MIC IN circuit is balanced at this point, it is possible to invert the "phase" or polarity of the incoming signal. Set center, the phase is unaltered. Set left, the switch reroutes pin 2 to wire 3, and pin 3 to wire 2, and thus the polarity of the incoming signal is reversed.
When a sound source is picked up by more than one microphone, the time displacement between each microphone's "hearing" of the signal can be different enough that the microphones actually cancel or add to each other to a greater or lesser degree; i.e., the sound may appear thinner or even fatter than anticipated due to the mic placement. Should this occur, "flipping" the phase on one or more of the microphones may cure the problem and eliminate the need to re-position the mics. Also, phase reversal may help to eliminate leakage from adjacent should sources into a given microphone. The PHASE reverse switch will affect only the MIC input circuit.

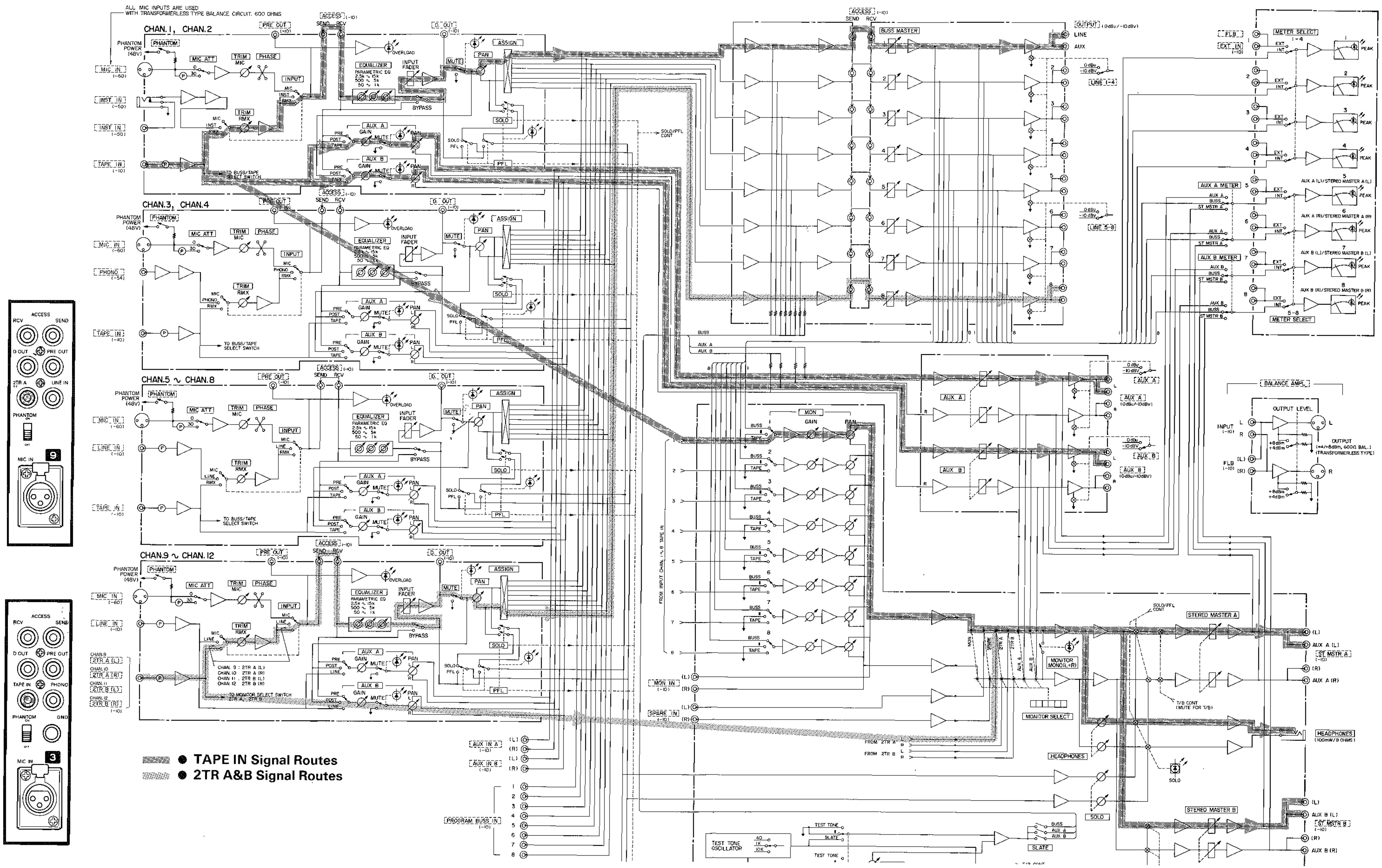
2. 8 Multi-Purpose Tape Inputs – Channels 1 through 8

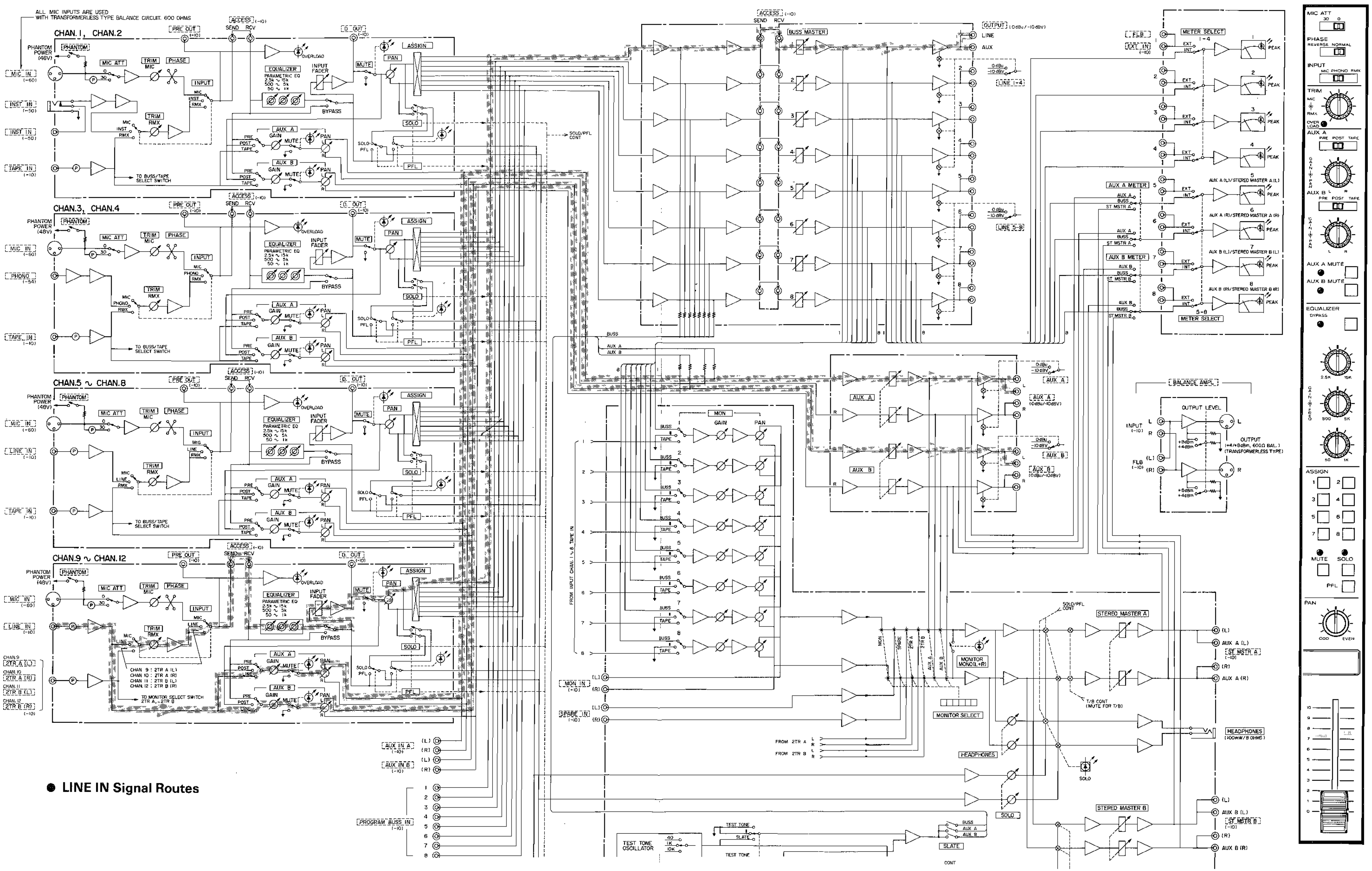
The TAPE INPUT provides signal to the channel's INPUT select switch and the AUX A and AUX B systems. The fact that the AUX A and AUX B systems have their own SIGNAL SELECT switch means that you may have a MIC IN selected as a source to feed the channel and *also* have a tape track feeding one or both AUX systems *at the same time!* You may split the functions on the channel and each system can be used to do its own job.
TAPE INs 1 through 8 also provide signal to their respective BUSS/I(OFF)/TAPE switches in the MONITOR SECTION for monitoring the output of the 8 track recorder without having to alter the controls or settings on the *Input Channels.*

3. 2TR A&B Tape Inputs – Channels 9 through 12

Located on the back panel of *Input Channels* 9 through 12, each of these inputs provides signal to the channel's INPUT select switch. It also provides signal to the MONITOR SELECT swtich rack where 2TR A selects the 2TR A, L/R inputs from channels 9 and 10 and 2TR B selects the 2TR B, L/R inputs from channels 11 and 12. We suggest that you consider using these two stereo inputs to the MONITOR as a two-track master monitor during *Remix* or as an effects return during *Overdub.*
In this way it is possible to monitor the *Mixdown* directly from the two-track or add effects return to your MONITOR mix without recording them.




ALL MIC INPUTS ARE USED WITH TRANSFORMERLESS TYPE BALANCE CIRCUIT. 600 OHMS
CHAN.1, CHAN.2
CHAN.3, CHAN.4
CHAN.5 ∿ CHAN.8
CHAN.9 ∿ CHAN.12
PHANTOM POWER (48V)
MIC IN
INST IN
TAPE IN
PHONO
LINE IN
MIC ATT
TRIM
PHASE
INPUT
EQUALIZER
PARAMETRIC EQ
INPUT FADER
BYPASS
AUX A
AUX B
ACCESS
PRE OUT
D. OUT
ASSIGN
PAN
MUTE
SOLO
PFL
OVERLOAD
TO BUSS/TAPE SELECT SWITCH
TO MONITOR SELECT SWITCH
BUSS MASTER
OUTPUT
LINE
AUX
METER SELECT
EXT IN
AUX A METER
AUX B METER
BALANCE AMPL.
OUTPUT LEVEL
MON
GAIN
MON IN
SPARE IN
AUX IN A
AUX IN B
PROGRAM BUSS IN
STEREO MASTER A
STEREO MASTER B
MONITOR SELECT
HEADPHONES
TEST TONE OSCILLATOR
SLATE
PEAK
TAPE IN Signal Routes
2TR A&B Signal Routes



● **LINE IN Signal Routes**

4. Secondary Inputs – Channels 1 through 8

Located on *Input Channels* 1 through 8, these secondary inputs provide signal *exclusively* to their respective *Input Channel's* INPUT select switch. They include Instrument, Phono, and Line inputs:

a. INST INput – Channels 1 and 2

Input Channels 1 and 2 each have a pair of INST IN jacks.

1) INST IN (RCA connector)

2) INST IN (1/4" phone jack)

The two jacks are parallel wired. However, when a signal source is connected to the INST IN 1/4" phone jack, the jack will disconnect the parallelled INST IN RCA connector from the circuit.

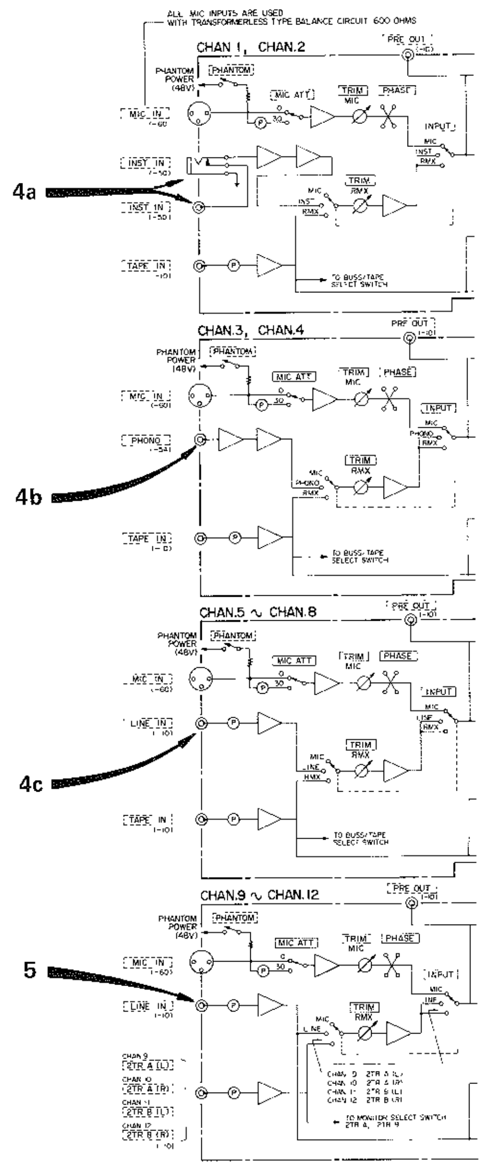
The INST INs will accept the signal "direct" from most electric guitars and basses. With some "hot" pickups you may have to turn down the instrument volume control to avoid overload, or adjust the RMX (LINE) TRIM control.

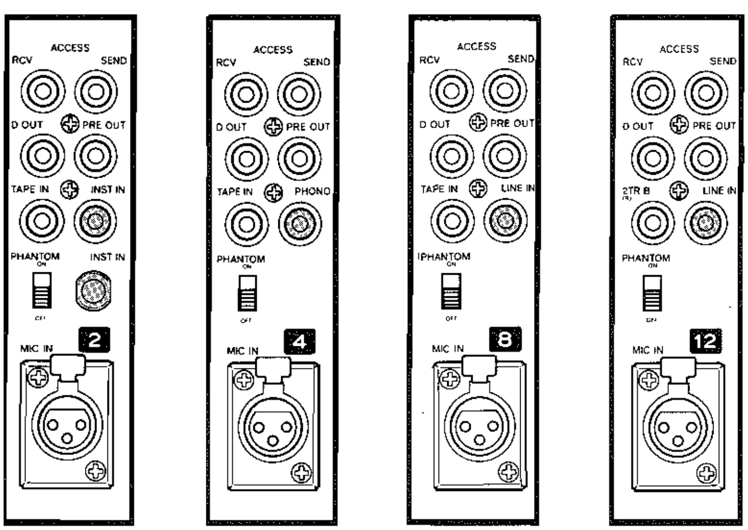
b. PHONO Input – Channels 3 and 4

The PHONO input on *Input Channels* 3 and 4 allows the use of a stereo turntable without the need for the purchase of a separate preamp. RIAA EQ is provided, and the input impedance is 50k ohms. the PHONO input has been incorporated for convenience in production which require Library materials to be incorporated; i.e., Multi-Image, Non-Sync filmwork, wild track, or to check a test pressing.

c. LINE INputs – Channels 5 through 8

The LINE INs on *Input Channels* 5 through 8 will accept signal from any line level source. Many electronic pianos and synthesizers are compatible with these inputs.





5. 4 Secondary Multi-Purpose Inputs – Channels 9 through 12

The LINE INput on channels 9 through 12 provides signal to the respective *Input Channel's* INPUT select switch and the channel's AUX A and B systems. You can have either of the other two inputs (MIC IN or 2 TR input) on these channels feeding the channel and simultaneously select LINE IN to feed the AUX A or AUX B system. In this way the functions on the channel may be split and each system can be used separately as required.

6. Trim

Used in conjunction with the OVERLOAD LED, TRIM will reduce the level of those *Input* signals which would otherwise overload the subsequent electronics in the signal chain. Each *Input Channel* is equipped with a MIC TRIM and a RMX (LINE) TRIM to avoid having to reset the trim or fader when alternating between the MIC IN and another of the inputs to the channel.

a. MIC TRIM (Upper Section)

This control provides variable attenuation to signal originating at the MIC IN. If additional gain reduction is needed, insert the MIC ATT.

b. RMX (LINE) TRIM (Lower Section)

Provides variable attenuation to signal originating at inputs to the channel other than the MIC INput.

7. Input Select Switch

This three position switch determines which input is to be routed through the channel, and the pre and post feeds to the AUX A and B systems.

a. Set Left

Select the MIC IN (all channels).

b. Set Right

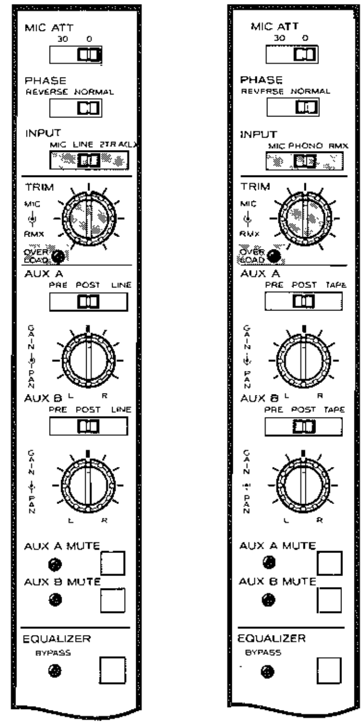
Selects the MULTI-PURPOSE TAPE IN on channels 1 through 8 and the 2TR A & B, L/R input on channels 9 through 12.

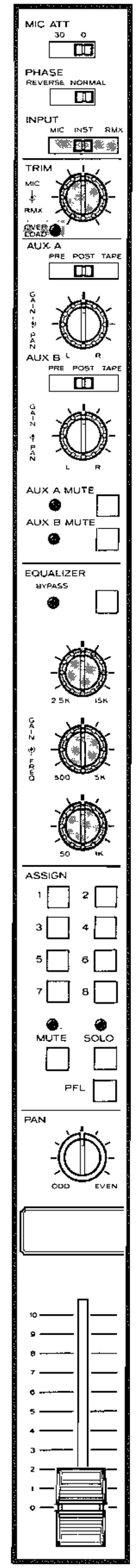
1) RMX (*Remix*) – Channel 1 through 8
   This position provides the mixer's full control capability (EQ, effects, mixing, etc.) for final *Remix* or fine tuning of the playback of the multitrack tape.
2) 2TR A and B – Channels 9 through 12
   Playback from the mixdown deck or any other stereo recorder requiring the mixer's full control capability would be the logical use for this position. However, we suggest you consider using this position as an effects return. You may wish to use 2TR A, L/R to return the effects and 2TR B, L/R for playback of your two-track master.

c. Set Center

Selects the SECONDARY INPUT on channels 1 through 8 and the SECONDARY MULTI-PURPOSE INPUT on *Input channels* 9 through 12.

1) INSTrument – Channels 1 and 2
   The INST INs may be considered as *direct boxes*.
2) PHONO – Channels 3 and 4
   Select this position to preamplify the output from a turntable.
3) LINE – Channels 5 through 12
   Selects signal from the LINE IN to the channel.





8. Pre Out RCA Jack

Is the preferred point for *Cue* mixes. A mix made from this point by adding an accessory mixer (Model 1) will not change if you move the input fader, use the MUTE function, or adjsut the EQ. The only thing that is more frustrating to a player than having the *Cue* "jump around" in the headphones is to have the sound of a critical part disappear entirely. The PRE OUT avoids this problem.

9. Overload LED

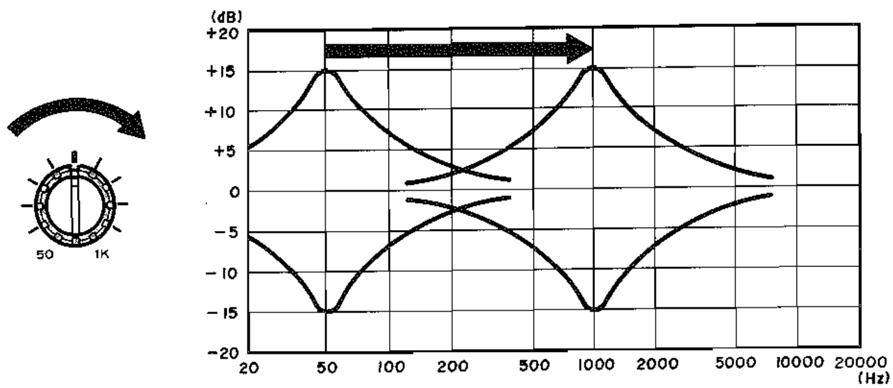
When signals high enough to make the PRE OUT and ACCESS SEND outputs exceed +15dB are applied to the channel, this LED will light. Adjust the appropriate gain reducing control (TRIM, or MIC ATT) until this LED remains out when signal is present. When working with extremely percussive transient material, maximum TRIM and MIC ATT may be required to prevent this LED from flashing on strong "peaks". Changing to a less sensitive mic may help.

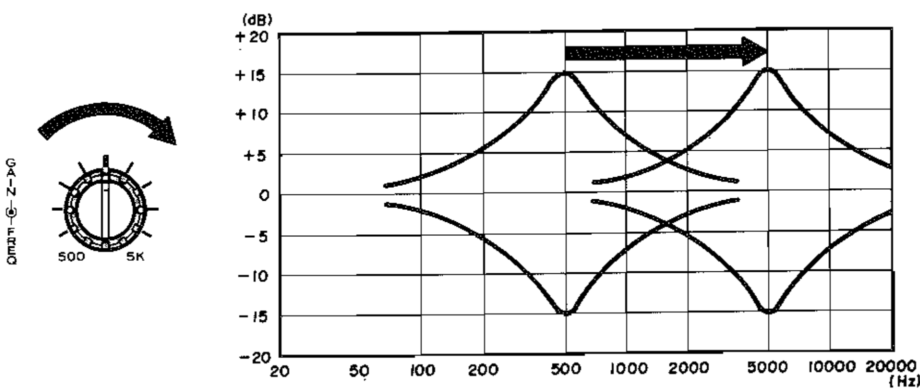
10. Access Send-Rcv Jacks

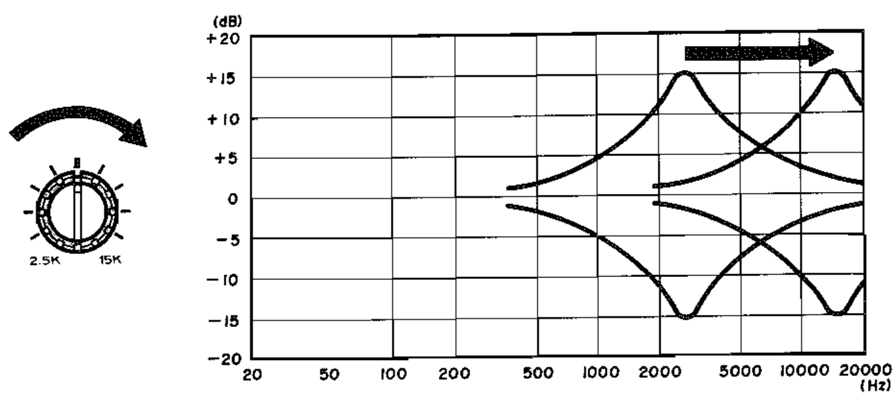
The high gain provided by the mic preamplifier allows us to place our first "patch point" in this useful location. A limiter connected to this point in the M-50 can be set to a range of compression that will not be altered when the input fader is moved, or the EQ is adjusted. When no accessory device is bridged from the SEND jack to the RCV jack, the jumpers provided *MUST* be in place for signal to flow to the EQ amps and on through the M-50. There is no "normal" or automatic internal connection when the jumpers are removed.

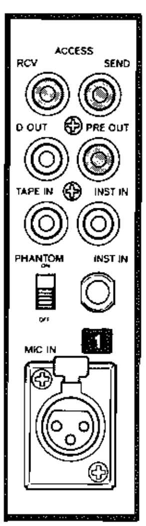
11. Three Section Semi-Parametric Type (Sweep) Equalizer

The classical definition of the word parameter is a variable, such as; weight, length, height, etc. In our case the term "parameter" refers to the adjustable frequency point. The "parameters" or "rules" are not fixed at any specific number, but are continuously variable. Two aspects of the circuit, the frequency center point and the "boost" or "cut" in gain are adjustable without "steps". Here are three graphs showing the control ranges of each of the three sections. Each section provides some "overlap" of the previous section in regards to the frequency range.









The great advantage of a parametric or continuously "tunable" equalizer over the more conventional "fixed center frequency" types is that you can adjust the frequency center point to the precise area you need and then the cut or boost you use will be more effective. You get the result needed with less rotation of the control, and this puts less "strain" on the electronics. No matter how many "frequencies" there are on a "set" type EQ it is unlikely that any one will prove to be "just right" and many more ranges are needed to do the job.

"Less" is always the best working concept in audio, so use the EQ after all other methods have been exhausted.

Move the mic, change the mic, and finally — try the "cut" functions of the EQ first.

Even experienced engineers have a tendency to forget that "cutting" the lows will have a similar effect to "boosting" the highs, and puts less of a strain on the electronics. The results are not indentical but they are close enough to warrant trying. Cut bass, raise the overall gain, and see if it sounds better than just "boosting" the highs.

12. Equalizer Bypass Switch, LED Indicator

This switch is provided to bypass the channel's entire EQ section with a single control. A setting can be compared to "flat" by alternately switching in and out, or, the setting can be bypassed until needed and "dropped in" with a single action.

Up, the equalizer is engaged.

Down, the equalizer is bypassed.

When the EQ BYPASS switch is depressed, the LED will light to remind you that the EQ has been disabled (bypassed).

13. PFL (Pre-Fader Listen) Switch, LED Indicator

In radio and PA, there are many instances when it is desirable to check a signal *before* opening the fader and committing the signal to broadcast or a "House feed". Is the mic working? Do you wish to talk to an announcer before going "on the air" or do you need to ask a vocal group a question (and hear the answer) about the *Cue* balance while doing a background vocal? Use this PFL function. When this push switch is depressed, the pre-fader signal goes directly to the SOLO circuits, replacing whatever signal group or groups you have selected on the MONITOR SELECT switch rack. PFL signal will be heard "center mono", and more than one PFL may be depressed at a time. Push to enable, push again to release. The switches latch to make a "Mix". Depressing the PFL switch will activate the channel's SOLO LED.

In addition, depressing one or more PFL switches will turn on the large SOLO LED on the upper right side of the console to warn you that the MONITOR SELECT switch rack has been bypassed. Why? If the MONITOR has been bypassed by the accidental depression of a SOLO or a PFL button, and, there is no signal in the circuit that is soloed, *THE MIXER MAY APPEAR TO BE INOPERATIVE!* No other MONITOR function or mixing control can affect the signal sent to the ST MSTR A L/R OUTs or the HEADPHONES jacks until you release the unwanted SOLO or PFL function. Even if you are positive that there *IS* signal in a soloed channel, you may forget to advance the separate SOLO volume and you will still hear nothing.

The PFL signal is affected by the EQ BYPASS switch, which changes the signal pickoff point. You can't hear the effect of equalization if the EQ BYPASS switch is depressed.

14. Input Fader

The main mixing control for individual signals on the M-50.

Faders, also called "pots" (potentiometers) or attenuators always cause loss in order to control signal.

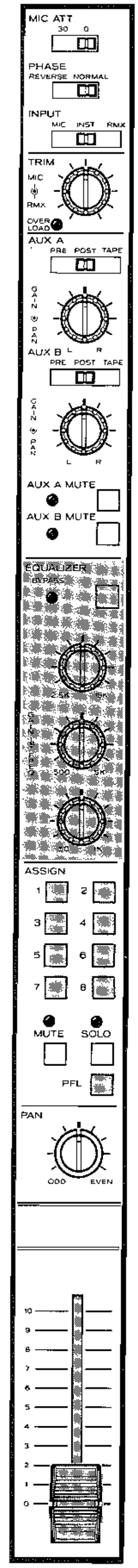
15. Input Channel Buffer Amp

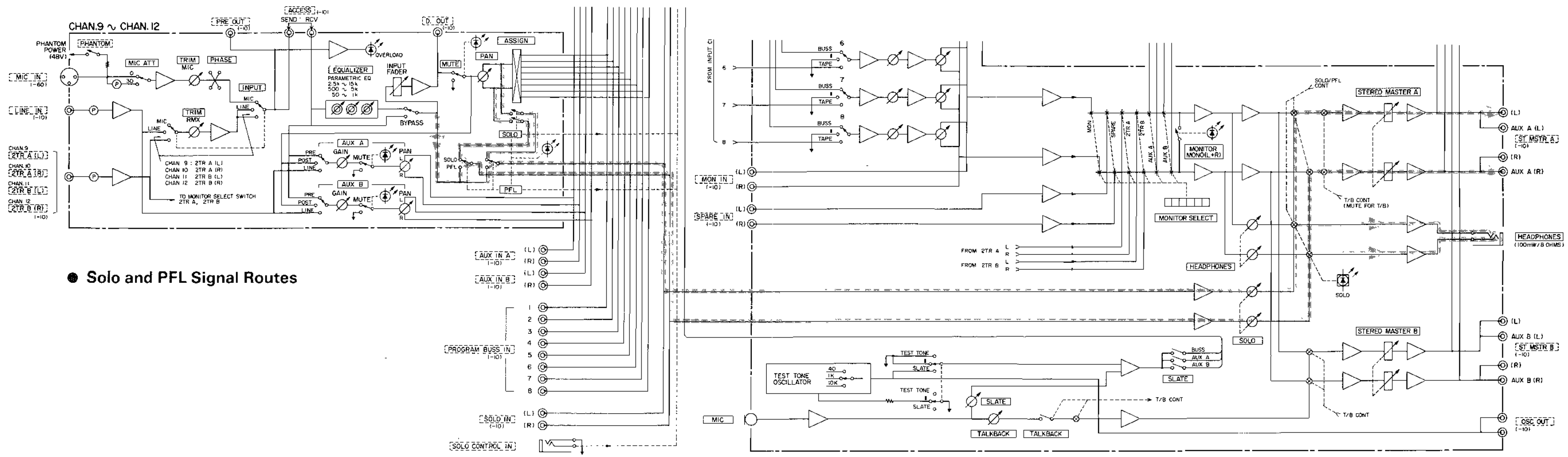
This amplifier has a gain of 8dB, but its primary purpose is not really signal "boosting". It is here to isolate the input fader from the effects caused by the connection and disconnection of the circuits that follow.

16. Direct Out RCA Jack

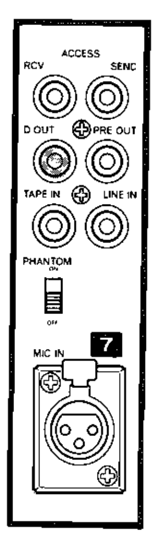
The specifications of the M-50's gain stages and summing networks are as close to ideal as we can offer. However, the fewer the number of parts, amplifiers, and summing networks that the signal passes through, the lower the amount of noise and distortion. Therefore, consider using the Direct OUT (D. OUT) to feed a one mic per track signal to the recorder.

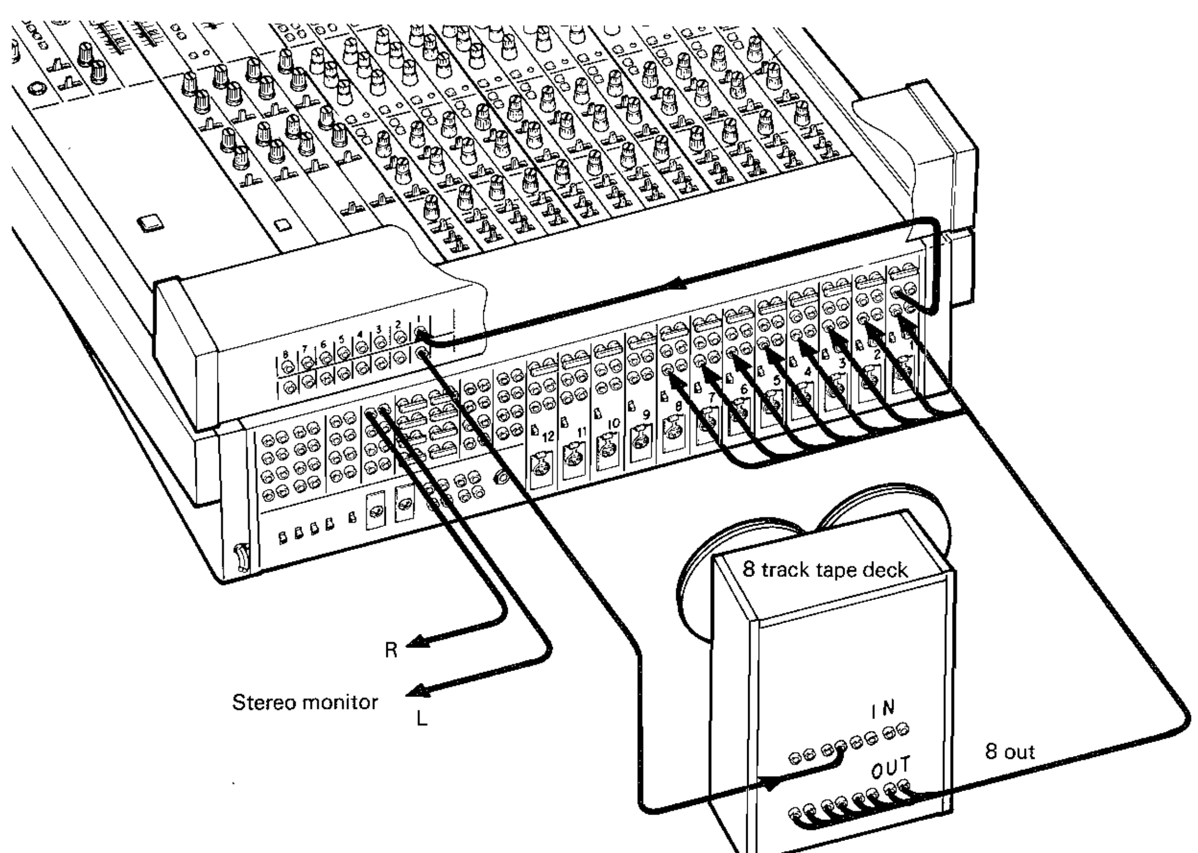
This output can also be used in combination with an outboard mixer to make up an additional *post* fader mix.





● Solo and PFL Signal Routes





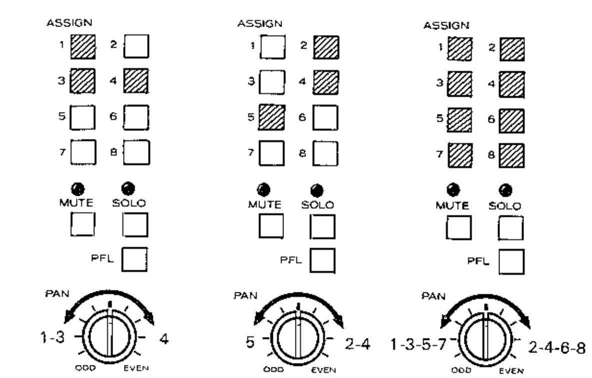
● Typical Example of Direct Out Usage

17. Mute Switch, LED Indicator

a. Located after the input fader in the signal chain, the MUTE switch *simultaneously* disrupts the flow of signal to the PAN control and the POST position of the AUX A and B signal select switch.

b. The MUTE switch can be used to assign a channel that has been preset and EQ'ed without having to reset the input fader accurately when you are rushed. The LED indicator will remain lit until the MUTE switch is released.

c. The MUTE switch does not affect the DIRECT OUT, PRE OUT, or the PRE position of the AUX A and AUX B signal select switch.



Typical examples of multichannel panning

18. Pan Pot (Buss Select)

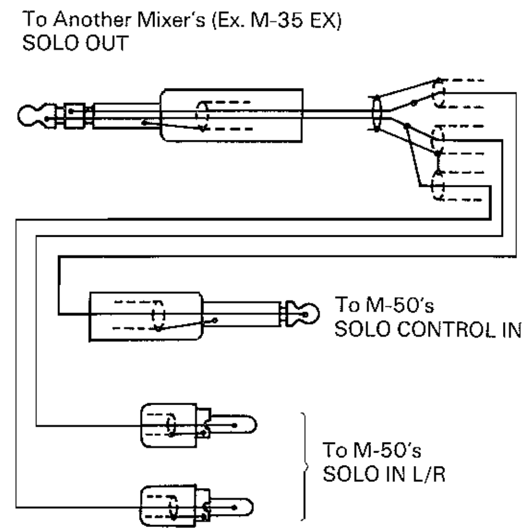
This knob works two rotary faders that are wired "back to back". As you rotate, one is turned up as the other is turned down, and the signal is shifted in stepless fashion from one BUSS to the other. When the control is "dead center", each fader is still reducing the signal slightly so that the signal transition through "center" does not become louder as you pan through it. Panning is possible only between odd and even numberred BUSSES.

19. Solo Button, LED Indicators

Depressing this button will cause the signal on the *Input Channel's* main line to go directly to the SOLO master volume control, and then, to the ST MSTR A OUTs L&R. The SOLO signal will temporarily replace the signal selected at the MONITOR SELECT switch rack.

Because the SOLO signal is taken off *after* the action of the PAN pot, this SOLO is a true *stereo* function and in *Remix* you will hear the effect of stereo placement as well as EQ, and level set by all other prior *Input Channel* controls.

When only one BUSS has been selected, the PAN pot still affects the stereo SOLO, and may be panned as desired without affecting the assignment to the particular BUSS. SOLO affects only the ST MSTR A OUTs L&R, and may be safely used when working. SOLO does *not* interrupt the ST MSTR B OUTs L&R, BUSS OUTs 1 through 8, AUX A&B outputs L&R, or the channel's DIRECT OUT or PRE OUT. The same cautions apply to the SOLO function as the PFL in regard to a possible confusion about whether the mixer is operating or not. Recall that when either SOLO or PFL is engaged on a channel that has no signal in it, you will hear nothing in the MONITOR. To warn you, there is a master SOLO/PFL indicator on the upper right side of the M-50, and, for each input, a smaller LED on each channel to show when SOLOs or PFLs are active.



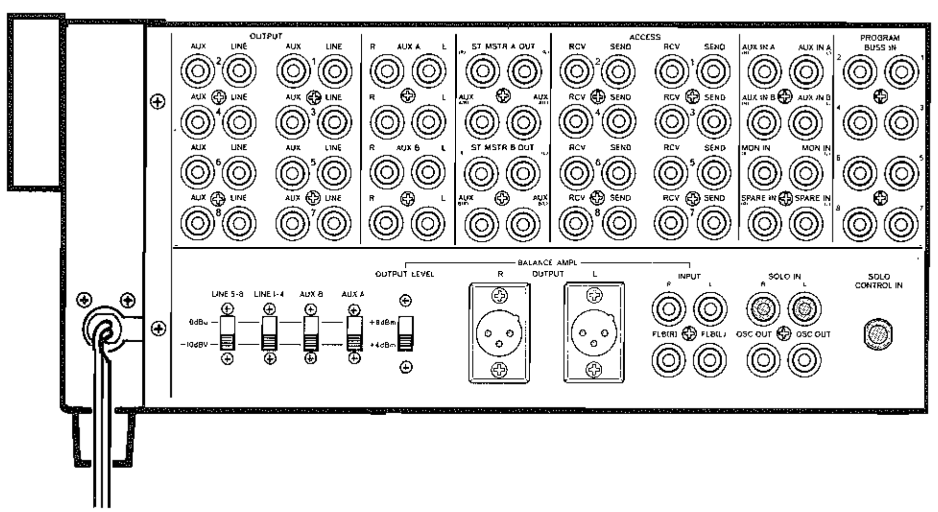
Solo Cable

20. Solo Input Jacks
a. SOLO IN L
b. SOLO IN R
c. SOLO CONTROL IN

These inputs are the stereo audio and FET control switching access points to the M-50's SOLO system. They may be used to combine the SOLO function output from another compatible mixer or expander with the SOLO system of the M-50. Should the external SOLO audio feed be mono, "Y"ing it to the M-50's SOLO INs L&R will insure center placement in the stereo SOLO field.

21. Buss Assign Switches

This rack of eight switches is arranged in two columns; odd numberred, left, even numberred, right, indicating which "side" of the PAN pot they will be assigned to. As in all TASCAM mixers before the M-50, it is still possible to assign a channel to a single BUSS by depressing just one switch and avoid the inevitable increase in crosstalk caused by using the PAN as a part of the basic signal assignment scheme.



AUX SECTION

The two AUX systems consist of a pair of stereo non-dedicated busses which can be used as *CUE BUSS, EFFECTS SEND, ECHO, SECONDARY MONITOR, BROADCAST REMOTE FEED, and REFERENCE RECORDING.*

22. AUX A & B Signal Select Switches
a. Set Left (PRE)

Pre-fader signal is taken from the stage preceding the fader and EQ, so it is not affected by the channel's fader or EQ settings, making this setting useful for stable *Cue* mixes.

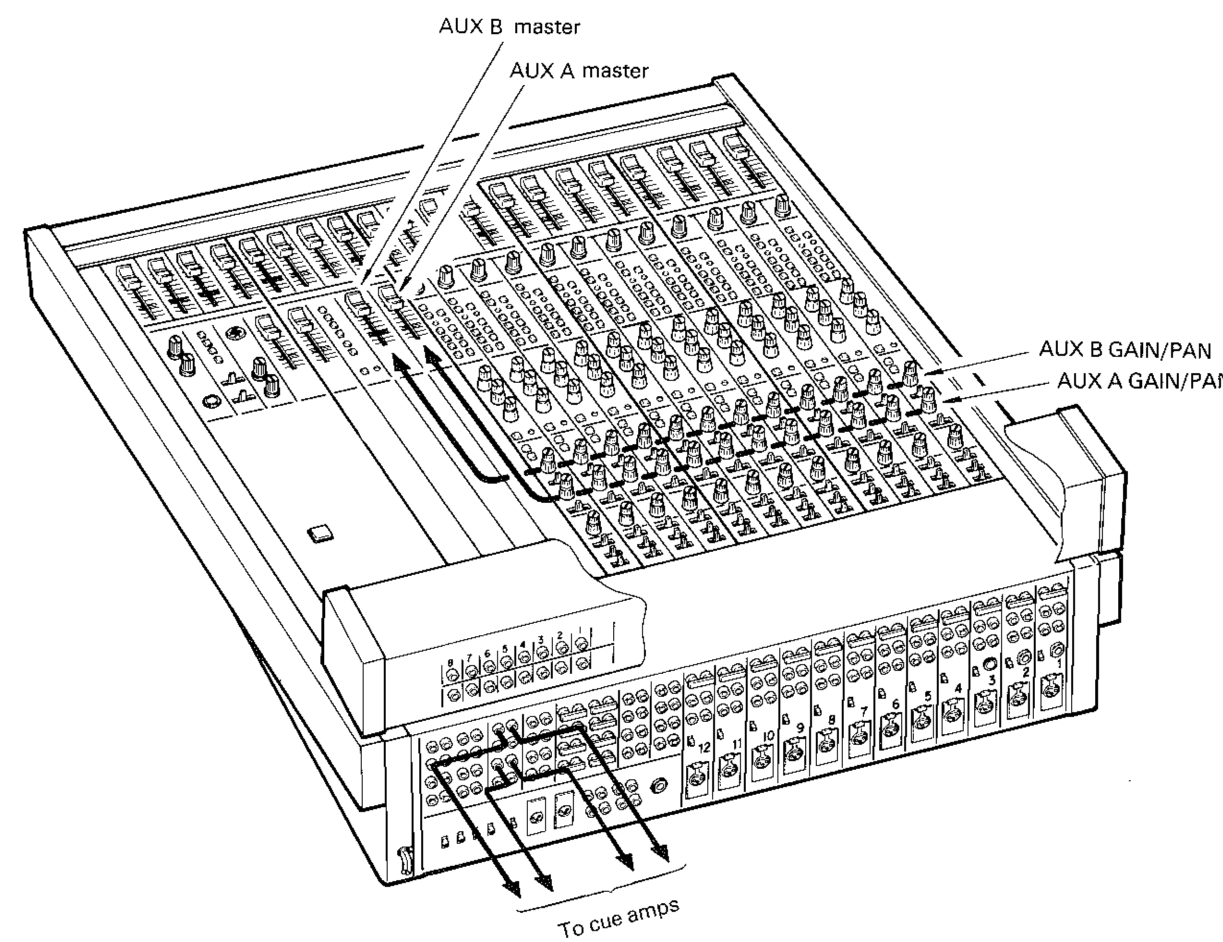
b. Set Center (POST)

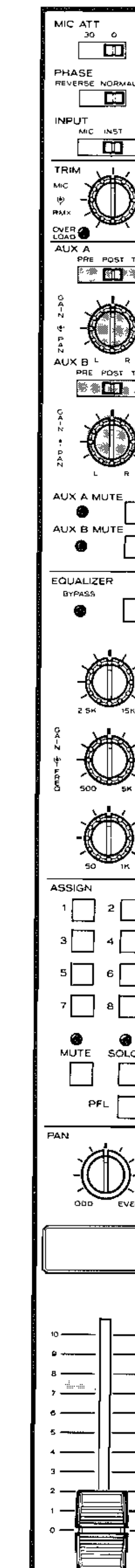
Selects *post-fader* signal from the point in the channel right after the MUTE switch. Because signal feeding this position will be subject to any adjustments to that channel's input fader, this position is usually preferred for *effects* or *echo* mixes.

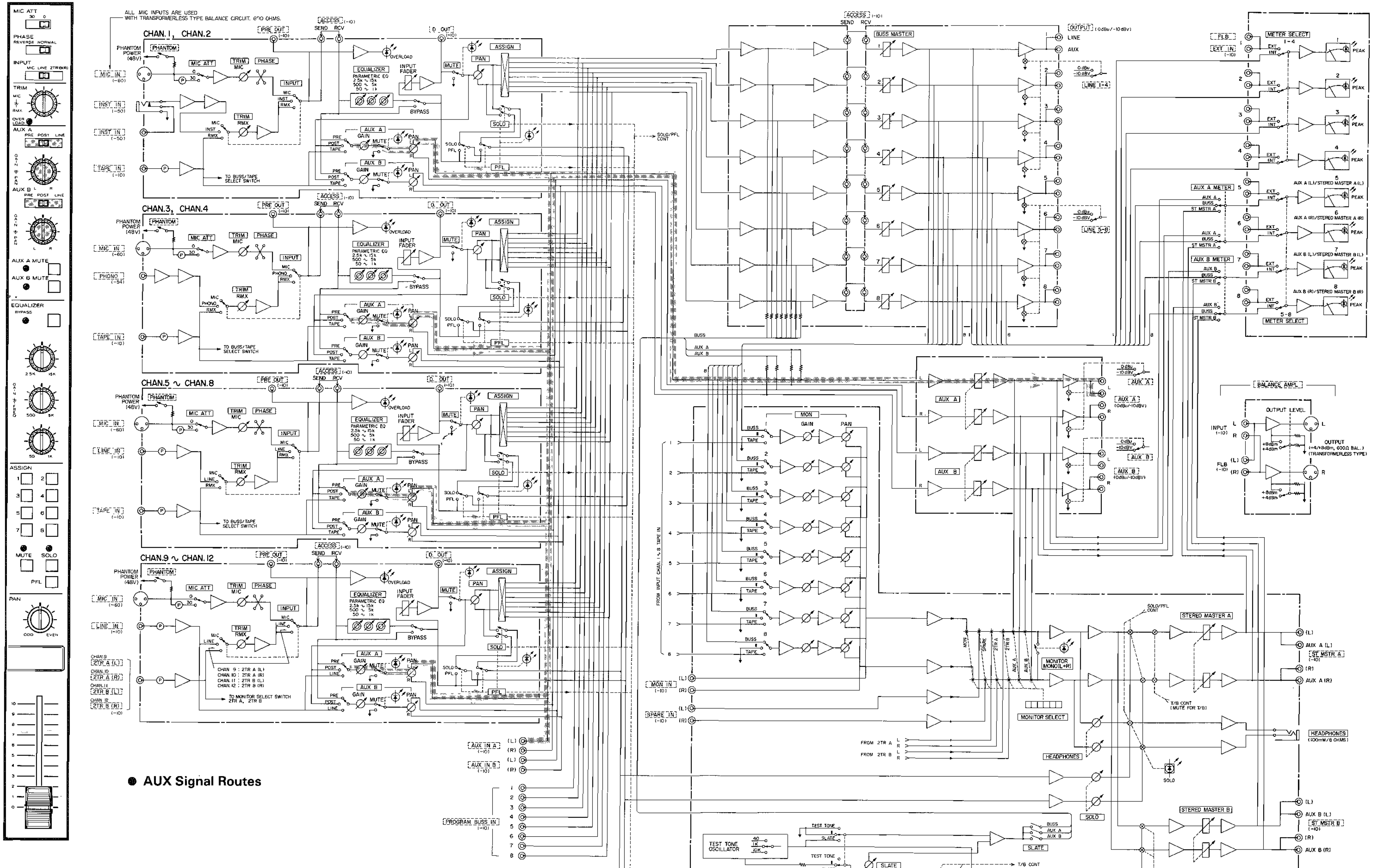
c. Set Right

1) TAPE – Channels 1 through 8
Selects the MULTI-PURPOSE TAPE IN. This is the preferred position to set up the performer's *Cue* mix for overdubbing which requires the ability to combine the already recorded tracks with the new material. By monitoring the recorders output while in Sync mode, you will have both the new and pre-recorded material available for an independent *Cue* mix.
When checking the overdub, the *Cue* system will now be fed all of the recorded tracks at relatively the same mix levels as occurred during the recording.

2) LINE – Channels 9 through 12
Selects the channel's SECONDARY MULTI-PURPOSE LINE IN. This line level input can be selected to feed either or both of AUX systems while one of the other remaining input separately feeds the channel.
The LINE setting is very useful as a way to return submixes or effects into either or both of the AUX systems.







● AUX Signal Routes

23. AUX A or B Gain (Upper Section, Dual Concentric Control)

Individual gain controls are provided for each circuit.

24. AUX A or B Mute Switch, LED Indicator

The AUX MUTE switch will interrupt the flow of signal to the AUX PAN control, light the LED and will affect all options of the AUX signal select switch. By pre-setting the level of the AUX GAIN and then depressing the AUX MUTE switch, a one button "drop in" can be performed by releasing the AUX MUTE switch at the desired moment.

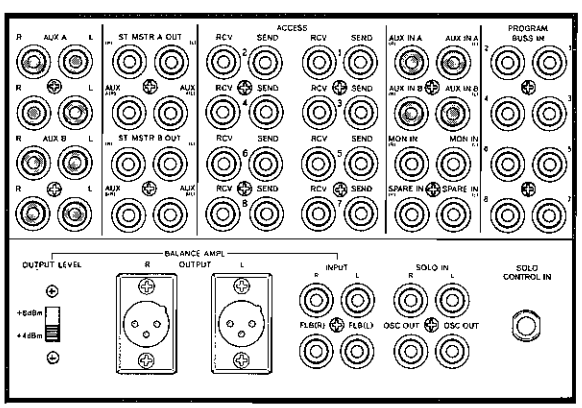
25. AUX A or B Pan (Lower Section, Dual Concentric Control)

The AUX A and AUX B PAN each accept signal from its respective AUX signal select switch. Each AUX system is stereo and the AUX PAN determines the placement of the signal within the system's stereo perspective. Stereo echo devices fed by either AUX system may be panned independently of the channel PAN assignment when performing a stereo mix.

26. AUX IN A or B, L/R RCA Jacks

Any line level signal may be introduced into the AUX systems at these patch points. These inputs may also be used to cascade the output from another mixer into the AUX A or AUX B mix.

Since there is no separate volume control just for these patch points, level control for these additions to your AUX mixes must come from the device that you have "patched in".

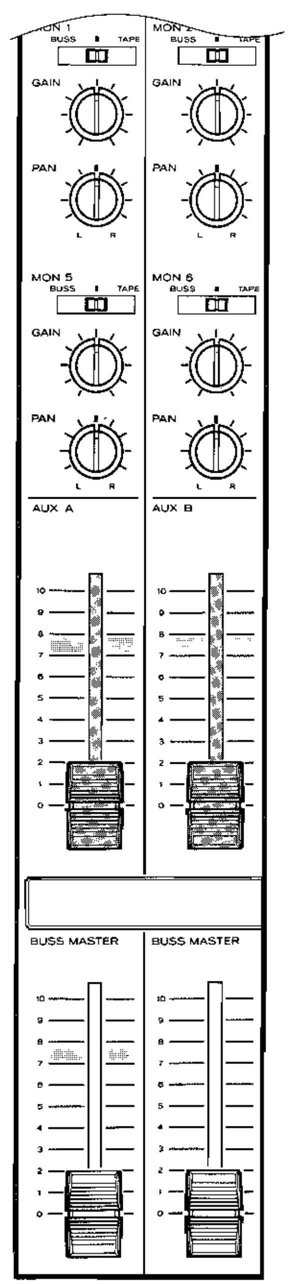


27. AUX A or B L/R Stereo Master Fader

Each of these *dual* straight line controls provides overall level adjustment of the stereo AUX signal sent to its respective AUX L/R output jacks, the AUX A and B METER select switch, and to its MONITOR SELECT switch.

28. AUX A or B L/R Out RCA Jacks

Each of these stereo output pairs can be used for a variety of accessory functions; effects sends, *Cues*, monitor mixes, and the like. What you connect here will depend on the job you need done by the AUX A or AUX B systems at the time.



BUSS MASTER SECTION

29. Program Buss Ins, 1 through 8

These inputs may be used to accept the output of another mixer or any other line level source you wish to add. Since there is no separate volume control just for this patch point, level control for additional signal introduced here must come from the device that you have "patched in".

30. Master Buss 1 through 8 Combining Network and Summing Amplifiers

These amplifiers don't show on the outside but their contribution to the system is considerable. These devices allow the twelve channels to add their signals together without one channel distorting the output of another. When you wish to "combine" or "sum" two or more varying voltages that are being used to represent sounds, a simple "joining together" of the wires *will not* work. This type of circuit protecting "summing amplifier" also appears in several other places inside the M-50:

AUX A, L/R;
AUX B, L/R;
MONITOR, L/R.

31. Master Buss Access Send/RCV RCA Jacks

This pair of jacks is used to add an accessory or effects device (echo, flanger, what have you) to the entire group of signals on a BUSS. This feature is not provided on the AUX A or B stereo busses. When no device is "bridged" across these jacks, the jumpers *must* be in place for signal to flow, as there is no "normal" or internal connection.

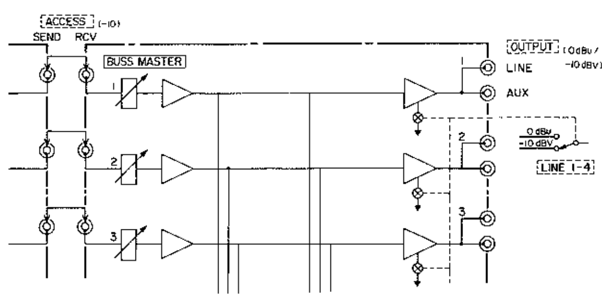
32. Buss Master Fader

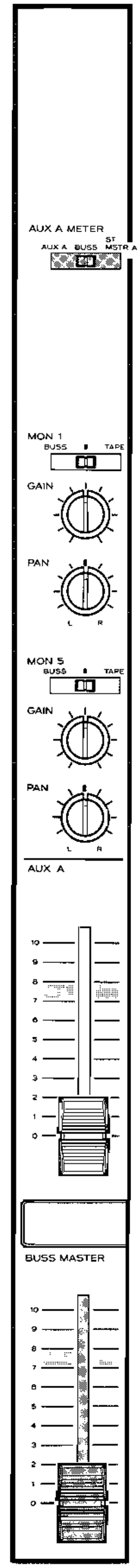
There are eight of these straight line faders, one for each of the eight BUSSes. Each BUSS MASTER fader controls the output from its buss summing amplifier. It is a "grand master" for all signals that have been assigned to the BUSS, from *Input Channels*, BUSS ACCESS SEND/RCV, or the PROGRAM BUSS IN. Use it to simultaneously adjust these three different "feeds":

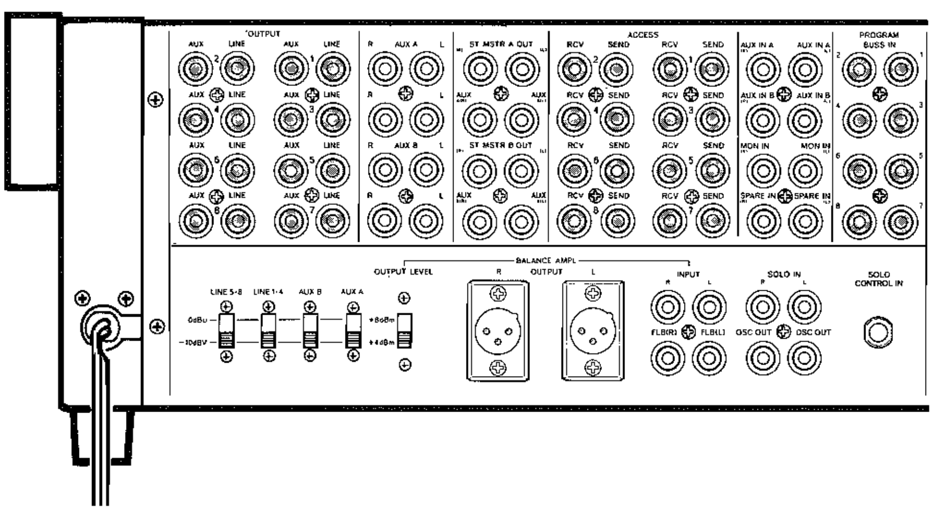
a. The level sent to the LINE/AUX OUTPUTs 1–8.
b. The level shown on the meters when their switches are set to read BUSSes 1–8.
c. The level sent to the MONITOR control group.

33. Line/AUX Output RCA Jacks (Busses 1 through 8)

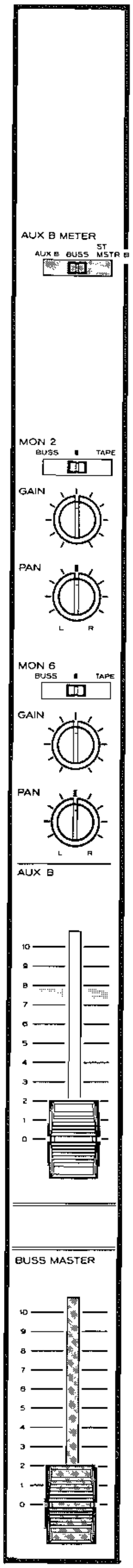
The final output of your mix. All functions have been applied to the signals. The only controls that remain are the sections of the mixer that allow you to see and hear what you are doing; the meters and the monitor feeds. We'll go to the block diagram and deal with the outputs first (p.63–64).







MONITOR SECTION



34. VU Meters 1 through 8

These eight meters have the standard volume unit ballistic. They respond to the *AVERAGE* level of the signal not the *PEAK* level. The 0 VU point is set to equal 0.3 volts (–10dB referenced to 1 volt). Because the signal level sent to the meter amplifier procedes the parts that switch the BUSS OUT (LINE /AUX OUTPUTs, AUX A, L&R OUTs, AUX B L&R OUTs) reference level from –10dBV (0.3 volts) to 0dBu (0.775 volts), it is not necessary to adjust the meter amps or the LED driver circuits when you wish to change reference levels.

35. Peak LEDs

These light emitting diodes will react much more quickly than the meters, and are set to "flash" 10dB above "0VU". They will show you the difference between average and peak levels. On most percussion material (kick drum, latin percussion such as castanets or the Brazilian instrument called an afuche) you will see these LEDs flash *long before* the VU meters read anywhere near zero. Short term peak distortion may be hard to detect. Use discretion and experiment with the final meter level when you see these lights flash. They are telling you the truth about the *REAL* level that is being sent to the final output and "average" is not always a safe concept. For example, castanets should be recorded with no more than a –20 indication showing on the *averaging* VU meter. Even when the meter reads this low you may still see the LED flash. Take care and avoid overload.

It is normal for the M-50 meters to jump when AC power is first applied, and the headphone amplifier may produce a substantial transient "pop" even if the HEADPHONES master pot is rotated fully leftwards (off).

Patching in mics and accessories with the power off will insure that you don't damage your ears, the M-50 or any other equipment that you may be using. Take care.

36. AUX A Meter, AUX A/BUSS/ST MSTR A Switch

This three-position switch affects meters 5 and 6.

a. Set Left – AUX A

Meters 5 and 6 will now indicate the signal level appearing at the AUX A, L/R outputs.

b. Set Center – BUSS

Meters 5 and 6 will now indicate the signal level appearing at the BUSS OUTs (LINE/AUX OUTPUT) 5 and 6.

c. Set Right – ST MSTR A (Stereo Master A)

Meters 5 and 6 will now indicate the signal level appearing at the ST MSTR A OUTs L/R.

37. AUX B Meter, AUX B/BUSS/ST MSTR B Switch

This three-position switch affects Meters 7 and 8.

a. Set Left – AUX B

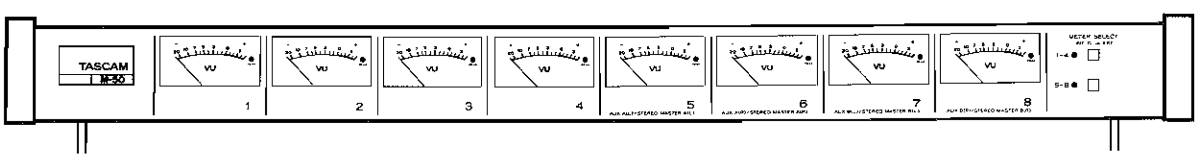
Meters 7 and 8 will now indicate the signal level appering at the AUX B, L/R outputs.

b. Set Center – BUSS

Meters 7 and 8 will now indicate the signal level appearing at BUSS OUTs (LINE/AUX OUTPUT) 7 and 8.

c. Set Right – ST MSTR B (Stereo Master B)

Meters 7 and 8 will now indicate the signal level appearing at the ST MSTR B OUTs L/R.



38. MON BUSS/ I(OFF)/TAPE Signal Select Switches, 1 through 8

These three-position switches determine which signals will be used to feed your MONITOR mix.

a. Set Left – BUSS

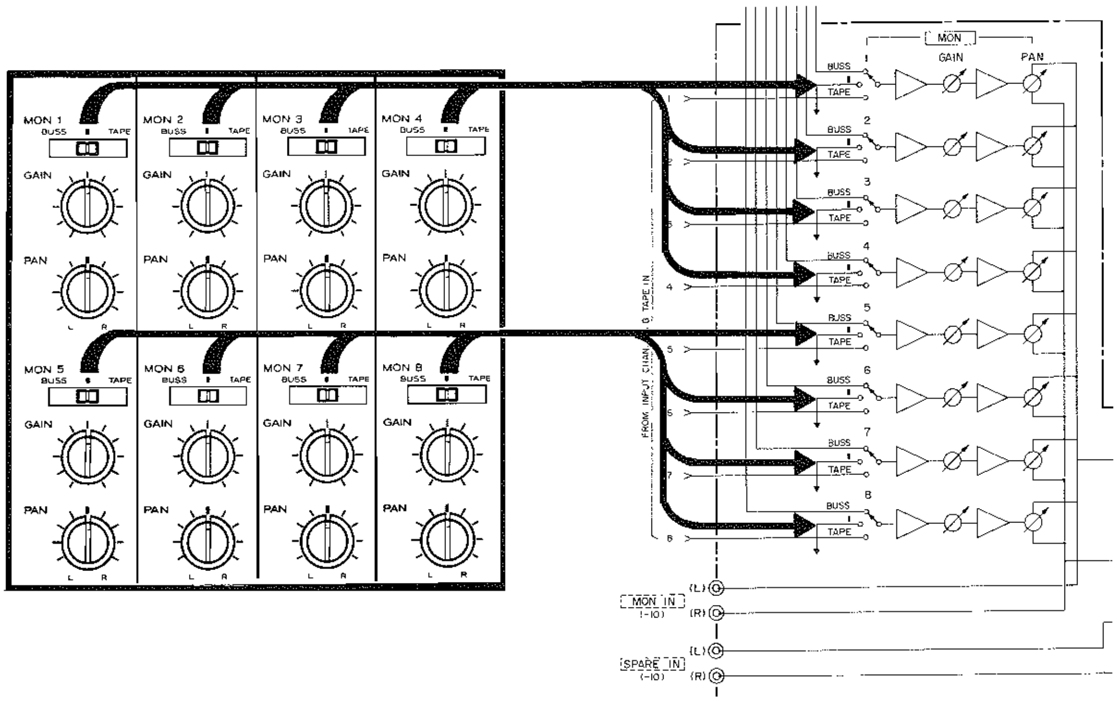
Signal appearing at the BUSS OUT (LINE /AUX OUTPUT) having the same number as the switch will be made available to the 8 x 2 MONITOR mix via the MONitor GAIN and PAN controls located directly below the switch.

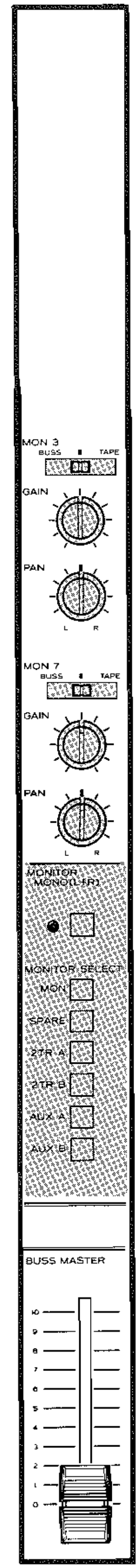
b. Set Center – I(OFF)

Signal is muted.

c. Set Right – TAPE

Routes signal from the MULTI-PURPOSE TAPE IN of the same number to the switch's corresponding MONitor GAIN and PAN controls.





39. MON Gain Control (x8)

This pot controls the level of signal selected to appear in the 8 x 2 MONITOR mix by its corresponding MON BUSS/ I(OFF)/TAPE signal select switch.

40. MON Pan Control (x8)

This pot determines the stereo placement of signal selected to appear in the 8 x 2 MONITOR mix by its respective MON BUSS/ I(OFF)/ TAPE signal select switch and MON GAIN control.

41. MON In L/R RCA Jacks

This input is provided in order to add any appropriate signal to the 8 x 2 MONITOR mix. Level control of this signal must come from the device that you are feeding in. There is no idividual gain or pan on this input pair.

42. Monitor Select Switch Rack

If you examine the *Block Diagram* you will see that this signal select determines what will appear at both the ST MSTR A and B OUT, L/R RCA jacks *and* the HEADPHONES tip-ring-sleeve final stereo output. There are 7 options, and since this switch rack can combine signals, any or all switches may be depressed simultaneously. There are several combinations of two or more of these switches that will solve listening problems that are common to the multitrack process, so we'll detail each option and it's benefit.

a. MON Switch

The first position selects the output of the 8 × 2 MONITOR section. Since this BUSS/❚(OFF)/TAPE group is the *Basic* 8-track working system for the whole mixer, you will probably have it selected almost all of the time.

b. SPARE Switch

When depressed, selects the SPARE IN L/R jacks on the rear panel. Any stereo input such as a submix or a two-track patched in to the SPARE IN L/R jacks can be switched in and out of the STEREO MASTER A&B busses.

c. 2TR A Switch

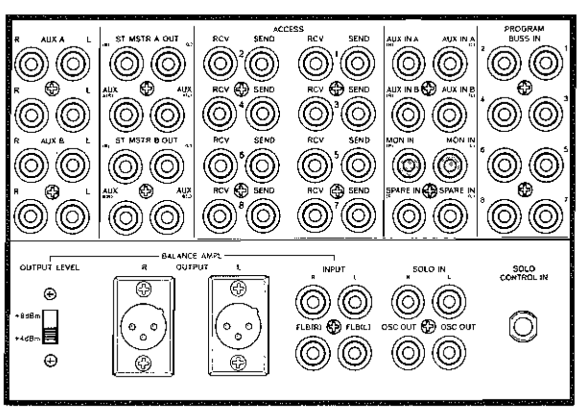
Selects the 2TR A, L/R input jacks on channels 9 and 10 (both at once). This position can be used to quickly switch the monitor to a two-track to check a mix-down, or, to listen to a signal group *without* recording it as we stated in the previous section 2TR A&B, L/R input.

d. 2TR B Switch

Selects the 2TR B, L/R IN jacks on channels 11 and 12 (both at once). Basically a duplicate of the function provided by the 2TR A switch, but for channels 11 and 12.

e. AUX A Switch

Selects the AUX A L/R final mix after the AUX A L/R master fader. This position will allow monitoring and adjustment of the AUX A stereo mix as it is sent out to a cue amp or effects device.



f. AUX B Switch

Selects the AUX B L/R final mix after the AUX B L/R master fader. This position will allow monitoring and adjustment of the AUX B stereo mix as it is sent out to a cue amp or effects device.

These two switches (AUX A and AUX B) are basic multitrack necessities. And, when any session that depends on a good *Cue* (headset) mix begins, either of these switches should be your first selection so you can listen to the *Cue* system balance, and set the rehearsal sound.

g. MONITOR MONO (L+R) Switch, LED Indicator

When the final format is *mono*, such as a radio spot, rather than force you to "center" all the MONitor PANs, we provide this switch. It will sum together both sides, left and right, of the stereo signal present in the MONITOR SELECT switch rack and will show you what your mix will sound like *BEFORE* it is broadcast. In stereo recording for disc release, it is useful to know in advance what will happen when a stereo sound is combined to mono, even though no mono mix is planned. Remember that radio is often *mono*, and much difficulty with mics wired "out of phase" or effects return added to the mix unwisely can be avoided by listening to a *mono* in the monitor while you still have a chance to change the approach. Disc cutters don't like too much out of phase stereo, and this one error can be the major cause of disappointment with a test pressing. Since a cutting tip is not capable of moving in two directions at the same time, and since two loudspeakers are truly independent systems, you can get a teriffic sounding tape that makes a very poor record if you don't check for mono compatibility. What to listen for? A mix that doesn't loose most of it's high frequency brilliance when you select mono with the switch we provide here. Phase is a difficult subject and there are no simple repairs that we can guarantee. You will have to experiment to find solutions one at a time. Moving the mic 1/2 inch may change everything.

Using the PHASE Reverse switch may also help solve this type of problem

h. MONO LED Indicator

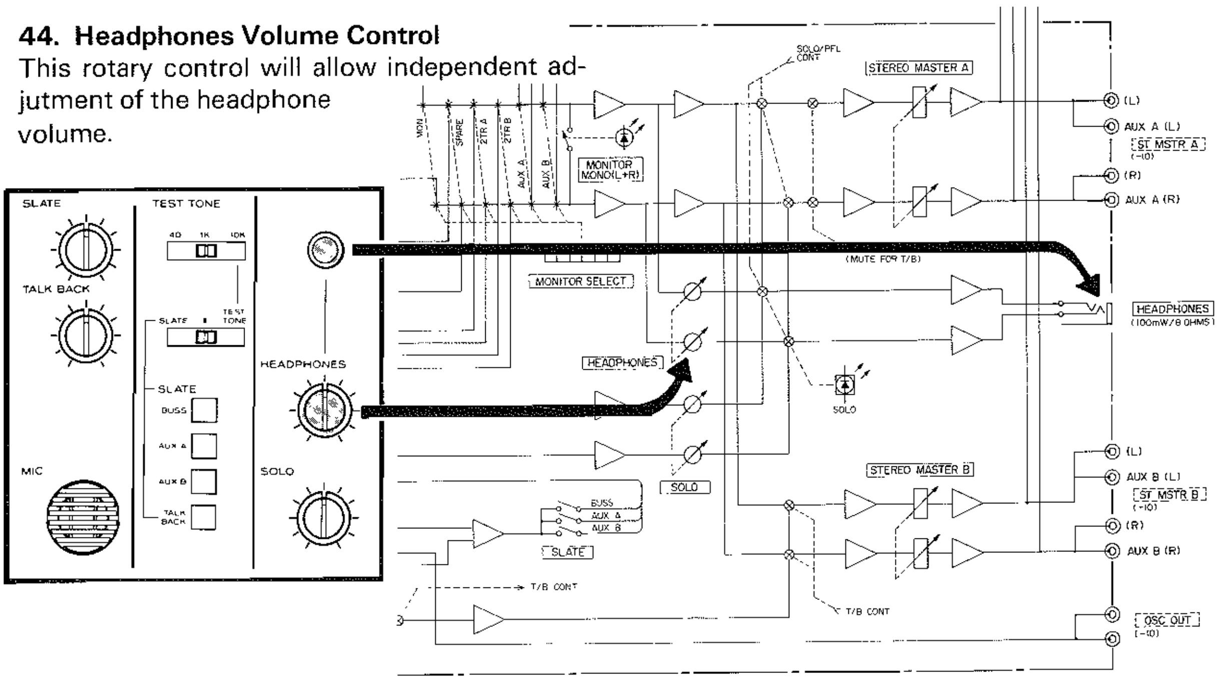
This LED is provided to remind you that the MONITOR MONO (L+R) switch is on.

43. Monitor Buffer Amp

Isolates the MONITOR from the multiple connections that follows.

44. Headphones Volume Control

This rotary control will allow independent adjutment of the headphone volume.

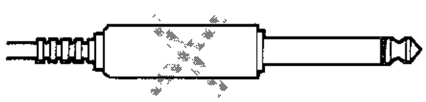


45. Headphones Tip-Ring-Sleeve Stereo Output Jack

Use only stereo phones!

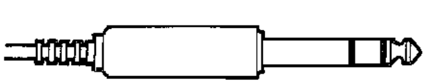
CAUTION! MONO (2 WIRE) HEADPHONES WILL CAUSE EVENTUAL CIRCUIT FAILURE

If your "phones" have this connector, *DON'T* use them.



(1/4" phone 2 section connector)

To be safe, the headset connector must have three sections. We realize that in any patchable system, accidents can happen. We do build protection circuits in to assure that a momentary mis-connection will not cause instant failure, but just because the circuit seems to work OK when you try it for a moment or two, don't assume that we are overly cautions and keep on. Sooner or later, it *WILL* fail (2 to 3 minutes). The reason? When the "sleeve" of the 2 wire phone jack is inserted, it will connect *both* outputs together "head to head" and this is not a usable signal combining method.



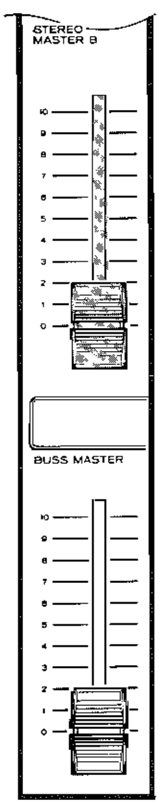
(1/4" phone 3 section connector)

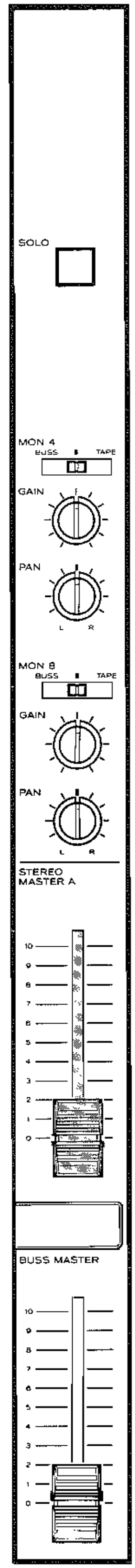
46. Stereo Master Faders, A&B

Each *dual* slide fader (stereo) adjusts the overall level of the signals selected at the MONITOR SELECT switch rack. The signal level apearing at the ST MSTR A OUTs L/R is determined by the STEREO MASTER A fader while the STEREO MASTER B fader determines the signal level appearing at the ST MSTR B OUTs L/R.

47. Monitor Buffer Amp

For signal isolation.





48. +4/+8 Balance Ampl. Output L/R Connectors

This balanced transformerless stereo output pair is patchable and will allow you to properly couple any output of the M-50 to long lines without signal loss. Signal may be patched into this output pair by means of the BALANCE AMPL. INPUT L/R RCA connector adjacent to the balanced connectors on the rear panel. The FLB L/R RCA connectors provide foldback *output* of the input to this system. *DO NOT USE THE FLB CONNECTORS AS INPUTS TO THE BALANCED AMPLIFIER SYSTEM.*

The FLB L/R connectors are there for convenience. Think of them as built in Y cords. They enable you to feed a single signal to the BALANCED AMPLIFIER SYSTEM and any other device.

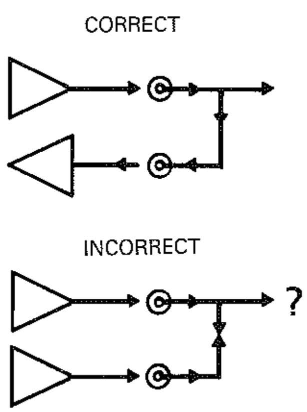
A switch is provided on the rear panel to set the nominal "0 VU" reference to either +4 dBm or +8 dBm.

49. ST MSTR A Out L/R RCA Jacks

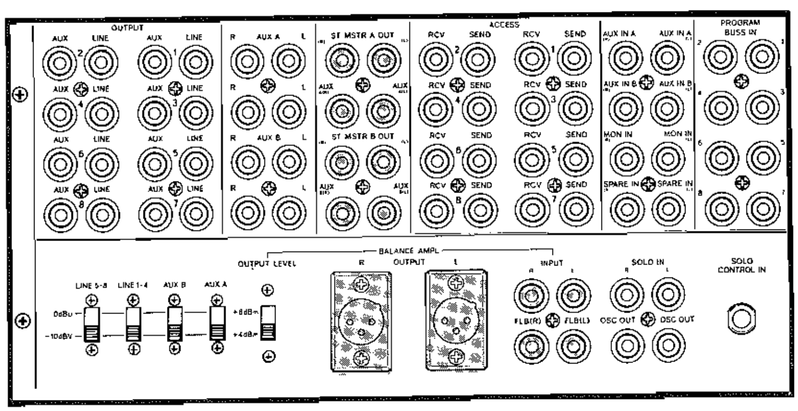
The expected use of this output pair is to send signal to a power amp and loudspeakers for control room monitoring. Output from the SOLO and PFL system will appear here.

50. ST MSTR B Out L/R RCA Jacks

Because output from the SOLO and PFL systems *does not* appear at this output pair, it may be used as either a studio feed or in conjunction with the balanced output amplifier as a broadcast clean feed, or as a secondary recording buss.



Look's OK ... but circuits are head to head.
No good.



TALKBACK SECTION

51. Talkback Mic

A talkback mic is built-in, and the switches and volume controls that follow will assign it to several outputs.

52. Slate Volume Control

Controls the level of the TALKBACK MIC to the BUSS, AUX A, and AUX B assign switches in the SLATE select switch rack.

53. Talkback Volume Control

Controls the level of the talkback mic exclusively to the TALKBACK switch in the SLATE select switch rack.

54. Slate/I(OFF)/Test Tone Switch

This switch has three positions and affects only the output from the test tone oscillator.

a. Set Left – SLATE
Output from the test tone oscillator is now made available to the BUSS, AUX A, and AUX B switches in the SLATE select switch rack.

b. Set Center – I(OFF)
The test tone oscillator is turned off.

c. Set Right – TEST TONE
Output from the test tone oscillator is now made available only to the OSC OUTs on the rear panel.

55. Test Tone Signal Select Switch

This three position switch will select the following frequencies:

a. Set Left – 40 Hz
This tone is useful for high speed search.

b. Set Center – 1k Hz (1000 Hz)
The basic set-up frequency, and the only correct one for aligning a dbx *unit without causing action of the noise reduction circuit.

c. Set Right – 10k Hz (10,000 Hz)
This is the standard alignment frequency that you should put on your masters if you are planning on making records. Thirty seconds of this frequency will allow the cutting room engineer to align the master recorder's playback azimuth to the same standard as your master machine, and you will retain good high frequency performance.

*dbx is the registerred trademark of dbx Inc.

56. Slate Select Switch Rack

There are four switches in the rack.

a. BUSS Switch
When depressed, signal from the built-in TALKBACK MIC will be made available to all eight BUSS OUTs. In addition, if the TEST TONE/I(OFF)/SLATE switch is in the SLATE position, output from the test tone oscillator will then be presented to all eight BUSS OUTs for system calibration and tone-striping your tapes.

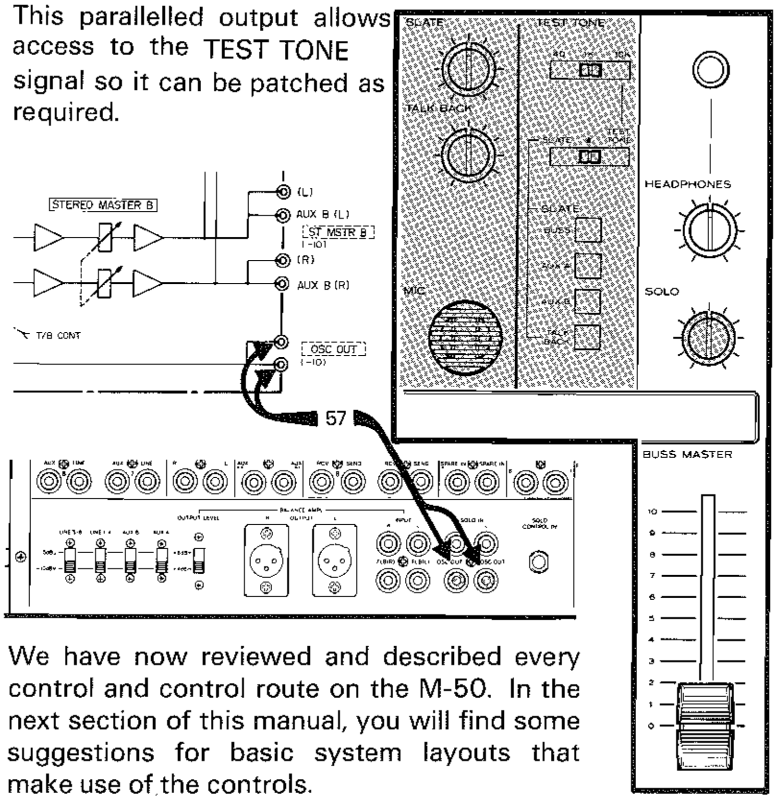
b. AUX A Switch
When depressed, signal from the built-in TALKBACK MIC will be made available to the AUX A output, L/R. In addition, if the TEST TONE/I(OFF)/SLATE switch is in the SLATE position, output from the test tone oscillator will then be presented to the AUX A outputs, L/R.

c. AUX B Switch
When depressed, signal from the built-in TALKBACK MIC will be made available to the AUX B outputs, L/R. In addition, if the TEST TONE/I(OFF)/SLATE switch is in the SLATE position, output from the test tone oscillator will then be presented to the AUX B outputs, L/R.

d. TALKBACK Switch
When depressed, the TALKBACK MIC is assigned to the ST MSTR B OUTs L&R.

57. OSC Out RCA Jacks

This parallelled output allows access to the TEST TONE signal so it can be patched as required.



We have now reviewed and described every control and control route on the M-50. In the next section of this manual, you will find some suggestions for basic system layouts that make use of the controls.

PATCH INTRO

The standard patching setups described here are provided with the hope that they will stimulate your imagination when you have mixing needs that cannot be solved with a standard setup. Line level is line level, whatever the source, and the many line level inputs on the M-50 can offer solutions to your specific problems that we have not addressed directly with a dedicated top panel control or subsystem. The jacks on the back are there to be used. Patching should be used to optimize the quality of your signal by bypassing unneeded controls or by making additional control possible.

Most people tend to look for permanent connections in order to reduce complex patching logic to something that can be dealt with "under pressure." It is true that the logic of the control functions on the top panel takes some time to become familiar with, but multichannel production has many mixing requirements. A *permanent patch* will severely restrict flexibility. If you can learn to examine the system with re-patching in mind, you can achieve significant improvements in system performance. For this reason, we suggest that you plan on access to the back panel of the mixer. Don't set up your system in such a way that you "hide all that mess" and have no access to the back panel. Leave yourself room to get at all the connectors. You will need all the options you can get.

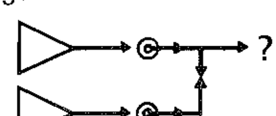
After you have made several patches you may find that the top panel labels are no longer correct, and so we strongly suggest that you take the time to re-label each control to correspond to the new function that your re-patch is controlling. Drafting tape labels applied to each control or group will prevent accidents from happening because you have tried to operate the mixer "normally."

It is also wise to label both ends of every cable. When repatching away from "normal", a label will save endless tracing and re-tracing of the wiring.

In all patching and connecting of two-wire single ended circuits, some basic rules are worth mentioning:

1. Keep your cable runs *SHORT!* – as short as possible.
   Installing a patch bay behind the engineers chair will require at least 20 foot runs out and back and is not recommended. Mounting the patch bay on the left or right side of your mixer will allow much shorter runs, and wisest of all is to us our PB-64 Patch Bay accessory mounted on top of the meter bridge itself. This location will permit the use of the shortest lengths of cable, and will improve your sound. Incidentally, short runs cost less so you will save money as well.
   The use of "professional" 3-conductor cable such as Belden 8451 should be avoided. Even though it is of excellent quality, it is not the right idea for 2-wire transformerless systems. If you are going to make up your own cables, we would suggest that you consider TASCAM low loss professional audio cable in the 500 foot rolls, or, cable such as Belden 8218. Solid core insulation and low capacitance are the important considerations in the 2-wire system. Some low capacitance cable uses soft foam insulation and is also not recommended as the center conductor will cut through the soft foam with time and the cable will short circuit. Don't use it.
   TASCAM low loss, professional audio cable has less than 15 pF per foot of capacitance and uses a very durable material for its insulator. In the "made up" lengths we offer, the connector is a heavy duty RCA jack made of steel that will stand up to the demands of constant patching and re-patching without breaking down.
2. Multiple output connections always require impedance matching calculations. Make sure you are not asking too much of your output stages. Permanently connecting several cables to a single output may produce poor quality. Be certain that a multiple connection is well within safe limits. Use the section on impedance calculations in this manual, abide by the rules for 2-wire circuits we have discussed, and you will get better results.
3. Using a "Y" cable to "sum" or join two outputs in order to feed one input *WILL NOT BE POSSIBLE*. Since there is no "one way" sign on a wire, signal from one side of the "Y" will flow back into the other side as well as on to the input of the next device. Summing, or adding two signals together requires that they be properly isolated. A simple joining together of the "hot" leads will not work.

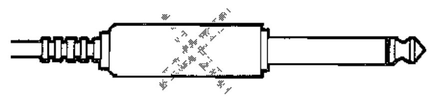
INCORRECT



Look's OK ... but circuits are head to head. No good.

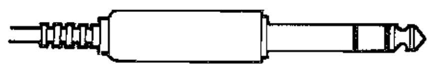
We recognize the fact that with a patchable system, accidents will occur. We have built protection circuits in to insure that a momentary mis-connection will not cause instant failure, but – just because it seems to function when you try it for a moment or two, don't assume that we are overly cautious and keep on. Sooner or later it *WILL* fail (2 to 3 minutes) and it is definately not a usable method of expanding mixer flexibility.

When using the STEREO HEADPHONE circuit on the M-50, a similar caution applies. The use of *MONO* headphones will cause circuit failure. If your "phones" have this connector, *don't* use them.



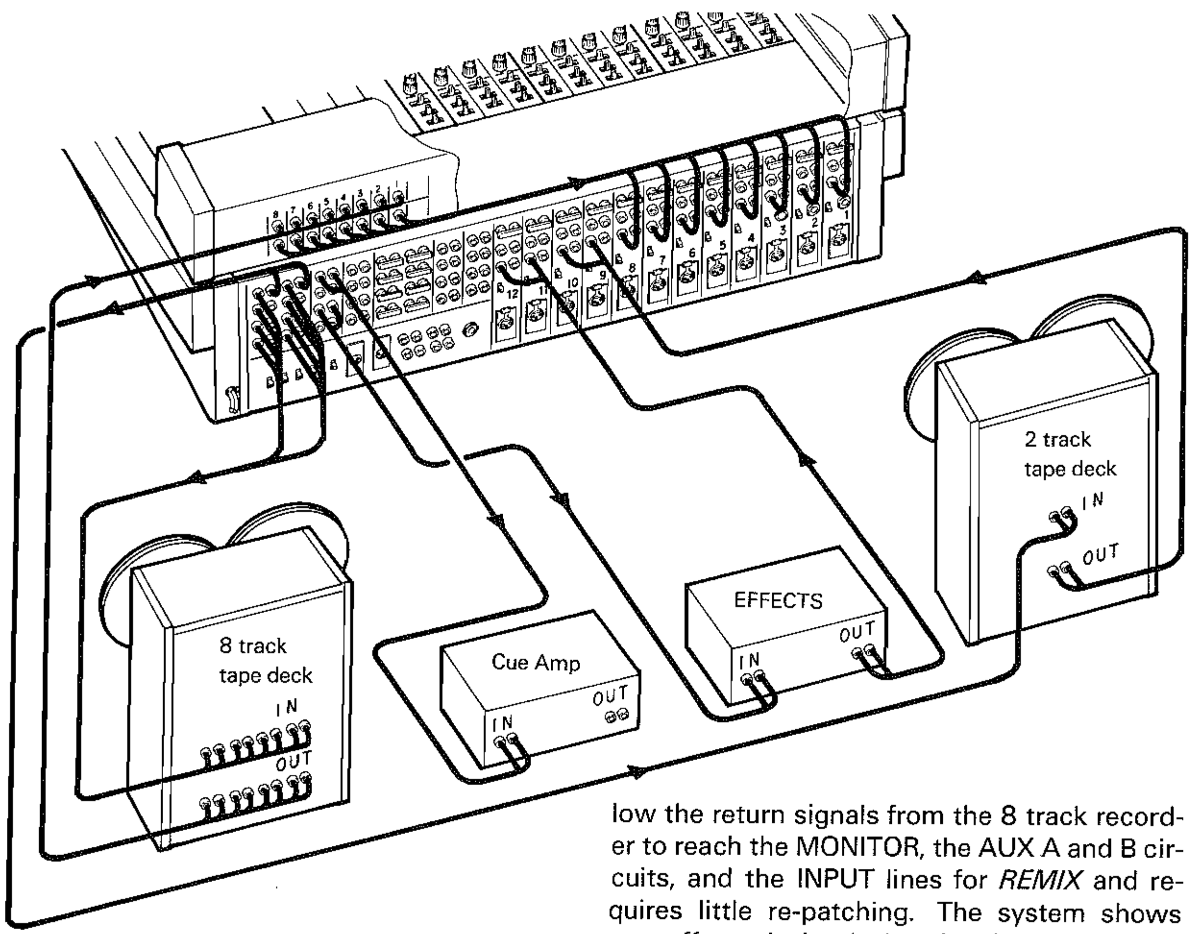
(1/4" phone 2 section connector)

The "sleeve" of the 2 section plug will connect both sides of the stereo headphone amplifier together in the "head to head" mode. To avoid this, you must have *THREE* bands on the plug. It is also a good idea to check the wiring to make sure that the three sections are actually wired individually. Look for this discrete configuration when you unscrew the protective cover on the connector.



(1/4" phone 3 section connector)

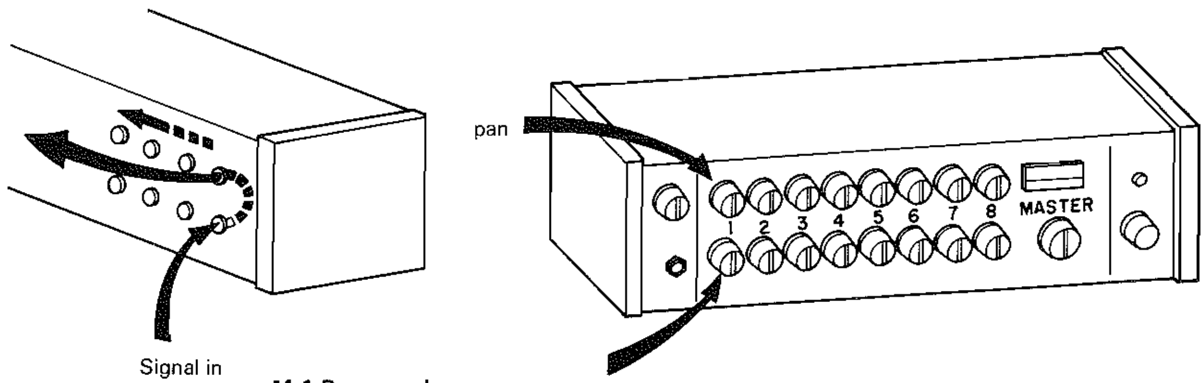
RECOMMENDED 8 TRACK BASIC PATCH



This patch makes use of the multiple function TAPE IN on *Input Channels* 1 through 8 to allow the return signals from the 8 track recorder to reach the MONITOR, the AUX A and B circuits, and the INPUT lines for *REMIX* and requires little re-patching. The system shows one *effects* device (echo chamber) and one 2 track recorder, and is the basic system most applications will require for 8 track production.

EXPANDING SECONDARY FUNCTIONS WITH THE MODEL 1

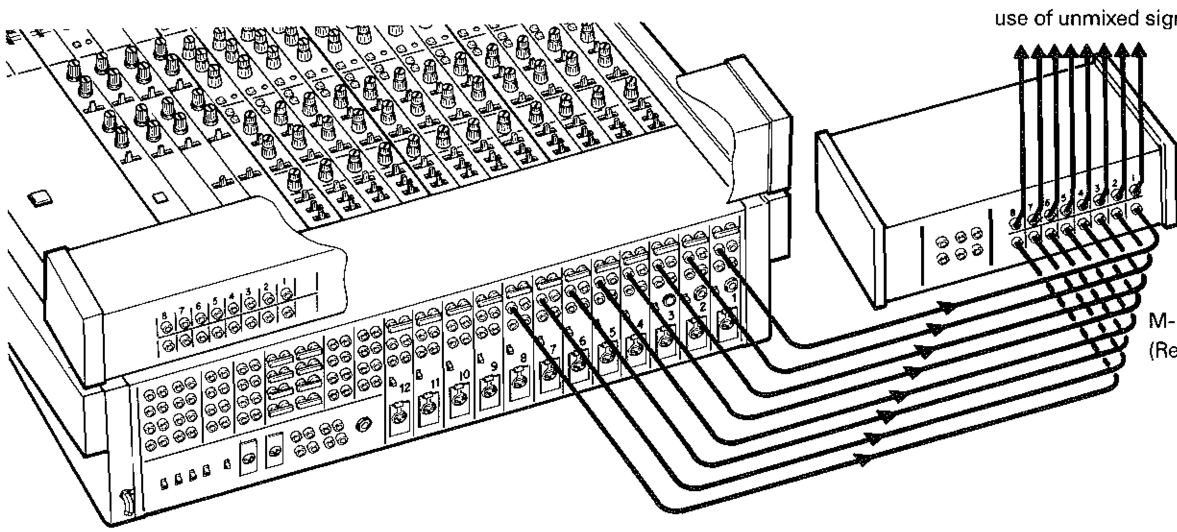
Although the M-50 has two separate stereo AUX circuits, there are times in multitrack production when another separate mix may be required. Here, we show the location of the available outputs that can be used to feed an *accessory mixer* from the M-50, and the possible uses that each patch point is best suited for. For each application, we suggest a method of return to the appropriate "mix" so the expansion can be included in the process. First, the back panel of the M-1, so you can understand the "pass through" method that allows the use of the signal in more than one M-1, or to continue an important feed to a second location.



M-1 Rear panel **M-1 Front panel**

On the back panel of the M-50 there are three places that allow the addition of M-1s and each jack can drive two without loss of signal quality.

1. Direct Out
This source of signal is *POST* fader and EQ and is suitable for *effects* mixes. Adding this M-1 will allow you to use *both AUX* mixes in the M-50 for *CUE* if you must have two independent systems for headphone feed. To monitor this effects mix, we connect one of the M-1 outputs to the effect, and the second output to the SPARE IN on the M-50 that can be assigned to the MONITOR. This connection will allow you to hear what signal balance is present in this mix *before* it is sent to the effect.

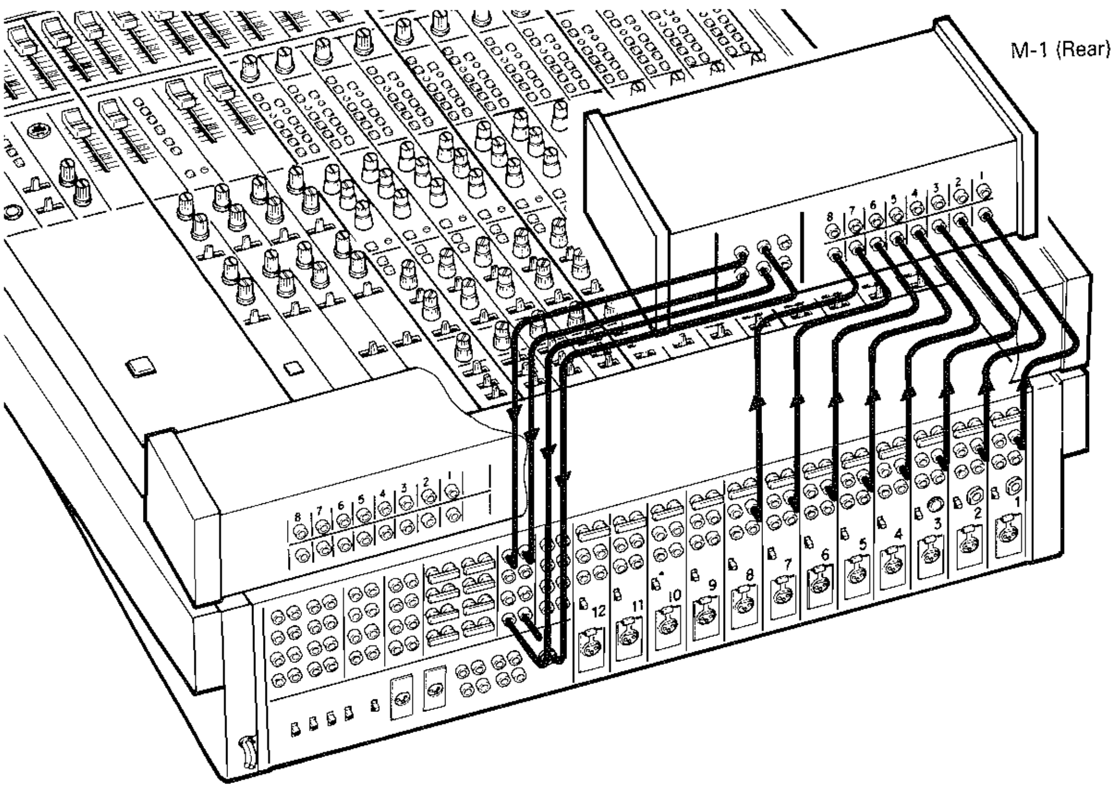


2. Pre Out

Using this connection will provide a second source for pre-fader signals. A possible use for these connections might be this: because the AUX A and B systems may be needed to *CUE* tape returns in 8 track production, a *CUE* of MIC signals in these *Input Channels* will not be available. Adding a M-1 via this output will give you 8 extra sections to add to the AUX buss that has the CUE system job.

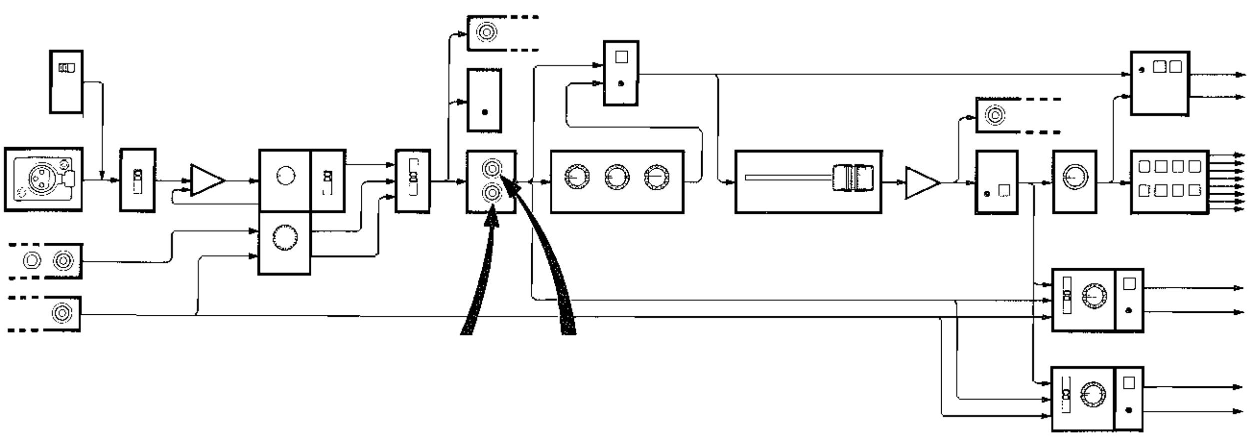
Use the AUX BUSS IN patch point to add the M-1.

To add the M-1 to your AUX Buss CUE system, simply patch into that AUX Buss' inputs.



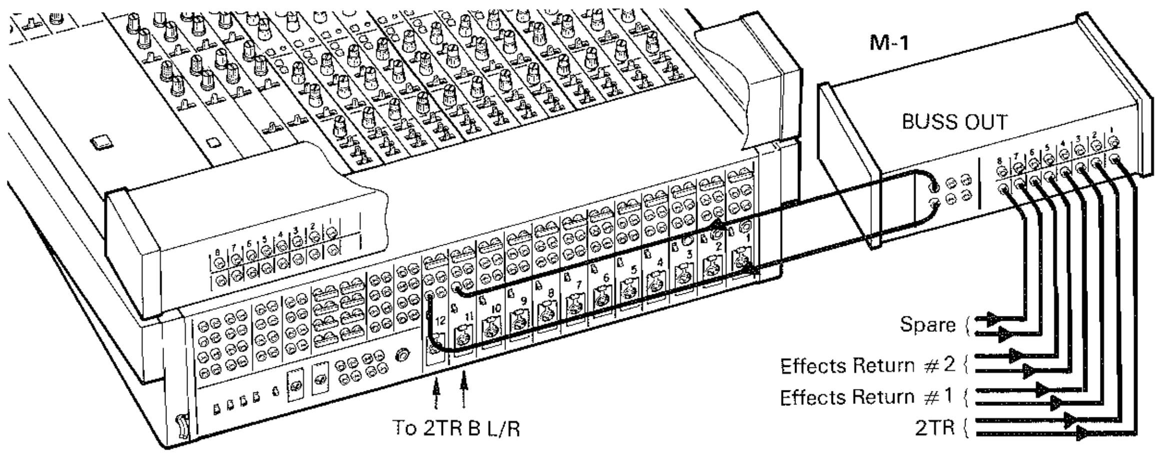
3. ACCESS SEND/RCV

This point is usable as an additional patch for a Model 1 if the "pass through" style of connection is used, but since it is the same signal point as the PRE OUT, we suggest that you use PRE OUT instead. if your requirements for extra subsystems exceed the two per output that we consider safe, then use this patch as a pass through add point.



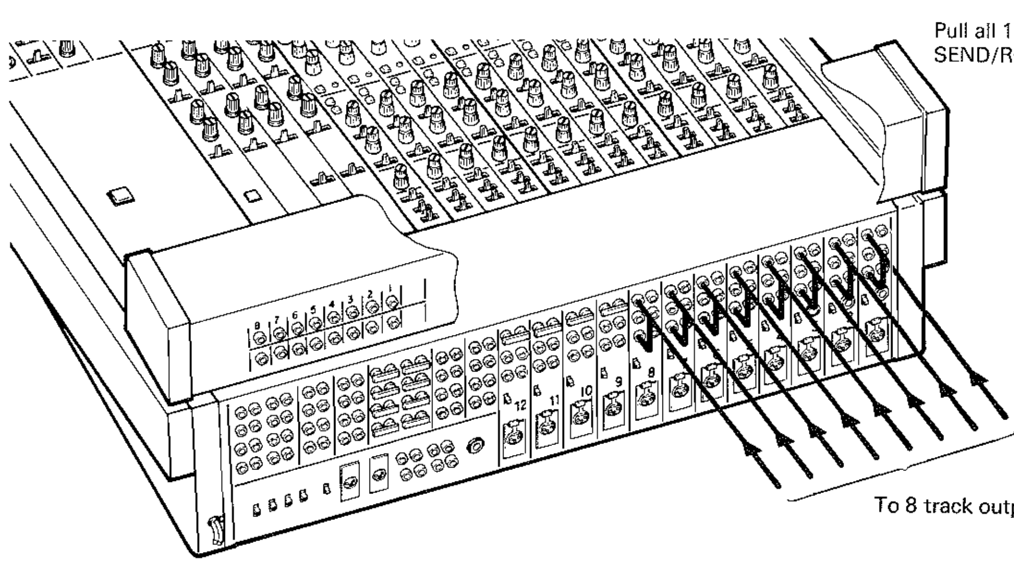
4. Expanding the 2 Track Return Inputs 11 & 12

Occasions may arise where the switch selection of this pair of *Input Channels* needs to accept more inputs than the possibilities we provide. Connect a Model 1 to the TAPE INs and then you will be able to select 4 possible stereo sources instead of one. Route them to the busses for recording or to the MONITOR for listening.



MINIMUM LOSS PATCH FOR MAXIMUM QUALITY IN MIXDOWN

Since *ALL* the line level controls on the *Input Channels* appear after the ACCESS SEND/RCV jacks, the ACC RCV jacks may be used as a line level input in order to bypass the first amplifier in the M-50. Bypassing amps wherever possible improves signal quality. The functions lost are the OVERLOAD indicator, use of the PRE-OUT, and the TRIM. Most of these functions may not be needed in mixdown, but if you consider PRE-FADER a necessary part of your mix, use a "Y" adapter and plug in one section to ACC RCV and the other to TAPE IN, and you will have the benefit of bypassing the input preamplifier without losing any function except the TRIM. With this arrangement, the TRIM will adjust only the TAPE IN signal to the AUX A&B (signal select switch) systems. This separation may prove useful.

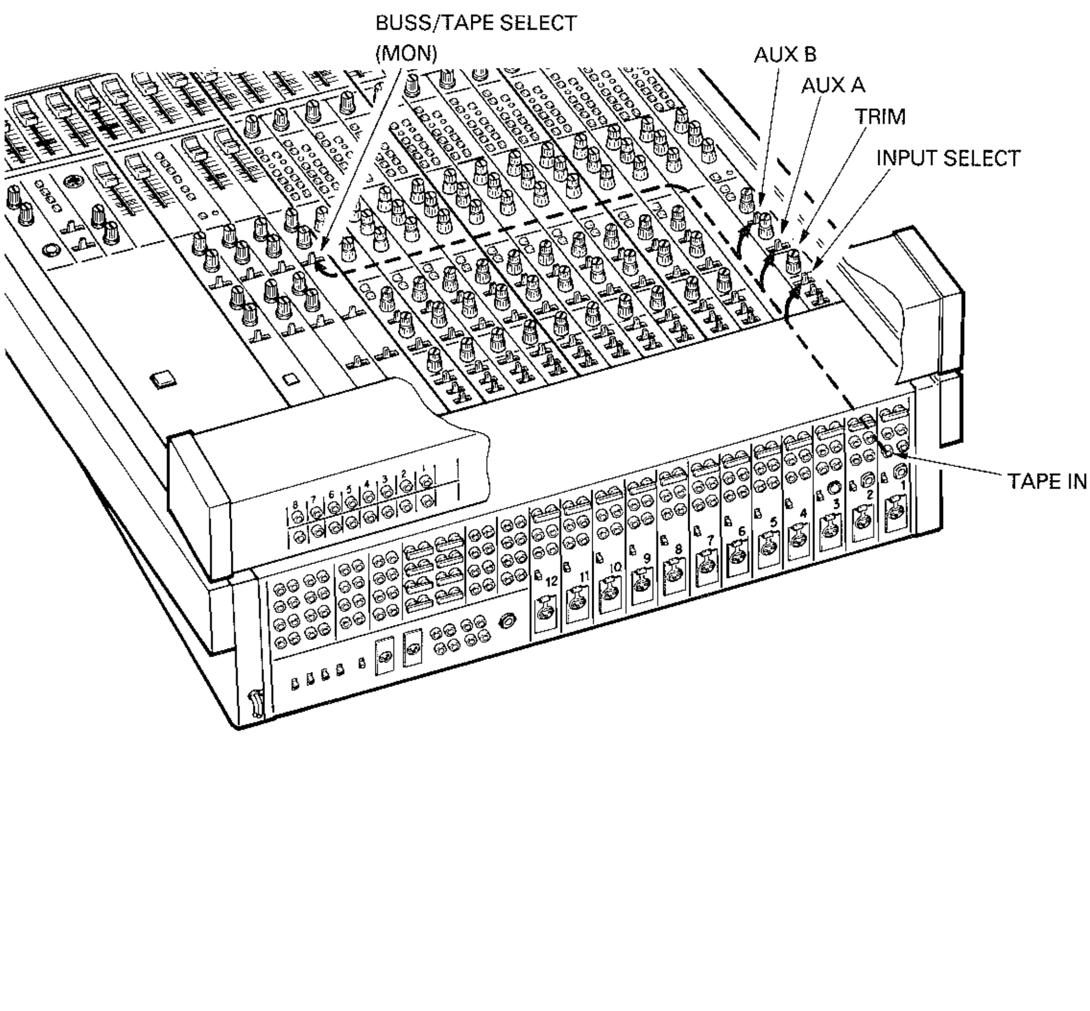


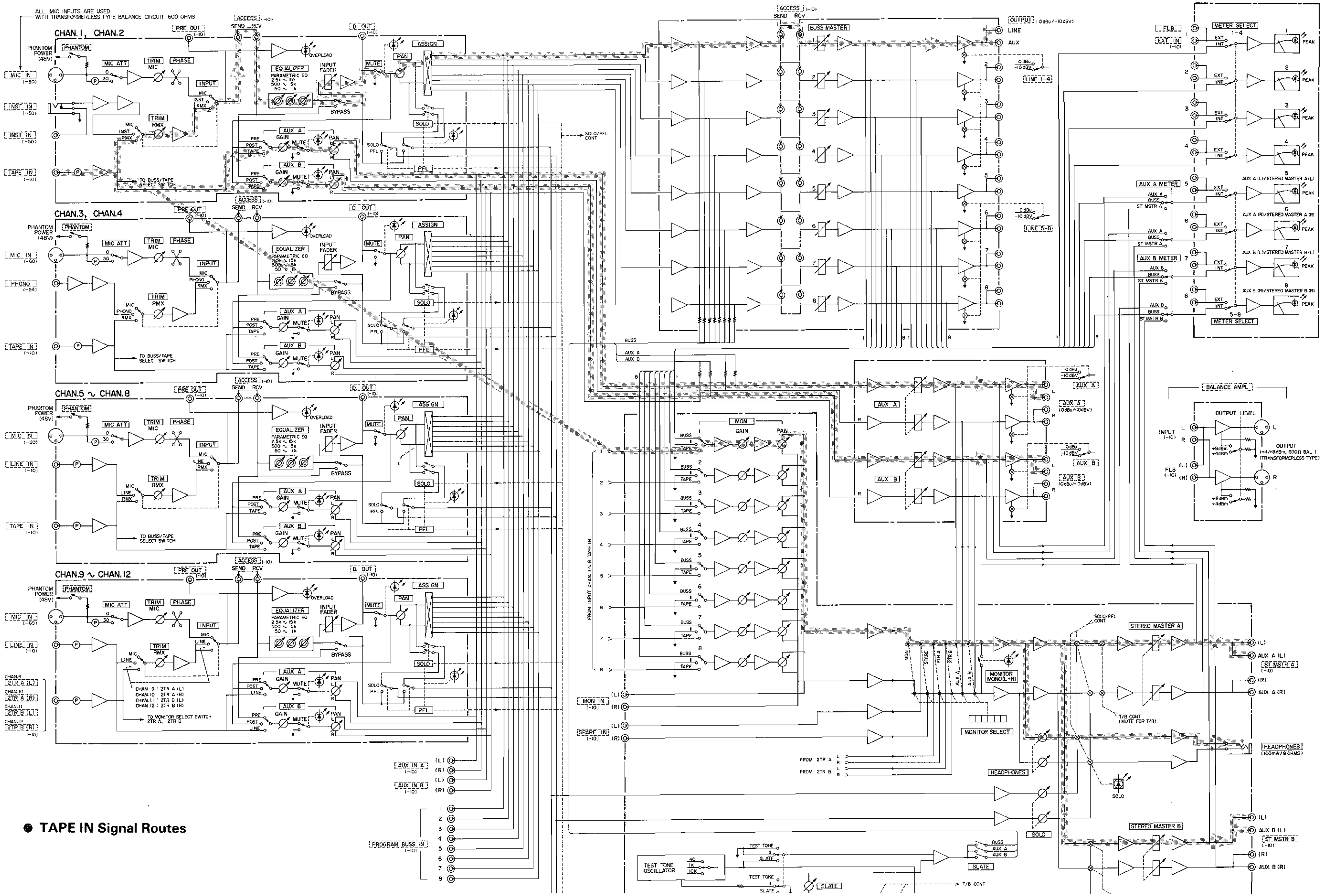
WORKING METHODS FOR THE M-50

Now that we have explained the available input signals, the switches and jacks, we can discuss the jobs.
We assume that any multichannel recorder has only one set of playback outputs. We will have at least three basic jobs to do that will require the playback signal:

1. Simple playback to judge a performance, requiring no corrective EQ. In short, what did you record?
2. Simple playback into a cueing system so partially completed tapes can be finished. This function should somehow combine the playback signals with "new" mic signals so musicians may hear a balance of both when overdubbing.
3. Final remix, when the full control capability of the system (EQ, effects, etc) can be used to "fine tune" the completed multichannel master.

Three basic tasks. One playback tape signal, so, to avoid resetting all the controls on the *Input Channels* and loosing the EQ and record level settings that have taken much time to get "just right" every time you change from record to play, you use the multi-purpose TAPE INPUTs instead of the LINE INPUTs. A perspective drawing may help you to visualize the routing. We show one channel only so the wiring can be seen clearly.





● **TAPE IN Signal Routes**

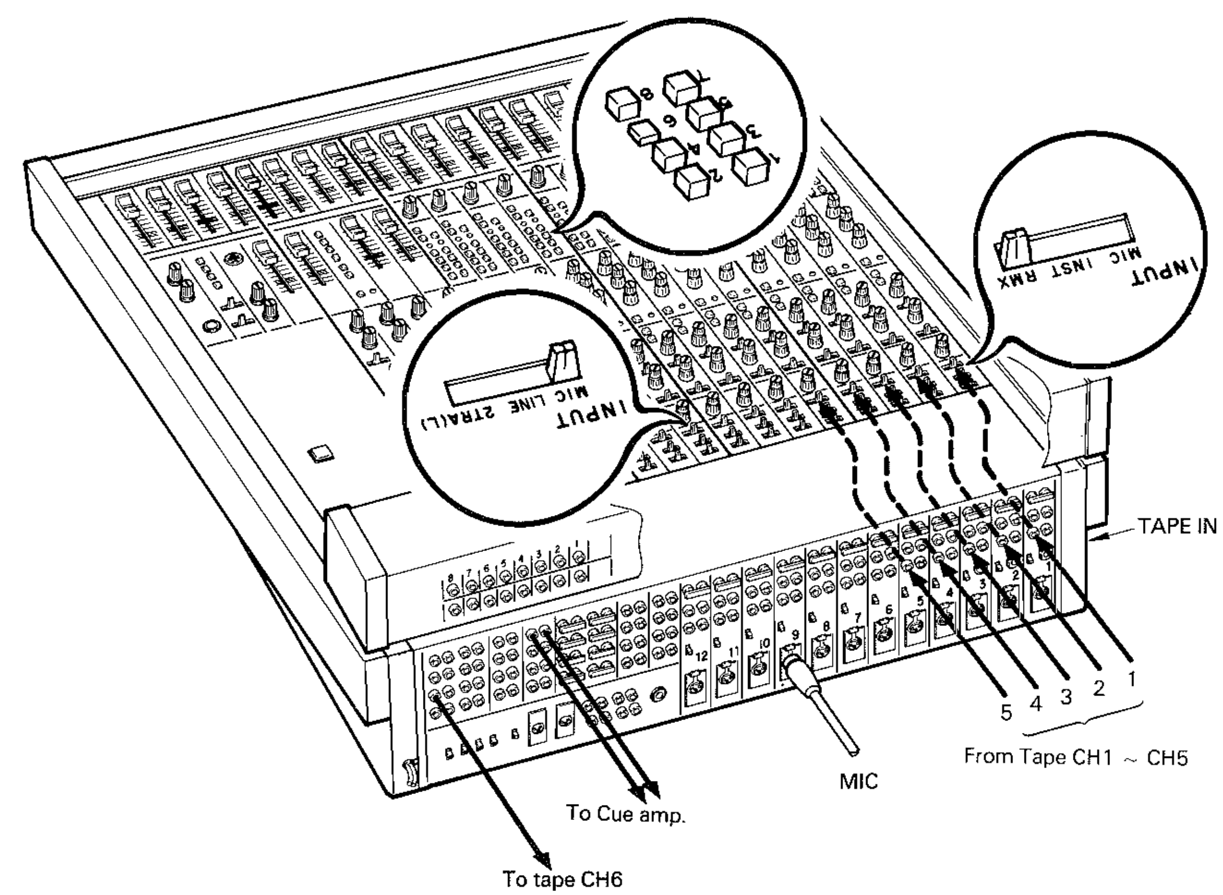
All these "routes" can be active at the same time. The *Block Diagram* shows all four systems. Since the size of the page in this manual forces us to reduce the *Block Diagram* a lot, we suggest that you use this block as an index in order to find the area we are discussing on the large separated version which will be easier to read.
Now that we have the signal routed to the right places, we'll keep going and use some more drawings to show you the rest of the signal pathway for each job.

Simple Record Check

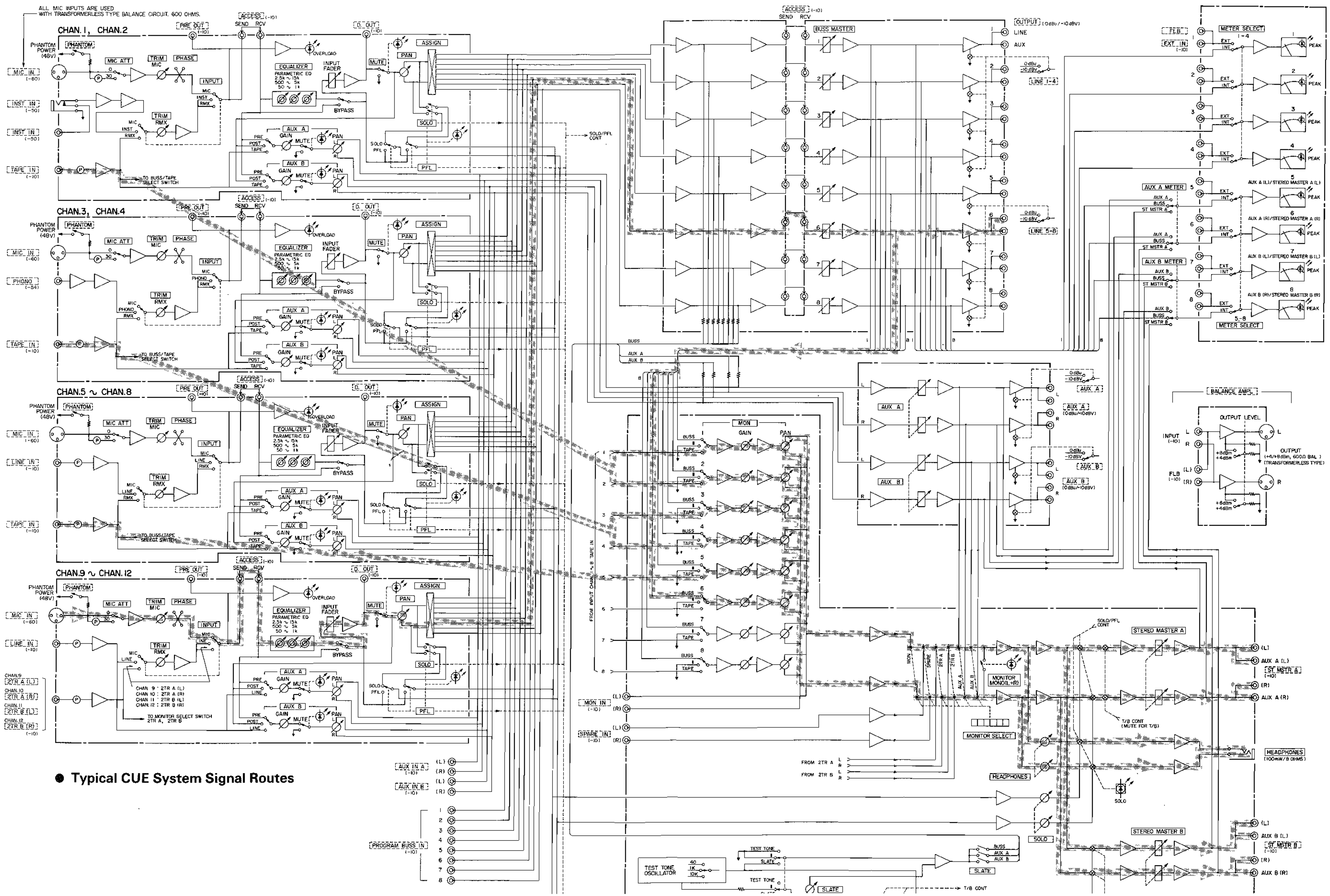
Move the three position MON BUSS/ I(OFF)/ TAPE signal select switches to the rightmost position marked TAPE. The MONITOR mix will now be derived from TAPE IN instead of BUSS OUT. To finish this "route", depress the MON switch in the MONITOR SELECT switch rack to send signal out to power amps or headphones. Many engineers use this "Logic" for control room monitor all the time. "Listening" to the tape recorder electronics solves the problem of "where is the signal coming from?" Never mind which output from the console is feeding track eight, lets just listen to track eight, and we won't have to remember under pressure how we "got there."
With this monitor method, *any* line level source that carries a signal can be considered as a "feed" to a track, even if it has no monitor capability on the way "out" of the console, because you will be monitoring the "return", not the "send." Since many tracks in multichannel work can be described as "one mic per track" recording, a little thought will show you that you can record more tracks than you have BUSS OUTs if you use this method. Another advantage of this "machine monitor" is that you won't have to change *anything* to make a playback for the musicians, because you are *already* listening to "playback." The "mix" that you have been working with will be what you get in the monitor when you rewind and play the tape. We recommend this monitor method highly. It saves much time and eliminates confusion.

Cue System

Tape playback plus mic cueing for overdubs.

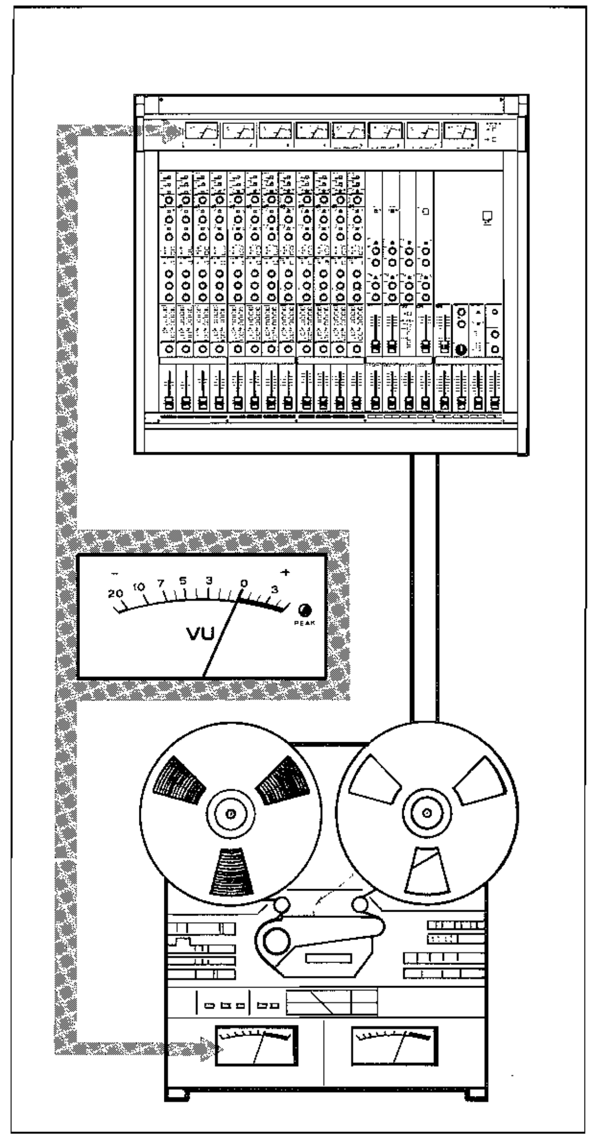


To get either stereo AUX mix out of the console to the cue system power amp, some additional control decisions will be required.
To audition the sound of the AUX A or B mix in the control room, depress the appropriate signal select push switch (AUX A, AUX B) in the MONITOR SELECT switch rack. In setting the actual level for the players, caution is advised. The volume set by the AUX A or B stereo master faders that feed the signal to the headphone power amps will not relate directly to the control room volume separately set by the MON GAIN control so take care.
As your eight-track master fills up and you use the AUX circuits in the TAPE position to cue the output of the recorder, you may not be able to cue the MIC INputs. A few solutions and some study may show the way:
If you are making one mic overdubs, use the MIC INs on *Input Channels* 9 through 12 and you will avoid the MIC-TAPE conflict altogether.
If you are working without effects, cascade the AUX A L/R outputs into the AUX IN B L/R inputs. With the two systems combined, one section can cue the microphones while the other cues the recorder.
If you are working with effects and must use all 12 MIC INs to record the last track, we have accessory mixers called M-1s that will add more knobs to your M-50 for a small fraction of the price of the main chassis. We think that most users will seldom wind up in that "12 mics on the last track" situation, but it does happen occasionally. Reviewing EXPANDING SECONDARY FUNCTIONS WITH THE MODEL 1 (page 45) will give you some ideas on how to solve the problem.
For a complete eight track working patch with full effects and cue details, refer to the RECOMMENDED 8 TRACK BASIC PATCH diagram and text located in the PATCH INTRO section of this manual.



● Typical CUE System Signal Routes

Calibration
"Calibration" simply means matching all the reference levels in your recording system to ensure that signals from one element in the system are equally interpreted by all the other elements in the system.
The built-in tone oscillator is ideal for calibrating your system, tracing out patches and getting levels set prior to recording. With it you can set reference levels, balance gain stages of components, and check overall system response.
Setting the SLATE/ I(OFF)/TEST TONE switch to the SLATE position, selecting the 1 kHz tone, and depressing the BUSS switch in the SLATE select switch rack, will apply the 1000 Hz tone to all 8 busses. A 0 VU buss output level can be obtained by reading the M-50 meters and adjusting the BUSS MASTER faders accordingly.
You can use this calibrated tone to insure that your multichannel recorder is properly calibrated. That means "0 level in" equals "0 level out". Then, record one minute of the tone. Turn the tone oscillator off, select the TAPE position for the INPUT select switches on the corresponding *Input Channels*, and set their input faders to the shaded zone. Assign each *Input Channel* to an individual buss.
Play the tape of the 1 kHz tone and adjust the RMX TRIM controls for a "0" reading on the M-50 meters. Your mixer and recorder are now calibrated so you can make all subsequent record level adjustments from the mixer.
The term "dBV", by international agreement, refers to 1 volt. Therefore, 0 dBV = 1 volt. The M-50 and all other TASCAM mixers and recorders reference dBV to 1 V with −10 dBV (0.316 V) corresponding to a TASCAM meter reading of 0VU. If the equipment you are using references dB to 0.775 V rather than 1 V (i.e., 0 dBu or 0 dBm in a 600 ohm circuit), a correction factor of +2.2 dB (or VU) will have to be used to compensate for the difference; i.e. 0 dBV (TASCAM +10 VU) = 1.0 volt = +2.2 dBu, or, −10 dBV (TASCAM 0 VU) = 0.316 V = −7.8 dBu.



RMX (*Remix*)
When an INPUT select switch on channels 1 through 8 is set to its rightmost position (RMX), the channel's TAPE IN jack provides the mixer's full control capability (EQ, effects, mixing, etc.) for final *Remix* or fine tuning of the output of the corresponding track of the multichannel recorder.
Selecting *Remix* will not disable the functions of cue and monitor that we have discussed in the two prior sections. TAPE IN signal will be available to the AUX A&B, MONITOR and input channel at the same time. There are several advantages that this multiple feed offers that are added to the necessary cue and monitor functions. In *Remix*, the cue function is not needed, so that stereo "mix" can be used instead as an extra effects send.
During the course of normal multitrack production, a good "take" may be acceptable in every way except one: some doubt may arise as to the "mixability" of one track.
Since the *Remix* function may be selected one channel at a time, a single track may be routed through the EQ section and a correction tried out to make sure that re-recording is not required. This checkout will only require the readjustment of one channel. Many other consoles force you to switch the whole system to *Remix* just to check one channel.

Effects Return Method
Use the *Input Channels* that don't have mics plugged in. Much of multitrack production is done on a "one mic per track" basis and will leave you with unused *Input Channels*. You can take advantage of the functions that they provide to do things to the return signal. Separate EQ can be used to improve the "sound" of the effect. The stereo AUX A and B outputs can be used to feed one device per jack and the 4 "spare" *Input Channels* (eight spares in 4 track) used to control the selection and balance of each signal returned separately. This method is not restricted to the "one mic per track" jobs, even *stereo* is possible. Remember that in 8 track work you will have a total of four unused channels.

A Caution
These complex patches can lead to a circular assignment, or *FEEDBACK LOOP*. To use these setups successfully, the AUX MUTE on the "effects return" *Input Channels* should be depressed (muted), or, the AUX A & B signal select switches on the "effects return" *Input Channels* must not be set to PRE or POST. Make sure that you don't assign the processed signal return *BACK OUT TO THE EFFECTS DEVICE* by accident.

A Word or Two of Reality
The first time user may say at this point that these extras are *So Hard To Grasp* that the benefits are not worth the risks. The M-50 is new, there are what seems like a thousand knobs, and the manual at first seems to be describing logics that are so sophisticated that they only make sense to a 20 year "pro". WE AGREE! These mix patches *are* complex and their routing are not easy to visualize. We will not insult your intelligence by saying otherwise. The M-50 is a Tool, not a toy. Like any good tool, good results depend on practice and understanding. You will find a use for the more "deluxe patches" when your art is in need of the control that they can provide.

Using Two Channels For More EQ

Because of the adjustable frequency point provided by a sweep control, the use of more than one *Input Channel* on a single sound offers a benefit that is not possible with a "set" point equalizer. On difficult signals such as electric bass or voice work in commercials or sound tracks, you can set the lower section of each dual concentric (frequency select point) to a different point in the frequency range and get six *different* boost or cut points instead of just an increase in the amount of adjustment.

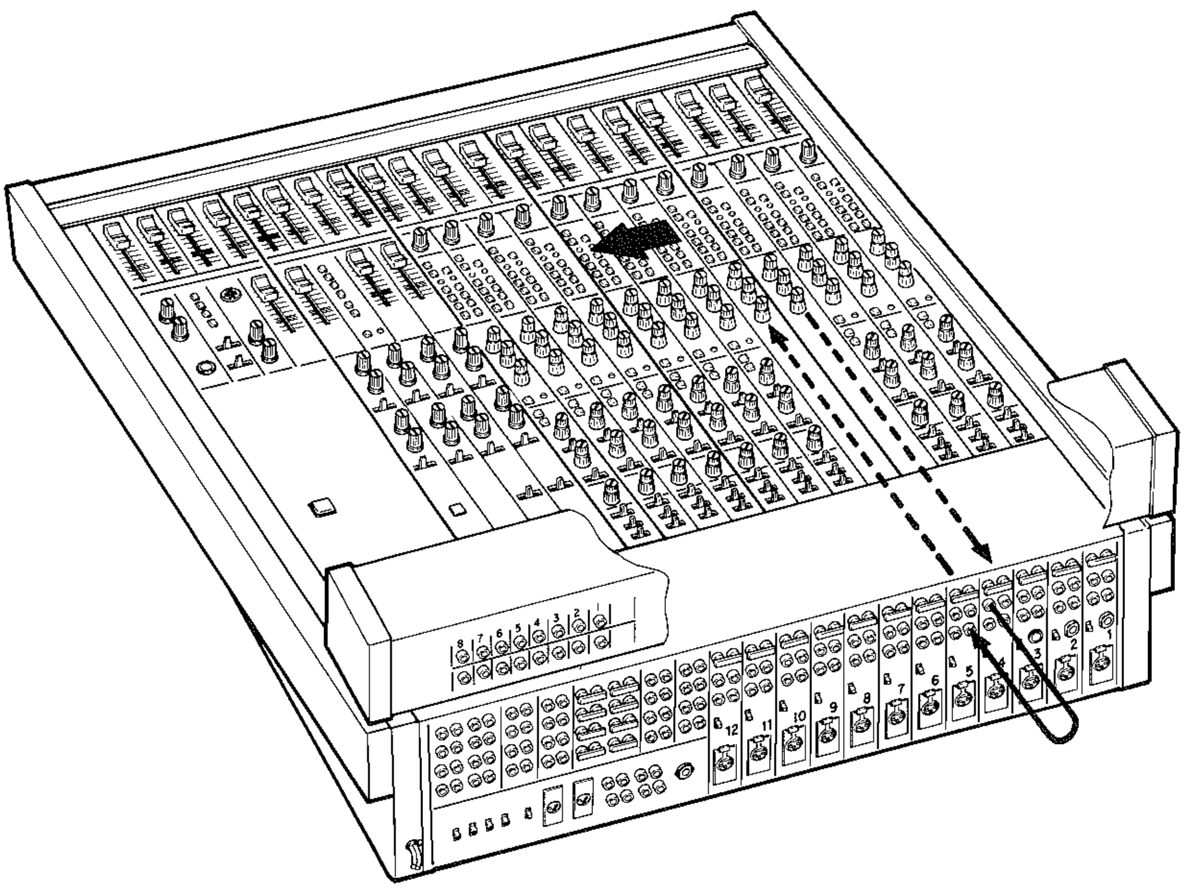
Here's how.

Patch from the DIRECT OUT of one channel to the spare LINE IN of an unused channel and then use the assign buttons or the DIRECT OUT on the second (final) channel to go on.

Pre & Post EQ When Using A Limiter

Many engineers like to EQ the low end before limiting to help avoid excessive "pumping" of the signal. If this is what you want to do, and, you have another channel free, do this: Take the DIRECT OUT from the first *Input Channel*, go to the limiter, use the first channel for your send, and *Don't Assign The First Channel To Any Output!*

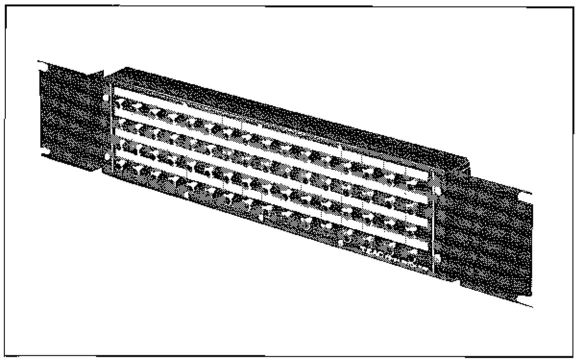
It is not going to have all of your signal control modifications and will not be limited. To reach a BUSS, patch from the limiter out to the second *Input Channel's* ACCESS RCV jack. Now you can set the limiter input level with the first channel's TRIM and fader, do part of your EQ, and run your final signal with the second channel's fader. You will have EQ available both before and after the limiter with the minimum of electronic stages. This "patch" is also recommended when pre & post EQ are desired for use with any signal processing unit and will also give your "double EQ" using the smallest possible electronic package for those stubborn processing jobs that only brute force will fix.



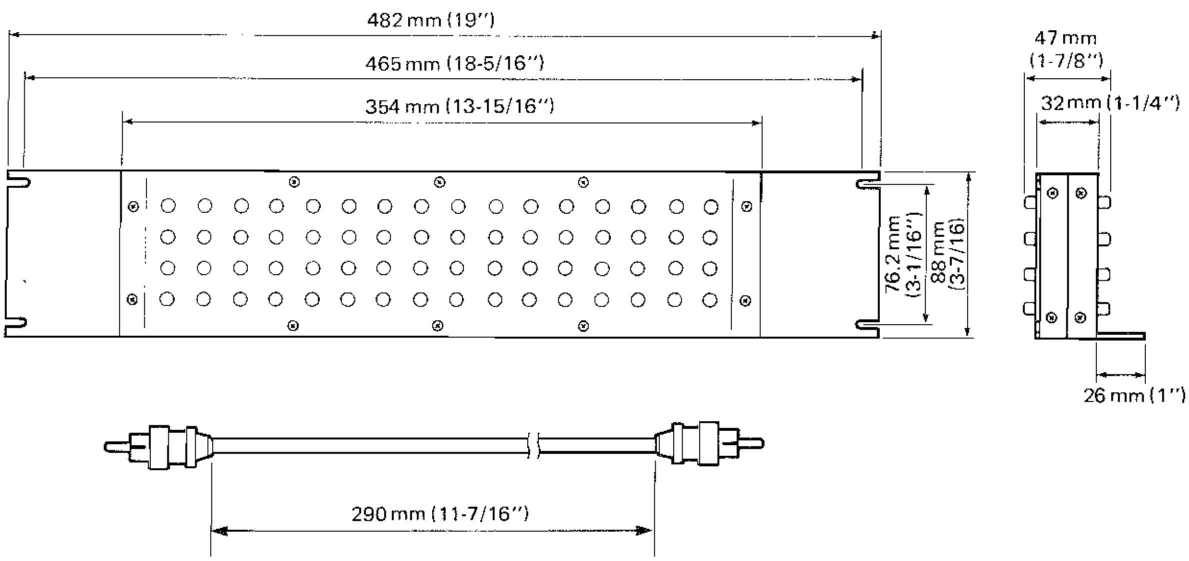
OTHER USEFUL ACCESSORIES

In addition to the Model 1, we also offer these valuable additions to your system.

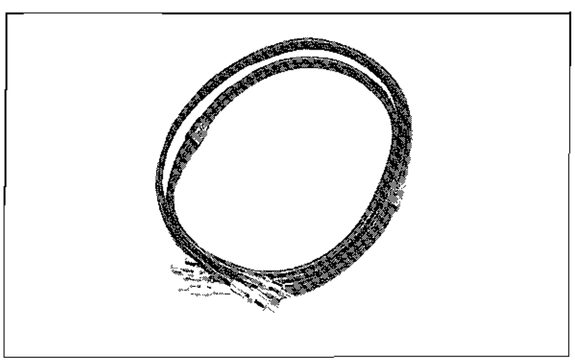
The PB-64 Patch Bay



When your system begins to expand beyond the basic, sorting out where things go can take much time away from the recording process. This accessory will allow you to speed things up and get back to what you really want to do. Sixty-four RCA pins on a panel. So you can bring all those jacks to where you are. It will get you off the floor and back to recording. Connect all you inputs and outputs to the back, and you can reroute your signals with short jumpers quickly.



Professional Low Loss Cable



There are vast differences in cable design and performance, and those differences can make or break an otherwise excellent sound system. When you're investing in the kind of high quality audio equipment represented by the TASCAM Studio Series, it makes sense to use TASCAM professional audio cables. Anyone who's switched to them will tell you they're worth every cent.

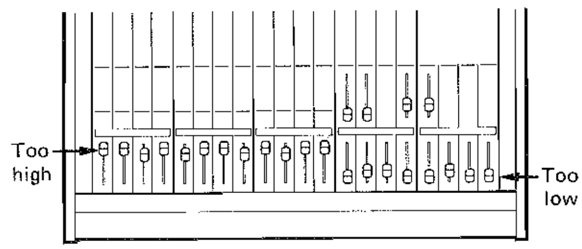
LOW CAPACITANCE CABLE
Our cables feature very low capacitance under 15 picofarads per foot, so they don't act as high-frequency roll-off filters as do typical cables of 100 or 300 pF/foot. In addition, our cables use an ultra-high density bare-copper braided shield (99% coverage), so electrostatic noise (Buzz or hum) and RFI (CB or broadcast signals) are kept out of your program.

Low capacitance is important, and so is consistent capacitance; that is, you want the electrical coupling of center conductor-to-shield to remain the same throughout the cable, even if it is sharply bent, crushed, flexed, or tugged. Should the local cable capacitance change, noise and/or signal losses often result. We utilize the unique dielectric known as Datalene. This special insulation keeps the stranded signal conductor perfectly centered within the shield. Datalene is about as flexible as foam core dielectrics but far more resistant to extreme heat or cold, and it has a "memory", so it retains its shape after flexing. Datalene also acts as a mechanical shock absorber, guarding against external impacts which, in other cables, might sever the center conductors and cause intermittent contact.
When we join the connector to the cable, we insert the cable's stranded center conductor all the way into the pin and then fill the pin with solder. The braid is wrapped and soldered a full 120° around the shell, not tacked at one spot, so you get maximum shielding and strength.

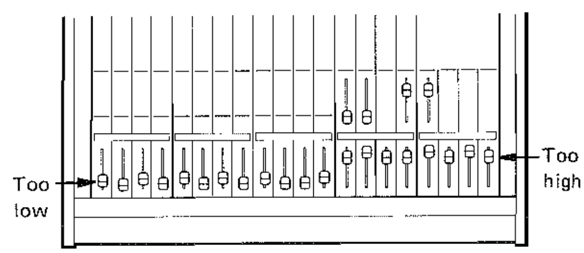
Note: If TASCAM professional audio cables are not obtainable in your area, use an equivalent cable.

A Final Word of Mixdown Advice:
All finished tapes must be balanced – one sound and its tone judged by blending with others. Don't depend on EQ in "solo" to set up a "perfect" tone, because the minute you add your perfect sound back to the "mix" the tone may not be so "perfect". Always try to get the levels as close to "right" as possible before using EQ. If the mix is close, you will know which tracks need fine EQ tuning to be heard. Less EQ means less distortion and full boost at 5K on every pot will also boost the noise in your mix as welll as the signal.

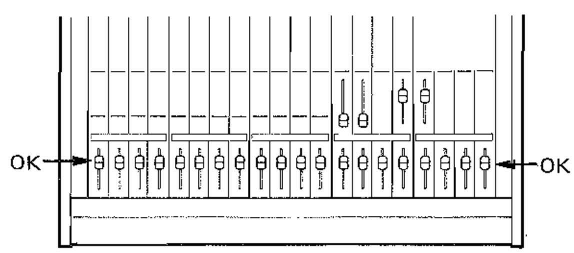
1. If your console faders always wind up like this, you are likely to be over-loading your summing amps. Pull down the inputs and raise the master.



2. Conversely, if this is what you usually have, you are getting too much gain from your master. Your mix is clean, but noisy.



3. This picture is a reasonable compromise, and is probably better all around.



MORE INFORMATION IS AVAILABLE

We've tried to give you representative examples of some of the things you can do to get started, and you'll discover many more – some by way of happy coincidence, others after long hours of concentration. If you're just getting into recording and want to expand your knowledge, more information is available.

BIBLIOGRAPHY

Beranek, Leo L.
ACOUSTICS
McGraw-Hill Book Co., Inc.
New York, New York
1954
More concerned with exact formulae, but still very readable. It is not necessary to do calculations to gain knowledge from this textbook.

Beranek, Leo L.
MUSIC ACOUSTICS AND ARCHITECTURE
John Wiley & Sons, Inc.
New York, N. Y.
1962
A technical survey on concert halls with much documentation. Worth reading. This author has many useful stories to tell about the interface of science and art.

Clifford, Martin
MICROPHONES: HOW THEY WORK AND HOW TO USE THEM
Tab Books
Blue Ridge Summit, Pa.
1977
An excellent lowcost book for the beginner on microphone types, history and construction. The explanations given assume no prior knowledge and are very complete. Recommended.

Everest F. Alton
ACOUSTIC TECHNIQUES FOR HOME AND STUDIO (3rd. Printing)
Tab Books
Blue Ridge Summit, Pa.
1978
Low-cost basic book. This book on studio acoustics is the easiest to read and understand of all the textbooks on the subject, and comes closest to dealing with the actual problems encountered in the home studio.

Everest F. Alton
HANDBOOK OF MULTICHANNEL RECORDING
Tab Books
Blue Ridge Summit, Pa.
1976
A survey volume containing good information on all topics. Very clearly written and recommended for a beginner.

Nisbett, Alec
THE TECHNICS OF THE SOUND STUDIO FOR RADIO, TELEVISION AND FILM
Hastings House Publishers, Inc.
New York, N. Y.
1976
Although not specifically written for the tape recordist, this 500-page book is well worth its cost. Very useful practical advice if you are working with speech (drama, commercial announcing, etc.)

Nisbett, Alec
THE USE OF MICROPHONES
Hastings House
New York, N. Y.
1976
The author's point of view is basically radio, but his ability to communicate difficult concepts is very good. Well illustrated.

Olsen, Harry F.
ACOUSTICAL ENGINEERING
D. Van Nostrand Company
New York, N. Y.
1957

and

Olsen, Harry F.
MUSICAL ENGINEERING
D. Van Nostrand Company
New York, N. Y.
1959
Anything you can find by this writer is worthwhile, and the latter book in particular will give scientific answers to musical questions (what frequency is the note Db above middle C?) and can be used to translate one "language" into another. Extremely valuable.

Rettinger, Michael
ACOUSTIC DESIGN AND NOISE CONTROL, VOL. 1
Chemical Publishing Company
New York, N. Y.
1977
Although this book is highly technical, the writing is very lucid and many examples are given to go along with the math. This writer is not afraid to draw conclusions and give his reasons for doing so in simple language.

Runstein, Robert E.
MODERN RECORDING TECHNIQUES
Howard W. Sams and Co.
Indianapolis, Indiana
1974
The first low-cost book on studio practice. The equipment dealt with is somewhat outdated, but the theory is still the same. Excellent basic survey.

Tremaine, Howard M.
THE AUDIO CYCLOPEDIA
Howard W. Sams and Co.
Indianapolis, Indiana
1976
This 1,700-page reference work is sure to contain the answer to almost any technical question you can think of. The writing assumes much prior knowledge and this book should be used with others that are more basic in their writing style if you are new to the field of scientific audio.

SOME MAGAZINES OF INTEREST:

"db" – THE SOUND ENGINEERING MAGAZINE
1120 Old Country Road
Plainview, N. Y. 11803

"MODERN RECORDING"
14 Vanderventer Avenue
Port Washington, N. Y. 11050

"RE/P" – RECORDING ENGINEER/PRODUCER
1850 Whitley Street, Suite 220
Hollywood, Ca. 90028

STUDIO SOUND And Broadcast Engineering
Link House Publications PLC
Linc House, Dingwall Avenue
Croydon CR9 2TA, Great Britain

SPECIFICATIONS

1. 12-Input/8-Line Output/2-Monitor Output (x2)/ 2-Aux A Output/2-Aux B Ouput:

2. Input Selector:

Channels 1,2	MIC/INSTrument/RMX
Channels 3,4	MIC/PHONO/RMX
Channels 5–8	MIC/LINE/RMX
Channel 9	MIC/LINE/2TR A (L)
Channel 10	MIC/LINE/2TR A (R)
Channel 11	MIC/LINE/2TR B (L)
Channel 12	MIC/LINE/2TR B (R)

3. Mic Input (Low Impedance) – channels 1–12:

Mic Impedance	200 to 600 ohms nominal (matched for mics of 600 ohms or less)
Input Impedance	600 ohms, balanced, XLR type equivalent
Nominal Input Level	–60dBV (1mV)
Minimum Input Level	–70dBV (0.3mV), MIC TRIM to max.
Maximum Input Level	0dBV (1V), MIC ATT to 30dB, MIC TRIM to min.

4. Instrument Input – channels 1,2:

Input Impedance	100k ohms
Nominal Input Level	–50dBV (3mV)
Maximum Input Level	–22dBV (80mV), RMX TRIM to min.
Minimum Input Level	–58dBV (1.3mV)

5. Tape Input (RMX – channels 1–8, 2TR A/B – channels 9–12):

Input Impedance	47k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V)

6. Phono Input – channels 3,4:

Input Impedance	47k ohms
Nominal Input Level	–54dBV (2mV) at 1kHz
Minimum Input Level	–60dBV (1mV) at 1kHz, RMX TRIM to max.
Maximum Input level	–30dBV (31.6mV) at 1kHz, RMX TRIM to min.

7. Line Input – channels 5–12:

Input Impedance	22k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V)

8. Line/Aux A/B Output:

Minimum Load Impedance	2k ohms
Nominal Load Impedance	10k ohms
Nominal Output Level	–10dBV (0.3V)/0dBu (0.775V) switchable
Maximum Output Level	+14dBV (+16dBu, 5V)

9. Stereo Master A/B Output:

Minimum Load Impedance	2k ohms
Nominal Load Impedance	10k ohms
Nominal Output Level	–10dBV (0.3V)
Maximum Output Level	+14dBV (5V)

10. Balanced Amp Input [Separate type]:

Input Impedance	47k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V) (OUTPUT LEVEL: +4dBm)

11. Balanced Amp Output [Separate type]:

Nominal Load Impedance	600 ohm, balanced
Nominal Output Level	+4dBm (1.23V)/+8dBm (1.95V) switchable
Maximum Output Level	+28dBm (19.5V)

12. Pre Output:

Minimum Load Impedance	2k ohms
Nominal Load Impedance	10k ohms
Nominal Output Level	–10dBV (0.3V)

13. Direct Output:

Minimum Load Impedance	2k ohms
Nominal Load Impedance	10k ohms
Nominal Output Level	–10dBV (0.3V)

14. Access Send Output (Input 1–12/Buss 1–8):

Minimum Load Impedance	2k ohms
Nominal Load Impedance	10k ohms
Nominal Output Level	–10dBV (0.3V)

15. Access Receive Input (Input 1–12/Buss 1–8):

Input Impedance	10k ohms (EQ IN:220k ohms, EQ OUT:10k ohms)
Nominal Input Level	–10dBV (0.3V)
Minimum Input Level	–18dBV (0.126V)

16. Program Buss Input:

Input Impedance	22k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V)

17. Aux Buss Input:

Input Impedance	22k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V)

18. Solo Buss Input:

Input Impedance	22k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V)

19. Monitor Input:

Input Impedance	22k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V)

20. Spare Input:

Input Impedance	100k ohms
Nominal Input Level	–10dBV (0.3V)
Maximum Input Level	+14dBV (5V)

21. Oscillator Output:

Frequency	40Hz/1kHz/10kHz switchable
Output Impedance	470 ohms
Nominal Output Level	–10dBV (0.3V)

22. **Headphones Output:**

Nominal Load Impedance	8 ohms
Maximum Output Power	Greater than 100mW, 8 ohms

23. **Frequency Response: Line Input to –**

Program Buss Output	20Hz – 20kHz ± 1dB (Reference 30kHz $^{+1}_{-2}$dB)
Aux Buss Output	20Hz – 20kHz ± 1dB (Reference 30kHz $^{+1}_{-2}$dB)
Mon Buss Output	20Hz – 20kHz $^{+1}_{-2}$dB (Reference 30kHz $^{+1}_{-2.5}$dB)
Headphones Output	50Hz – 20kHz ± 2dB (Reference 30kHz ± 3dB)

24. **Equalizer:**

Type	Sweep
Level	Boost/Cut ± 15dB
Frequency (Low)	50Hz to 1kHz
(Middle)	500Hz to 5kHz
(High)	2.5kHz to 15kHz

25. **Signal to Noise Ratio (at nominal input levels, 20Hz ~ 20kHz, "A"WTD/UNWTD):**

1 line to 1 buss	80dB/76dB
8 lines to 1 buss	77dB/73dB
1 line to access send	88dB/84dB
1 line to direct out	87dB/84dB
1 remix (tape) to 1 buss	80dB/76dB
12 remix (tape) to 1 buss	72dB/70dB
1 remix (tape) to access send	83dB/80dB
1 remix (tape) to direct out	82dB/80dB
1 mic to 1 buss	70dB/68dB
12 mics to 1 buss	60dB/58dB
1 mic to access send	70dB/68dB
1 mic to direct out	70dB/68dB

26. **Cross Talk:** Better than 60dB (1kHz, nominal input level)

27. **Total Harmonic Distortion (THD):**

1 mic input to 1 buss output	0.025% (at 1kHz, EQ OUT, nominal input level above 50dB and MIC ATT 30dB on, with 30kHz L.P.F. connected)
1 line input to 1 buss output	0.025% (at 1kHz, EQ OUT, nominal input level , with 30kHz L.P.F. connected)

28. **Fader Attenuation:** 60dB or more

29. **Overload Indicator Level:** 25dB above nominal input level

30. **Peak Indicator Level:** 10dB above nominal output level

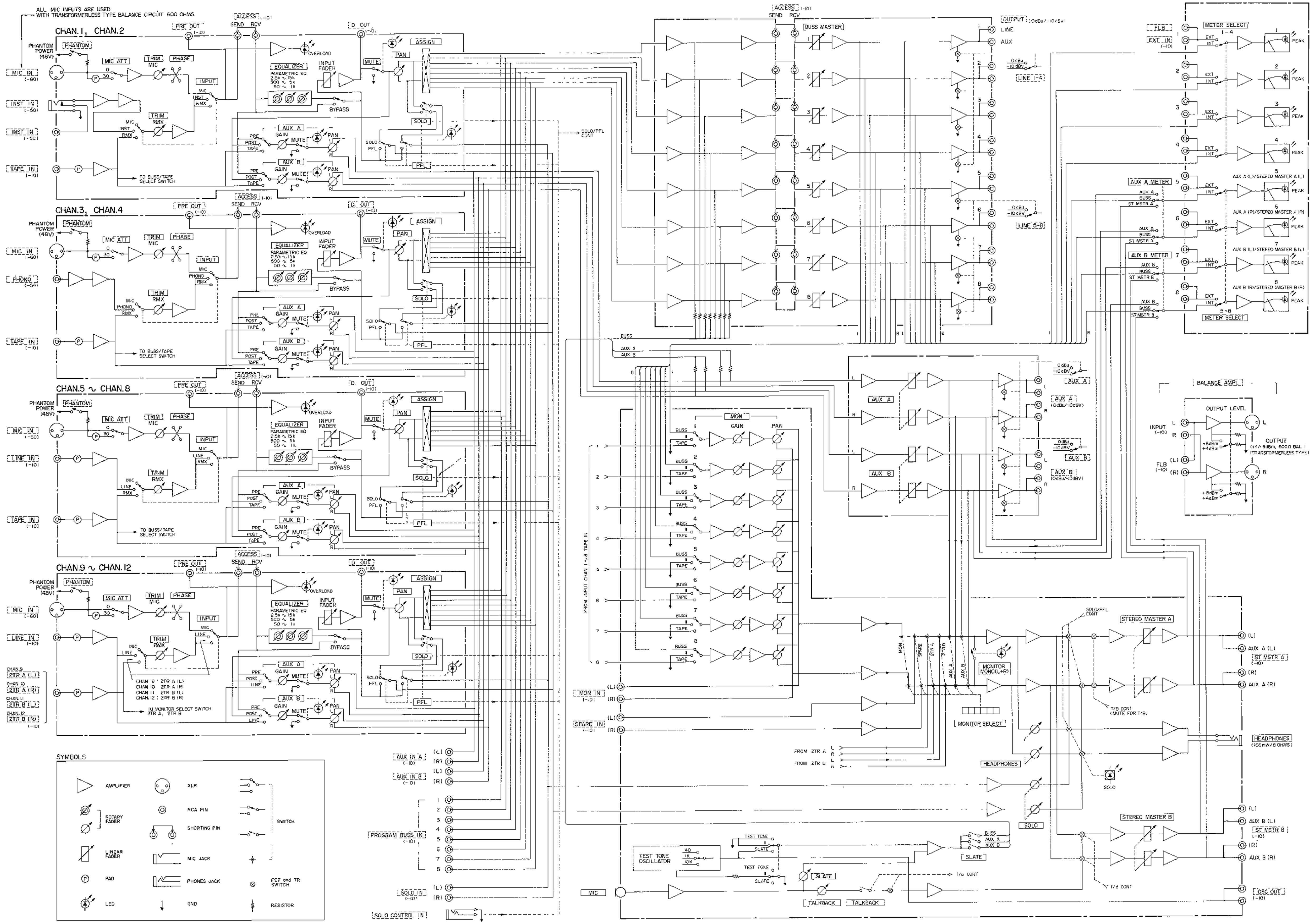
31. **Dimensions (W × H × D):** 802 × 240 × 728 mm (31-9/16" × 9-7/16" × 28-11/16")

32. **Weight:** 36kg (79-6/16 lbs) net

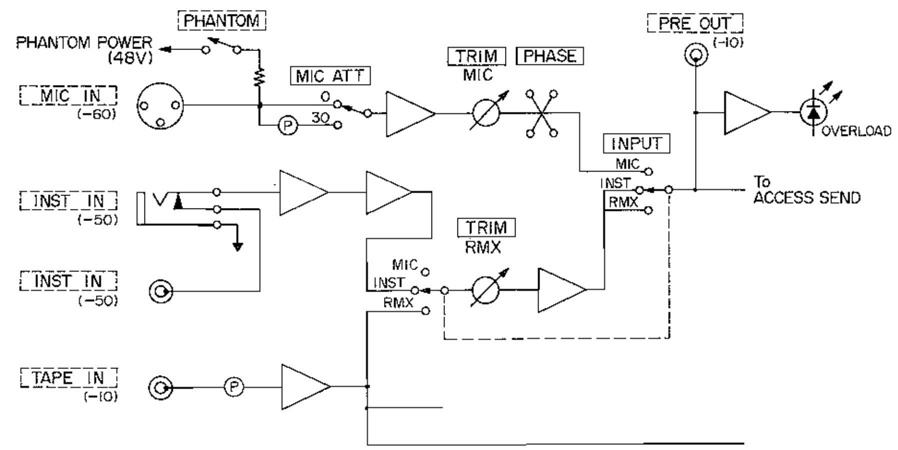
33. **Power Requirements:** 100/120/220/240V AC, 50/60Hz, 63W (General Export Model)
120V AC, 60Hz, 63W (U.S.A./Canada Model)
220V AC, 50Hz, 63W (Europe Model)
240V AC, 50Hz, 63W (U.K./Australia Model)

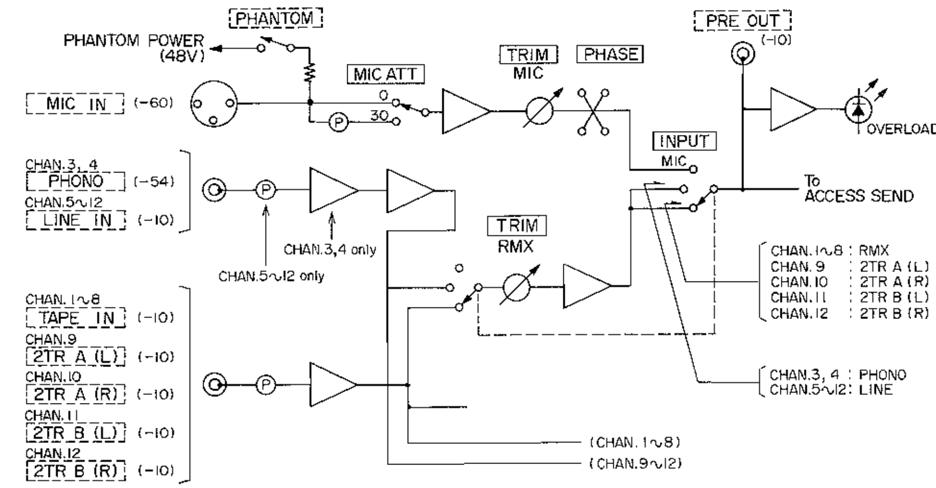
In these specifications, 0dBV is referenced to 1.0 volt, actual voltage levels are also given in parenthesis. To calculate the 0dB/0.775 volt reference level (i.e., 0dBm in a 600 ohm circuit) add 2.2dB to the listed value; i.e., −10dB re: 1V/−7.8dB re: 0.775V. Changes in specifications or features may be made without notice or obligation.

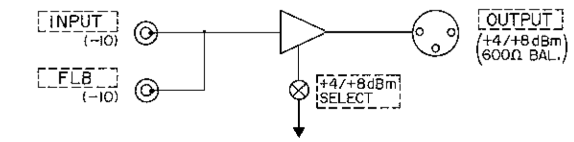
BLOCK DIAGRAM

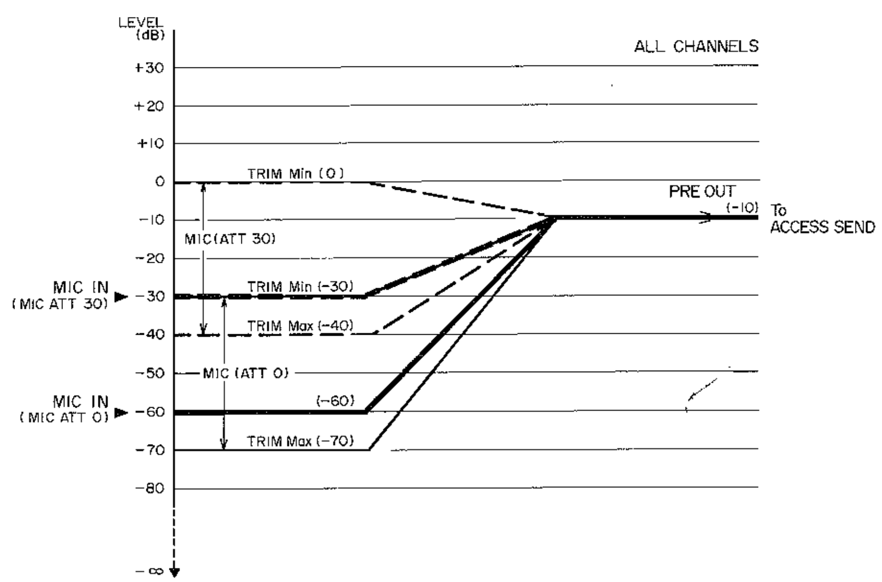


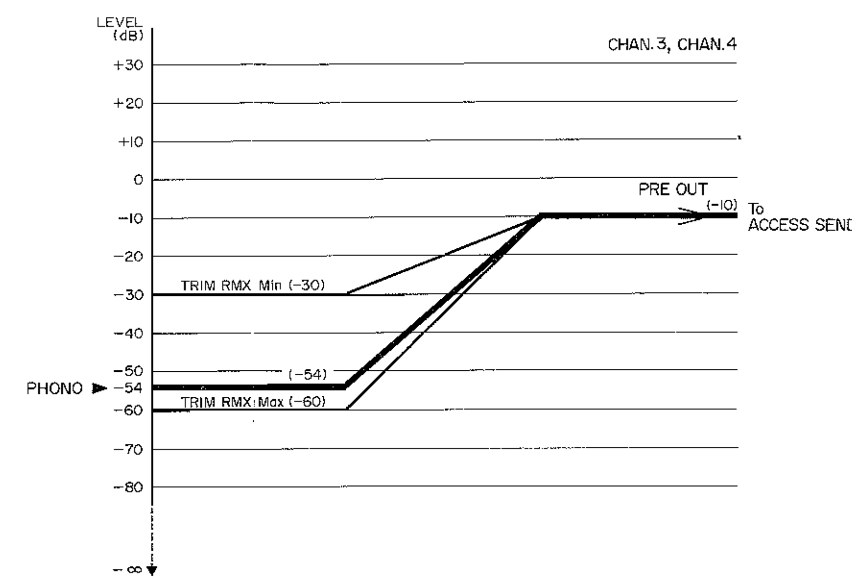
LEVEL DIAGRAM

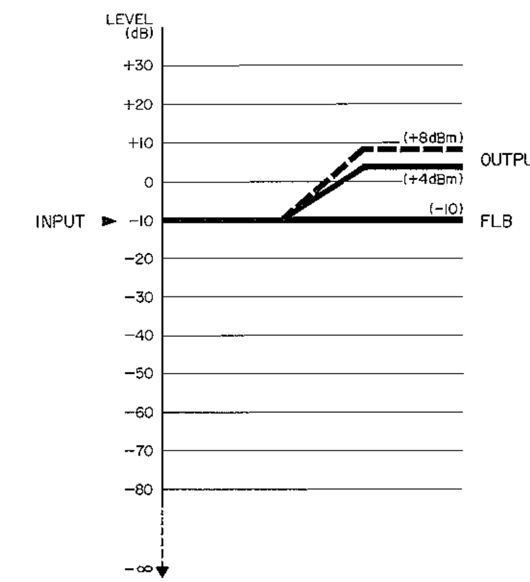


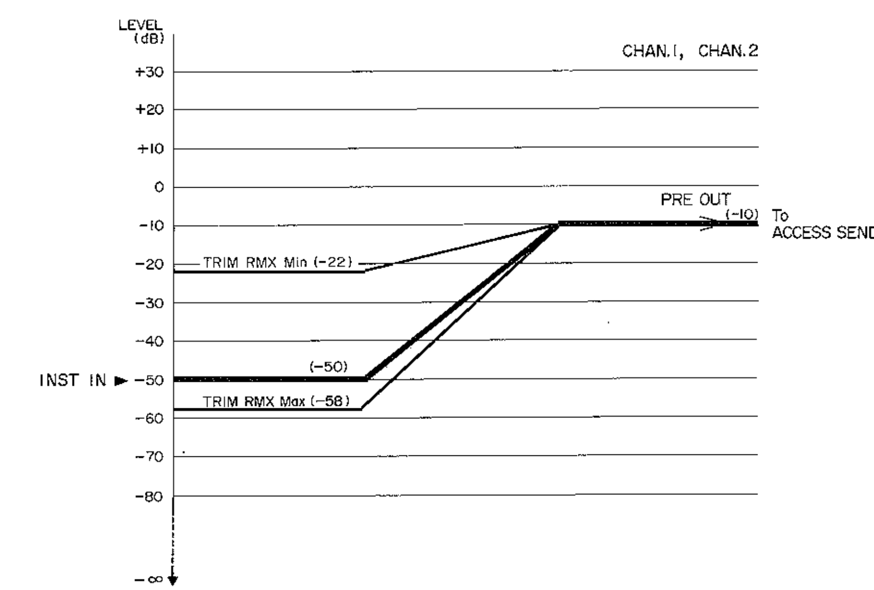


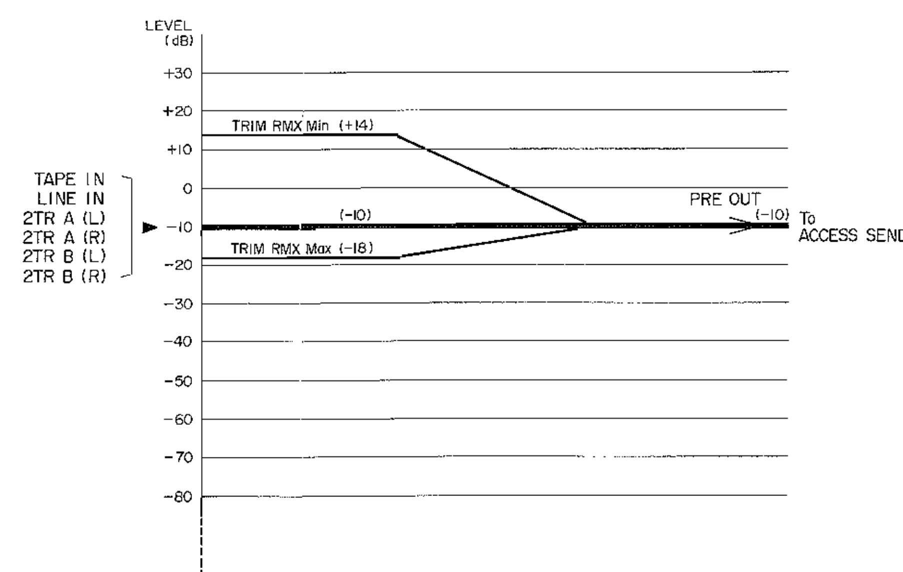


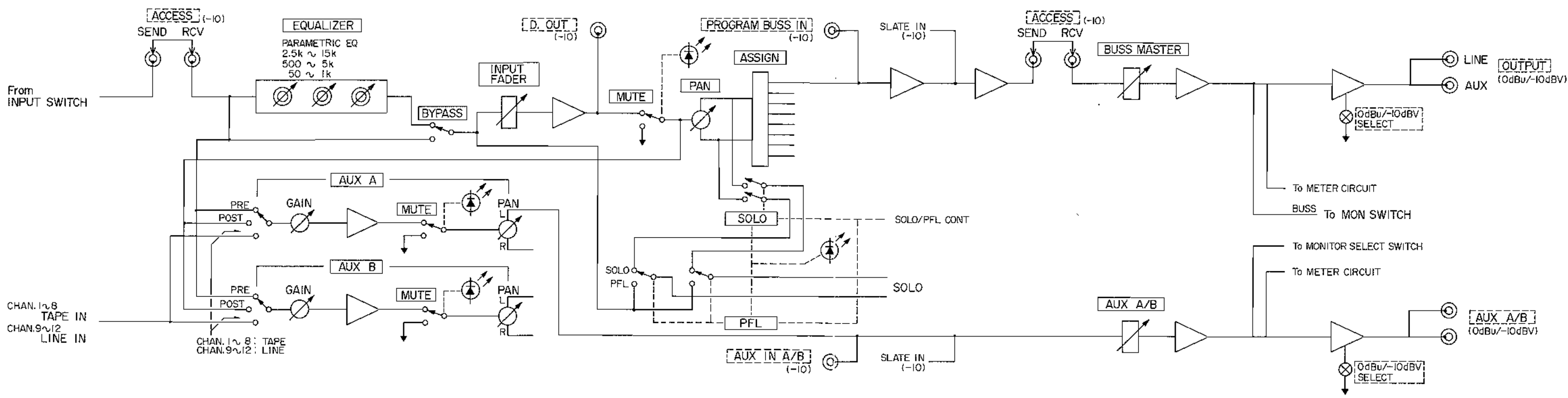


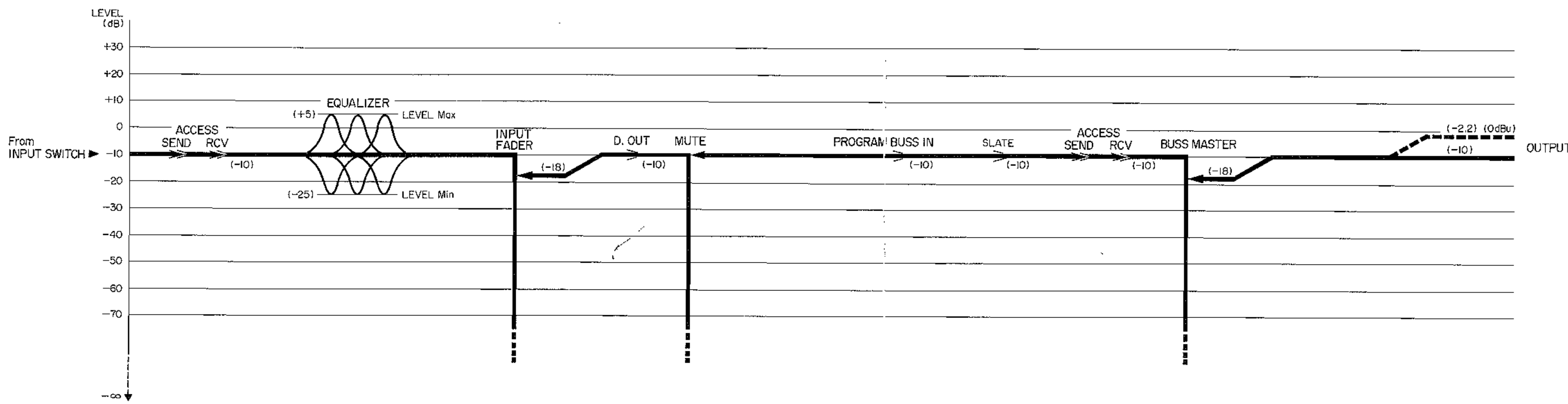


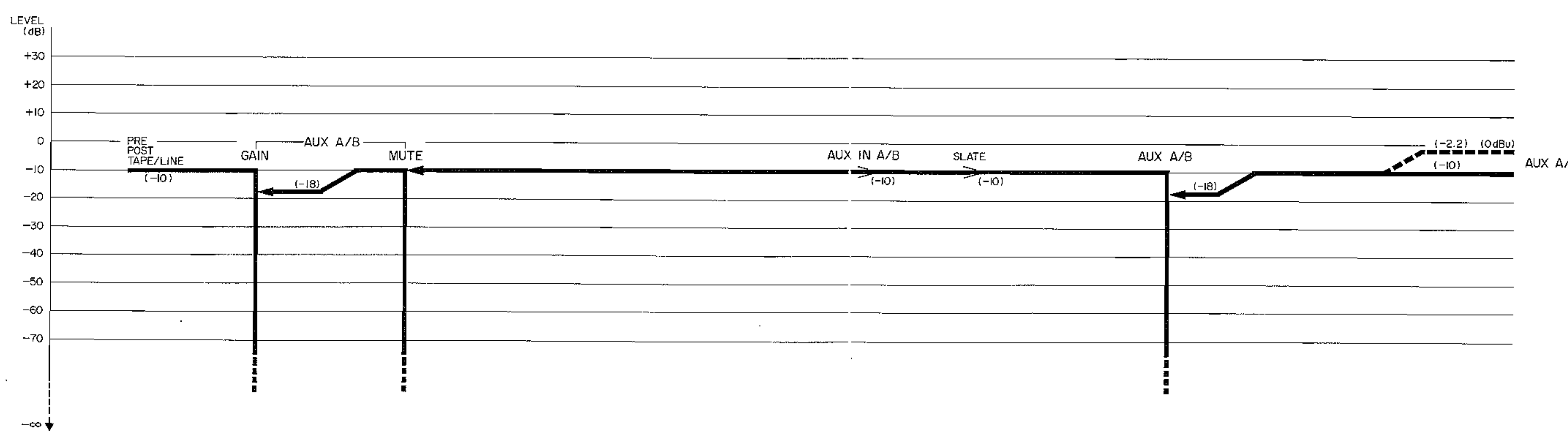


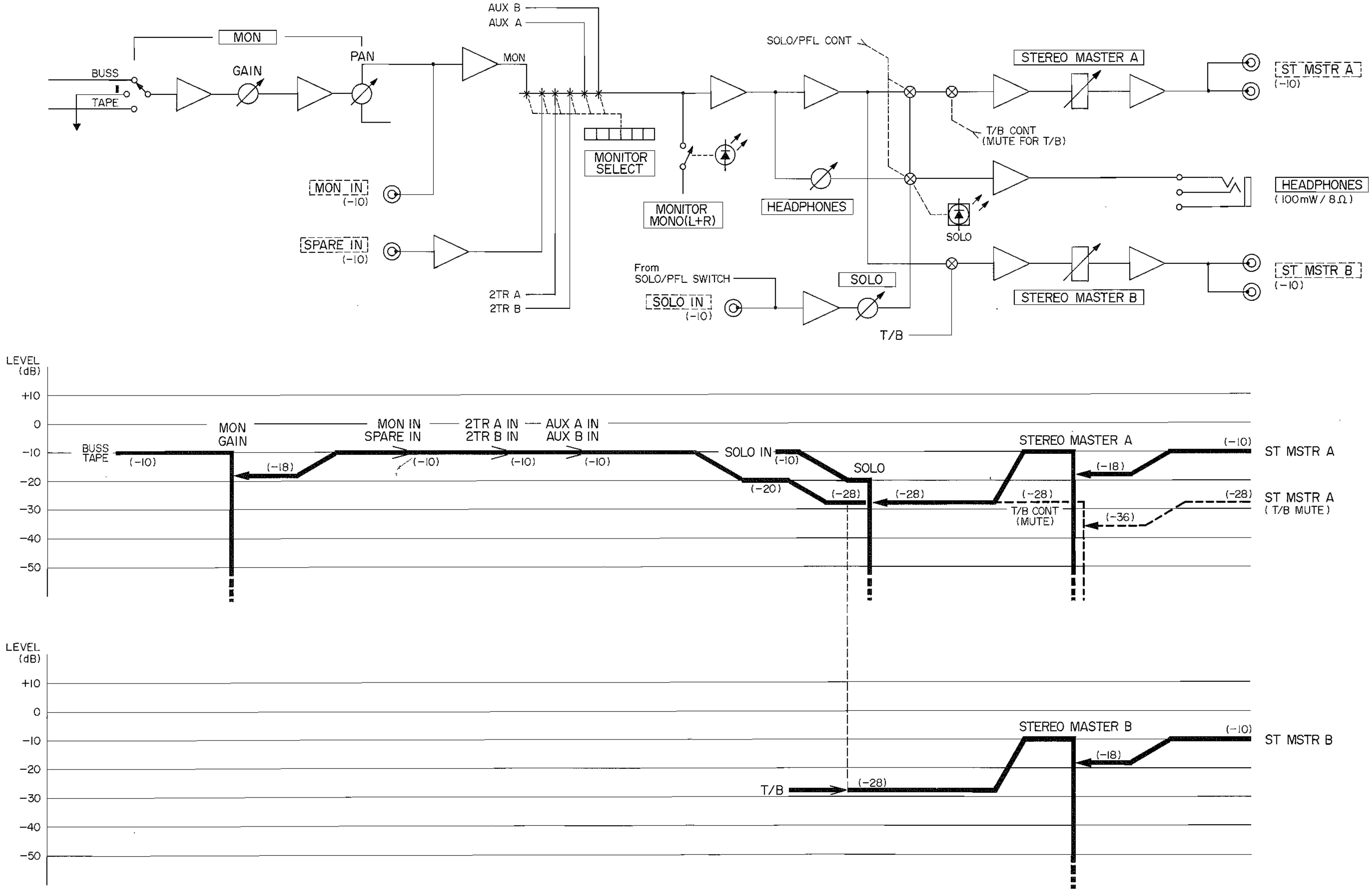





ACCESS (-10)
SEND RCV
EQUALIZER
PARAMETRIC EQ
From INPUT SWITCH
BYPASS
INPUT FADER
D. OUT (-10)
MUTE
PROGRAM BUSS IN (-10)
ASSIGN
PAN
SLATE IN (-10)
BUSS MASTER
LINE
AUX
OUTPUT (0dBu/-10dBV)
0dBu/-10dBV SELECT
AUX A
AUX B
PRE
POST
GAIN
SOLO
PFL
SOLO/PFL CONT
To METER CIRCUIT
BUSS To MON SWITCH
To MONITOR SELECT SWITCH
AUX A/B
AUX IN A/B (-10)
TAPE IN
LINE IN


LEVEL (dB)
EQUALIZER
LEVEL Max
LEVEL Min
ACCESS
SEND RCV
From INPUT SWITCH
INPUT FADER
D. OUT
MUTE
PROGRAM BUSS IN
SLATE
BUSS MASTER
OUTPUT


LEVEL (dB)
PRE
POST
TAPE/LINE
GAIN
AUX A/B
MUTE
AUX IN A/B
SLATE
AUX A/B

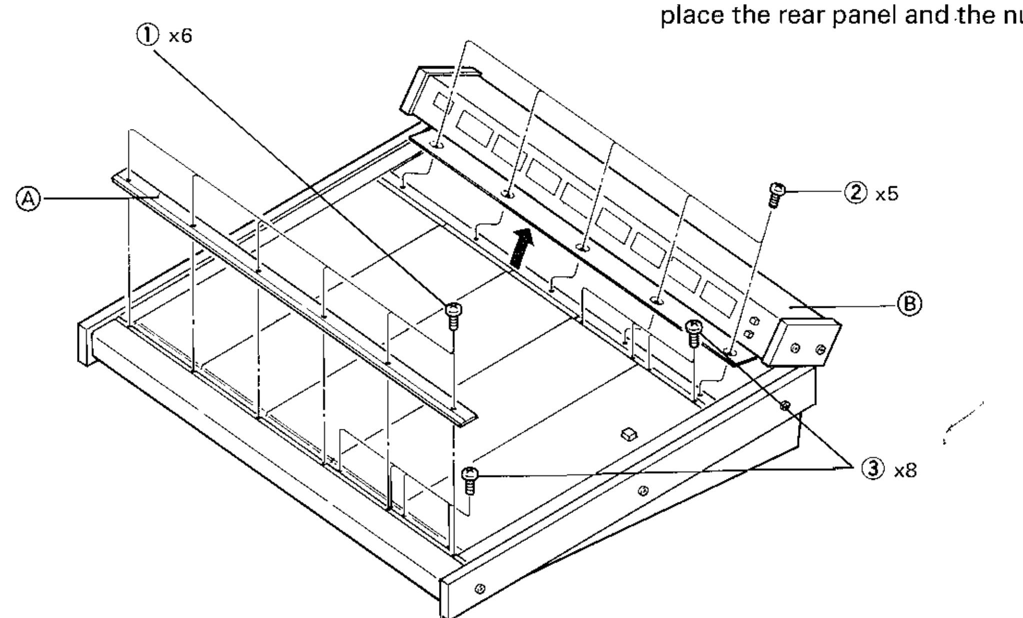

MON
BUSS
TAPE
GAIN
PAN
AUX B
AUX A
MON
MONITOR SELECT
MON IN (-10)
SPARE IN (-10)
2TR A
2TR B
MONITOR MONO(L+R)
SOLO/PFL CONT
HEADPHONES
From SOLO/PFL SWITCH
SOLO IN (-10)
SOLO
T/B
STEREO MASTER A
T/B CONT (MUTE FOR T/B)
STEREO MASTER B
ST MSTR A (-10)
HEADPHONES (100mW / 8Ω)
ST MSTR B (-10)
LEVEL (dB)
+10
0
-10
-20
-30
-40
-50
BUSS TAPE
(-10)
MON GAIN
(-18)
MON IN SPARE IN
2TR A IN 2TR B IN
AUX A IN AUX B IN
SOLO IN
(-20)
(-28)
STEREO MASTER A
T/B CONT (MUTE)
(-36)
ST MSTR A
ST MSTR A (T/B MUTE)
STEREO MASTER B
ST MSTR B

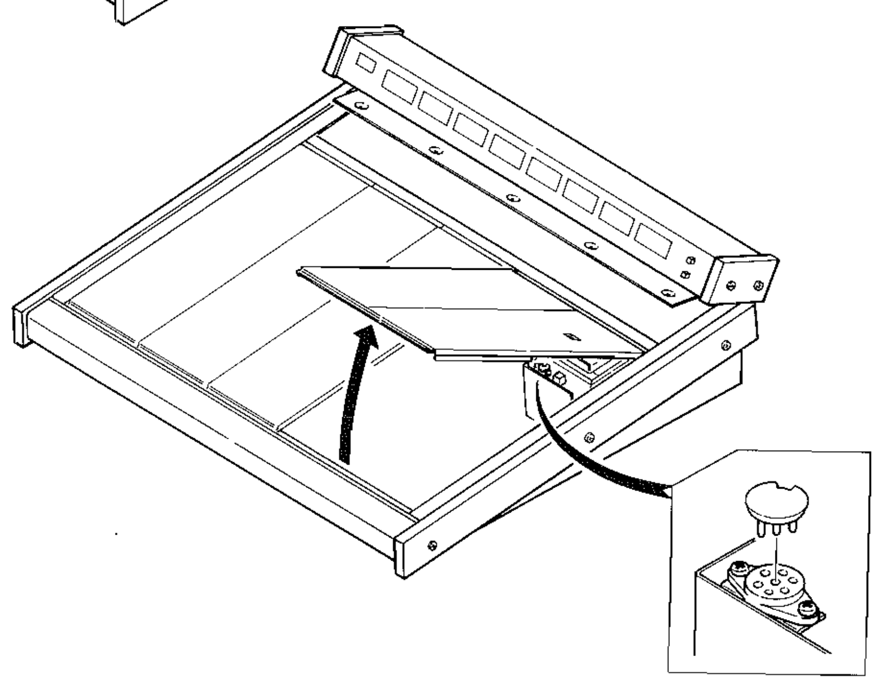
VOLTAGE CONVERSION

This mixer is adjusted to operate on the electric voltage specified on the packing carton.

Note: This voltage conversion is not possible on model sold in the U.S.A. and Canada, U.K., Australia or Europe.
For general export units, if it is necessary to change the voltage requirements of this mixer to match your area, use the following procedures. Always disconnect Power Line Cord before making these changes.

1. Remove six screws ① to remove number plate Ⓐ.
2. Remove five screws ② , then tilt the rear panel by pushing back meter bridge Ⓑ.
3. Remove eight screws ③ which fasten the monitor/talkback panel to the main frame.
4. Lift up the front edge of the monitor/talkback panel.
5. The voltage selector plug is located near the power switch and transformer inside the unit.
6. Pull out the plug and reinsert it so that the desired voltage can be read through the cut-out window of the plug.
7. Replace the monitor/talkback panel, then replace the rear panel and the number plate.





NOTE FOR U.K. CUSTOMERS

U.K. Customers Only: Due to the variety of plugs being used in the U.K., this unit is sold without an AC plug. Please request your dealer to install the correct plug to match the mains power outlet where your unit will be used as per these instructions.

IMPORTANT

The wires in this mains lead are coloured in accordance with the following code:

BLUE: NEUTRAL
BROWN: LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured makings identifying the terminals of your plug, proceed as follows:

The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK. The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

MAINTENANCE

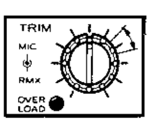
NOTES

* All procedures refer to all inputs and outputs within the circuit or system discussed. For convenience, the procedures are described referring to a single input-output chain, but must be followed for all inputs and outputs of the circuit or system being discussed, unless expressing stated otherwise.
* All resistors are 1/4 watt, 5%, unless marked otherwise. Resistor values are in ohms (k=1,000 ohms, M=1,000,000 ohms).
* All capacitor values are in microfarads (p=picofarads).
* ⚠ Parts marked with this sign are safety critical components. They must always be replaced with identical components-refer to the TEAC Parts List and ensure exact replacement.
* 0 dB is referenced to 1 V in this manual unless otherwise specified.
* PC boards shown viewed from component side.

1. LEVEL SETTING AND OPERATION CHECK

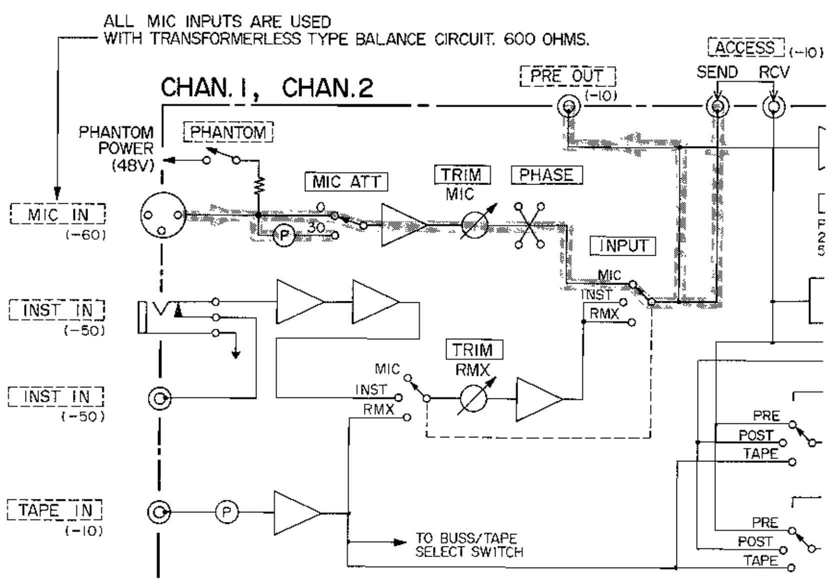
1-1. MIC IN → PRE OUT (ACCESS SEND)

1. In the MIC IN connector, pin #3 is "hot", pin #2 is "cold", and pin #1 is "shield".
2. Remove the jumper between the ACCESS SEND and the RCV jacks for the channel being tested.
3. Plug an AC voltmeter into the PRE OUT or the ACCESS SEND jack. The voltmeter should have an input impedance of 50k ohms or more, input capacitance less than 20pF, a sensitivity selector switch and a maximum sensitivity of –90dB.
4. Set the front panel control for the channel being tested as follows:
   INPUT select switch : Set to MIC
   MIC ATT switch : Set to 0
   PHASE switch : Set to NORMAL
   PHANTOM power switch: Set to OFF
5. Apply a 1kHz, –60dB (1mV) signal to the MIC IN connector on the back panel.
6. Adjust the MIC TRIM for a –10dB (316mV) reading on the voltmeter. After this adjustment, the MIC TRIM knob should be between 6.5 and 7.5 (between 1 : 30 and 2 : 30 o'clock).



TRIM Knob
at normal setting

7. If there is any malfunction, refer to the preamplifier (Q1 ~ Q4 and U1) circuit schematic and check the IC and transistor voltages and signal levels.
8. Check all remaining channels in the same manner.
9. Set the MIC ATT switch to 30 and apply a 1kHz, –30 dB (31.6mV) signal to the MIC IN connector on the back panel.
10. If the output is not –10dB, readjust the MIC TRIM for a –10dB (316mV) reading on the voltmeter. After this adjustment, the MIC TRIM knob should be between 6.5 and 7.5.
11. Measurement of S/N ratio, T.H.D.:
    S/N ratio : More than 70dB (using "A" weighted network)
    or : 68dB (measured with a bandpass filter, 20Hz ~ 20kHz)
    or : More than 62dB, on an AC voltmeter with a 100kHz or greater bandwidth
    T.H.D. : Less than 0.025% (at 1kHz, 20dB above nominal input level measured with 30kHz L.P.F.)
12. Set the PHASE switch to REVERSE.
    Confirm that the phase of the output signal is inverted using an oscilloscope connected to the PRE OUT jack.



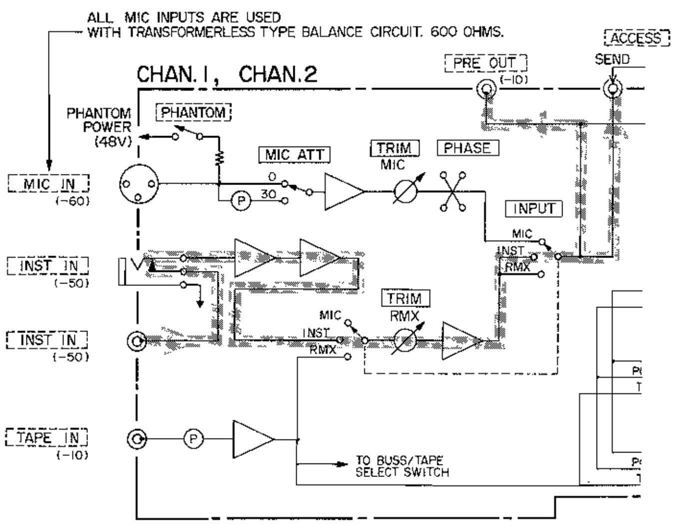
1-2. INST IN → PRE OUT (ACCESS SEND) for Channels 1 and 2

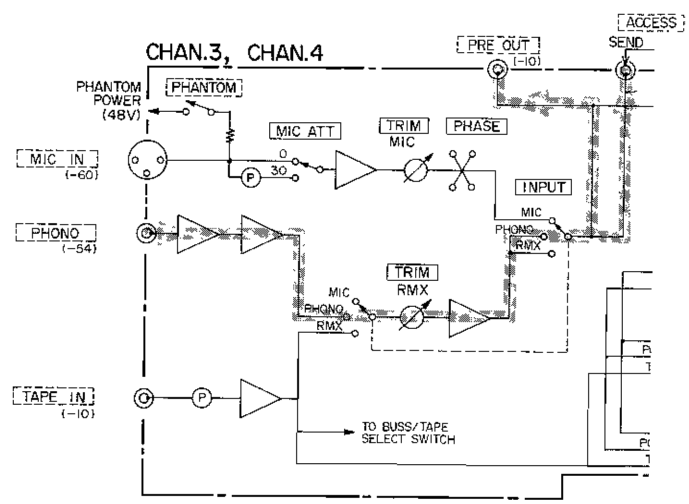
1. Use same test set up as previous section 1-1.
2. Apply a 1kHz, –50dB (3.16mV) signal to the INST IN (phono or phone jack) on the back panel and set INPUT select switch to INST.
3. Adjust the RMX TRIM for –10dB (316mV) reading on the voltmeter. After this adjustment, the RMX TRIM knob should be between 6.5 and 7.5.
4. If there is any malfunction, refer to the preamplifier (U1 and U2) circuit schematic and check the IC voltages and signal levels.
5. Check channel 2 in the same manner.
6. Measurement of S/N ratio:

   S/N ratio : More than 71dB (using "A" weighted network)
   or : 68dB (measured with a bandpass filter, 20Hz ~ 20kHz)
   or : More than 62dB, on an AC voltmeter with a 100kHz or greater bandwidth

1-3. PHONO IN → PRE OUT (ACCESS SEND) for Channels 3 and 4

1. Use same test set up as previous section 1-1.
2. Apply a 1kHz, –54dB (2mV) signal to the PHONO jack on the back panel and set the INPUT select switch to PHONO.
3. Adjust the RMX TRIM for a –10dB (316mV) reading on the voltmeter. After this adjustment, the RMX TRIM knob should be between 6.5 and 7.5.
4. If there is any malfunction, refer to the preamplifier (U3) circuit schematic and check the IC voltages and signal levels.
5. Check channel 4 in the same manner.
6. The circuit is considered normal if the frequency response is +17dB, ±1dB for 50Hz; and –13.5dB, ±1dB for 10kHz; both in reference to 1kHz when the signal frequency applied to the PHONO input is swept from 50Hz through 10kHz.
7. Short-circuit the PHONO input. The S/N ratio should then be greater than 64dB (in the range of 20Hz ~ 20kHz).





1-4. LINE IN → PRE OUT (ACCESS SEND) for Channels 5 through 12

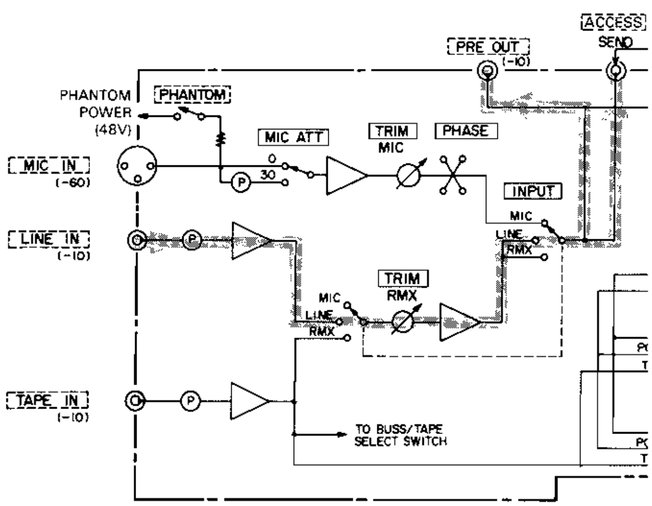
1. Use same test set up as previous section 1-1.
2. Apply a 1kHz, −10dB (316mV) signal to the LINE IN jack on the back panel and set the INPUT select switch to LINE.
3. Adjust the RMX TRIM for a −10dB (316mV) reading on the AC voltmeter. After this adjustment, the RMX TRIM knob should be between 6.5 and 7.5.
4. If there is any malfunction, refer to the preamplifier (U3) circuit schematic and check the IC voltages and signal levels.
5. Check channels 5 through 12 in the same manner.
6. Measurement of frequency response, S/N ratio, T.H.D.:

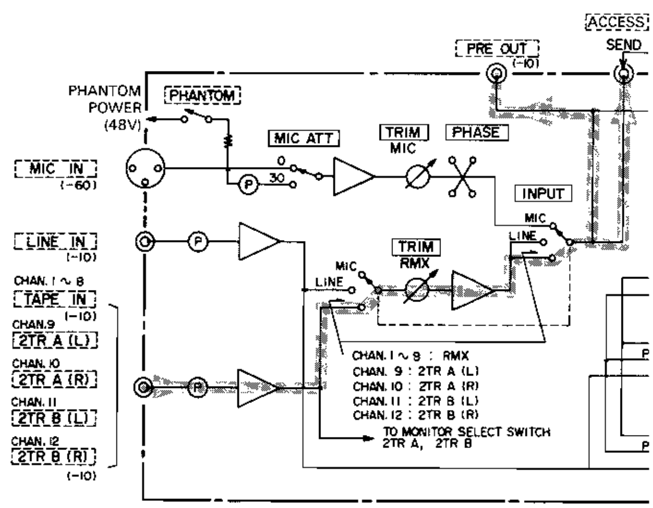
Frequency response	:	20Hz ~ 20 kHz, within ±1dB
S/N ratio	:	More than 88dB (using "A" weighted network)
	or :	84dB (measured with a bandpass filter, 20Hz ~ 20kHz)
	or :	More than 75dB, on an AC voltmeter with a 100kHz or greater bandwidth
T.H.D.	:	Less than 0.025% (at 1kHz, measured with 30kHz L.P.F.)

1-5. TAPE IN [2TR A&B (L/R)] → PRE OUT (ACCESS SEND)

1. Use same test set up previous section 1-1.
2. Apply a 1kHz, −10dB (316mV) signal to the TAPE IN or 2TR A (L/R) or 2TR B (L/R) jack on the back panel and set the INPUT select switch, as appropriate, to RMX or 2TR A (L/R) or 2TR B (L/R).
3. Adjust the RMX TRIM for a −10dB (316mV) reading on the voltmeter. After this adjustment, the RMX TRIM knob should be between 6.5 and 7.5.
4. If there is any malfunction, refer to the preamplifier (U1) circuit schematic and check the IC voltages and signal levels.
5. Check all remaining channels in the same manner.
6. Measurement of frequency response, S/N ratio, T.H.D.:

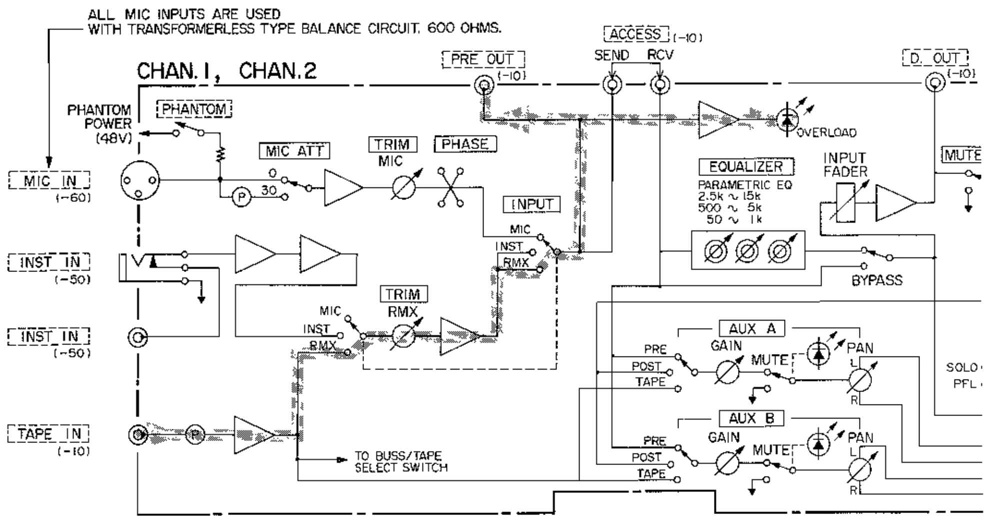
Frequency response	:	20 Hz ~ 20 kHz, within ±1 dB
S/N ratio	:	More than 83dB (using "A" weighted network)
	or :	80dB (measured with a bandpass filter, 20Hz ~ 20kHz)
	or :	More than 73dB, on an AC voltmeter with a 100kHz or greater bandwidth
T.H.D.	:	Less than 0.025% (at 1kHz, measured with 30kHz L.P.F.)





1-6. Input Section OVERLOAD LED

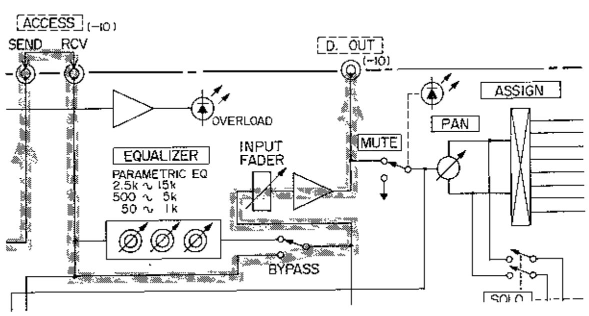
1. Apply a –10dB (316mV) signal to the TAPE IN or 2 TR A (L/R) or 2 TR B (L/R) jack on the back panel.
2. Plug an AC voltmeter into the PRE OUT jack and check the output level for a –10dB (316mV) reading on the voltmeter.
3. The LED should light at +15dB ± 1 dB (5.0V to 6.3V), 25dB ± 1 dB above the nominal PRE OUT level of –10dB (316mV).
4. Confirm that the output signal is not distorted.



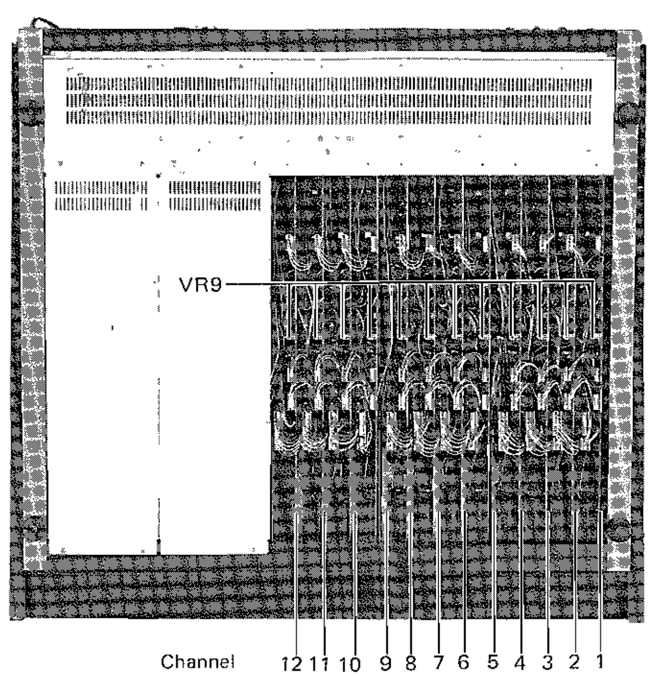
1-7. TAPE IN [2 TR A&B (L/R)] → D(irect) OUT

Carry out the following tests with the same settings specified in section 1-1 procedure #3, except reinsert the shorting plug in the ACCESS SEND and RCV jacks, depress the EQ bypass switch.

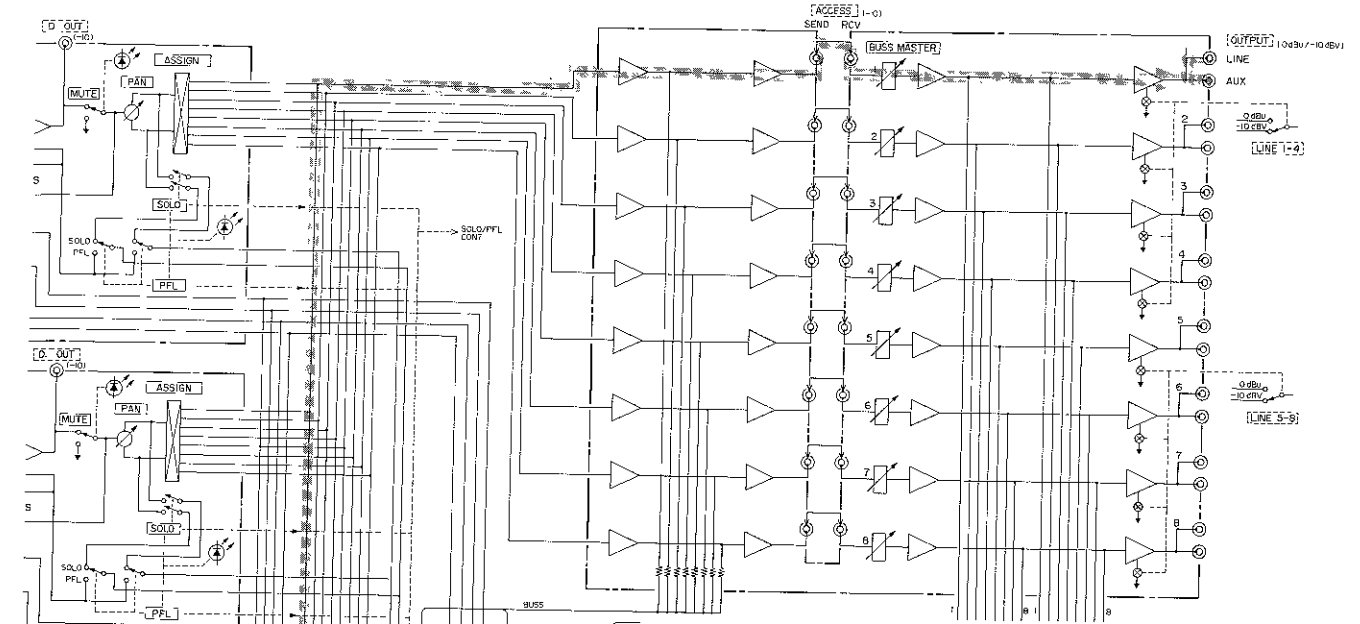
1. Set the INPUT select switch, to appropriate, RMX or 2 TR A(L/R) or 2TR B(L/R).
2. Set the RMX TRIM so that a –10 dB output is obtained at the PRE OUT jack.
3. Plug an AC voltmeter into the D OUT jack for the channel being tested.
4. Adjust the Input Fader for a –10dB reading on the AC voltmeter.
5. The Input Fader should then be in the shaded area.
6. If it is slightly out of this area:
   a) Set the Input Fader between position 7 and 8.
   b) Adjust resistor VR9 on the Input Amplifier PC board for a –10dB (316mV) output reading from the D OUT jack.

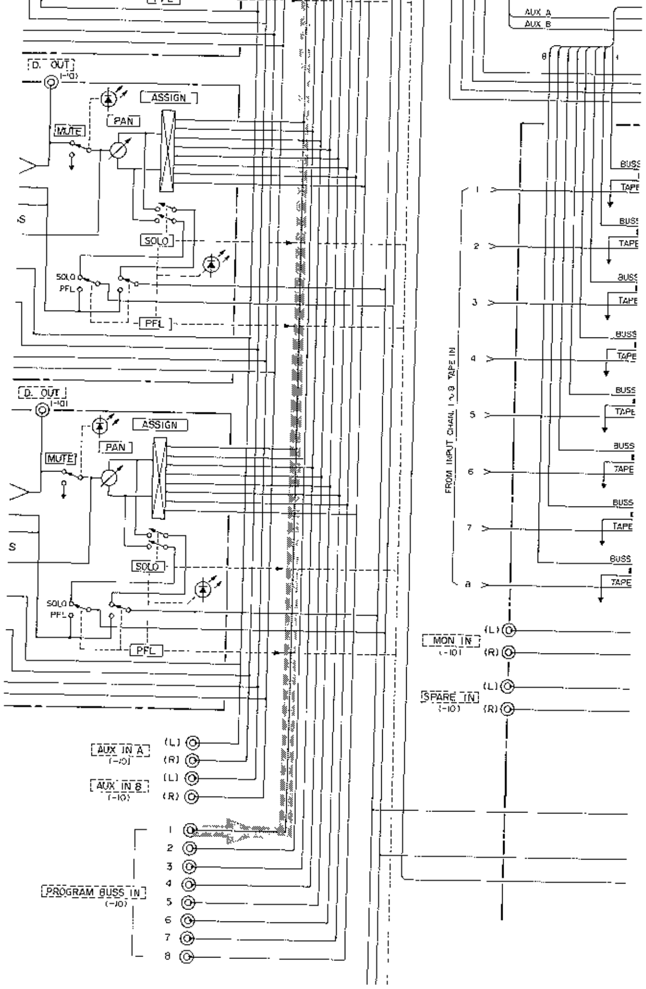


7. If there is any malfunction, the trouble may be in IC's U5, U6, U7 or U8. The gain of amplifier IC's U5-2, U6-1 and U6-2 are unity, when the EQUALIZER knobs are set in the center position. Refer to the level diagram.
8. Check channels 2 ~ 12 in the same manner.



1-8. PROGRAM BUSS IN → LINE OUTPUT

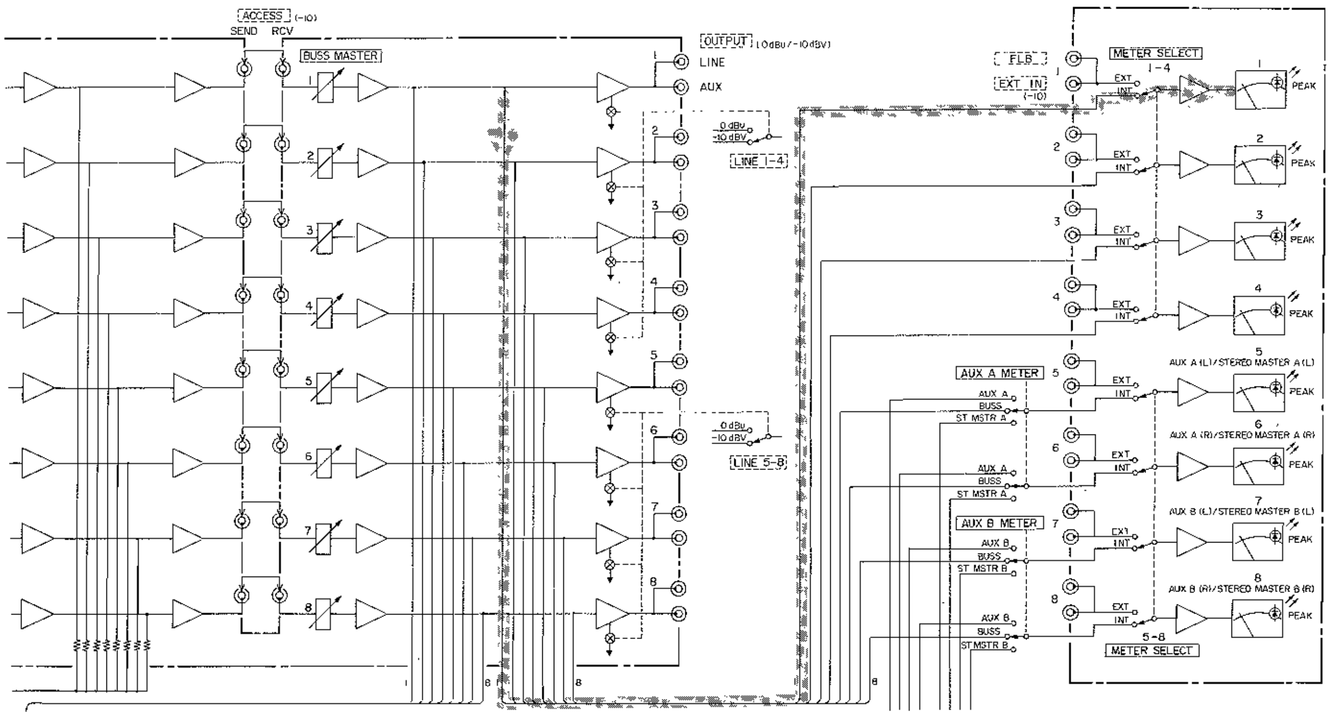


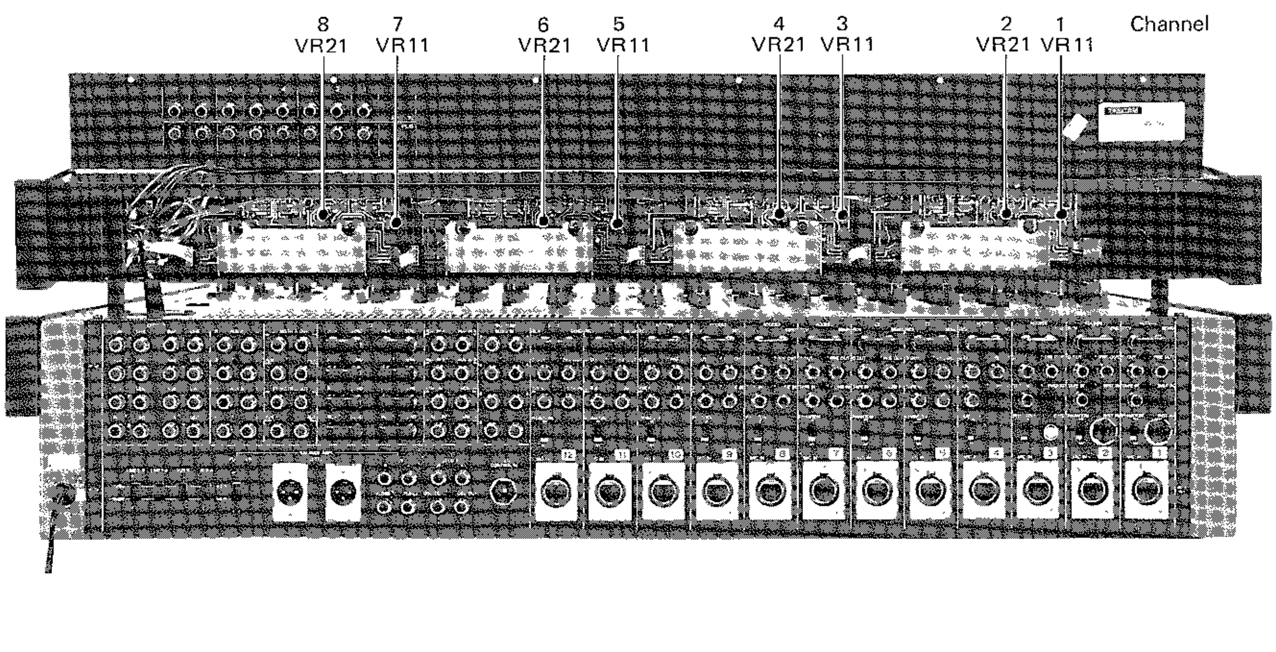


1. Connect an AC voltmeter to the buss output (LINE/AUX OUTPUT) under test.
2. Apply a 1kHz, –10dB (316mV) signal to the PROGRAM BUSS IN jack.
3. Set the BUSS MASTER fader on the front panel between positions 7 and 8.
4. The circuit is operating properly if a –10 dB PROGRAM BUSS IN produces a reading of –10 dB at the LINE OUTPUT or AUX OUTPUT.
5. If a –10dB output is not obtained, adjust the BUSS MASTER fader. The circuit is considered normal if the fader is in the shaded area.
6. If the output differs greatly from the proper level.
   a) Unplug the jumper between ACCESS SEND and RCV in the Buss Master Section.
   b) Plug an AC voltmeter into the ACCESS SEND jack.
   c) Check the level here.
   Should the output level be –10dB ±0.5dB, check the circuits of the Master fader next. Should the output level reading not be at –10dB ±0.5dB, check the Summing Amplifier in the Buss Master Section.
7. BUSSES 2 through 8 should be checked in the same manner.
8. Refer to paragraph 1-9 for calibration of the VU meters and peak indicators.

1-9. Meter Calibration and The LED Circuit

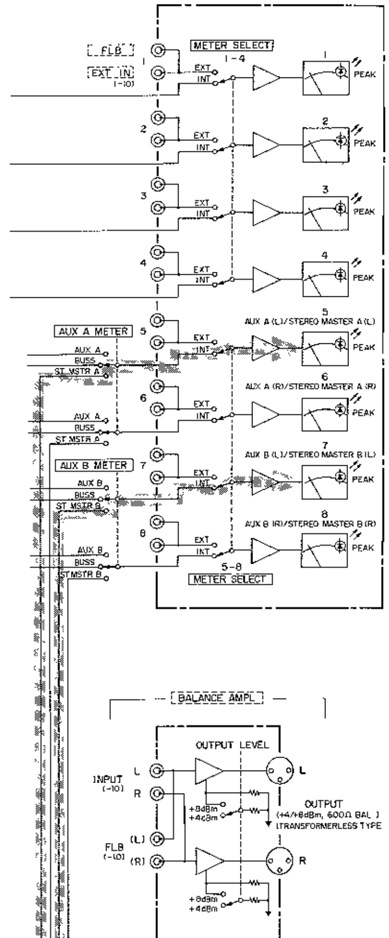
1. Use the test instrument connections described in paragraph 1–8 for calibrating the VU meter.
2. Set the AUX A METER and the AUX B METER switches to BUSS.
3. Set the METER SELECT 1–4 and 5–8 switches to INT.
4. The calibration is correct if the VU meter indication is 0VU, ±0.5VU when the reading of an AC voltmeter connected to LINE OUTPUT is –10dB (316mV).
5. If the VU meter does not indicate 0VU, adjust the calibrating pots, VR11 for odd channels and VR21 for even channels, on the METER AMPL PCB shown in the photo below, which corresponds to the off-spec meter.
6. Raise the PROGRAM BUSS IN input level.
7. The PEAK level LED should light up at 0dB ±1dB (0.89V to 1.12V), 10dB ±1dB above nominal PROGRAM BUSS IN level of –10dB (316mV).
8. Test all meters from the EXT position for proper meter reading.

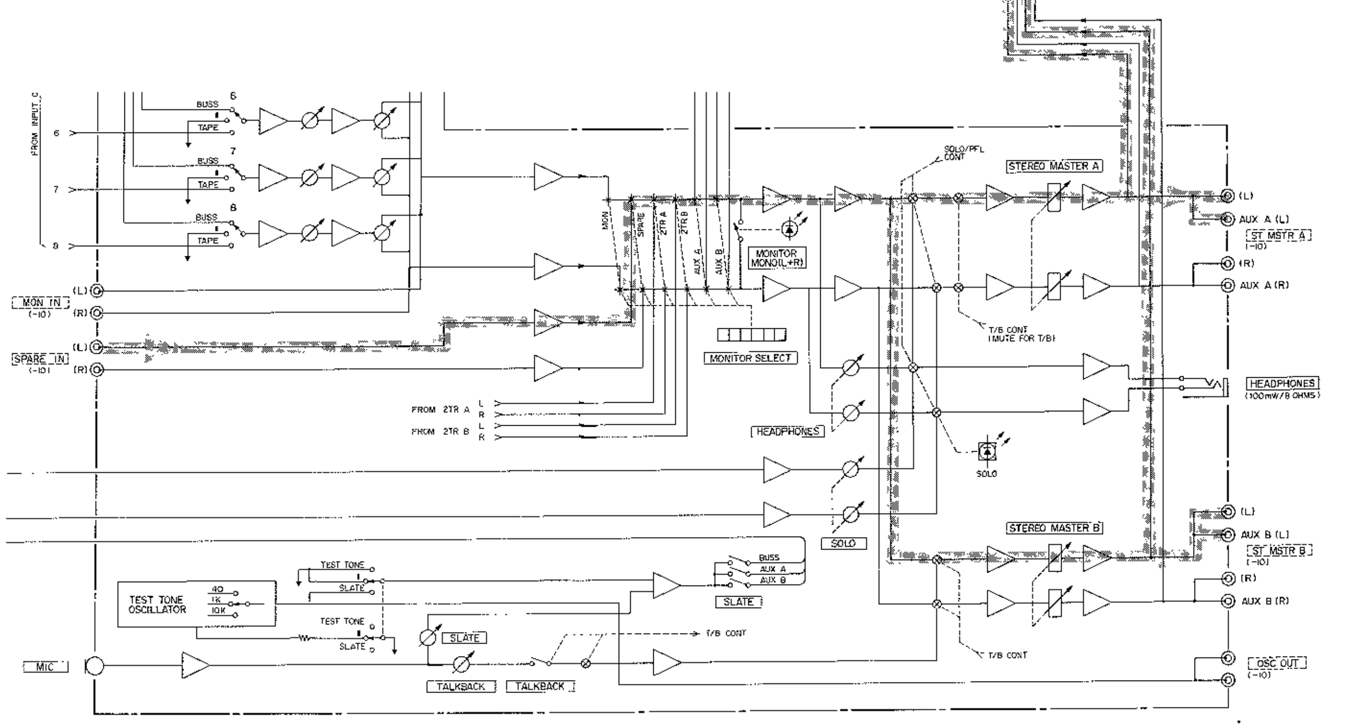




1-10. SPARE IN → ST MSTR A/B

1. Apply a 1kHz, –10dB (316mV) signal to the SPARE IN (L) jack.
2. Plug AC voltmeters into the ST MSTR A(L) and the ST MSTR B (L) jacks.
3. Set the Stereo Master Section controls as follows:
   MONITOR SELECT switch: Depress SPARE to "on".
   METER SELECT switch: Set to INT (up)
   AUX A METER switch: Set to ST MSTR A
   AUX B METER switch: Set to ST MSTR B
4. Adjust the STEREO MASTER A and STEREO MASTER B faders for a –10dB (316mV) reading on the voltmeters.
5. The STEREO MASTER A and the STEREO MASTER B faders should then be in the shaded area between positions 7 and 8.
6. Confirm that the VU meters of the STEREO MASTER A (L)/5 and the STEREO MASTER B (L)/7 indicate 0VU.
7. Check the SPARE IN (R)ight channel in the same manner.





1-11. 2TR A/B → ST MSTR A/B

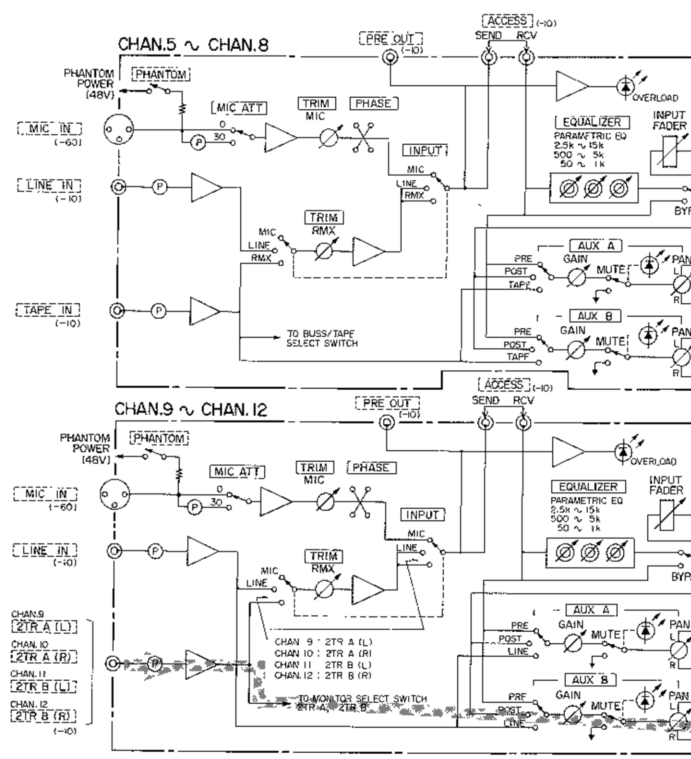
The 2TR A/B to ST MSTR A/B circuits are identical to the SPARE IN to ST MSTR A/B circuits already explained. Following the procedures in paragraph 1-10:

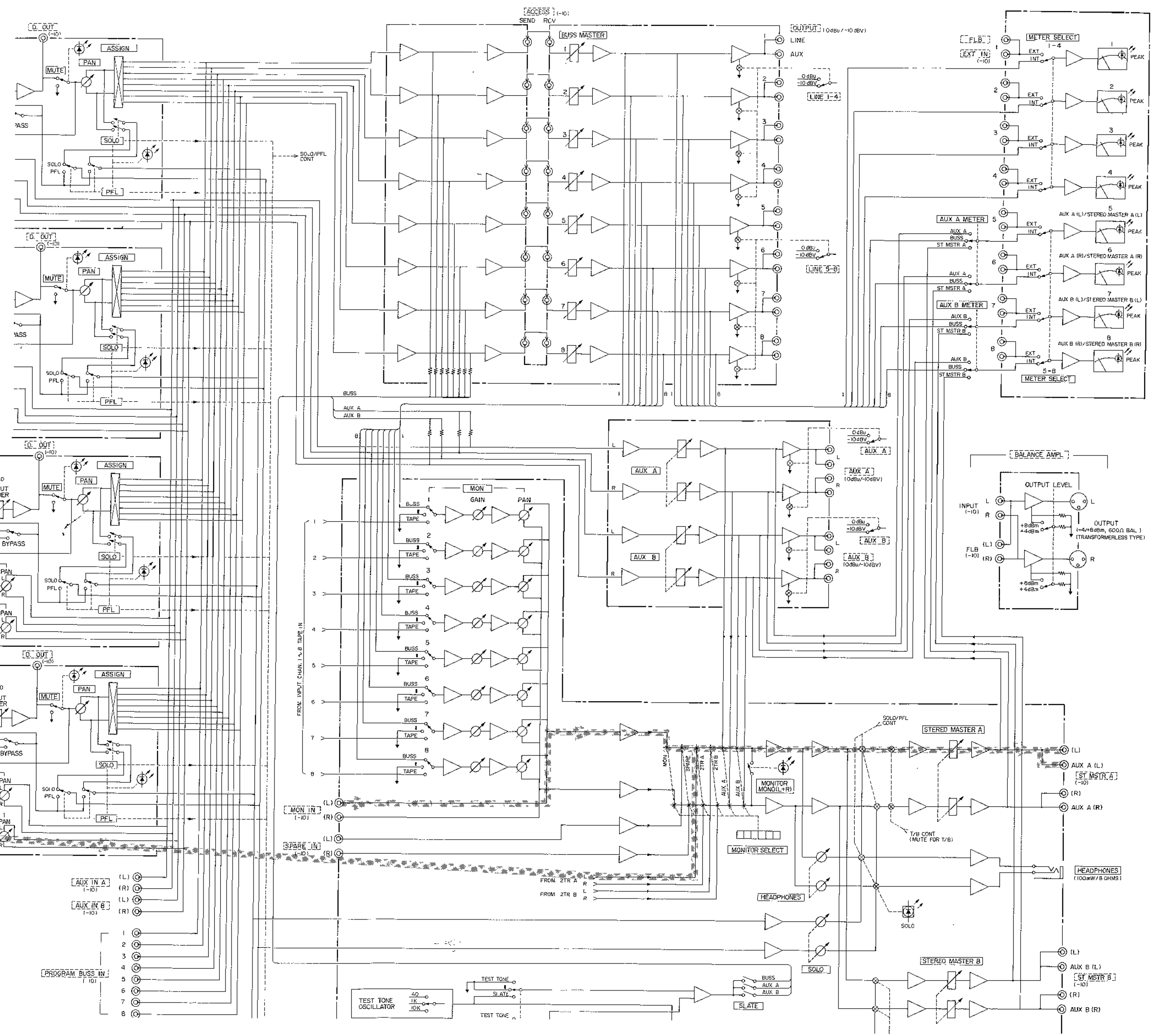
1. Apply a 1kHz, −10dB (316mV) signal to the 2TR A(L) jack and depress the 2TR A switch of the MONITOR SELECT to "on".
2. Check all input channels in the same manner.

1-12. MON IN → ST MSTR A/B

The circuit of MON IN to ST MSTR A/B is identical to the SPARE IN to ST MSTR A/B circuit already explained. Following the procedures in paragraph 1-10:

1. Apply a 1kHz, −10dB (316mV) signal to the MON IN jack and depress MON switch of the MONITOR SELECT to "on".
2. Check all input channels in the same manner.





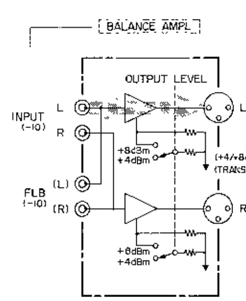
1-13. PROGRAM BUSS IN → ST MSTR A/B

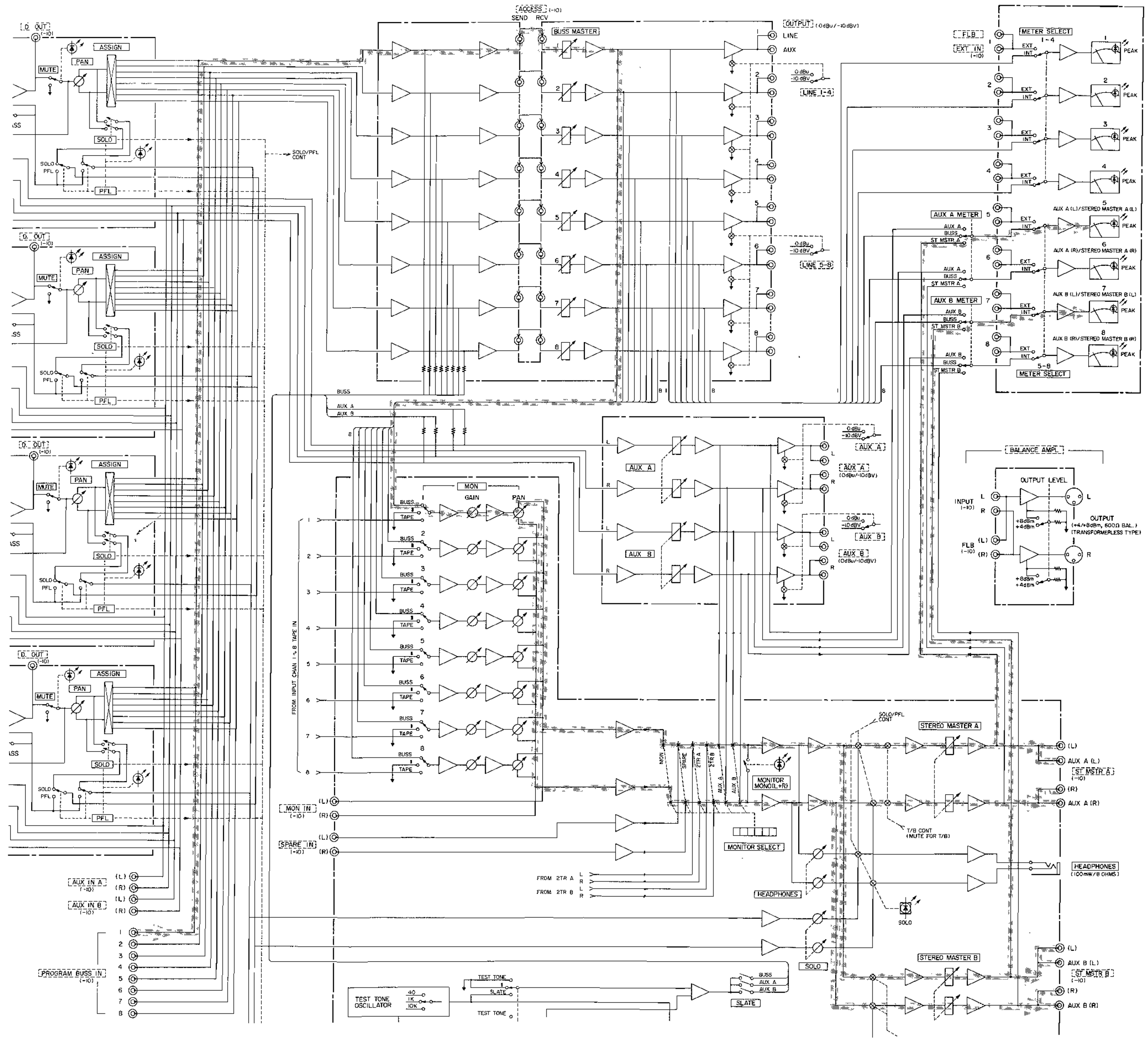
Carry out the following check with the settings of paragraph 1-8:

1. Set the controls so that an output is obtained at LINE OUTPUT. Also set up the METER SELECT so that it indicates a signal at the output.
2. Set the Monitor Section controls as follows:
   MON 1 to 8 switches : Set to BUSS
   GAIN knobs : Set to 2 o'clock position
   PAN knobs : Set to L (full CCW) position
3. Adjust the STEREO MASTER A and the STEREO MASTER B faders for a –10dB (316mV) reading from the ST MSTR A (L) and the ST MSTR B (L) jacks.
4. Confirm that the VU meters of the STEREO MASTER A (L)/5 and the STEREO MASTER B (L)/7 indicate 0VU.
5. Set the PAN knobs to the R (full CW) position, and check the right channel in the same manner.
6. Set the PAN knobs at center position. Both the ST MSTR A&B (L) and the ST MSTR A&B (R) output levels should be –12.5dB ± 1dB.
7. Confirm that VU meters 5 through indicate –2.5 VU within ± 1VU.
8. Check all remaining channels in the same manner.
9. Reset the PAN knobs to the L (full CCW) position.

1-14. BALANCE AMPL. INPUT → BALANCE AMPL. OUTPUT

1. Apply a 1kHz, –10dB (316mV) signal to the BALANCE AMPL. INPUT (L) jack.
2. Plug an AC voltmeter into the BALANCE AMPL. OUTPUT (L) connector.
3. Set the BALANCE AMPL OUTPUT LEVEL switch to +4dBm.
4. The voltmeter should read +4dBm ± 0.5dB.
5. Set the BALANCE AMPL OUTPUT LEVEL switch to +8dBm.
6. The AC voltmeter should read +8dBm ± 0.5dB.
7. Check the right channel in the same manner.





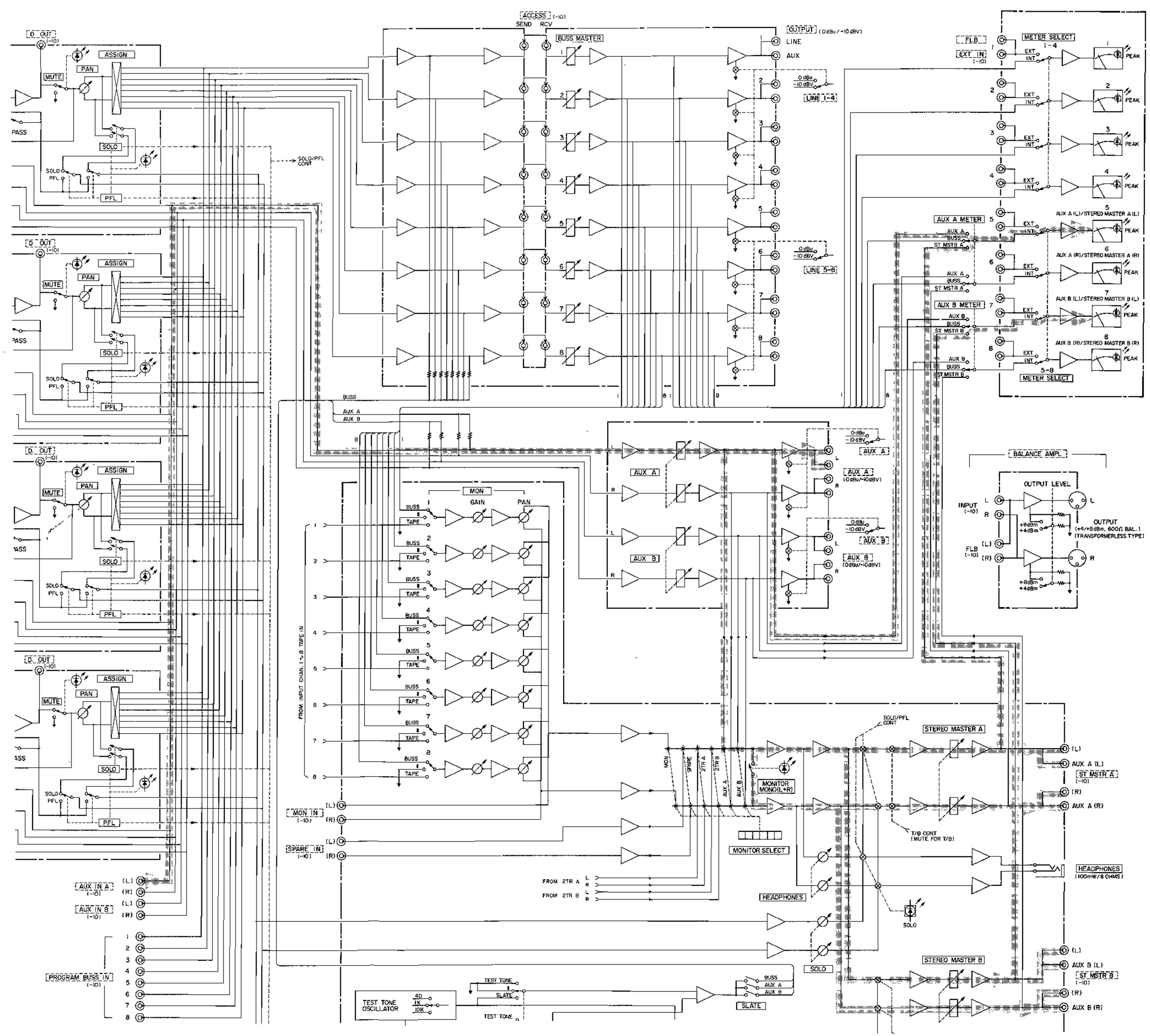
1-15. AUX IN A/B → AUX A/B Out

1. Plug an AC voltmeter into the AUX A (L) jack.
2. Apply a 1kHz, −10dB (316mV) signal to the AUX IN A (L) jack.
3. Set the AUX A METER switch to AUX A.
4. Adjust the AUX A fader for a −10dB (316mV) reading on the voltmeter.
5. Confirm that the VU meter of the AUX A (L)/5 indicates 0VU.
6. Check the right channel and AUX B (L/R) circuit in the same manner.

1-16. AUX IN A/B → ST MSTR A/B

Carry out the following check with the settings of paragraph 1-15.

1. Set the controls so that a −10dB output is obtained at AUX A/B output.
2. Depress AUX A switch of the MONITOR SELECT to "on".
3. Adjust the STEREO MASTER A and STEREO MASTER B faders for a −10dB (316mV) reading from the ST MSTR A (L) and ST MSTR B (L) jacks.
4. The STEREO MASTER A and the STEREO MASTER B faders should then be in the shaded area between positions 7 and 8.
5. Set the AUX A METER and AUX B METER switchs to ST MSTR A or ST MSTR B.
6. Confirm that the VU meters of the STEREO MASTER A (L)/5 and the STEREO MASTER B (L)/7 indicate 0VU.
7. Check the right channel in the same manner.
8. Depress the MONITOR MONO (L+R) to "on". When the signal is input to either the left or right channel of the AUX IN A/B jack, the AC voltmeter should read −14.5dB ±1dB from both left and right channels of the ST MSTR A and ST MSTR B outputs.



1-17. TAPE IN [2 TR A&B (L/R)] → LINE OUTPUT

Carry out the following check with the settings of paragraph 1-7.

1. Set the controls so that a –10dB output is obtained at D OUT.
2. Set controls of the selected channel being tested on the Input Section panel as follows:

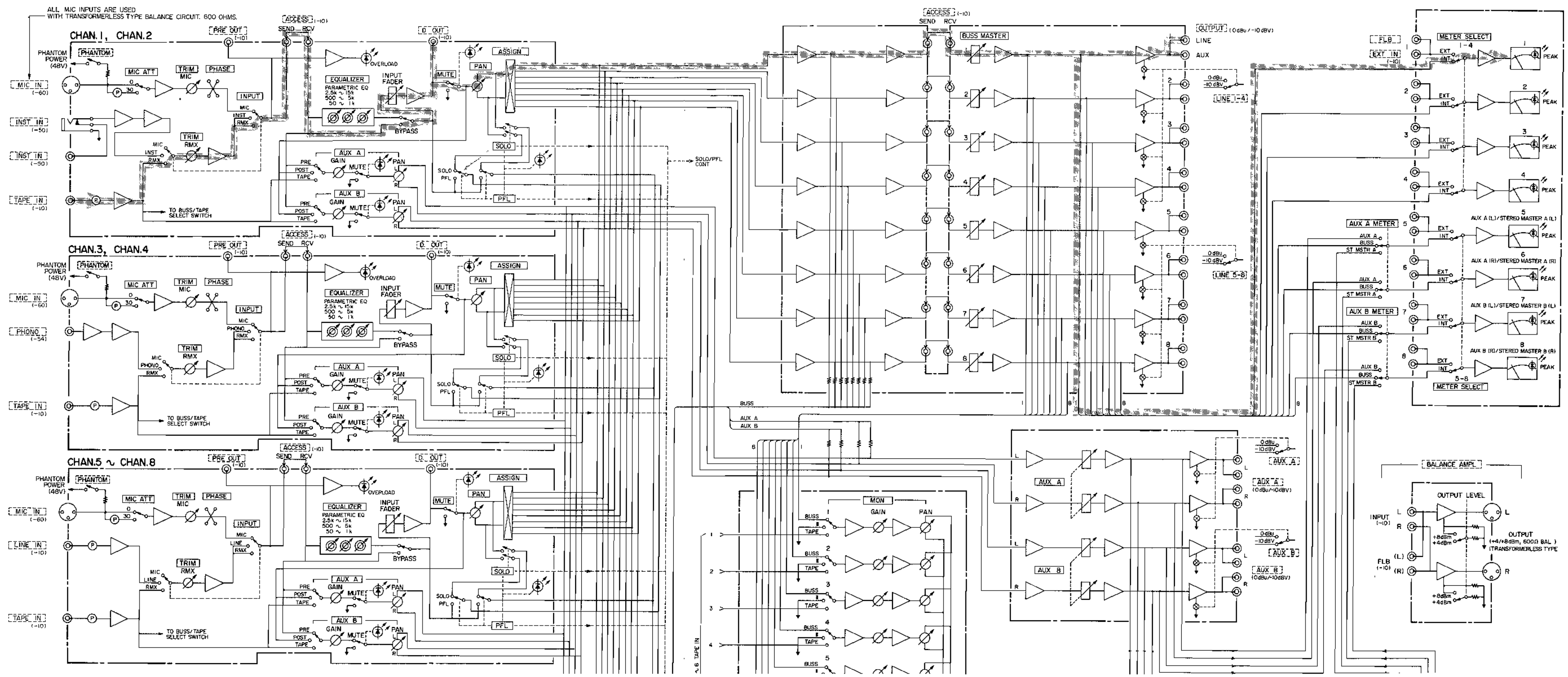
MUTE	: Set to OFF
ASSIGN	: Depress 1 to ON
PAN	: Set to position 0 (full CCW rotation)
BUSS MASTER fader	: Set between positions 7 and 8
AUX A/B METER	: Set to BUSS
METER SELECT	: Set to INT

3. The circuit is normal if a –10dB LINE OUTPUT reading is obtained against a –10dB TAPE IN [2 TR A&B (L/R)] level.
4. If a –10dB output is not obtained, adjust the BUSS MASTER fader. The circuit is normal if the fader is in the shaded area.
5. Confirm that the VU meter indicates 0VU.
6. If the output differs greatly from the proper level.
   a) Unplug the jumper between ACCESS SEND and RCV in the Buss Master Section.
   b) Plug an AC voltmeter into the ACCESS SEND jack.
   c) Check the level here.

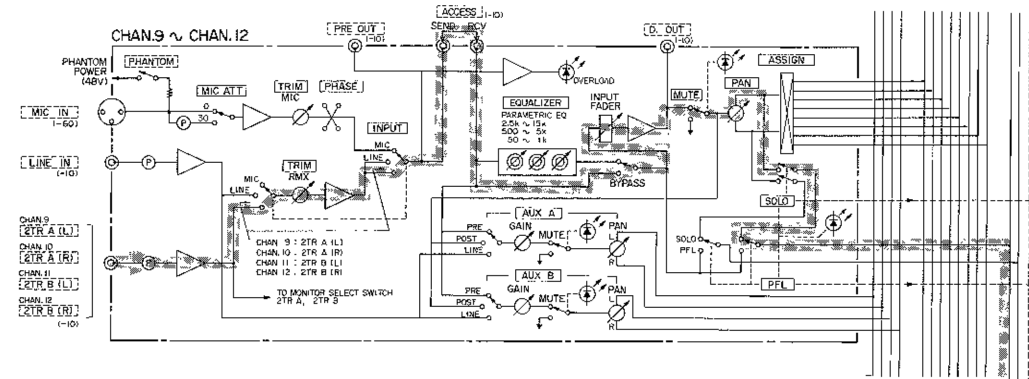
   Should the output level be –10dB, check the circuits of the BUSS MASTER fader next. Should the output level reading not be at –10dB, check the circuits of the ASSIGN switch of the Input Section and the Summing Amplifier in the Buss master Section.
7. Frequency response and T.H.D. of TAPE IN [2 TR A&B (L/R] → LINE OUTPUT

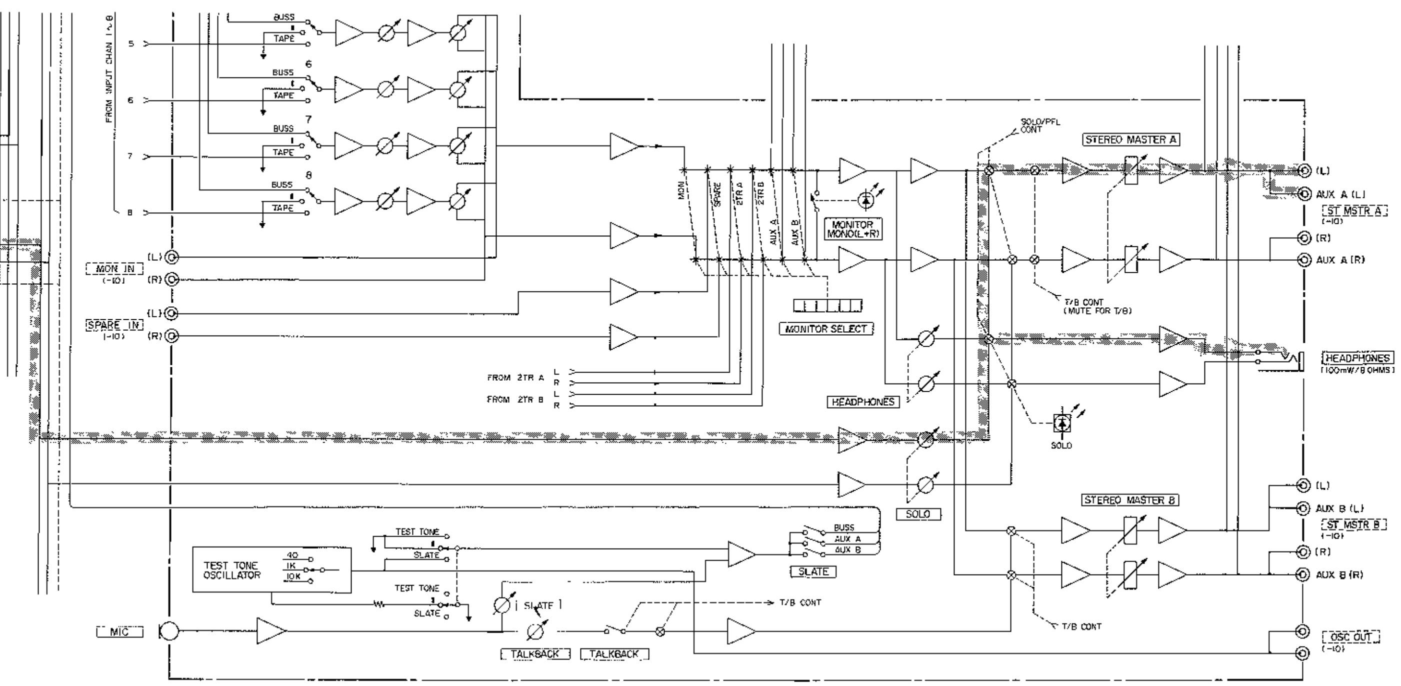
Frequency response	: 20Hz ~ 20 kHz, within ±1dB
T.H.D.	: Less than 0.025% (at 1kHz, EQ OUT, measured with 30kHz L.P.F.)

8. S/N - 1: 1 Channel to 1 Buss
   When only one of the 12 channels is ASSIGNED to Buss Master group 1, the S/N ratio should be:
   Better than 80dB using an "A" weighted network.
   Better than 76dB when measured with a band-pass filter, 20Hz to 20kHz.
   Better than 70dB when measured with an AC voltmeter of 100kHz or greater bandwidth.
9. S/N - 2: 12 Channels to 1 Buss
   When all of the 12 channels are ASSIGNED to Buss Master 1, the S/N ratio should be:
   Better than 72dB using an "A" weighted network.
   Better than 70dB when measured with a band-pass filter, 20Hz to 20kHz.
   Better than 66dB when measured with an AC voltmeter of 100kHz or greater bandwidth.
10. The remaining Buss Master groups 2 ~ 8 should also be checked in the same manner.
    When an even-numbered ASSIGN switch is depressed, set the PAN knob to position "10" (full CW).
11. Set the PAN knob to the center position.
    The LINE OUTPUT level for each selected ASSIGN switch should be –12.5dB ±1dB.



1-18. SOLO Circuit and HEADPHONES Circuit

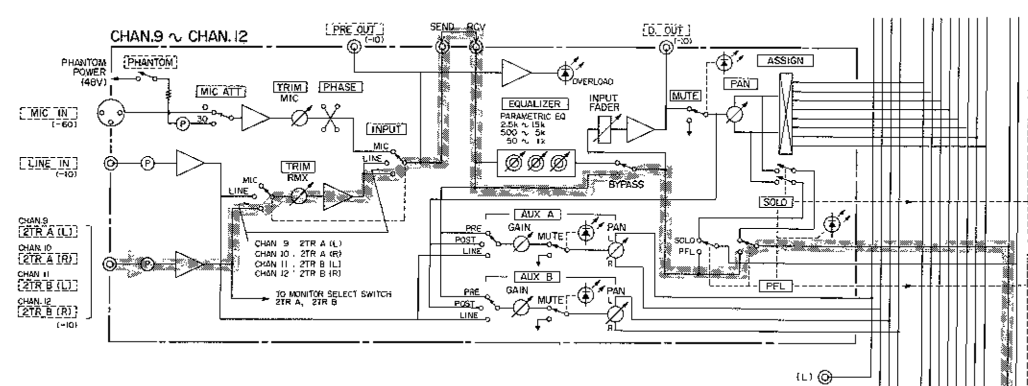


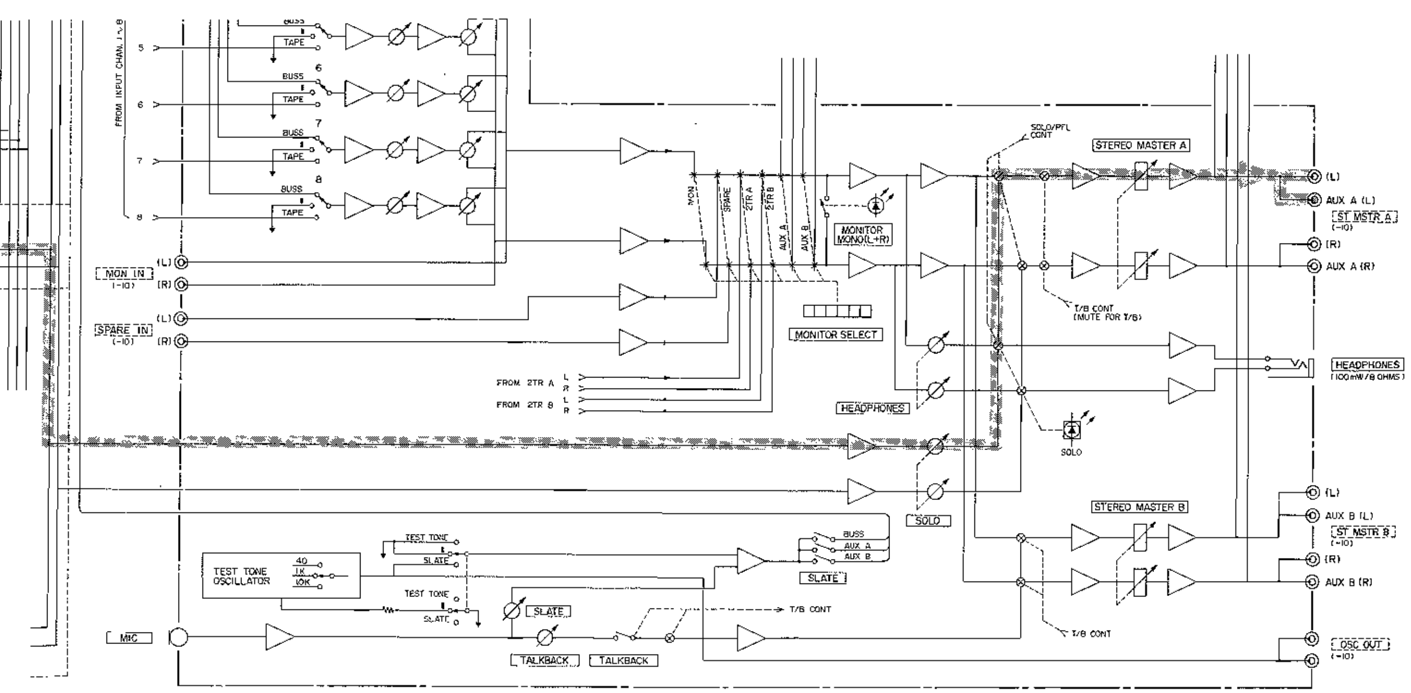


1. Apply a 1kHz, –10dB (316mV) signal to the TAPE IN or the 2 TR A&B (L/R) jack, set the input fader for a –10dB (316mV) signal at the D(irect) OUT jack, depress the SOLO button, and set the PAN knob to the CCW position.
2. Adjust the SOLO control for a –10dB (316mV) reading from the ST MSTR A jack when the STEREO MASTER A fader is set to nominal position.
3. Verify that the input fader varies the output level.
4. The LEDs located above the SOLO knob and the monitor section will light whenever the SOLO button on the input section is depressed.
5. Check all remaining input channels in the same manner.
6. Connect an 8 ohm load resistor to the HEADPHONES jack and set the HEADPHONES knob to max.
7. Adjust the input signal and measure the HEADPHONES output level just before the waveform begins to clip. This should be performed by connecting an oscilloscope across the 8 ohm load resistor.
   Max. output level: More than 0.9V (100mW)

IMPORTANT: BE SURE TO OBSERVE THE PROPER POLARITY OF THE SCOPE TEST PROBE AND THE OUTPUT OF THE HEADPHONES JACK, FAILURE TO PROPERLY CONNECT MAY CAUSE DAMAGE TO THE HEADPHONE AMPLIFIER.

1-19. PFL Circuit



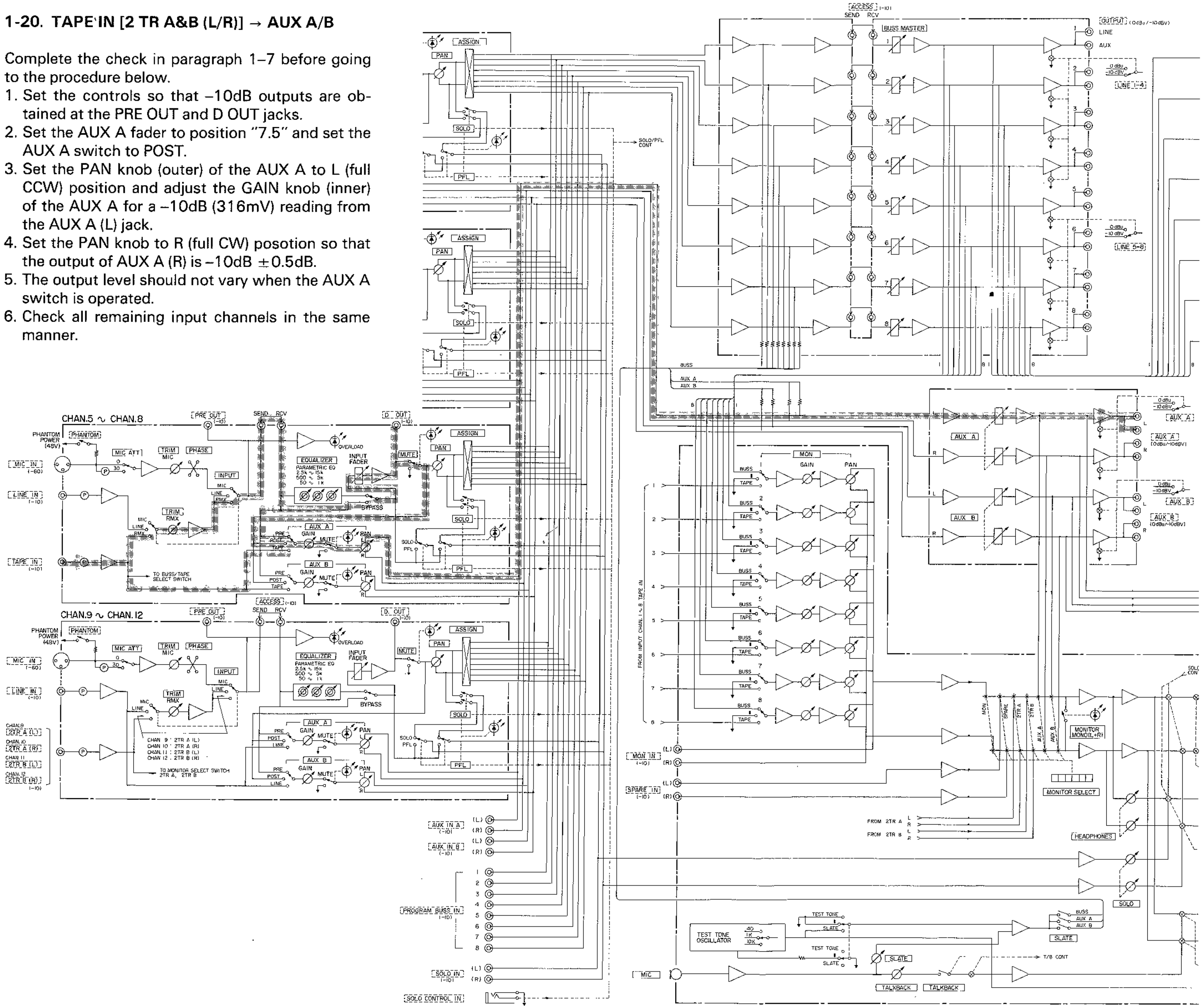


1. Apply a 1kHz, –10dB (316mV) signal to the TAPE IN or the 2TR A&B (L/R) jack, set the RMX TRIM for a –10dB (316mV) reading at the PRE OUT jack, and depress the PFL button. (Reset the SOLO button to "off".)
2. Adjust the SOLO control for a –10dB (316mV) reading from the ST MSTR A jack when the STEREO MASTER A fader is set to nominal position.
3. Varying the input fader should not cause the output level to vary.
4. The LEDs located above the SOLO knob and the monitor section will light whenever the PFL button on the input section is depressed.
5. Check all remaining input channels in the same manner.

1-20. TAPE IN [2 TR A&B (L/R)] → AUX A/B

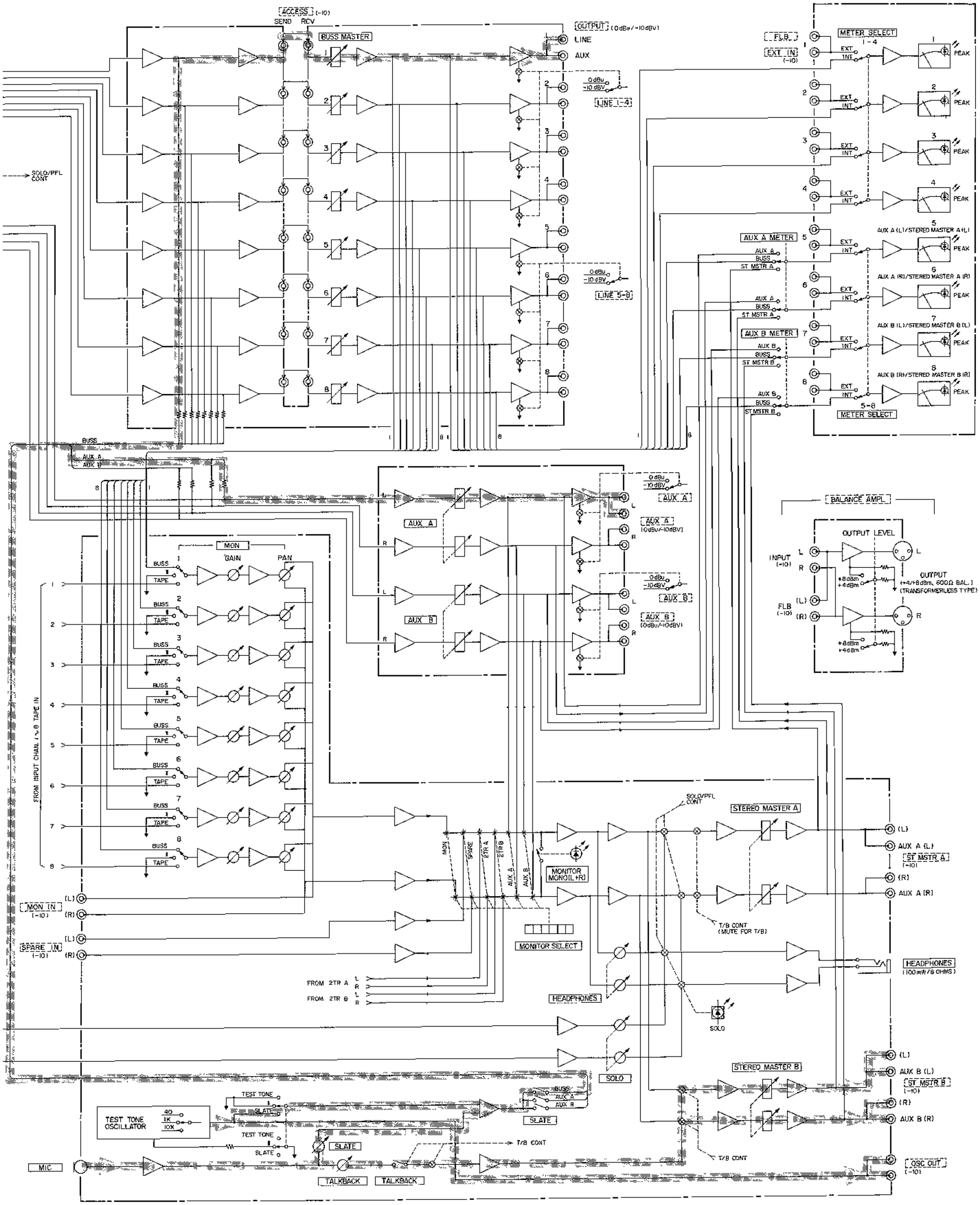
Complete the check in paragraph 1-7 before going to the procedure below.

1. Set the controls so that −10dB outputs are obtained at the PRE OUT and D OUT jacks.
2. Set the AUX A fader to position "7.5" and set the AUX A switch to POST.
3. Set the PAN knob (outer) of the AUX A to L (full CCW) position and adjust the GAIN knob (inner) of the AUX A for a −10dB (316mV) reading from the AUX A (L) jack.
4. Set the PAN knob to R (full CW) posotion so that the output of AUX A (R) is −10dB ±0.5dB.
5. The output level should not vary when the AUX A switch is operated.
6. Check all remaining input channels in the same manner.



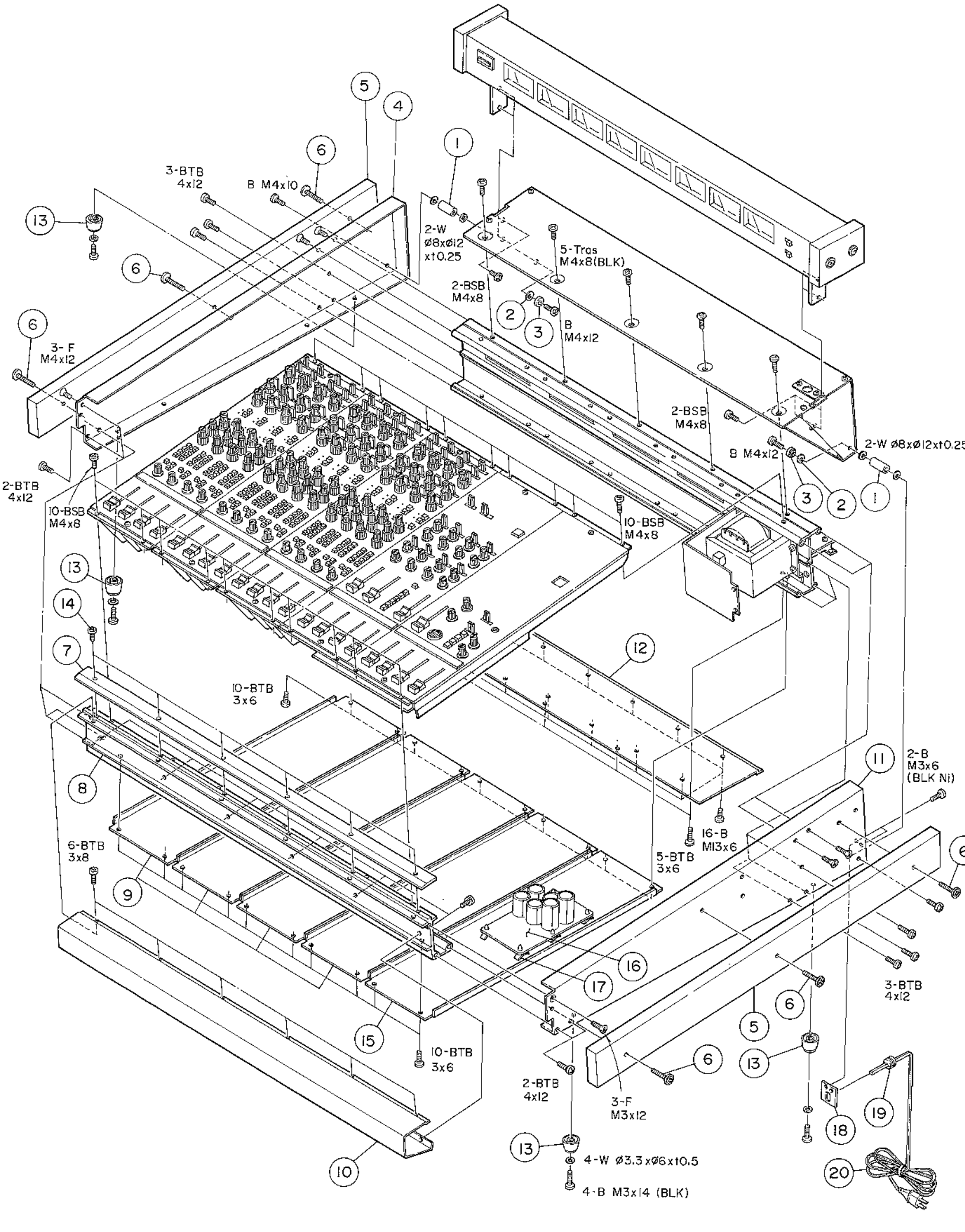
1-21. TALKBACK Circuit

1. Set the SLATE/I/TEST TONE switch to TEST TONE.
   A −10dB±1dB signal (40/1k/10k Hz) should appear at the OSC OUT jack.
2. Set the SLATE/I/TEST TONE switch to SLATE and depress the SLATE (BUSS, AUX A and AUX B) switches.
   The signal goes through the SLATE (BUSS, AUX A and AUX B) switches and appears at the LINE OUTPUT, AUX A and AUX B jacks.
3. Set the SLATE/I/TEST TONE switch to I and depress the TALKBACK switch to "on". The output from the MICrophone installed in the talkback circuit is then applied to the SLATE and the TALKBACK pots.
4. The signal is applied to the SLATE (BUSS, AUX A and AUX B) switches and the TALKBACK switch, and signal from the TALKBACK switch is applied to the STEREO MASTER B circuit.


ACCESS (-10)
SEND RCV
BUSS MASTER
OUTPUT (0dBu/-10dBV)
LINE
AUX
LINE 1-4
LINE 5-8
SOLO/PFL CONT
FLB
EXT IN
METER SELECT
PEAK
AUX A METER
AUX B METER
BUSS
AUX A
AUX B
ST MSTR A
ST MSTR B
BALANCE AMPL
OUTPUT LEVEL
INPUT
OUTPUT
MON
GAIN
PAN
TAPE
FROM INPUT CHAN. 1~8 TAPE IN
MON IN
SPARE IN
STEREO MASTER A
STEREO MASTER B
MONITOR MONO(L+R)
MONITOR SELECT
T/B CONT
HEADPHONES
SOLO
TEST TONE OSCILLATOR
TEST TONE
SLATE
TALKBACK
MIC
OSC OUT

2. EXPLODED VIEW AND PARTS LIST

2-1. Exploded View – 1 (Main Frame)



Exploded View – 1

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
1- 1	*5800370700	Coller, Rear: A	
1- 2	*5022121000	Spring, Hold: Bearing	
1- 3	*5800395100	Coller, Rear: B	
1- 4	*5800372800	Chassis, Side: L	
1- 5	5800395300	Board, Side	
1- 6	*5504549000	Screw, M4 x 25	
1- 7	*5800369702	Plate, Number	
1- 8	*5800372600	Chassis, Flont	
1- 9	*5800372301	Cover, Rear: A	
1-10	*5800397101	Pad Assy	
1-11	*5800372900	Chassis, Side: R	
1-12	*5800371302	Cover, Rear: B	
1-13	5534596000	Foot	
1-14	*5780023006	Screw, M3 x 6 Bind	
1-15	*5800455300	Cover, Rear: C	
1-16	*5200110000	PCB Assy, POWER SUPPLY [All except E]	
	*5200110010	PCB Assy, POWER SUPPLY [E]	
1-17	*5534726000	Support, Locking PCB: LCBS-3N	
1-18	*5800137100	Bracket, Cord Bush	
1-19	⚠ *5534660000	Bush, Cord: 4N-4 [J, CE, E, A]	
	⚠ *5534661000	Bush, Cord: 4K-1 [UK]	
	⚠ *5534662000	Bush, Cord: 5N-4 [C, U]	
1-20	⚠ *5128027000	Cord, AC Power [J, CE]	
	⚠ *5350008100	Cord, AC Power [C, U]	
	⚠ *5350008200	Cord, AC Power [E]	
	⚠ *5128047000	Cord, AC Power [UK]	
	⚠ *5350008300	Cord, AC Power [A]	

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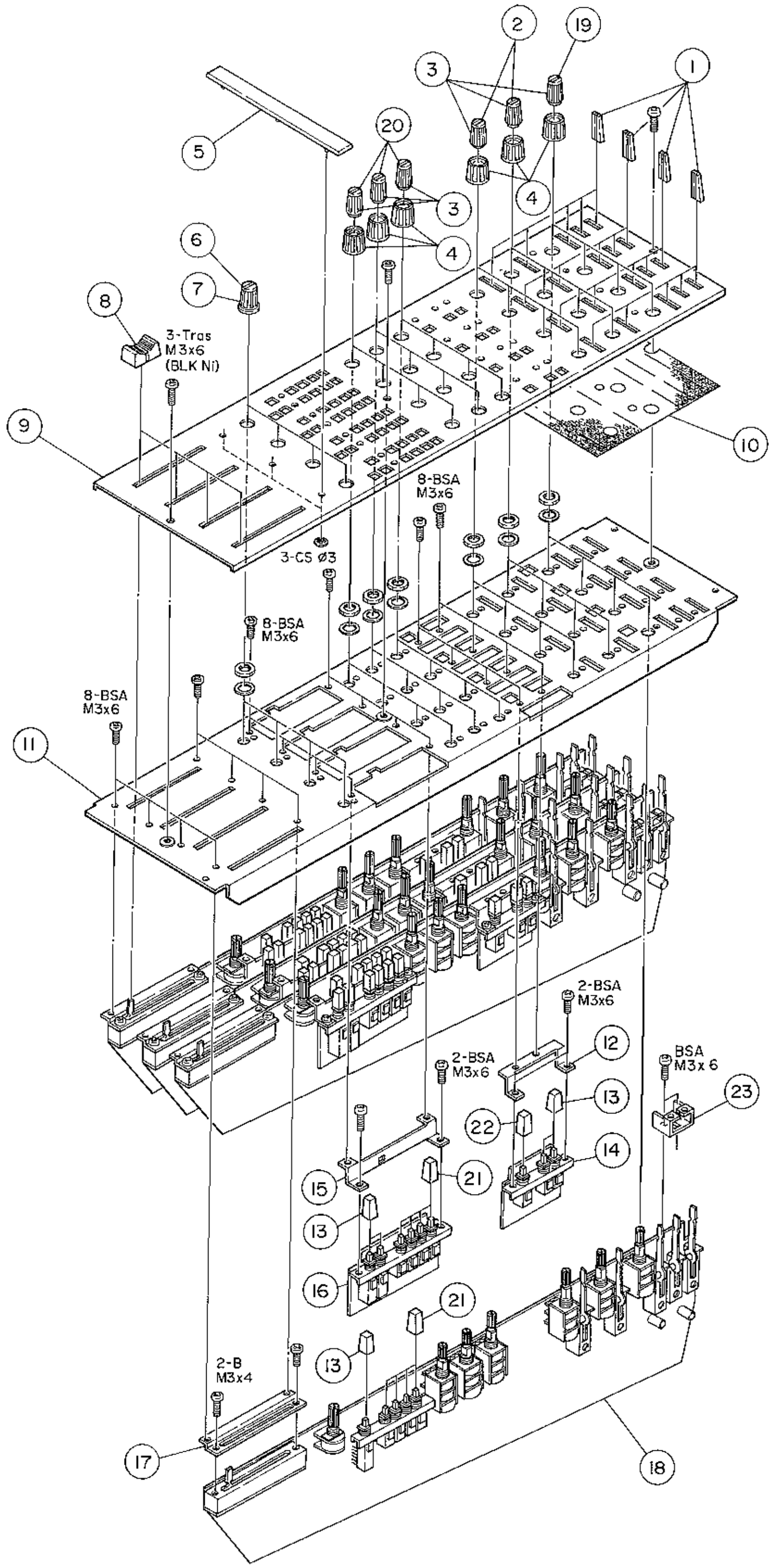
2-2. Exploded View – 2 (Input Ampl.)

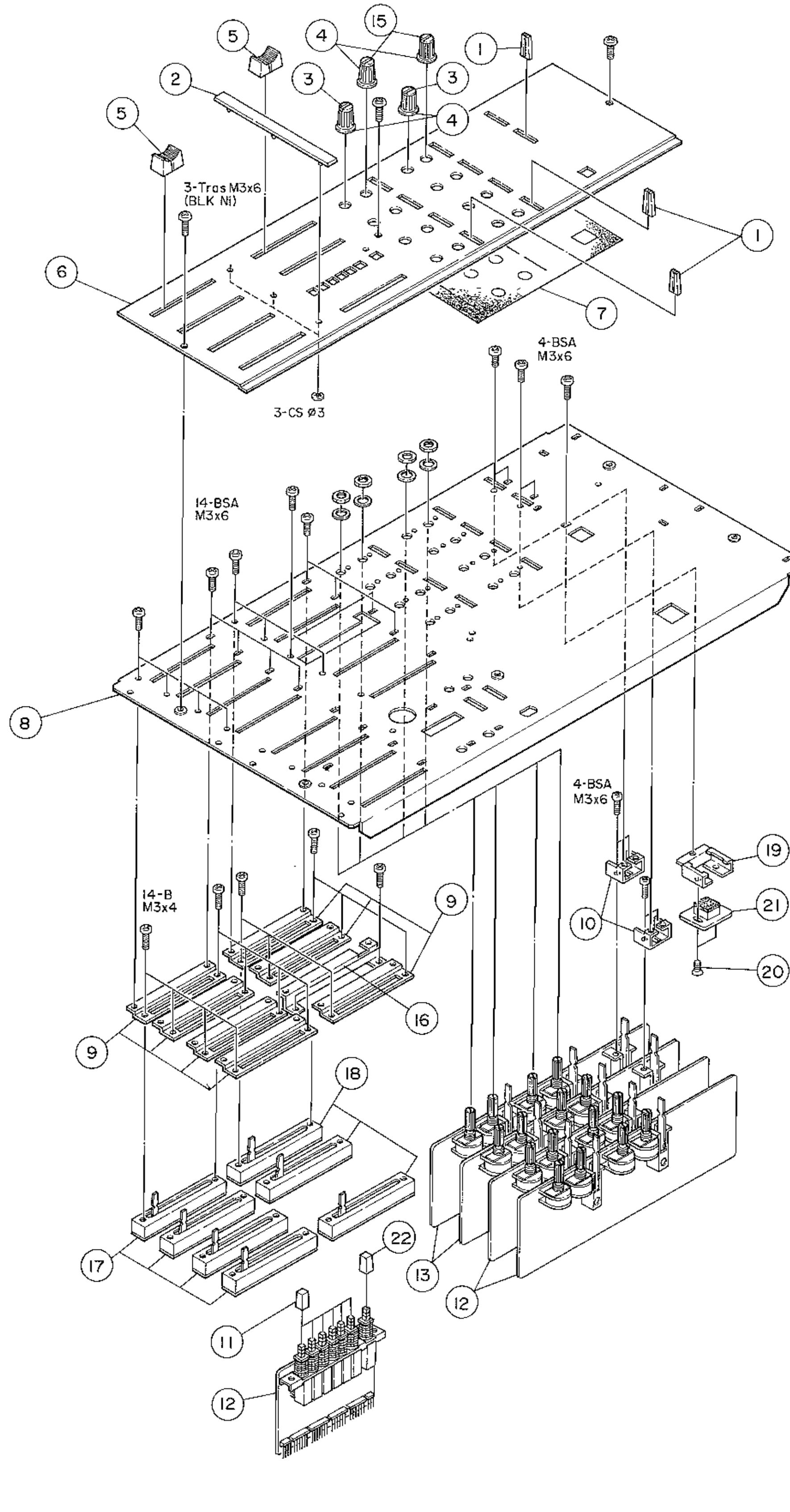


Exploded View – 2

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
2- 1	5800403300	Knob, Lever Switch	
2- 2	5800134200	Knob Cap: (green)	
2- 3	5800382800	Knob, B-11D	
2- 4	5800383000	Knob, B-15W	
2- 5	*5800380900	Plate, Memo	
2- 6	6006054100	Knob Cap: (white)	M-5
2- 7	5800382900	Knob, B-15D	
2- 8	5800383200	Knob, Fader	
2- 9	*5800372001	Panel, Input: A	
	*5800395801	Panel, Input: B	
	*5800395901	Panel, Input: C	
2-10	*5800385200	Mask, Lever Switch: C	
2-11	*5800381500	Chassis Assy, Input	
2-12	*5800370302	Plate, Switch: 4P	
2-13	5800370901	Knob, J	
2-14	5300029400	Switch A	
2-15	*5800370400	Plate, Switch: 7P	
2-16	5300029700	Switch B	
2-17	*5800370200	Plate, Fader	
2-18	*5200086200	PCB Assy, INPUT AMPL.: A	
	*5200086210	PCB Assy, INPUT AMPL.: B	
	*5200086220	PCB Assy, INPUT AMPL.: C	
	*5200086230	PCB Assy, INPUT AMPL.: D	
2-19	5800134000	Knob Cap: (red)	
2-20	5800133900	Knob Cap: (orange)	
2-21	5800453000	Knob	
2-22	5800404001	Knob, J33	
2-23	*5800370100	Plate, Lever Switch	

2-3. Exploded View – 3 (Monitor Ampl.)

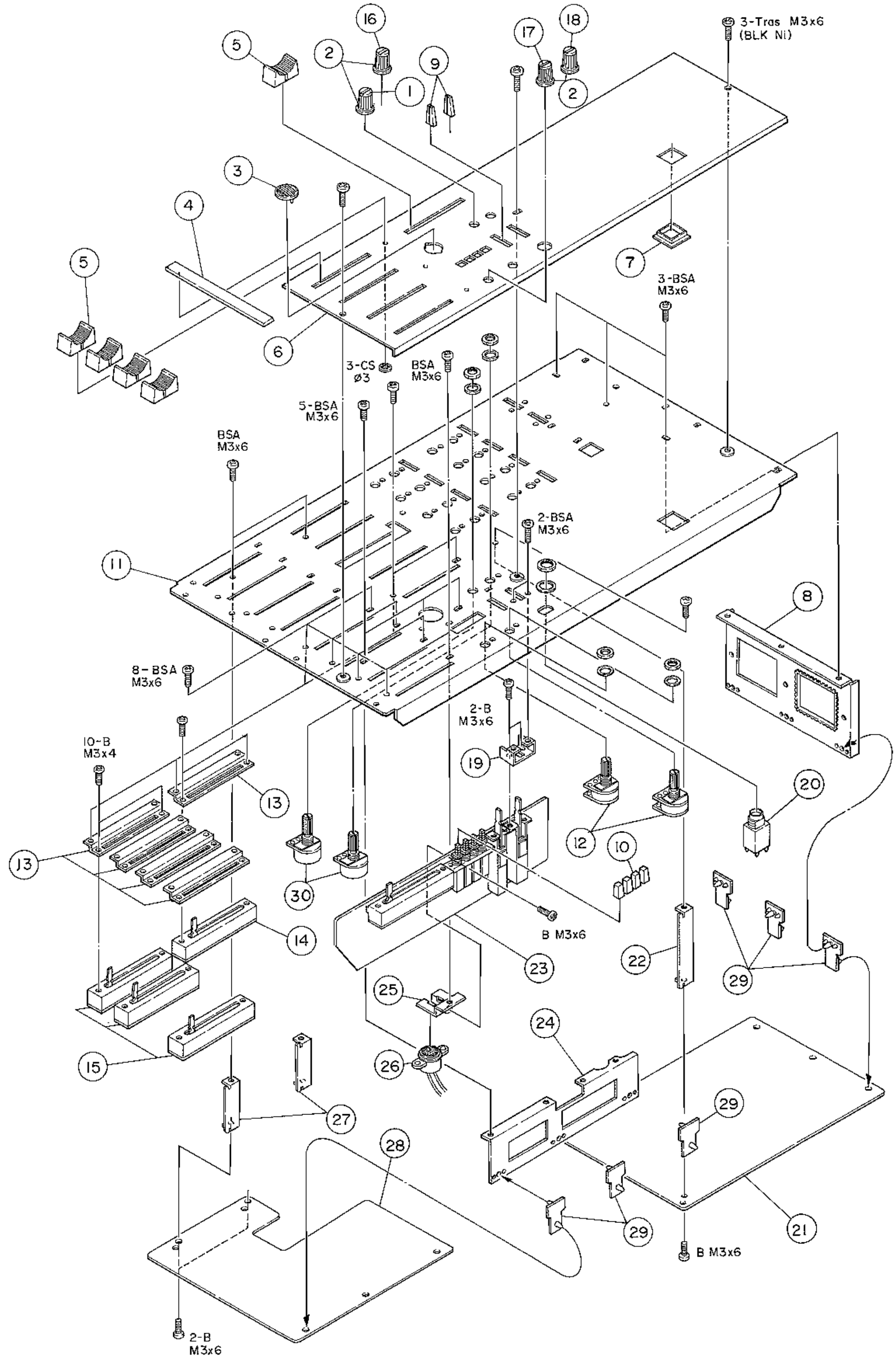


Exploded View – 3

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
3- 1	5800403300	Knob, Lever Switch	
3- 2	*5800380900	Plate, Memo	
3- 3	6006054100	Knob Cap: (ivory)	
3- 4	5800382900	Knob, B-15D	
3- 5	5800383200	Knob, Fader	
3- 6	*5800372102	Panel, Monitor	
3- 7	*5800384800	Mask, Lever Switch: D	
3- 8	*5800443600	Chassis Assy, Master	
3- 9	*5800370200	Plate, Fader	
3-10	*5800370100	Plate, Lever Switch	
3-11	5800371000	Knob, N	
3-12	*5200086900	PCB Assy,	
3-13	*5200086800	PCB Assy, MONITOR AMPL.: A	
3-14	*5200086710	PCB Assy, MONITOR AMPL.: C	
3-15	6006055100	Knob Cap: (yellow)	
3-16	*5800443000	Bracket, Selector	
3-17	5284006200	Variable Resistor, Slide; 10k ohm (A)	
3-18	5284006300	Variable Resistor, Slide; 10k ohm (A) ×2	
3-19	*5800442900	Bracket, MIC	
3-20	*5534118000	Rivet, Push	
3-21	*5200087400	LED PCB (B) Assy	
3-22	5800403900	Knob, N33	

2-4. Exploded View – 4 (Buss Ampl.)



Exploded View – 4

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
4- 1	6006056100	Knob, Cap: (red)	M-5
4- 2	5800382900	Knob, B-15D	
4- 3	*5800383100	Escutcheon, MIC	
4- 4	*5800380900	Plate, Memo	
4- 5	5800383200	Knob, Fader	
4- 6	*5800372202	Panel, Talkback	
4- 7	*5800218400	Escutcheon, Power Switch	44
4- 8	*5800443500	Bracket, BUSS PCB	
4- 9	5800403300	Knob, Lever Switch	
4-10	5800371000	Knob, N	
4-11	*5800443600	Chassis Assy, Master	
4-12	5282408500	Variable Resistor; 10k ohm (A) ×2	
4-13	*5800370200	Plate, Fader	
4-14	5284006300	Variable Resistor, Slide; 10k ohm (A) ×2	
4-15	5284006200	Variable Resistor, Slide; 10k ohm (A)	
4-16	6006055100	Knob, Cap; (yellow)	M-5
4-17	6006057100	Knob, Cap: (blue)	M-5
4-18	6006058100	Knob, Cap (green)	M-5
4-19	*5800370100	Plate, Lever Switch	
4-20	5124026000	Jack, PHONES	
4-21	*5200086600	PCB Assy, BUSS AMPL.	
4-22	*5800443100	Support, BUSS PCB	
4-23	*5200087300	PCB Assy, TALKBACK	
4-24	*5800443400	Bracket, MONITOR PCB	
4-25	*5800442900	Bracket, MIC	
4-26	6055017000	MIC, EM10PB	
4-27	*5800443200	Support, MONITOR PCB	
4-28	*5200110000	PCB Assy, POWER SUPPLY [All except E]	
	5200110010	PCB Assy, POWER SUPPLY [E]	
4-29	*5800273000	Hinge, PCB	V-1RX
4-30	5282011600	Variable Resistor; 10k ohm (A)	

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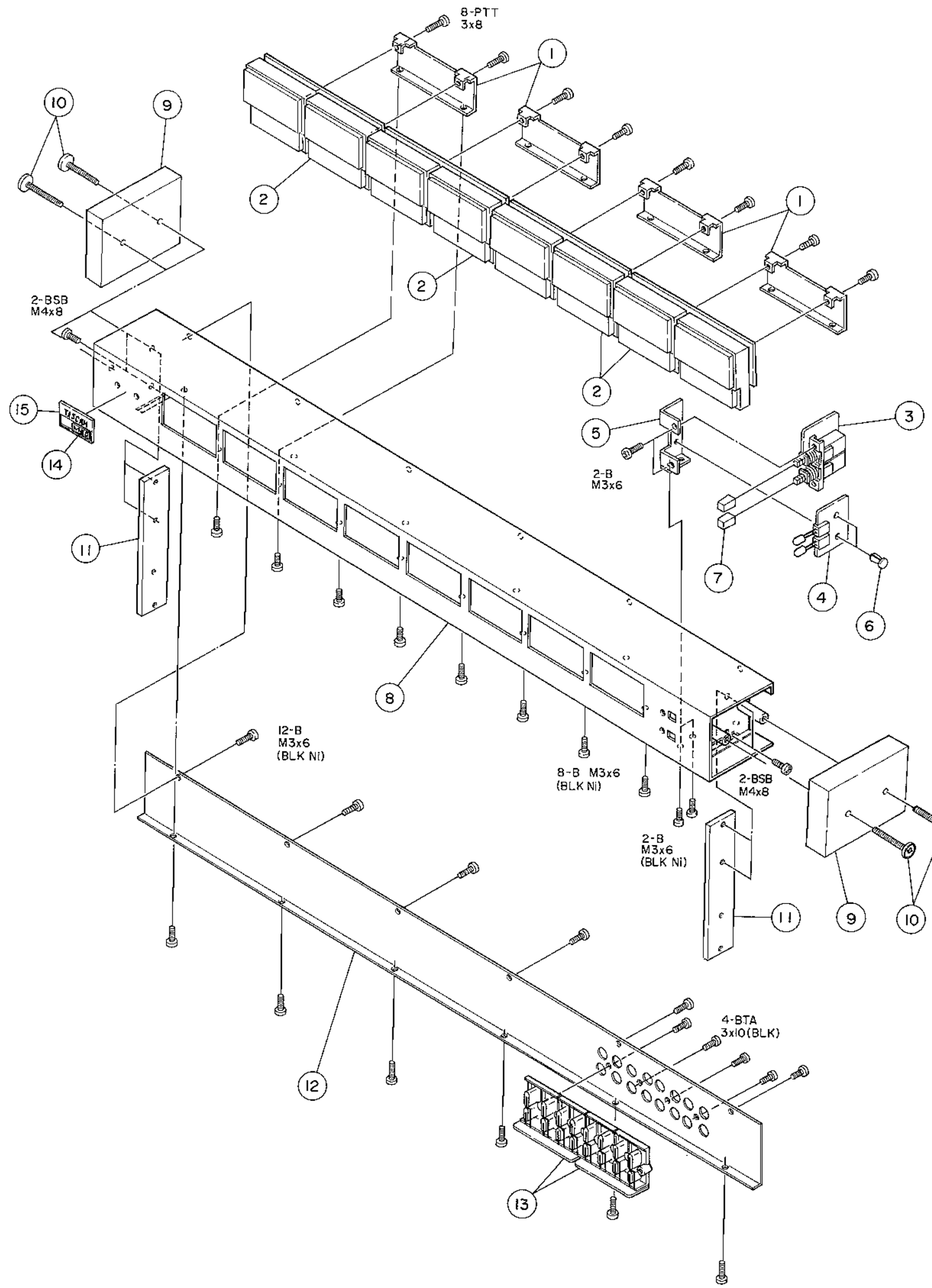
2-5. Exploded View – 5 (Meter Section)



Exploded View – 5

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
5- 1	*5800369901	Plate, Mounting Meter	
5- 2	*5200087600	PCB Assy, METER	
5- 3	*5200088200	PCB Assy, SWITCH (C)	
5- 4	*5200088300	PCB Assy, LED: A	
5- 5	*5800381000	Plate, Switch: 2P	
5- 6	*5534118000	Push Rivet	
5- 7	5800404000	Knob, J	
5- 8	*5800387501	Chassis Assy, Meter	
5- 9	*5800395200	Side Board, Meter	
5-10	*5504549000	Screw, M4 x 25	
5-11	*5800370800	Post, Meter	
5-12	*5800371900	Panel, Meter Rear	
5-13	*5200088400	PCB Assy, JACK	
5-14	*5800381100	Plate, Model	
5-15	*5720047400	Emblem: TASCAM	M-35

Exploded View – 6

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
6- 1	⚠ *5320018202	Transformer, Power [J]	
	⚠ *5320018302	Transformer, Power [U, C]	
	⚠ *5320018402	Transformer, Power [GE]	
	⚠ *5320018502	Transformer, Power [E, UK, A]	
6- 2	*5800370000	Plate, Transformer	
6- 3	*5800372702	Chassis, Main	
6- 4	*5800362500	Braket, Power Switch	
6- 5	*5200127000	PCB Assy, POWER [J]	V-1RX
	*5200127010	PCB Assy, POWER [U]	V-1RX
	*5200127020	PCB Assy, POWER [C]	V-1RX
	*5200127030	PCB Assy, POWER [GE]	V-1RX
	*5200127040	PCB Assy, POWER [E, UK A]	V-1RX
6- 6	⚠ *5043299000	Plug, Voltage Selector [GE]	
6- 7	⚠ *5332014400	Socket, Voltage Selector [GE]	
6- 8	*5800136900	Bracket, Voltage Selector [GE]	MM-20
6- 9	*5800371800	Plate, BUSS PCB	
6-10	*5200088100	PCB Assy, MOTHER: B	
6-11	*5200087100	PCB Assy, MONITOR: C	
6-12	*5200088000	PCB Assy, MOTHER: A	
6-13	*5800371700	Shield Plate, Transformer	
6-14	⚠ *5230779400	Transistor, 2SC3181 (O): Q4, Q6	
6-15	⚠ *5230506400	Transistor, 2SB755 (O): Q10	
6-16	⚠ *5230017700	Transistor, 2SA1264 (O): Q3	
6-17	*5786700400	Lug, GND [U, C]	
6-18	*5800173100	Button, Power Switch	44
6-19	*5534713000	Rod, C	X-10R

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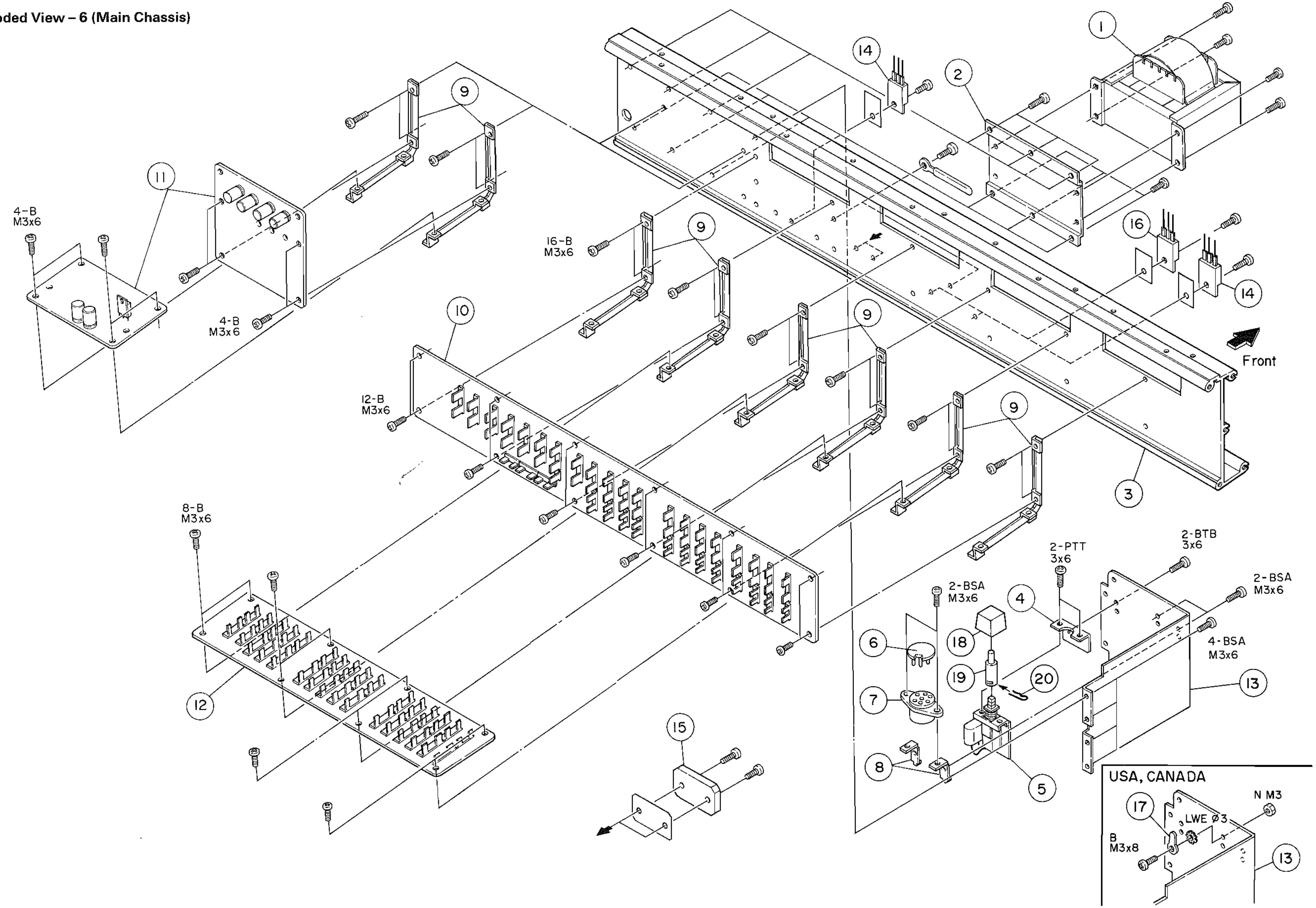
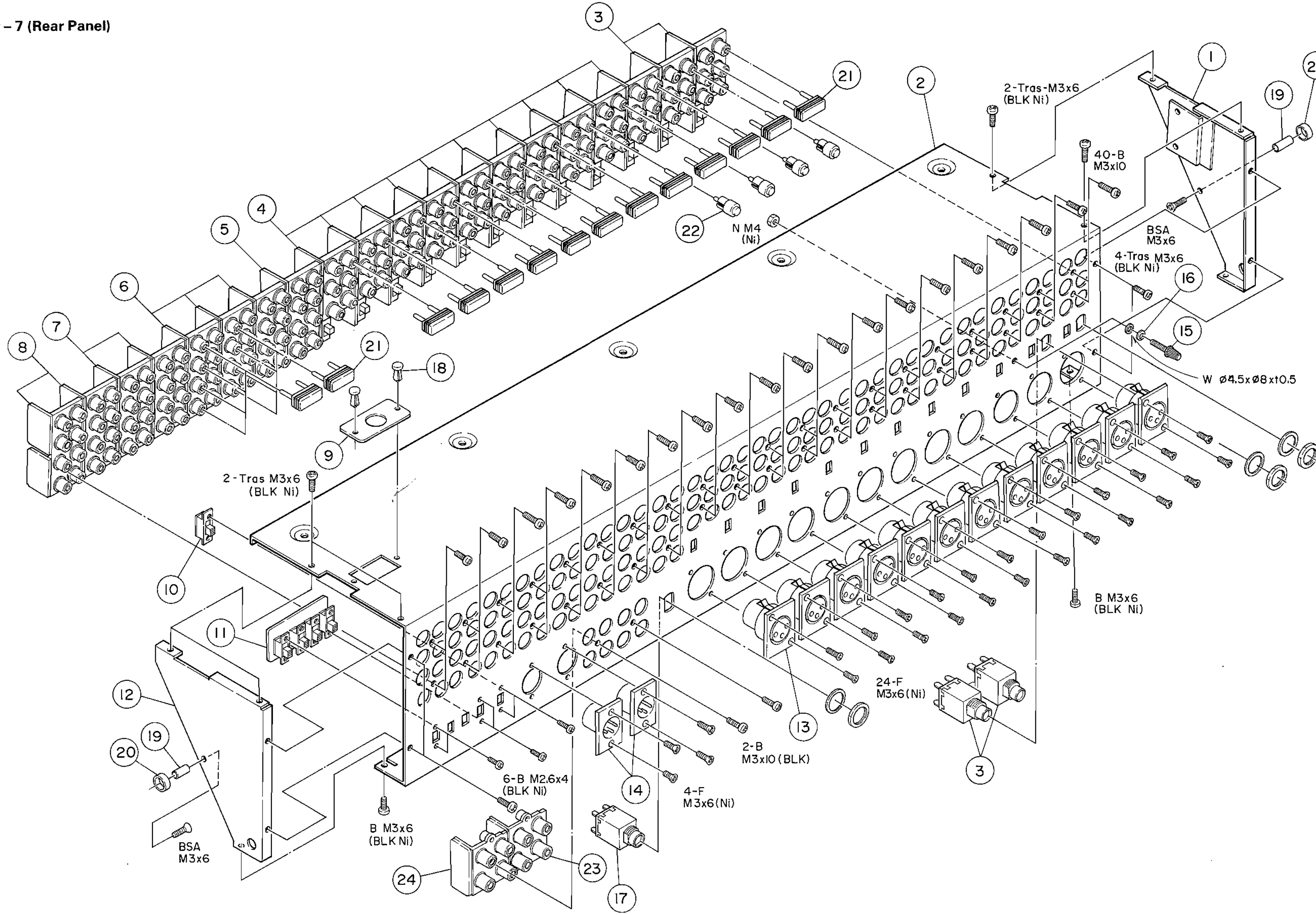
2-6. Exploded View – 6 (Main Chassis)



2-7. Exploded View – 7 (Rear Panel)



Exploded View – 7

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
7- 1	*5800395501	Plate Assy Rear: L	
7- 2	*5800372402	Panel, Rear	
7- 3	*5200088500	PCB Assy, IN/OUTPUT: A (Included INST IN Jack)	
7- 4	*5200088510	PCB Assy, IN/OUTPUT: A	
7- 5	*5200095100	PCB Assy, IN/OUTPUT: B-A	
7- 6	*5200095110	PCB Assy, IN/OUTPUT: B-B	
7- 7	*5200095120	PCB Assy, IN/OUTPUT: B-C	
7- 8	*5200095130	PCB Assy, IN/OUTPUT: B-D	
7- 9	*5800395700	Plate, Cable	
7-10	5044410000	Switch, Slide: SSB-042 (L-6)	
7-11	*5200095200	PCB Assy, Switch:D	
7-12	*5800395601	Plate Assy, Rear: R	
7-13	5334027300	Connector, Canon: XLB-31	
7-14	5334027200	Connector, Canon: XLB-32	
7-15	*5045407100	Terminal, GND	
7-16	*5785114000	Washer, Ø4	
7-17	*5043298000	Jack, SOLO CONTROL IN	
7-18	*5534118000	Push Rivet	
7-19	*5800443300	Stopper, Rear Panel	
7-20	*6014803000	Damper	
7-21	*5330507500	Shorting Bar, 2P	
7-22	*6052202000	Shorting Pin	M-3
7-23	*5200108100	PCB Assy, IN/OUTPUT: C-A	
7-24	*5200108110	PCB Assy, IN/OUTPUT: C-B	

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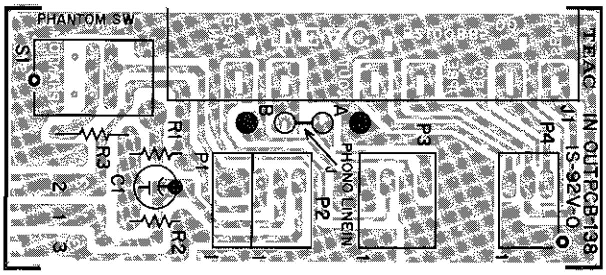
3. ELECTRONICS – PCB'S AND ELECTRONIC COMPONENTS

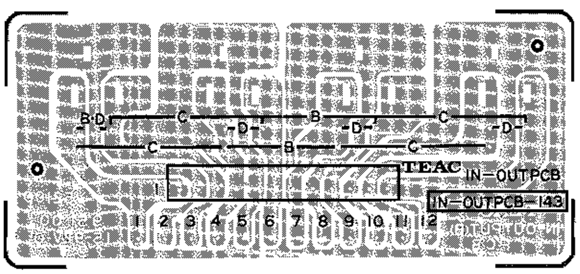
3-1. IN/OUTPUT A PCB Ass'y (1, 2)



IN/OUTPUT A PCB Ass'y (1, 2)

REF. NO.	PARTS NO.	DESCRIPTION
	5200088500	PCB Ass'y (1)
	5200088510	PCB Ass'y (2)
	5210088500	PCB
R1, R2	5241340200	Resistor, Plate ohm, 6.8kΩ
R3	⚠ 5183578000	Resistor, Carbon 100Ω Nonflammble
C1	5260163150	Capacitor, Elec., 10μ 100V
J1	5330507300	Pin Jack, 6P
S1	5300908900	Switch, Slide
P1	5122145000	Connector Plug, 2P
P2	5122146000	Connector Plug, 3P
P3	5122147000	Connector Plug, 4P
P4	5122454000	Connector Plug, 3P (RED)
	5043297000	INST IN Jack (1 only)
	5800453400	Plate, Shield (2 only)
	5780003006	Screw, Bind, M3 × 6 (2 only)
	5781823000	Nut, M3 (2 only)

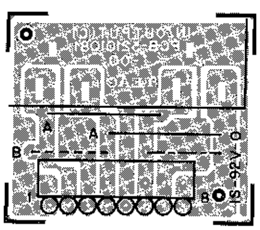
3-2. IN/OUTPUT B PCB Ass'y (A, B, C, D)



IN/OUTPUT B PCB Ass'y (A, B, C, D)

REF. NO.	PARTS NO.	DESCRIPTION
	5200095100	PCB Ass'y (A)
	5200095110	PCB Ass'y (B)
	5200095120	PCB Ass'y (C)
	5200095130	PCB Ass'y (D)
	5210095100	PCB
	5330507200	Jack, 4P
	5122155000	Connector Plug, 12P

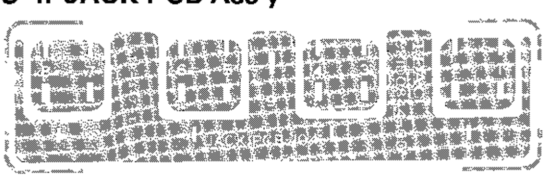
3-3. IN/OUTPUT C PCB Ass'y (A – D)



IN/OUTPUT C PCB A'ssy (A – B)

REF. NO.	PARTS NO.	DESCRIPTION
	5200108100	PCB Ass'y
	5210108100	PCB
	5330507200	4P Jack
P1	5122147000	Connector Plug, 4P
P2	5122145000	Connector Plug, 2P (B only)

3-4. JACK PCB Ass'y

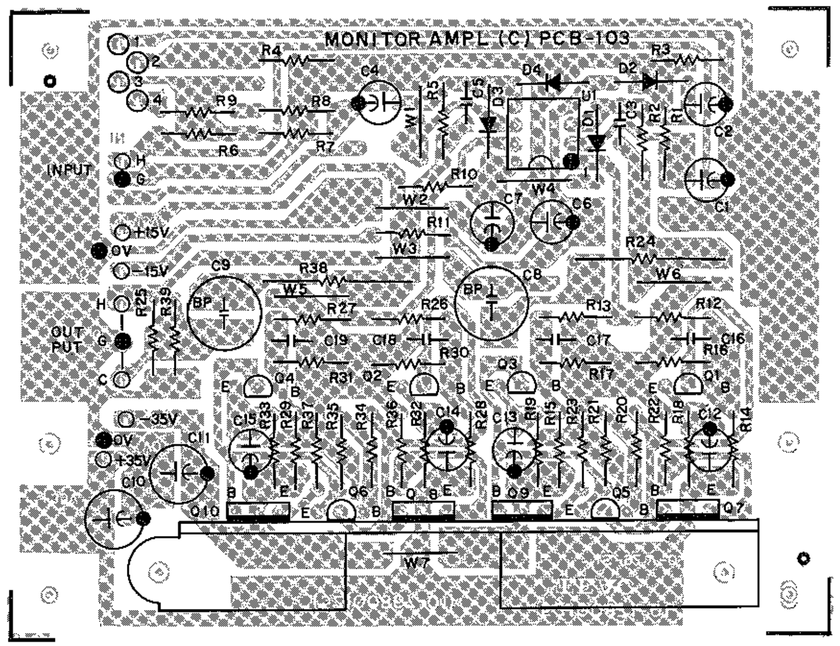


(Viewed from foil side)

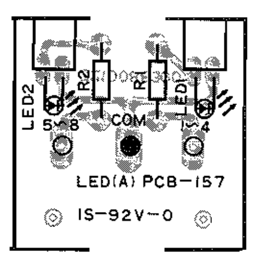
JACK PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	5200088400	PCB Ass'y
	5210084400	PCB
J1, J2	5330507200	Pin Jack, 4P

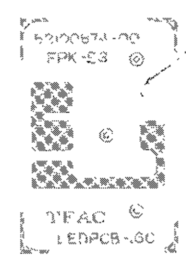
3-9. MONITOR AMPL. C



3-10. LED A PCB Ass'y



3-11. LED B PCB Ass'y



(Viewed from foil side)

LED A PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION	
	5200088300	PCB Ass'y	
	5210088300	PCB	
		CARBON RESISTORS	
R1, R2	5181482000	1kΩ	±5% 1/2W
		MISCELLANEOUS	
D1, D2	5225006900	LED, PR3432S	
J1, J2	5122373000	Connector Socket, 2P	

LED B PCB Ass'y

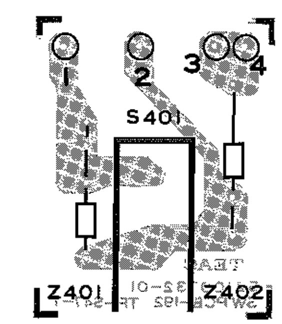
REF. NO.	PARTS NO.	DESCRIPTION
	5200087400	PCB Ass'y
	5210087400	PCB
D1	5225008800	LED Ass'y (RED)

MONITOR AMPL. C PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION		
	5200087101	PCB Ass'y		
	5210087101	PCB		
		IC		
U1	5220407000	TL072CP		
		TRANSISTORS		
Q1, Q2	5230016200	2SA-992 (E)		
Q3, Q4	5230774300	2SC-1845 (F)		
Q5, Q6	5230770400	2SC-1815 (BL)		
Q7, Q8	5230779200	2SC-2824 (Y)		
Q9, Q10	5230017500	2SA-1184 (Y)		
		DIODES		
D1～D4	5143118000	1S2473HJ		
		CARBON RESISTORS All resistors are rated ±5% tolerance at 1/4W.		
R1	5181522000	47kΩ		
R2	5241149700	4.3kΩ	Metal Film	
R3	5241148600	1.5kΩ	Metal Film	
R4	5241148800	1.8kΩ	Metal Film	
R5	5241152500	62kΩ	Metal Film	
R6	5181446000	33Ω		
R7	5241151100	16kΩ	Metal Film	
R8	5241151500	24kΩ	Metal Film	
R9	5181488000	1.8kΩ		
R10, R11	⚠ 5183566000	33kΩ	Nonflammable	
R12, R13	5181522000	47kΩ		
R14, R15	5181490000	2.2kΩ		
R16, R17	5181532000	120kΩ		
R18, R19	5181480000	820Ω		
R20	5181488000	1.8kΩ		
R21	5181490000	2.2kΩ		
R22, R23	5181428000	5.6kΩ		
R24	5184802000	300Ω		2W
R25	5181506000	10kΩ		
R26, R27	5181522000	47kΩ		
R28, R29	5181490000	2.2kΩ		
R30, R31	5181532000	120kΩ		
R32, R33	5181480000	820kΩ		
R34	5181488000	1.8kΩ		
R35	5181490000	2.2kΩ		
R36, R37	5181428000	5.6kΩ		
R38	⚠ 5184802000	300Ω (2W)	Nonflammable	
R39	5181506000	10kΩ		

REF. NO.	PARTS NO.	DESCRIPTION		
		CAPACITORS		
C1	5260162650	Elec.	10μF	25V
C2	5260165252	Elec.	47μF	25V
C3	5172217000	Ceramic	270pF	
C4	5260163452	Elec.	22μF	25V
C5	5172204000	Ceramic	22pF	
C6, C7	5260165252	Elec.	47μF	25V
C8, C9	5260069910	Elec.	47μF	50V
C10, C11	5260165452	Elec.	47μF	50V
C12～C15	5260165952	Elec.	100μF	10V
C16～C19	5172204000	Ceramic	22pF	
		MISCELLANEOUS		
	5033291000	Plate, Insulator (4 used)		
	5780103008	Screw, PM3 x 8		
	5800463400	Heat Sink; A		
	5781023006	Screw, PTB 3 x 6		

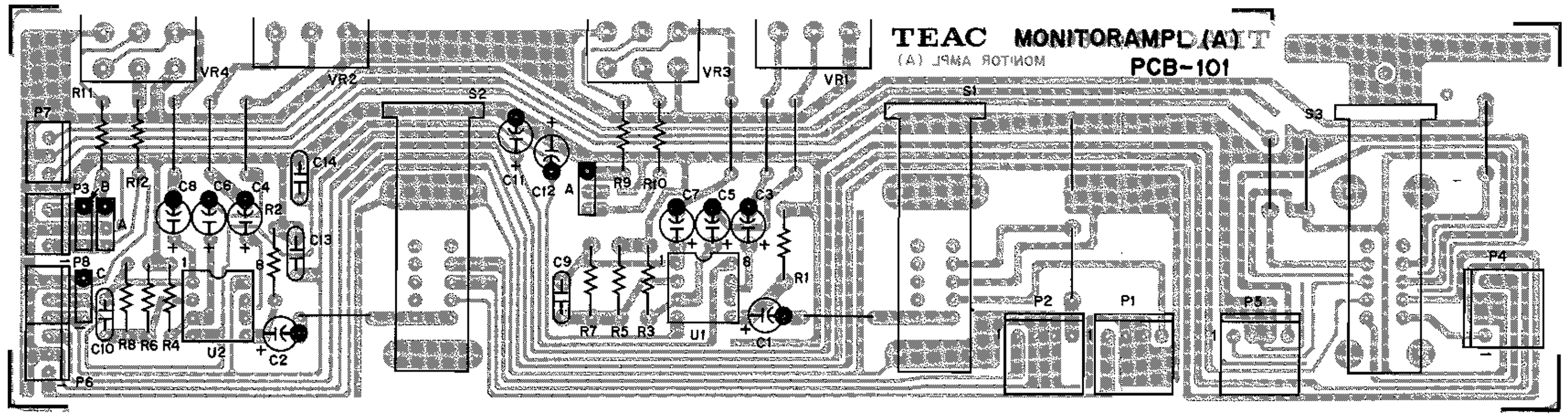
3-12. POWER SWITCH PCB Ass'y



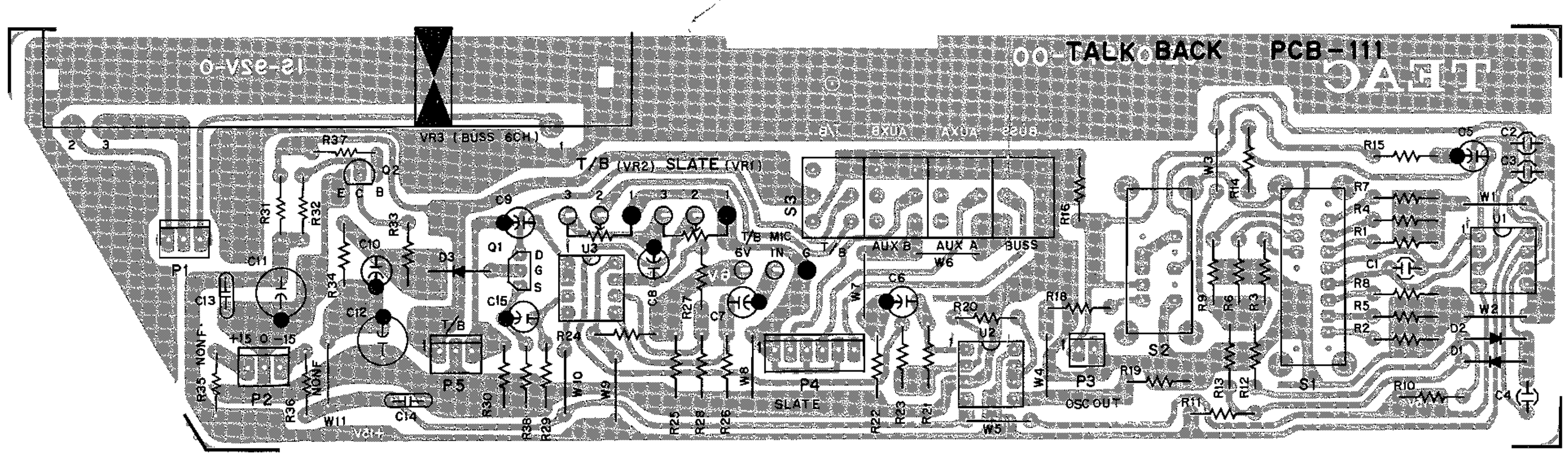
POWER SWITCH PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION	
	5200127000	Power Switch PCB Ass'y	[J]
	5200127010	Power Switch PCB Ass'y	[U]
	5200127020	Power Switch PCB Ass'y	[C]
	5200127030	Power Switch PCB Ass'y	[GE]
	5200127040	Power Switch PCB Ass'y	[E, UK, A]
	5210073201	PCB	
S401	⚠ 5300030800	Switch, Push	
Z401	⚠ 5052907000	Spark Killer 0.01μF + 300Ω/300V [J]	
	⚠ 5052910000	Spark Killer 0.033μF + 120Ω/125V [U]	
	⚠ 5292002600	Spark Killer 0.033μF + 120Ω/125V [C]	
	⚠ 5292002500	Spark Killer 0.01μF + 300Ω [GE]	
	⚠ 5267702500	Spark Killer 0.0047μF 250V [E, UK, A]	
Z402	⚠ 5267702600	Spark killer 0.047μF 250V [E, UK, A]	

3-13. MONITOR AMPL. A PCB Ass'y



3-14. TALKBACK PCB Ass'y



MONITOR AMPL. A PCB Ass'y

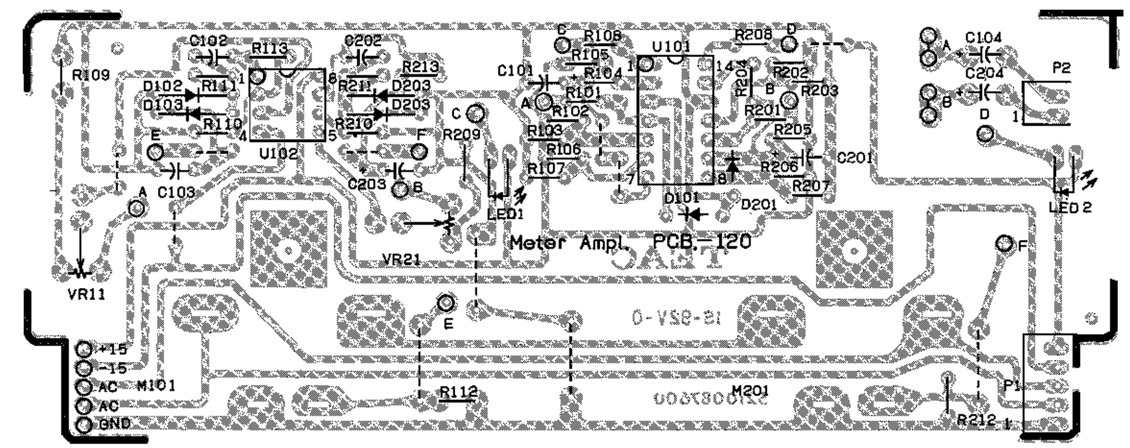
REF. NO.	PARTS NO.	DESCRIPTION
	5200086800	PCB Ass'y (1)
	5200086810	PCB Ass'y (2)
	5210086800	PCB
		IC'S
U1, U2	5220407000	TL072CP
		CARBON RESISTORS All resistors are rated ±5% tolerance at 1/4W.
R1 ~ R4	5181530000	100kΩ
R5, R6	5181506000	10kΩ
R7, R8	5181510000	15kΩ
R9 ~ R12	5181514000	22kΩ
		CAPACITORS
C1, C2	5260162550	Elec. 10μF 16V
C3, C4	5260163452	Elec. 22μF 25V
C5, C6	5260162550	Elec. 10μF 16V
C7, C8	5260163452	Elec. 22μF 25V
C9, C10	5054758000	Dip Mica 82pF
C11, C12	5260165252	Elec. 47μF 25V
C13, C14	5254204000	Ceramic 0.01μF 50V
		VARIABLE RESISTORS
VR1, VR2	5282011500	10kΩ (A)
VR3, VR4	5282408600	5kΩ (A, C)
		CONNECTOR PLUGS
P1	5122128000	4P
P2	5122185000	4P (BLK) (1 Only)
P3	5122127000	3P
P4	5122147000	4P (1 Only)
P5	5122128000	4P
P6	5334028800	3P (YEL) (1 Only)
P7	5122184000	3P (BLK) (1 Only)
P8	5122300000	3P (RED)
		SWITCHES
S1 ~ S3	5132036000	Lever, SLR523 (S3 = 1 Only)

TALKBACK PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	5200087301	PCB Ass'y
	5210087300	PCB
		IC'S
U1 ~ U3	5220406600	μPC4558
		TRANSISTORS
Q1	5232007000	2SK-304 (EF)
Q2	5145151000	2SC-1815 (GR)
		DIODES
D1 ~ D3	5143118000	1S2473HJ
		CARBON RESISTORS All resistors are rated ±5% tolerance at 1/4W.
R1 ~ R3	5181544000	390kΩ
R4 ~ R6	5181510000	15kΩ
R7 ~ R9	5181486000	1.5kΩ
R10, R11	5181492000	2.7kΩ
R12, R13	5181482000	1kΩ
R14	5181502000	6.8kΩ
R15	5181501000	6.2kΩ
R16	5181474000	470kΩ
R18	5181482000	1kΩ
R19	5181530000	100kΩ
R20 ~ R22	5181522000	47kΩ
R23	5181510000	15kΩ
R24	5181504000	8.2kΩ
R25	5181500000	5.6kΩ
R26	5181522000	47kΩ
R27	5181530000	100kΩ
R28	5181482000	1kΩ
R29, R30	5181522000	47kΩ
R31	5181506000	10kΩ
R32	5181514000	22kΩ
R33	5181530000	100kΩ
R34	5181536000	180kΩ
R35, R36	5183570000	47Ω Nonflammable
R37	5181530000	100kΩ
R38	5181522000	47kΩ

REF. NO.	PARTS NO.	DESCRIPTION		
		CAPACITORS		
C1, C2	5054877500	Myler	0.01μF	
C3	5054878500	Myler	0.001μF	
C4	5054877500	Myler	0.01μF	
C5, C6	5260163352	Elec.	22μF	16V
C7	5260162550	Elec.	10μF	16V
C8, C9	5260163352	Elec.	22μF	16V
C10	5260160750	Elec.	1μF	50V
C11, C12	5260166052	Elec.	100μF	16V
C13, C14	5054204000	Ceramic	0.01μF	50V
C15	5260162550	Elec.	10μF	16V
		VARIABLE RESISTORS		
VR1, VR2	5282011600		10kΩ (A)	
VR3	5284006400	Slide	10kΩ (C)	
		SWITCHES		
S1	5132040000	Lever, SLR543		
S2	5132036000	Lever, SLR523		
S3	5300032100	Push, 4-gang		
		CONNECTOR PLUGS		
P1	5122127000	3P		
P2	5122300000	3P (RED)		
P3	5122126000	2P		
P4	5122130000	6P		
P5	5122184000	3P (BLK)		
		MISCELLANEOUS		
M1	6055017000	MIC, EM10PB		

3-15. METER AMPL. PCB Ass'y

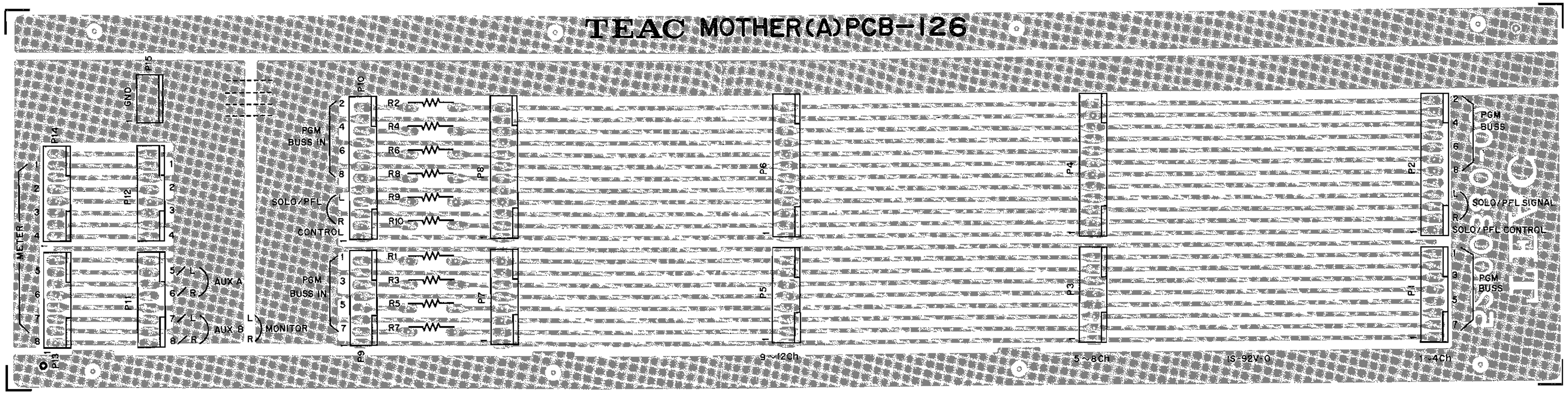


METER AMPL. PCB Ass'y

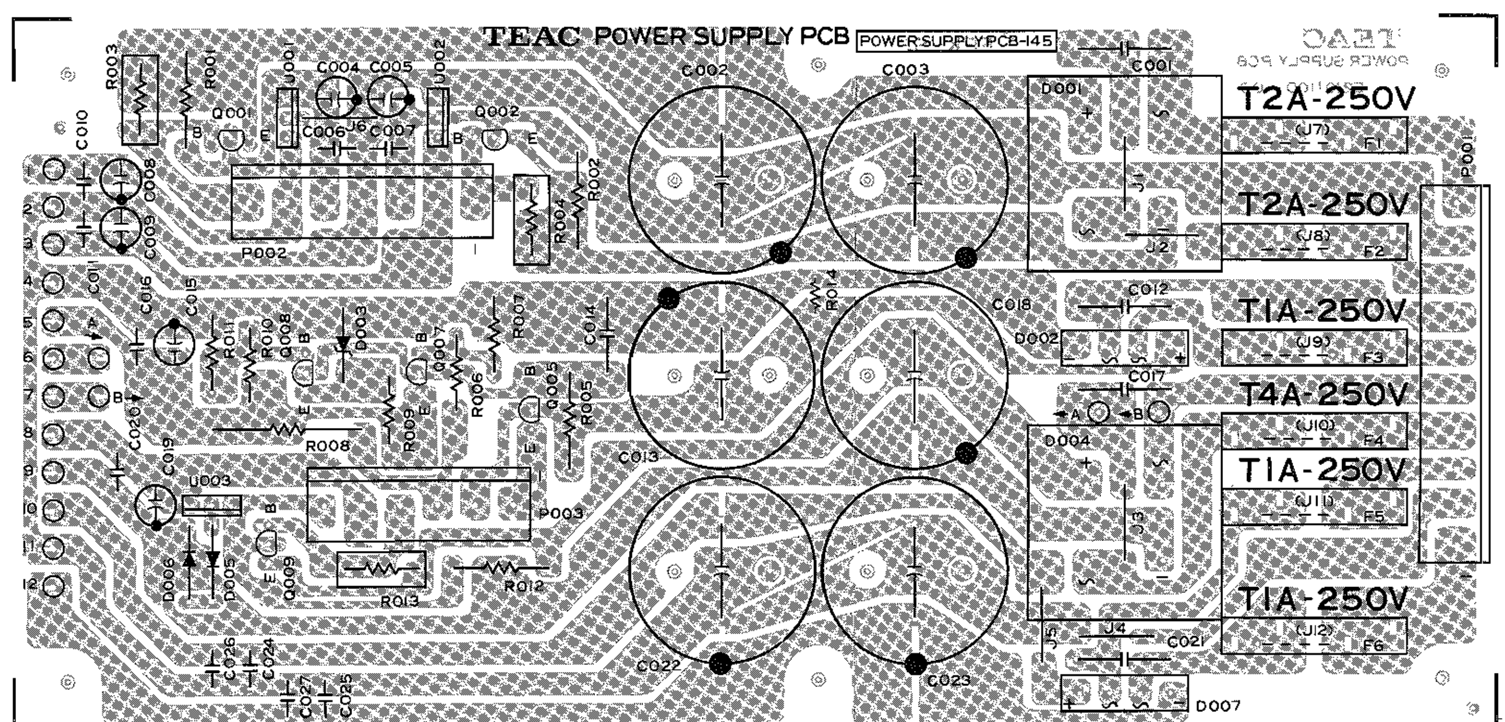
REF. NO.	PARTS NO.	DESCRIPTION
	5200087600	PCB Ass'y
	5210087600	PCB
		IC'S
U101	5220416900	LM339N
U102	5220406600	μPC4558
		DIODES
D101	5042517000	IS2473VE
D102, D103	5042213000	IN60
D201	5042517000	IS2473VE
D202, D203	5042213000	IN60
		CARBON RESISTERS All resistors are rated ±5% tolerance at 1/4W.
R101	5240173000	100kΩ
R102	5240173700	150kΩ
R103	5240171100	16kΩ
R104	5240165800	100Ω
R105	5240173000	100kΩ
R106	5240171600	27kΩ
R107	5240172200	47kΩ
R108	5240168600	1.5kΩ
R109	5240170600	10kΩ
R110	5240171200	18kΩ
R111, R112	5240168800	1.8kΩ
R113	5240173000	100kΩ
R201	5240173000	100kΩ
R202	5240173000	150kΩ
R203	5240171100	16kΩ

REF. NO.	PARTS NO.	DESCRIPTION		
R204	5240165800	100Ω		
R205	5240173000	100kΩ		
R206	5240171600	27kΩ		
R207	5240172200	47kΩ		
R208	5240168600	1.5kΩ		
R209	5240170600	10kΩ		
R210	5240171200	18kΩ		
R211, R212	5240168800	1.8kΩ		
R213	5240173000	100kΩ		
		CAPACITORS		
C101	5260160750	Elec.	1μF	50V
C102	5260163352	Elec.	22μF	16V
C103	5260162050	Elec.	4.7μF	35V
C104	5260162550	Elec.	10μF	16V
C201	5260160750	Elec.	1μF	50V
C202	5260163352	Elec.	22μF	16V
C203	5260162050	Elec.	4.7μF	35V
C204	5260162550	Elec.	10μF	16V
		VARIABLE RESISTORS		
VR11	5280003502	Semi-fixed	10kΩ (B)	
VR21	5280003502	Semi-fixed	10kΩ (B)	
		MISCELLANEOUS 11V AC		
M101, M201	5296006100	VU Meter ← Meter lamp 5310005200		
D1, D2	5225006900	LED, PR3432S		
	5800385100	LED Spacer		
P1	6052379005	Connector Plug, 5P		
P2	6052379002	Connector Plug, 2P		

3-16. MOTHER A PCB Ass'y



3-17. POWER SUPPLY PCB Ass'y



MOTHER A PCB Ass'y

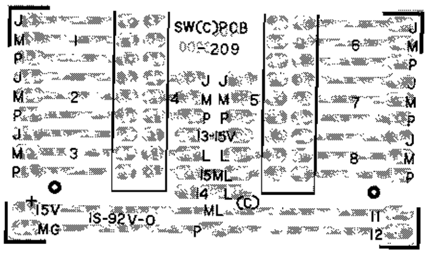
REF. NO.	PARTS NO.	DESCRIPTION
	5200088000	PCB Ass'y
	5210088000	PCB
		CARBON RESISTORS All resistors are rated ±5%, tolerance at 1/4W.
R1~R10	5181514000	22kΩ
		CONNECTOR PLUGS
P1	5122132000	8P
P2	5122136000	12P
P3	5122132000	8P
P4	5122136000	12P
P5	5122132000	8P
P6	5122136000	12P
P7	5122132000	8P
P8	5122136000	12P
P9	5334029300	8P (YEL)
P10	5334029700	12P (YEL)
P11	5122305000	8P (RED)
P12	5122132000	8P
P13	5122305000	8P (RED)
P14	5122132000	8P

POWER SUPPLY PCB Ass'y

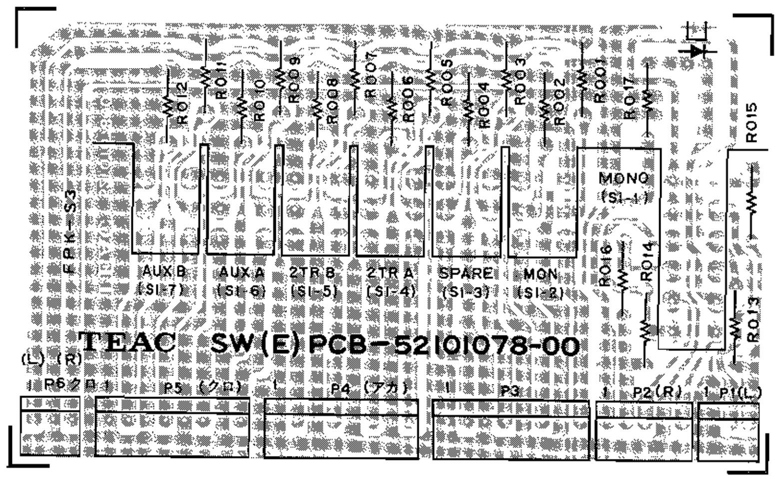
REF. NO.	PARTS NO.	DESCRIPTION
	5200110000	PCB Ass'y (All except EUR)
	5200110010	PCB Ass'y (EUR)
	5210110000	PCB
		IC'S
U1	⚠ 5220415600	7815
U2	⚠ 5220412400	7915
U3	⚠ 5220405100	78M05
		TRANSISTORS
Q1	5230014000	2SA-1020 (Y)
Q2	5230773800	2SC-2655 (Y)
Q5	5230773800	2SC-2655 (Y)
Q7, Q8	5230773800	2SC-2655 (Y)
Q9	5230014000	2SA-1020 (Y)
		DIODES
D1	⚠ 522800T200	D4BB20
D2	⚠ 5228006600	KBP604 G1
D3	⚠ 5143297000	WZ240, Zener
D4	⚠ 5228007200	D4BB20
D5, D6	5143211800	1S2473HJ
D7	⚠ 5228006600	KBP604 G1
		CARBON RESISTORS' **All resistors are roted ±5% tolerance at 1/4W.**
R1, R2	⚠ 5184247000	82Ω Nonflammable
R3, R4	⚠ 5185191000	0.33Ω 2W Metal Film
R5	⚠ 5182042000	6.8kΩ Nonflammable
R6	5181486000	1.5kΩ
R7	5181522000	47kΩ
R8	⚠ 5052810000	10Ω 2W Metal Film
R9	⚠ 5180094000	3.3kΩ
R10	5181498000	4.7kΩ
R11	5181500000	5.6kΩ
R12	⚠ 5184247000	82Ω Nonflammable
R13	⚠ 5185191000	0.33Ω 2W Metal Film

REF. NO.	PARTS NO.	DESCRIPTION		
		CAPACITORS		
C1	⚠ 5263164500	Metalized	0.047μF	250V
C2, C3	⚠ 5262001800	Elec.	4700μF	35V
C4, C5	5260160750	Elec.	1μF	50V
C6, C7	5054204000	Ceramic	0.01μF	50V
C8, C9	5260165252	Elec.	47μF	25V
C10, C11	5054204000	Ceramic	0.01μF	50V
C12	⚠ 5263164500	Metalized	0.047μF	250V
C13	⚠ 5262001900	Elec.	1000μF	100V
C14	5054223000	Ceramic	0.01μF	500V
C15	5260163150	Elec.	10μF	100V
C16	5054223000	Ceramic	0.01μF	500V
C17	⚠ 5263164500	Metalized	0.047μF	250V
C18	⚠ 5262002000	Elec.	10000μF	25V
C19	5260165252	Elec.	47μF	25V
C20	5054204000	Ceramic	0.01μF	50V
C21	⚠ 5263164500	Metalized	0.047μF	250V
C22, C23	⚠ 5262002500	Elec.	4700μF	50V
C24~C27	5054204000	Ceramic	0.01μF	50V
		FUSES		
F1, F2	⚠ 5142189000	T2A 250V (EUR only)		
F3	⚠ 5142140000	T1A 250V (EUR only)		
F4	⚠ 5142192000	T4A 250V (EUR only)		
F5, F6	⚠ 5142140000	T1A 250V (EUR only)		
		CONNECTOR PLUGS		
P1	5336091000	10P		
P2	5336090700	7P		
P3	5336070600	6P		
		MISCELLANEOUS		
	5142087000	Fuse Holder (12 used) EUR only		

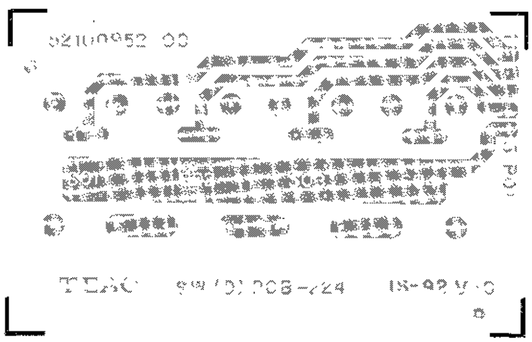
3-18. SW C PCB Ass'y



3-20. SW E PCB Ass'y



3-19. SW D PCB Ass'y



(Viewed from foil side)

SW C PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	5200088200	PCB Ass'y
	5210088200	PCB
S1	5300029600	Push Switch

SW D PCB Ass'y

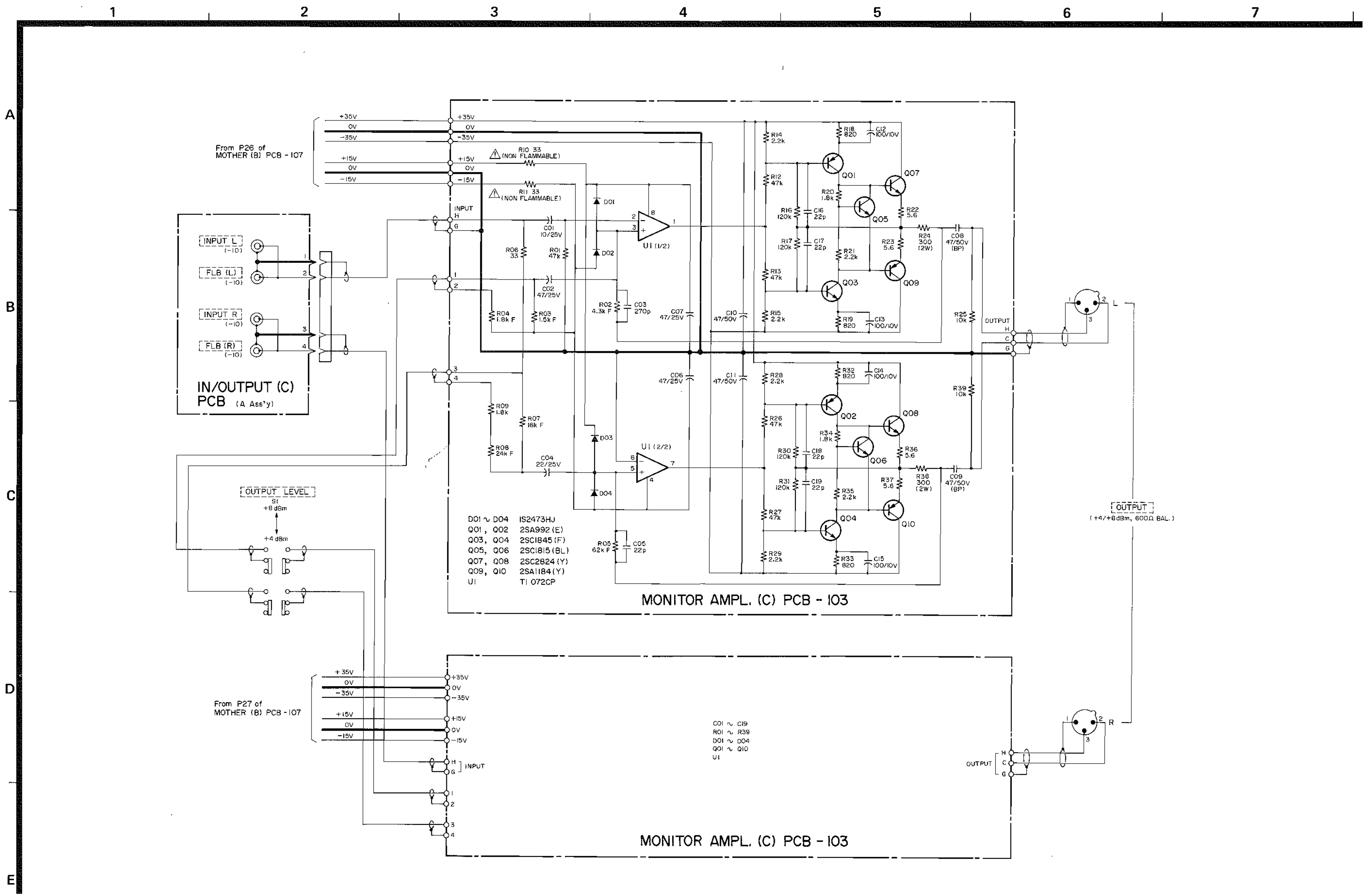
REF. NO.	PARTS NO.	DESCRIPTION
	5200095200	PCB Ass'y
	5210095200	PCB
S1～S4	5300909200	Switch, Slide, SSB-022
P1	6052379005	Connector Plug, 5P

SW E PCB Ass'y

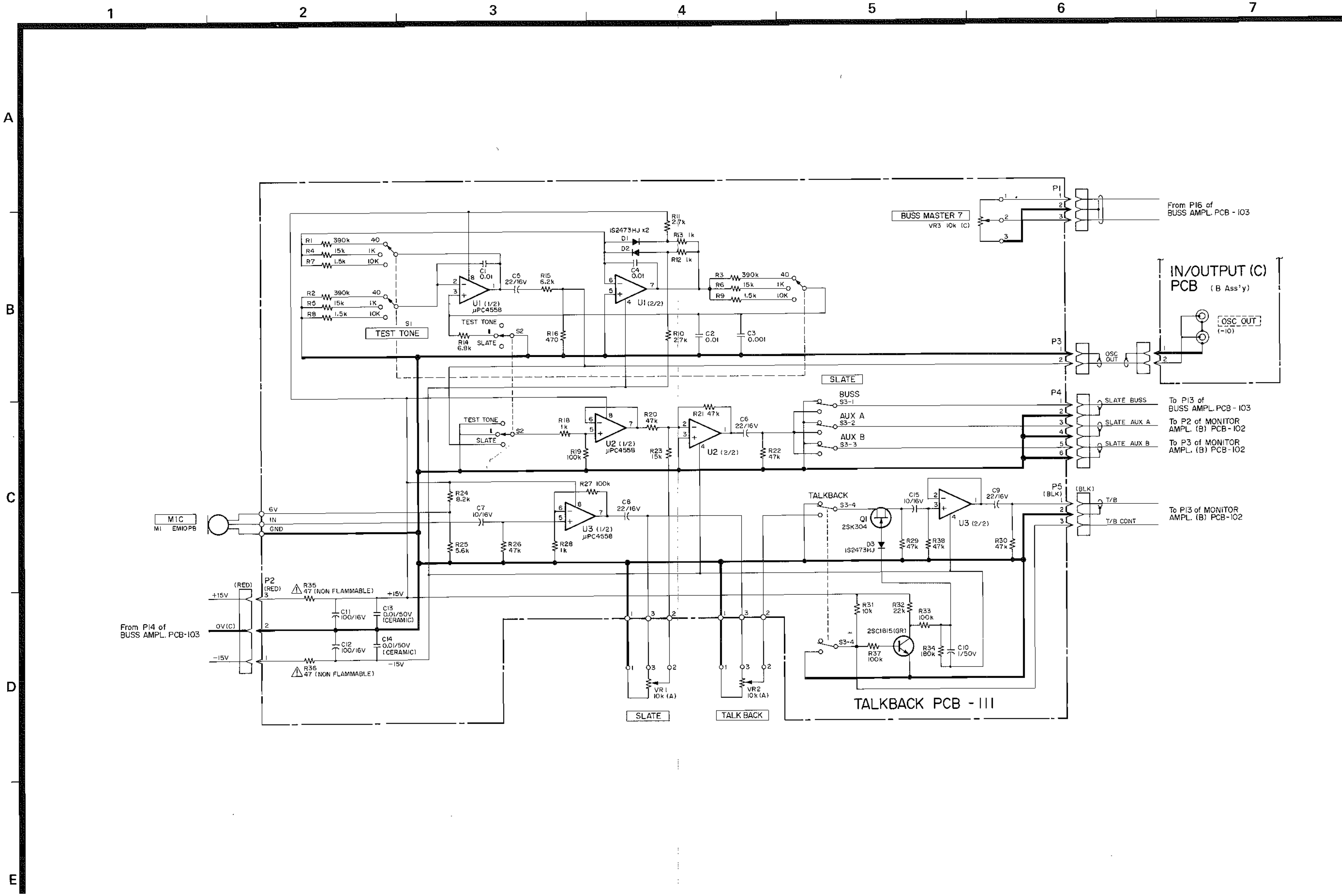
REF. NO.	PARTS NO.	DESCRIPTION
	5200107800	PCB Ass'y
	5210107800	PCB
		CARBON RESISTORS
		All resistors are rated ±5% tolerance at 1/4W.
R1～R12	5181514000	22kΩ
R13, R14	5181506000	10kΩ
R15, R16	5181526000	68kΩ
R17	5181470000	330Ω
		CONNECTOR PLUGS
P1	5122146000	3P
P2	5122148000	5P
P3	5122151000	8P
P4	5122459000	8P (RED)
P5	5122208000	8P (BLK)
P6	5122203000	3P (BLK)
		MISCELLANEOUS
S1	5300030200	Switch, Push
D1	5225006900	LED, PR3432S
	5122373000	Connector Socket, 2P

4. SCHEMATIC DIAGRAM

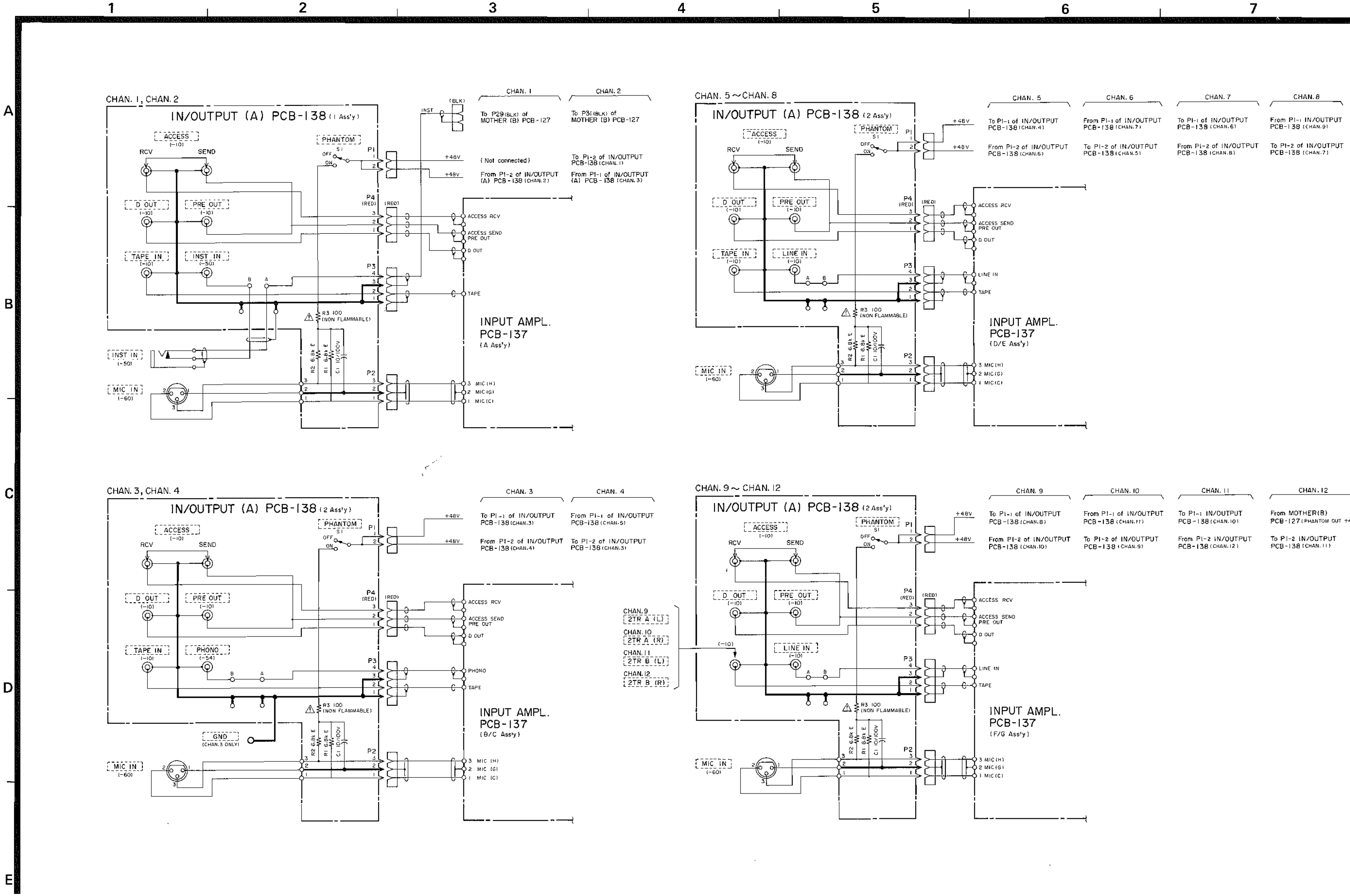
4-1. Monitor Ampl. (C)



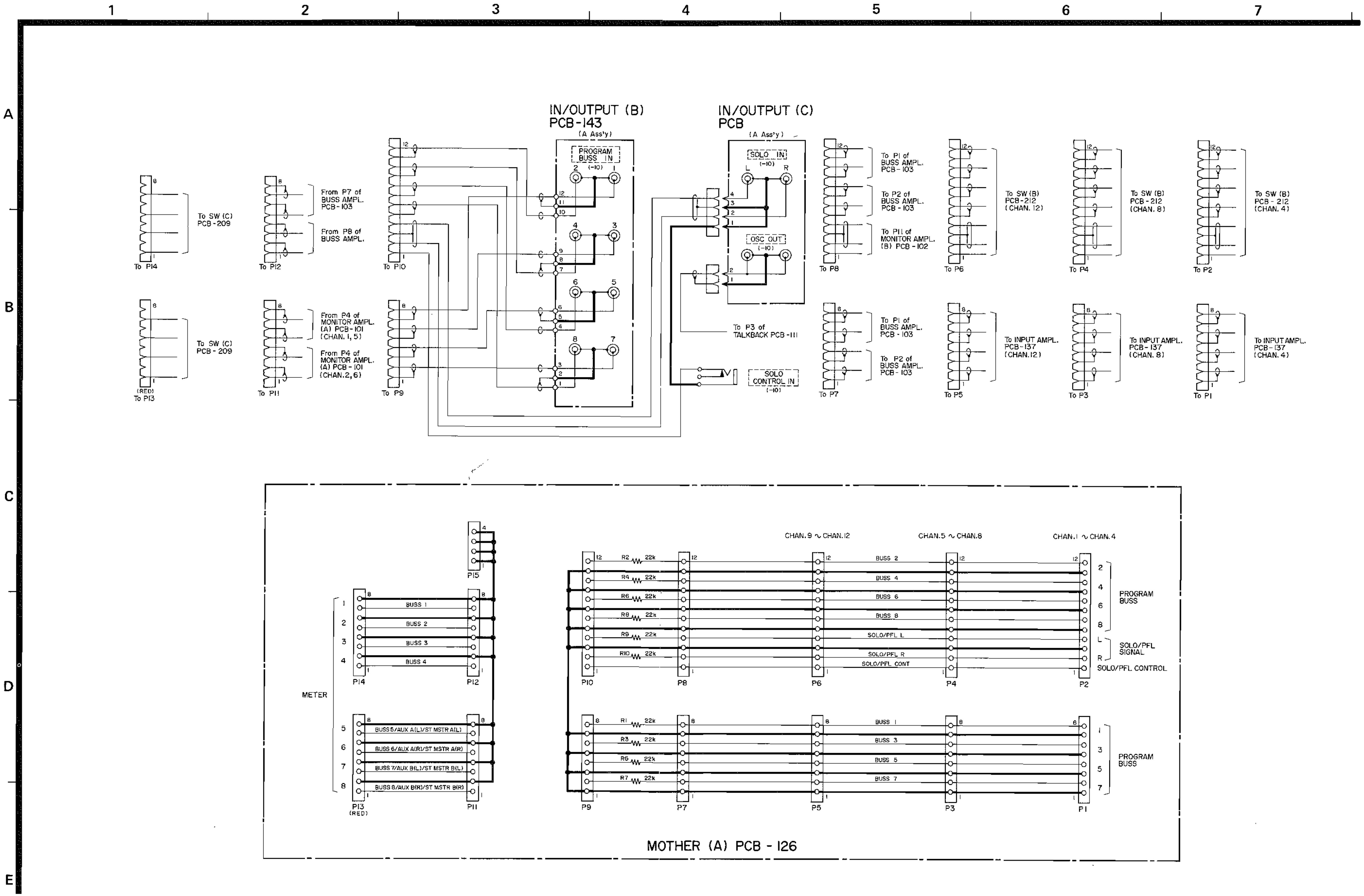
4-2. Talkback PCB



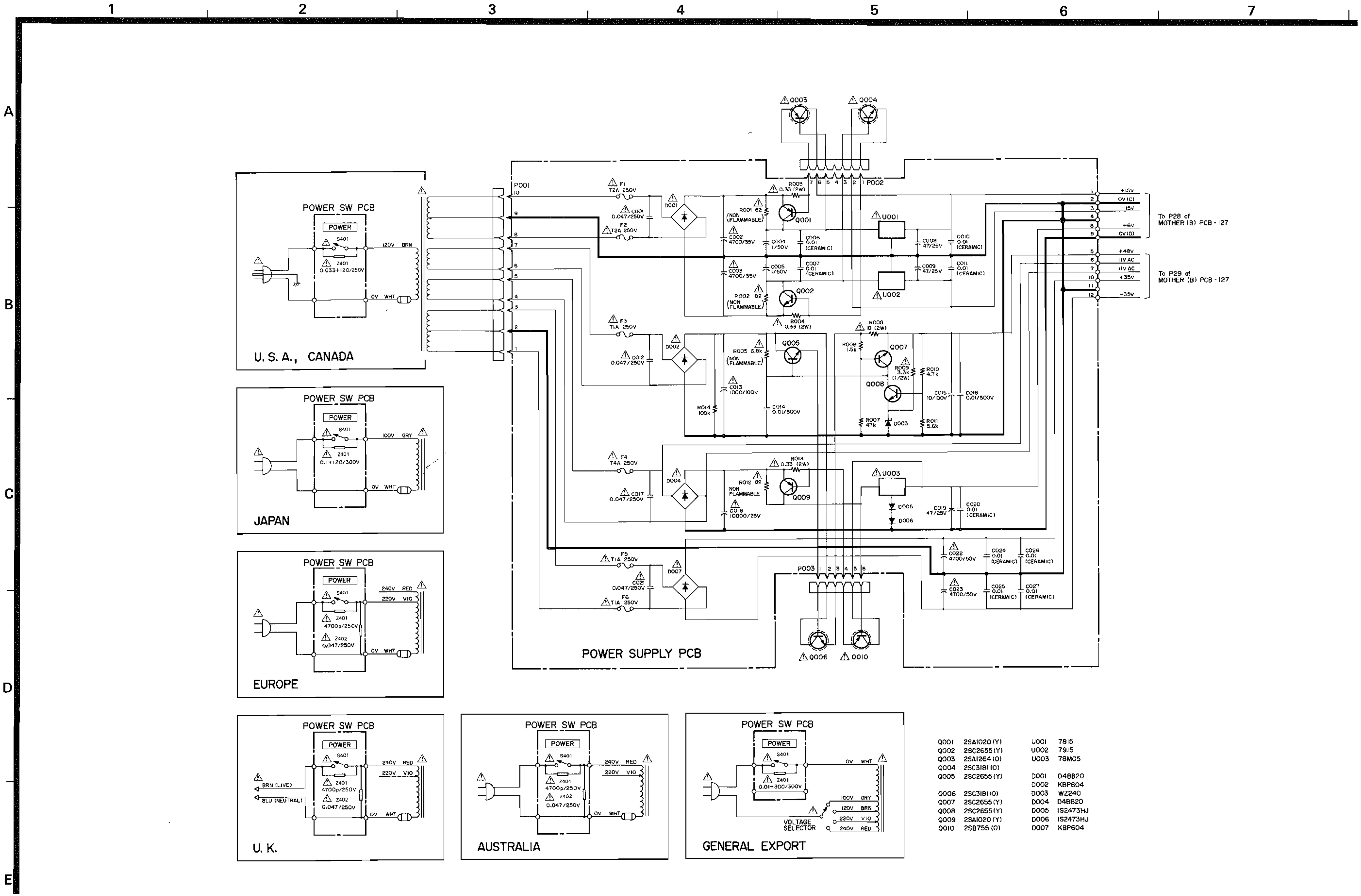
4-3. In/Output (A) PCB



4-4. Mother (A) PCB

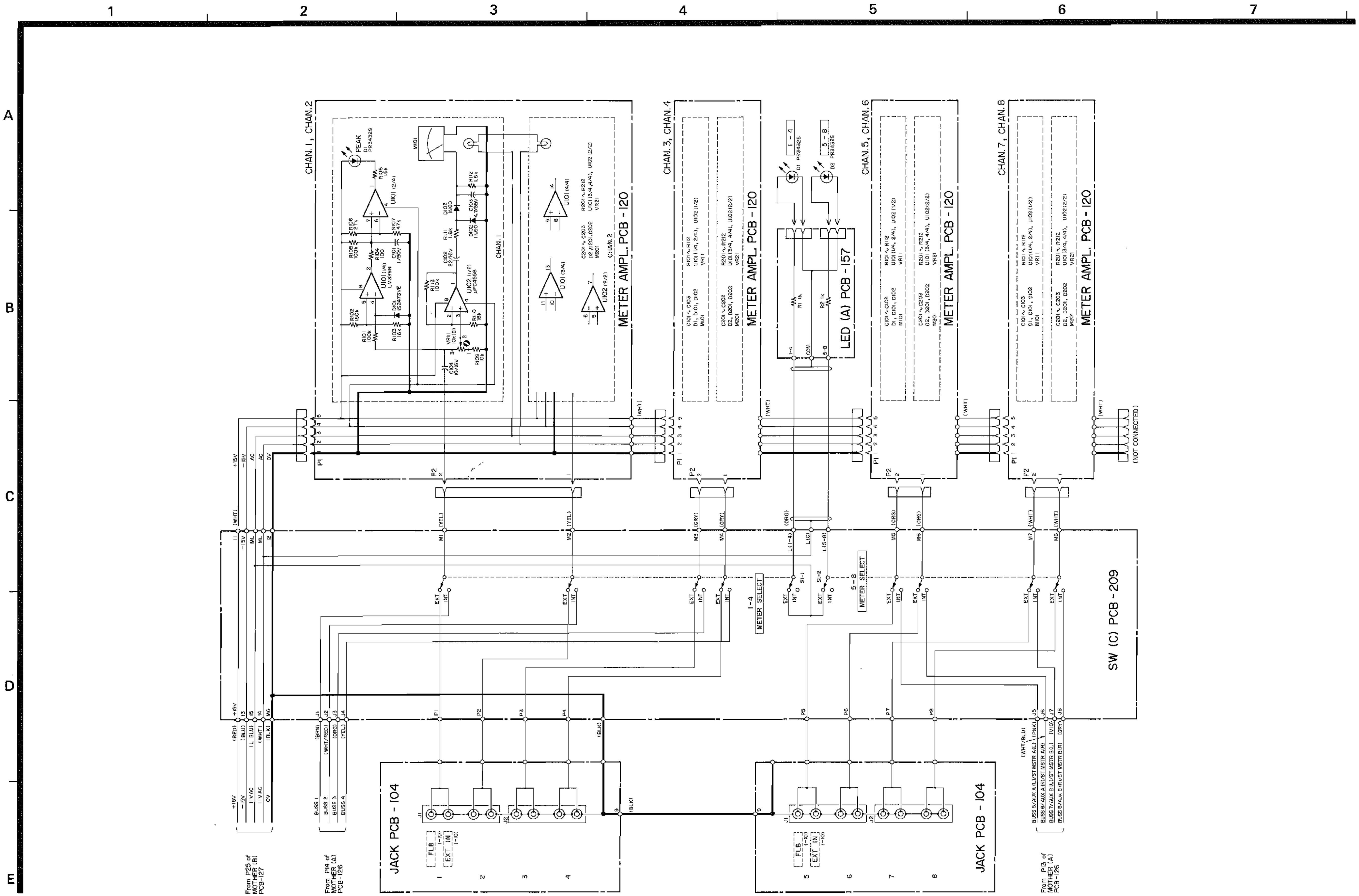


4-5. Power Supply PCB

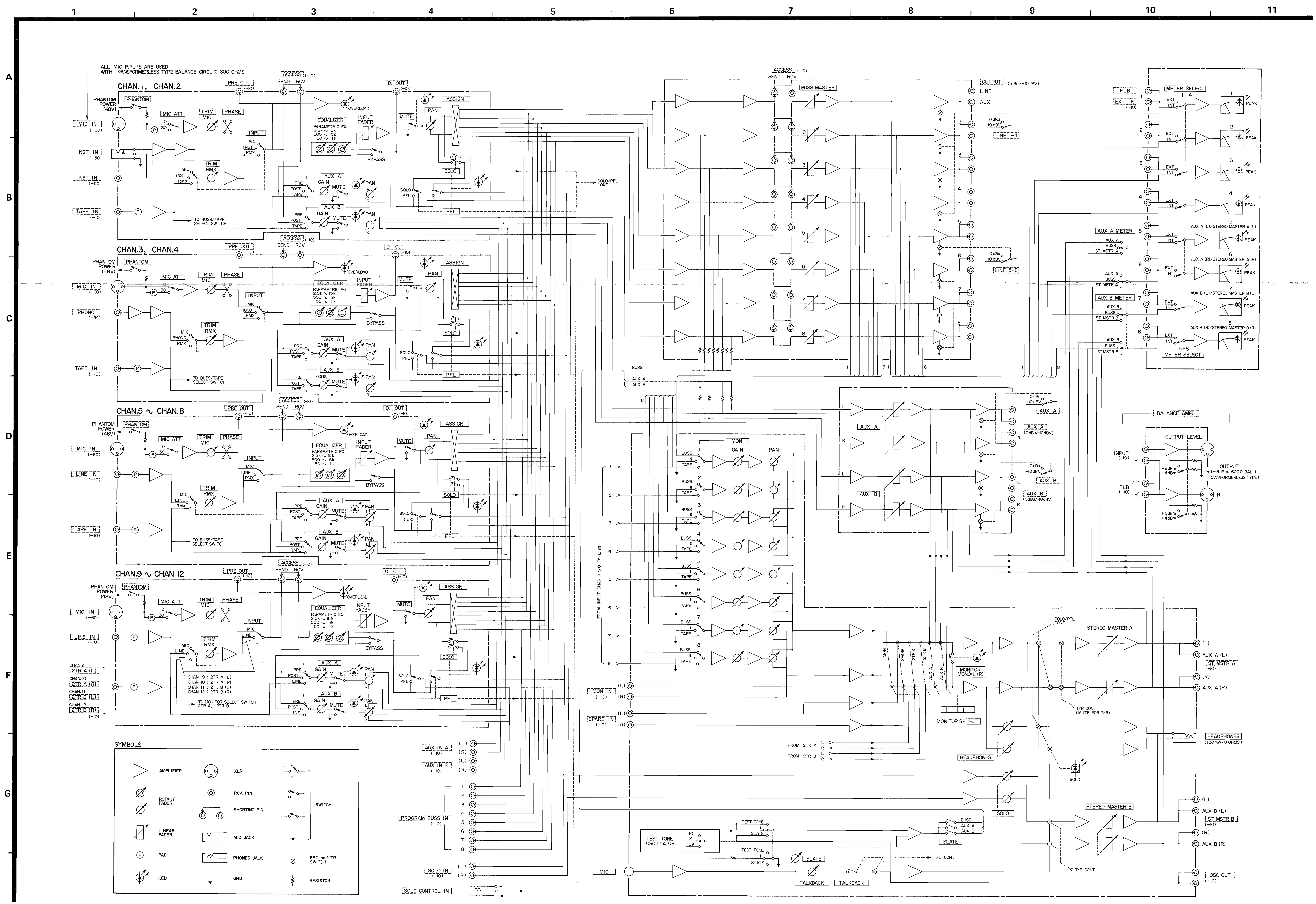


Q001	2SA1020 (Y)	U001	7815
Q002	2SC2655 (Y)	U002	7915
Q003	2SA1264 (O)	U003	78M05
Q004	2SC3181 (O)		
Q005	2SC2655 (Y)	D001	D4BB20
		D002	KBP604
Q006	2SC3181 (O)	D003	WZ240
Q007	2SC2655 (Y)	D004	D4BB20
Q008	2SC2655 (Y)	D005	1S2473HJ
Q009	2SA1020 (Y)	D006	1S2473HJ
Q010	2SB755 (O)	D007	KBP604

4-6. Meter Ampl. PCB/SW (C) PCB/Jack PCB



BLOCK DIAGRAM



INPUT AMPL. A through G Ass'y (Included SW A PCB and SW B PCB.)

REF. NO.	PARTS NO.	DESCRIPTION	
	5200086201	PCB A Ass'y (Chan. 1, 2)	
	5200086211	PCB B Ass'y (Chan. 3)	
	5200086221	PCB C Ass'y (Chan. 4)	
	5200086231	PCB D Ass'y (Chan. 5, 6, 7)	
	5200086241	PCB E Ass'y (Chan. 8)	
	5200086251	PCB F Ass'y (Chan. 9, 10, 11)	
	5200086261	PCB G Ass'y (Chan. 12)	
	5200086201	PCB	
		IC'S	
U1	5220407000	TLO72CP	
U2	5220414400	NJM4556D	
U3	5220416600	NJM2041DD	
U4	5220417000	LM393P	
U5, U6	5220407000	TLO73CP	
U7	5220414400	NJM4556D	
U9, U10	5220414400	NJM4656D	
		TRANSISTORS	
Q1, Q2	5145119000	2SC-1844F	
Q3, Q4	5145151000	2SC-1815GR	
		DIODES	
D1 ~ D4	5143118000	1S24T3HJ	
		CARBON RESISTORS All resistors are rated ±5% tolerance, 1/4W and of carbon type unless otherwise noted.	
R1	5181482000	1kΩ	
R2	5181454000	68Ω	
R3	5181482000	1kΩ	
R4	5181491000	2.4kΩ	
R5, R6	5181506000	10kΩ	
R7	5241152200	47kΩ	1% Metal Film
R8, R9	5241149800	4.7kΩ	1% Metal Film
R10	5181458000	100Ω	
R11	5181448000	39Ω	
R12	5181546000	470kΩ	
R13	5241152200	47kΩ	1% Metal Film
R14, R15	5241150600	10kΩ	1% Metal Film
R16, R17	5181530000	100kΩ	
R18	5181500000	5.6kΩ	
R19	5241148600	1.5kΩ	1% Metal Film
R20	5181486000	1.5kΩ	
R21	5241148600	1.5kΩ	1% Metal Film
R22	5181522000	47kΩ	
R23	5181498000	4.7kΩ	
R24	5181482000	1kΩ	
R25	5181506000	10kΩ	
R26	5181522000	47kΩ	
R27	5181522000	47kΩ	
R28, R29	5181462000	150Ω	
R30	5181530000	100kΩ	

REF. NO.	PARTS NO.	DESCRIPTION	
R31	5181506000	10kΩ	
R32	5181510000	15kΩ	
R33	5181514000	22kΩ	
R34	5181522000	47kΩ	
R34	5181490000	2.2kΩ	
R35	5181498000	4.7kΩ	
R36	5181522000	47kΩ	
R37	5181548000	560kΩ	
R38	5181482000	1kΩ	
R39	5181530000	100kΩ	
R40	5181482000	1kΩ	
R41	5181506000	10kΩ	
R42	5181522000	100kΩ	
R43	5181458000	100Ω	
R44	5181530000	100kΩ	
R45	5181515000	24kΩ	
R46	5181516000	27kΩ	
R47	5181530000	100kΩ	
R48	5181458000	100Ω	
R49	5181516000	27kΩ	
R50	5181522000	47kΩ	
R51	5181456000	560Ω	
R52	5181538000	220kΩ	
R53, R54	5181506000	10kΩ	
R55, R56	5181499000	5.1kΩ	
R57, R58	5181506000	10kΩ	
R59, R60	5181507000	11kΩ	
R61, R62	5181506000	10kΩ	
R63, R64	5181513000	20kΩ	
R65 ~ R67	5181506000	10kΩ	
R68	5181510000	15kΩ	
R69	5181522000	47kΩ	
R70	5181458000	100Ω	
R71 ~ R78	5181514000	22kΩ	
R79, R80	5181530000	100kΩ	
R81, R82	5181506000	10kΩ	
R83, R84	5181510000	15kΩ	
R85 ~ R88	5181514000	22kΩ	
R89 ~ R93	5181476000	560Ω	
R94 ~ R97	5181530000	100kΩ	
R98, R99	5181514000	22kΩ	
R100	5181530000	100kΩ	
R101, R102	⚠ 5183566000	33Ω	Nonflammable
R103, R104	5181434000	10Ω	
R105	5181522000	47kΩ	
R106	5181522000	47kΩ	
R107, R108	5181458000	100Ω	
R109 ~ R111	5181522000	47kΩ	

REF. NO.	PARTS NO.	DESCRIPTION			
		CAPACITORS			
C1, C2	5260163652	Elec.	22μF	50V	
C3, C4	5054744000	Dip Mica	100pF		
C5	5170006000	Dip Mica	68pF		
C6	5054878500	Mylar	0.001μF		
C7	5260072700	Bipolar	470μF	16V	
C9	5170006000	Dip Mica	68pF		
C10, C11	5260165252	Elec.	47μF	25V	
C12, C13	5260163452	Elec.	22μF	25V	
C14	5260162550	Elec.	10μF	16V	
C15	5260165152	Elec.	47μF	16V	
C17	5054896500	Mylar	0.0015μF		5%
C18	5054891500	Mylar	0.0047μF		5%
C19	5260163352	Elec.	22μF	16V	
C20	5260162550	Elec.	10μF	16V	
C21, C22	5260163452	Elec.	22μF	25V	
C24	5260160750	Elec.	1μF	50V	
C25	5260162550	Elec.	10μF	16V	
C26	5054479500	Mylar	0.051μF		5%
C27	5054897500	Mylar	0.018μF		5%
C28	5054891500	Mylar	0.047μF		5%
C29	5054888500	Mylar	0.0018μF		5%
C30	5172827000	Polyst.	910pF		
C31	5172816000	Polyst.	330pF		
C33, C34	5260162550	Elec.	10μF	16V	
C35	5260163452	Elec.	22μF	25V	
C36, C37	5260162550	Elec.	10μF	16V	
C38, C39	5260163452	Elec.	22μF	25V	
C40 ~ C43	5260162550	Elec.	10μF	16V	
C44, C45	5260163452	Elec.	22μF	25V	
C46, C47	5260166052	Elec.	100μF	16V	
C48 ~ C53	5054758000	Dip Mica	82pF		
C54, C55	5054204000	Ceramic	0.01μF	50V	
C56 ~ C58	5054758000	Dip Mica	47pF		
C59, C60	5260165252	Elec.	47μF	25V	
C61	5054204000	Ceramic	0.01μF	50V	
		VARIABLE RESISTORS			
VR1	5282706700		5kΩ (RD) + 10kΩ (A)		
VR2 ~ VR4	5283504402		10kΩ (BP) + 100kΩ (30C) × 2		
VR5	5284006400	Slide	10kΩ (C)		
VR6, VR7	5283504200		10kΩ (A) + 5kΩ (A, C)		
VR8	5282408600		5kΩ (A, C)		
VR9	5280001102	Semi-fixed	20kΩ (B)		
		SWITCHES			
S1, S2	5132037000	Lever, SLR522			
S3 ~ S5	5132036000	Lever, SLR523			
S6	5300029400	Push, SUJ30			
S7	5300029800	Push, SUJ50			
S8	5300029700	Push, SUJ60			

REF. NO.	PARTS NO.	DESCRIPTION
		CONNECTOR PLUGS
P1	5122151000	8P
P2	5122150000	7P (RED)
P3	5122151000	8P
P4, P5	5122155000	12P
P6	5122149000	6P
		MISCELLANEOUS
	5210086300	PCB-211, SW (A)
	5210086400	PCB-212, SW (B)
	5122373000	Connector Socket, 2P
LED1 ~ LED6	5225006900	LED, PR3432S

Components Mounted Chart

○ : Mounted
– : Not Mounted

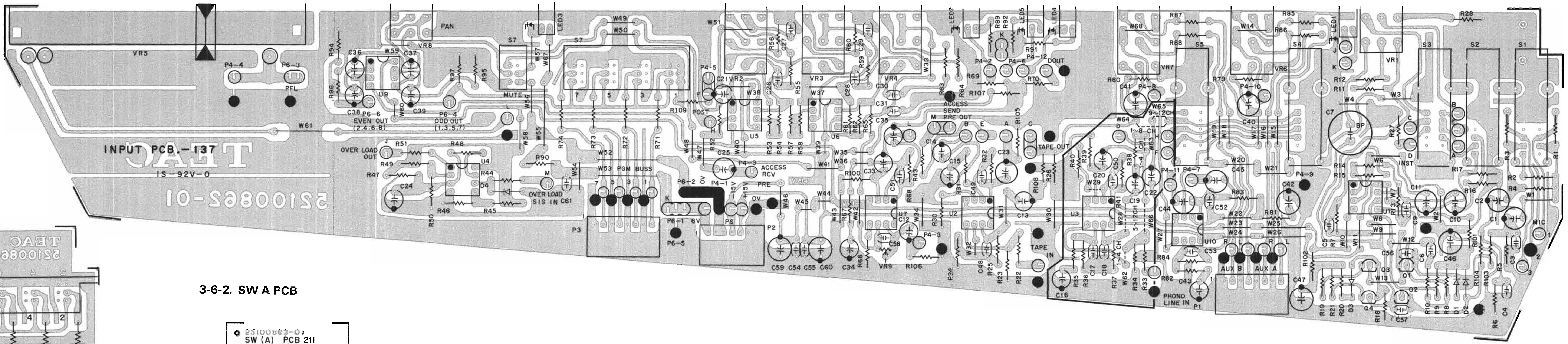
PCB Ass'y		A	B	C	D	E	F	G
CHANNEL		1, 2	3	4	5, 6, 7	8	9, 10, 11	12
REF. NO.	U3	–	○	○	○	○	○	○
	R33	–	–	–	○	○	○	○
	R34	–	47k	47k	2.2k	2.2k	2.2k	2.2k
	R35	–	○	○	–	–	–	–
	R36	–	○	○	–	–	–	–
	R37	–	○	○	–	–	–	–
	R38	–	○	○	–	–	–	–
	R39	–	○	○	○	○	○	○
	R40	–	○	○	○	○	○	○
	R41	–	○	○	○	○	○	○
	C16	–	○	○	–	–	–	–
	C17	–	○	○	–	–	–	–
	C18	–	○	○	–	–	–	–
	C19	–	○	○	–	–	–	–
	C20	–	○	○	○	○	○	○
	C22	–	○	○	○	○	○	○
	C50	–	○	○	○	○	○	○

MOTHER B PCB Ass'y

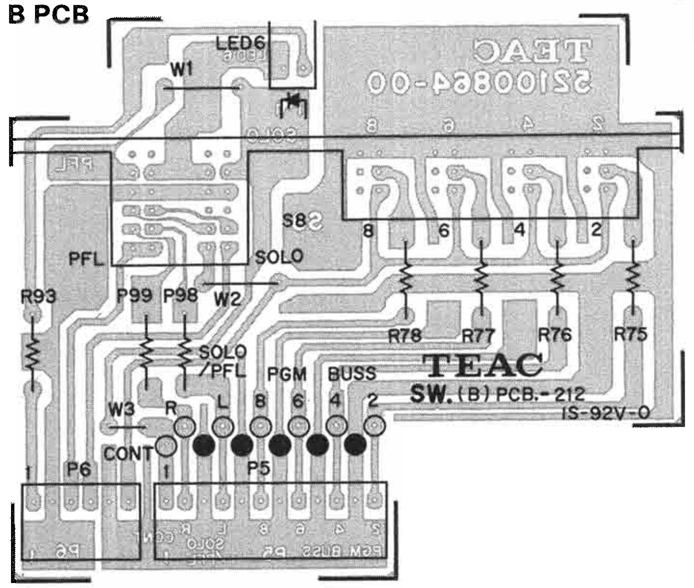
REF. NO.	PARTS NO.	DESCRIPTION
	5200088100	PCB Ass'y
	5210088100	PCB
		IC'S
U1, U2	5220416600	NJM2041DD
		CARBON RESISTORS All resistors are rated ±5% tolerance at 1/4W.
R1 ~ R4	5181514000	22kΩ
R5	5181530000	100kΩ
R6	5181484000	1.2kΩ
R7	5181506000	10kΩ
R8	5181482000	1kΩ
R9	5181526000	68kΩ
R10	5181482000	1kΩ
R11	5181506000	10kΩ
R12	5181530000	100kΩ
R13	5181484000	1.2kΩ
R14	5181506000	10kΩ
R15	5181482000	1kΩ
R16	5181526000	68kΩ
R17	5181482000	1kΩ
R18	5181506000	10kΩ
R19, R20	5183566000	33kΩ

REF. NO.	PARTS NO.	DESCRIPTION		
		CAPACITORS		
C2	5054758000	Dip Mica	82pF	
C3	5260163352	Elec.	22μF	16V
C5	5054758000	Dip Mica	82pF	
C6	5260163352	Elec.	22μF	16V
C8	5054758000	Dip Mica	82pF	
C9	5260163352	Elec.	22μF	16V
C11	5054758000	Dip Mica	82pF	
C12	5260163352	Elec.	22μF	16V
C13, C14	5260165252	Elec.	47μF	25V
C15, C16	5054204000	Ceramic	0.01μF	50V
		CONNECTOR PLUGS		
P1 ~ P12	5122126000	2P		
P13	5122304000	7P (RED)		
P14	5122189000	8P (BLK)		
P15	5122304000	7P (RED)		
P16	5122189000	8P (BLK)		
P17	5122304000	7P (RED)		
P18, P19	5122189000	8P (BLK)		
P20	5122132000	8P		
P21	5122193000	12P (BLK)		
P22	5122309000	12P (RED)		
P23	5122128000	4P		
P24	5122131000	7P (BLK)		
P25	5122130000	6P		
P26, P27	5122189000	8P (BLK)		
P28	5122304000	7P (RED)		
P29	5122302000	5P (RED)		

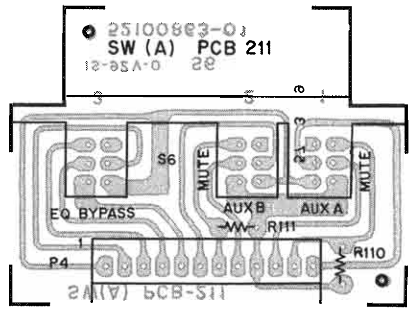
3-6. INPUT AMPL. A through G Ass'y



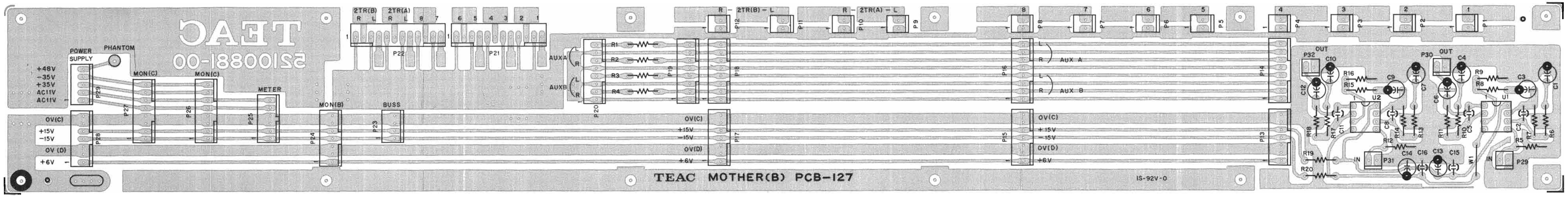
3-6-1. SW B PCB



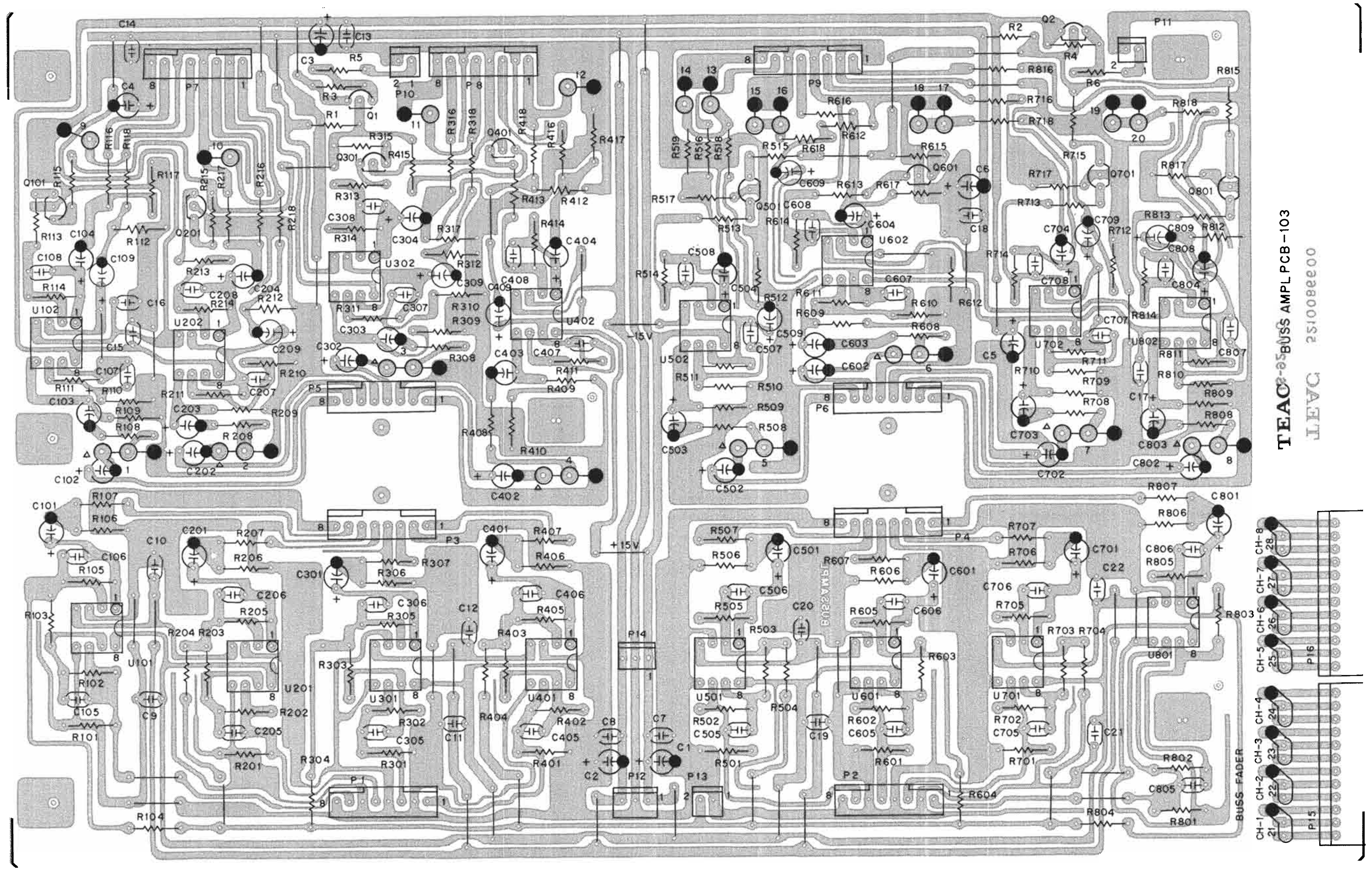
3-6-2. SW A PCB



3-7. MOTHER B PCB Ass'y



3-5. BUSS AMPL. PCB Ass'y



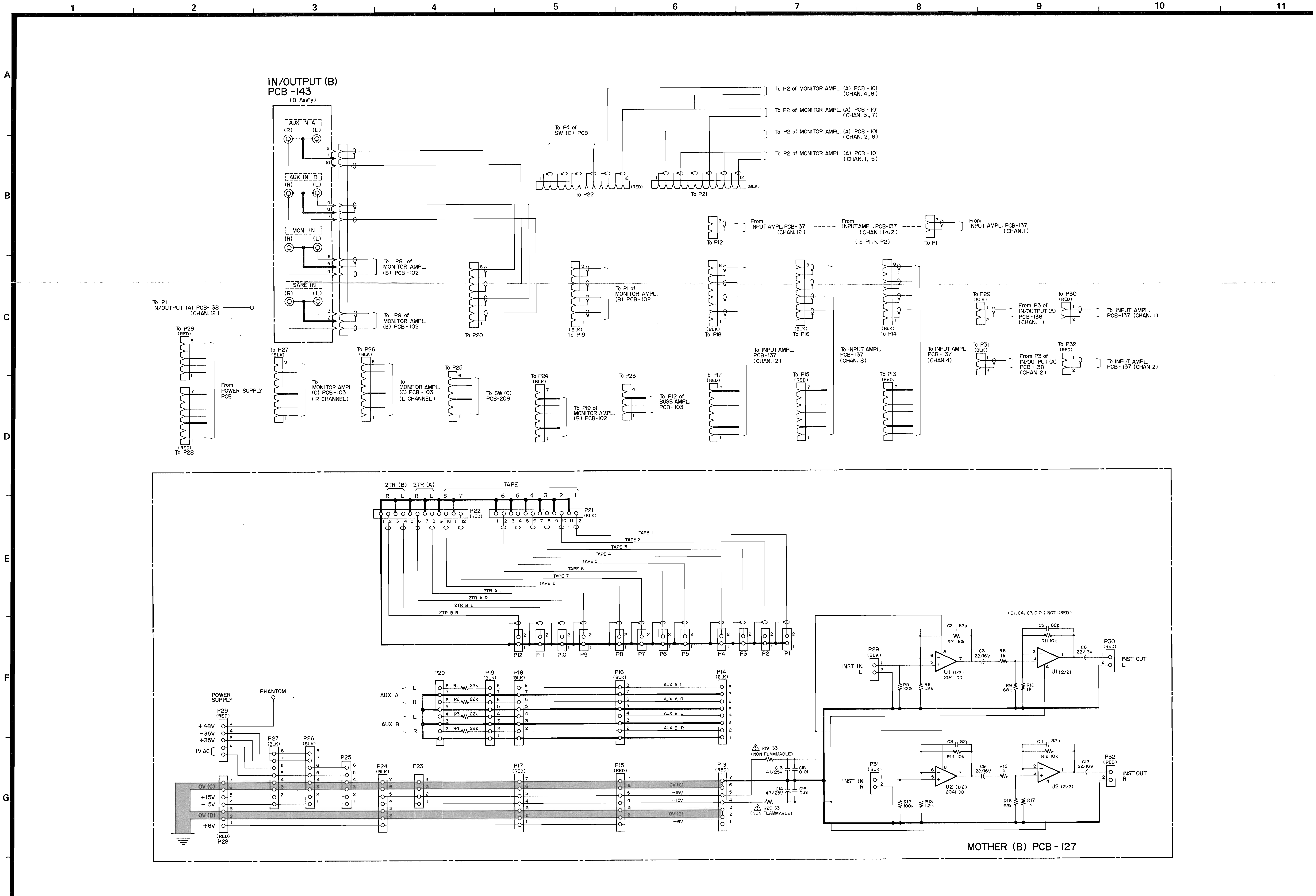
BUSS AMPL. PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	5200086600	PCB Ass'y
	5210086600	PCB
		IC'S
U101, U201	5220414400	NJM4556D
U301, U401	5220414400	
U501, U601	5220414400	
U701, U801	5220414400	
U102, U202	5220414400	NJM4556D
U302, U402	5220414400	
U502, U602	5220414400	
U702, U802	5220414400	
		TRANSISTORS
Q1, Q2	5145150000	2SA-1015GR
Q101, Q201	5230775000	2SC-2878B
Q301, Q401	5230775000	
Q501, Q601	5230775000	
Q701, Q801	5230775000	
		CARBON RESISTORS All resistors are rated ±5% tolerance at 1/4W.
R1 ~ R4	5181522000	47kΩ
R5, R6	5181506000	10kΩ
R101, R201	5181514000	22kΩ
R301, R401	5181514000	22kΩ
R501, R601	5181514000	22kΩ
R701, R801	5181514000	22kΩ
R102, R202	5181514000	22kΩ
R302, R402	5181514000	22kΩ
R502, R602	5181514000	22kΩ
R702, R802	5181514000	22kΩ
R103, R203	5181514000	22kΩ
R303, R403	5181514000	22kΩ
R503, R603	5181514000	22kΩ
R703, R803	5181514000	22kΩ
R104, R204	5181514000	22kΩ
R304, R404	5181514000	22kΩ
R504, R604	5181514000	22kΩ
R704, R804	5181514000	22kΩ
R105, R205	5181514000	22kΩ
R305, R405	5181514000	22kΩ
R505, R605	5181514000	22kΩ
R705, R805	5181514000	22kΩ
R106, R206	5181522000	47kΩ
R306, R406	5181522000	47kΩ
R506, R606	5181522000	47kΩ
R706, R806	5181522000	47kΩ
R107, R207	5181458000	100Ω
R307, R407	5181458000	100Ω
R507, R607	5181458000	100Ω
R707, R807	5181458000	100Ω

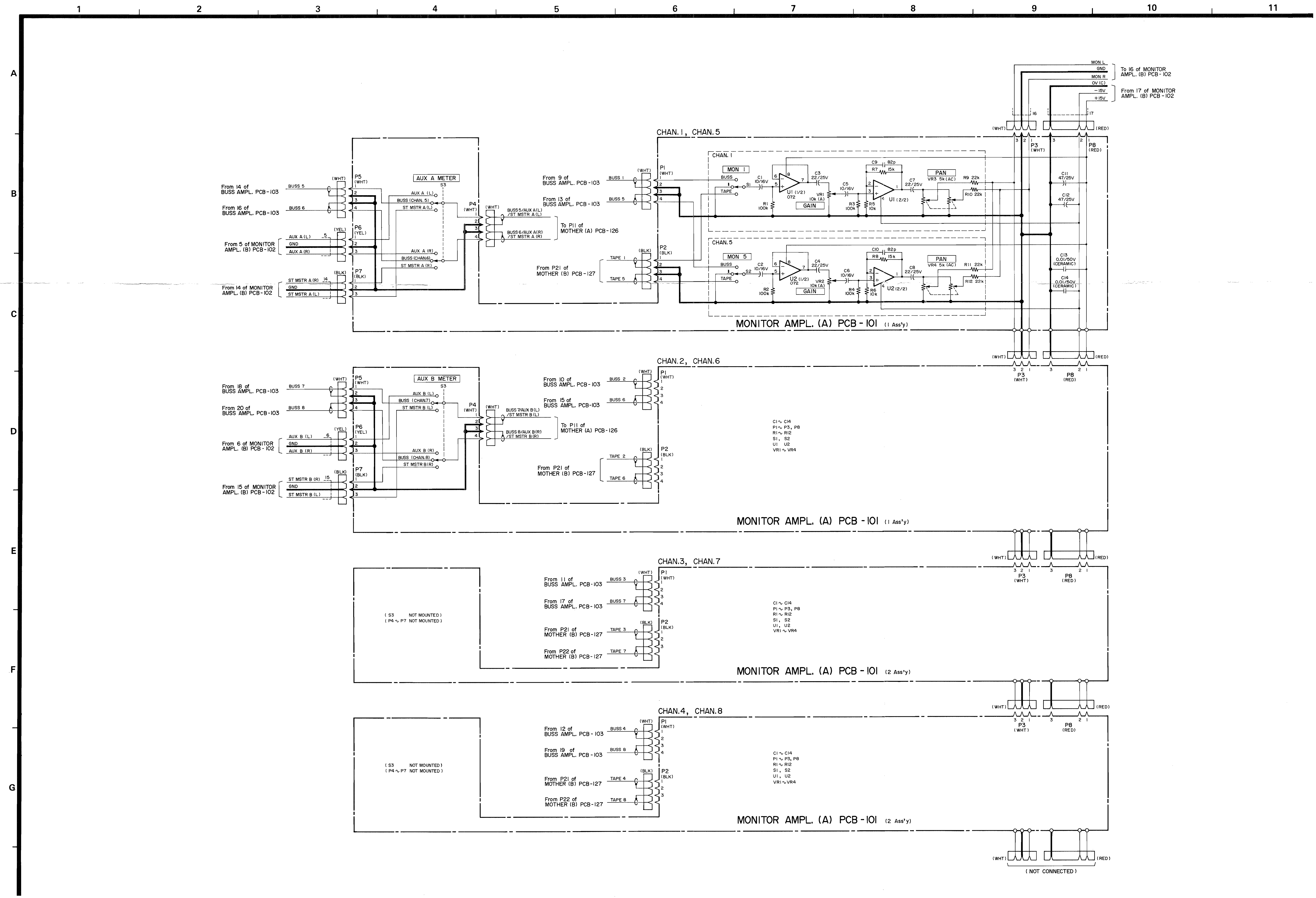
REF. NO.	PARTS NO.	DESCRIPTION
R108, R208	5181482000	1kΩ
R308, R408	5181482000	1kΩ
R508, R608	5181482000	1kΩ
R708, R808	5181482000	1kΩ
R109, R209	5181530000	100kΩ
R309, R409	5181530000	100kΩ
R509, R609	5181530000	100kΩ
R709, R809	5181530000	100kΩ
R110, R210	5181506000	10kΩ
R310, R410	5181506000	10kΩ
R510, R610	5181506000	10kΩ
R710, R810	5181506000	10kΩ
R111, R211	5181510000	15kΩ
R311, R411	5181510000	15kΩ
R511, R611	5181510000	15kΩ
R711, R811	5181510000	15kΩ
R112, R212	5181530000	100kΩ
R312, R412	5181530000	100kΩ
R512, R612	5181530000	100kΩ
R712, R812	5181530000	100kΩ
R113, R213	5181506000	10kΩ
R313, R413	5181506000	10kΩ
R513, R613	5181506000	10kΩ
R713, R813	5181506000	10kΩ
R114, R214	5181510000	15kΩ
R314, R414	5181510000	15kΩ
R514, R614	5181510000	15kΩ
R714, R814	5181510000	15kΩ
R115, R215	5181522000	47kΩ
R315, R415	5181522000	47kΩ
R515, R615	5181522000	47kΩ
R715, R815	5181522000	47kΩ
R116, R216	5181458000	100Ω
R316, R416	5181458000	100Ω
R516, R616	5181458000	100Ω
R716, R816	5181458000	100Ω
R117, R217	5181522000	47kΩ
R317, R417	5181522000	47kΩ
R517, R617	5181522000	47kΩ
R717, R817	5181522000	47kΩ
R118, R218	5181458000	100Ω
R318, R418	5181458000	100Ω
R518, R618	5181458000	100Ω
R718, R818	5181458000	100Ω

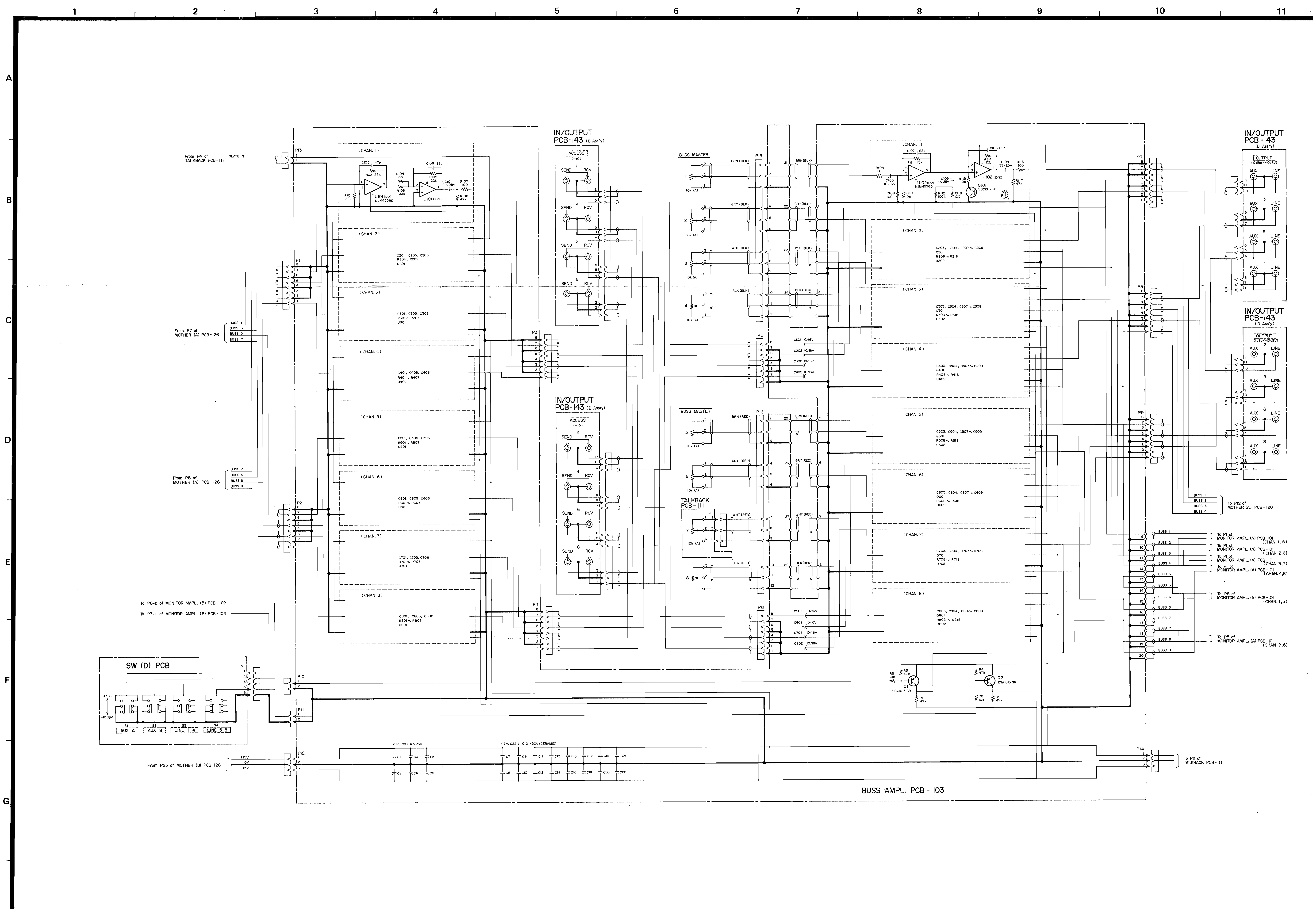
REF. NO.	PARTS NO.	DESCRIPTION		
		CAPACITORS		
C1 ~ C6	5260165252	Elec.	47μF	25V
C7 ~ C22	5054204000	Ceramic	0.01μF	50V
C101, C201	5260163452	Elec.	22μF	25V
C301, C401	5260163452	Elec.	22μF	25V
C501, C601	5260163452	Elec.	22μF	25V
C701, C801	5260163452	Elec.	22μF	25V
C102, C202	5260162550	Elec.	10μF	16V
C302, C402	5260162550	Elec.	10μF	16V
C502, C602	5260162550	Elec.	10μF	16V
C702, C802	5260162550	Elec.	10μF	16V
C103, C203	5260162550	Elec.	10μF	16V
C303, C403	5260162550	Elec.	10μF	16V
C503, C603	5260162550	Elec.	10μF	16V
C703, C803	5260162550	Elec.	10μF	16V
C104, C204	5260163452	Elec.	22μF	25V
C304, C404	5260163452	Elec.	22μF	25V
C504, C604	5260163452	Elec.	22μF	25V
C704, C804	5260163452	Elec.	22μF	25V
C105, C205	5054758000	Dip Mica	82pF	
C305, C405	5054758000	Dip Mica	82pF	
C505, C605	5054758000	Dip Mica	82pF	
C705, C805	5054758000	Dip Mica	82pF	
C106, C206	5054742000	Dip Mica	47pF	
C306, C406	5054742000	Dip Mica	47pF	
C506, C606	5054742000	Dip Mica	47pF	
C706, C806	5054742000	Dip Mica	47pF	
C107, C207	5054758000	Dip Mica	82pF	
C307, C407	5054758000	Dip Mica	82pF	
C507, C607	5054758000	Dip Mica	82pF	
C707, C807	5054758000	Dip Mica	82pF	
C108, C208	5054758000	Dip Mica	82pF	
C308, C408	5054758000	Dip Mica	82pF	
C508, C608	5054758000	Dip Mica	82pF	
C708, C808	5054758000	Dip Mica	82pF	
C109, C209	5260163452	Elec.	22μF	25V
C309, C409	5260163452	Elec.	22μF	25V
C509, C609	5260163452	Elec.	22μF	25V
C709, C809	5260163452	Elec.	22μF	25V
		CONNECTOR PLUGS		
P1 ~ P9	5122132000	8P		
P10 ~ P11	5122126000	2P		
P12	5122127000	3P		
P13	5122126000	2P		
P14	5122127000	3P		
P15, P16	5122155000	12P		

4-7. Mother (B) PCB

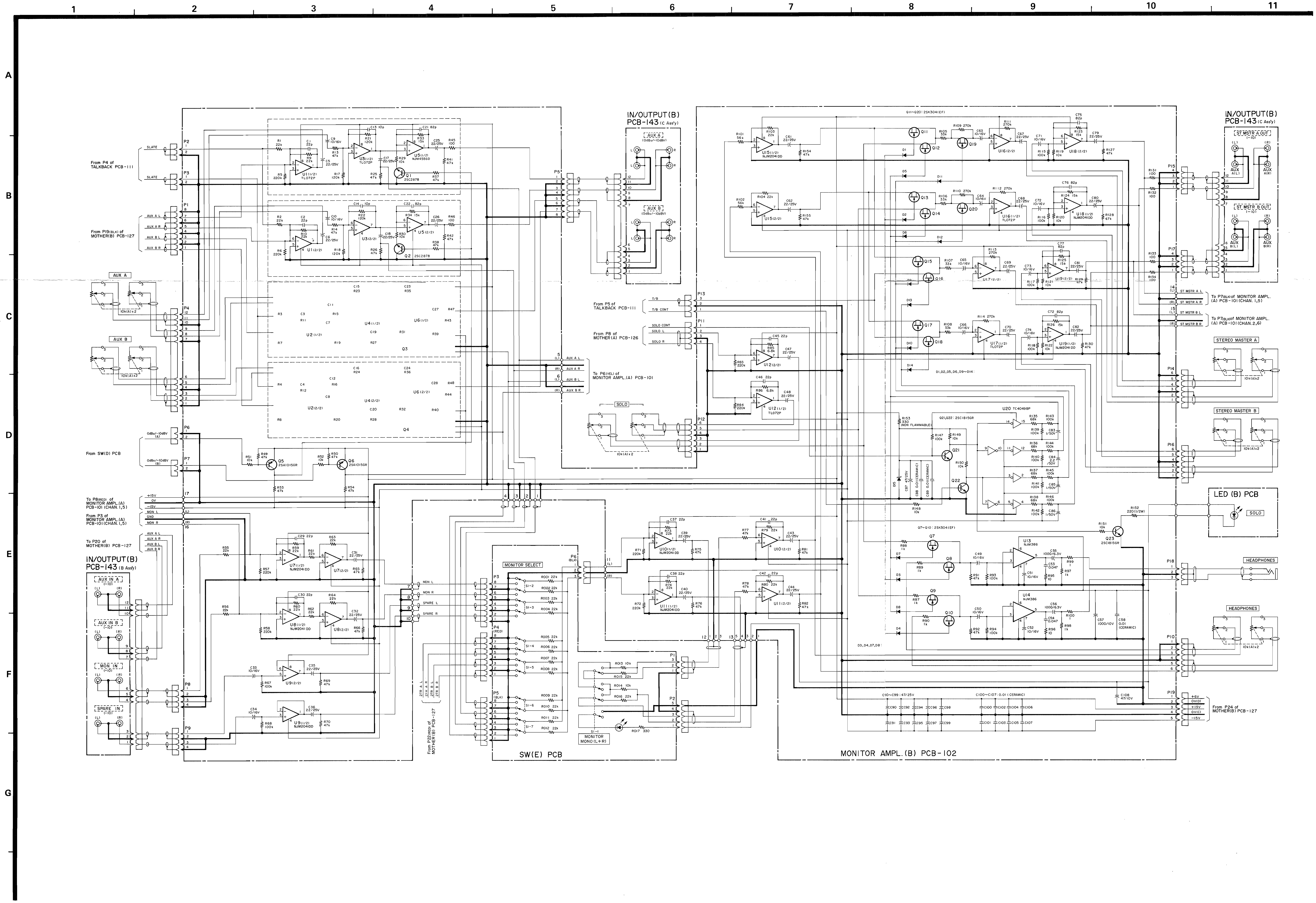


4-8. Monitor Ampl. (A) PCB

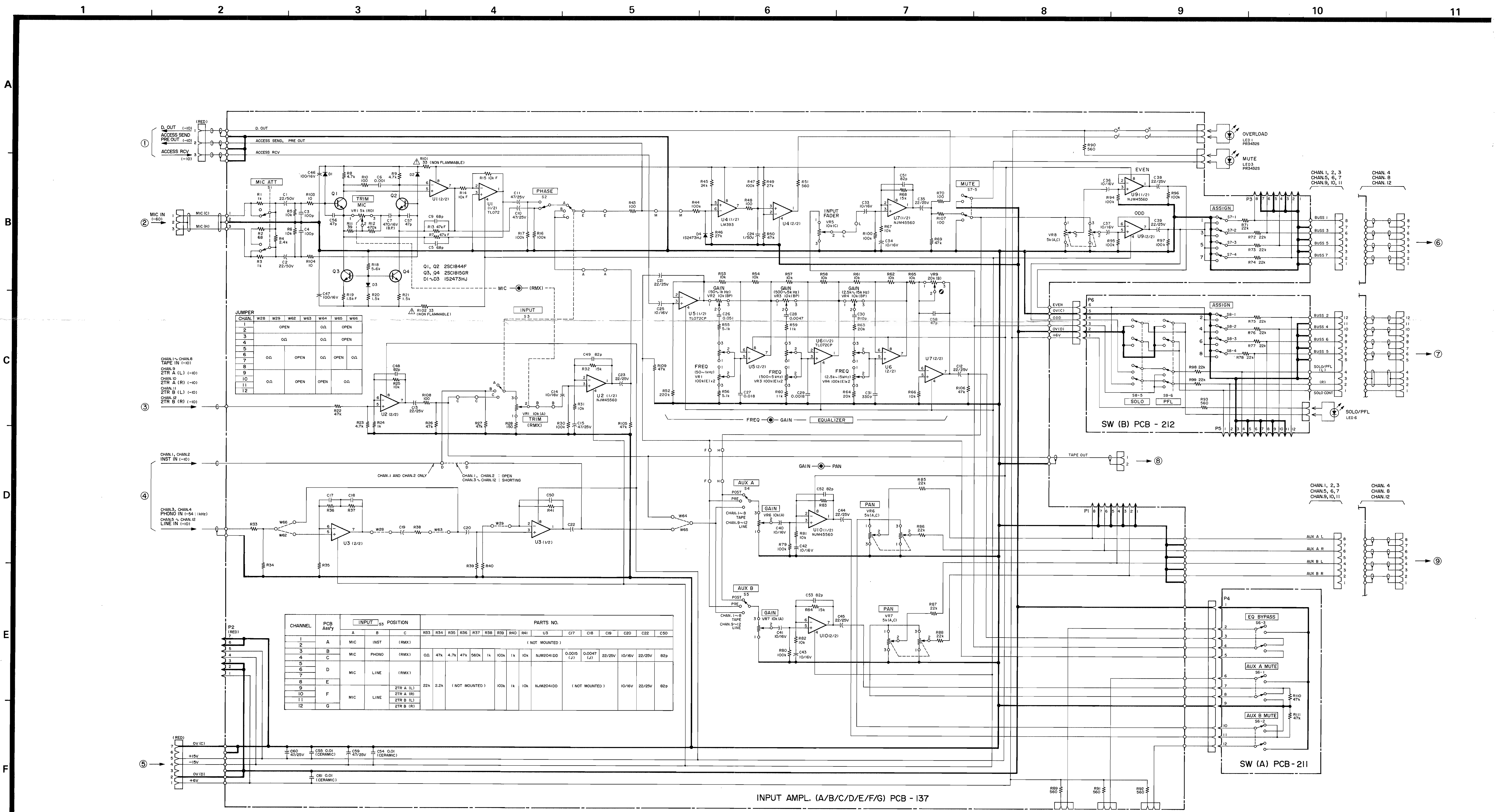



IN/OUTPUT PCB-143 (B Ass'y)
IN/OUTPUT PCB-143 (D Ass'y)
SW (D) PCB
TALKBACK PCB-111
BUSS MASTER
BUSS AMPL. PCB - 103
From P4 of TALKBACK PCB-111
From P7 of MOTHER (A) PCB-126
From P8 of MOTHER (A) PCB-126
To P6-2 of MONITOR AMPL. (B) PCB-102
To P7-1 of MONITOR AMPL. (B) PCB-102
From P23 of MOTHER (B) PCB-126
To P12 of MOTHER (A) PCB-126
To P2 of TALKBACK PCB-111

4-10. Monitor Ampl. (B) PCB



4-11. Input Ampl. (A/B/C/D/E/F/G) PCB



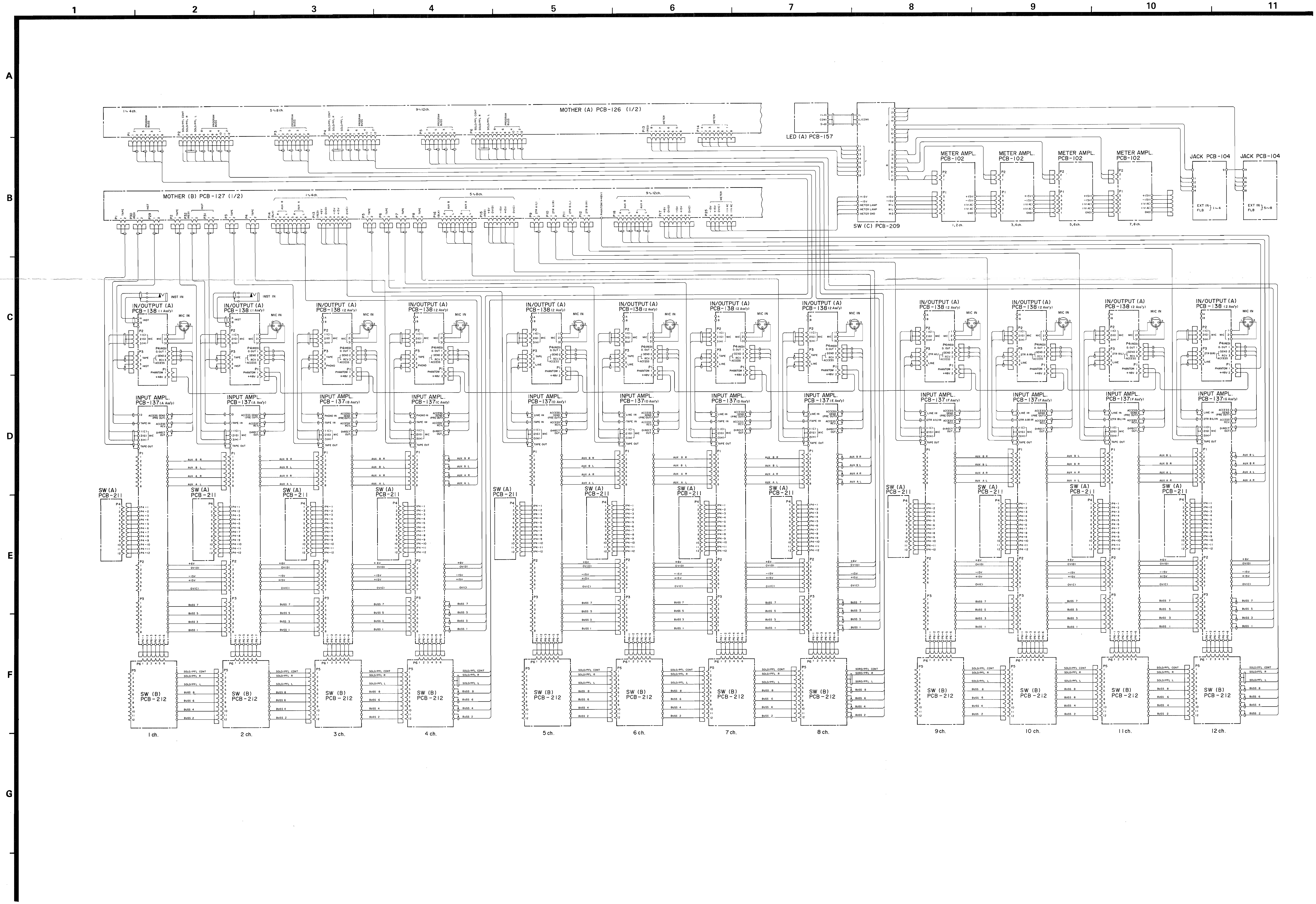
JUMPER

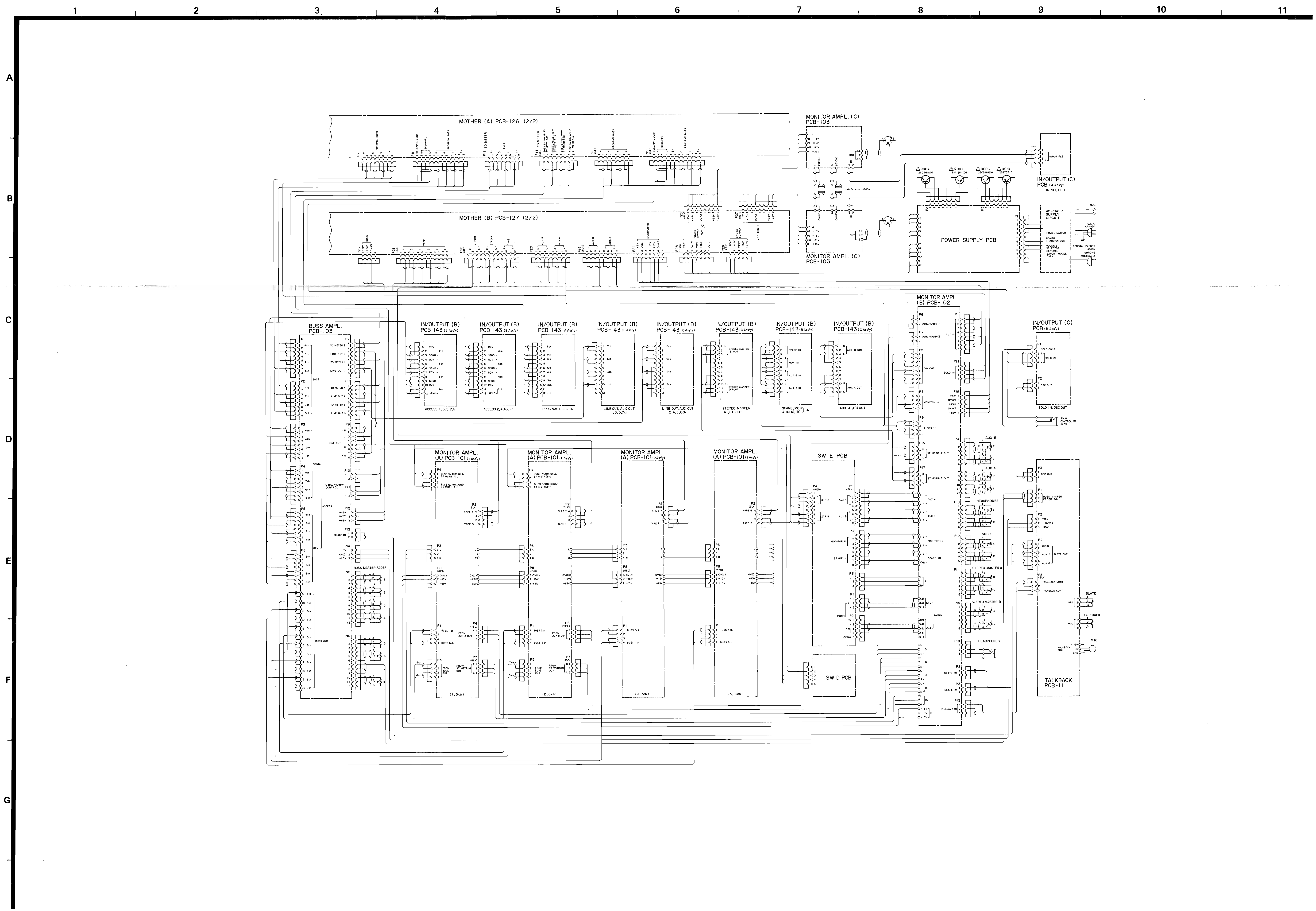
CHAN.	W28	W29	W62	W63	W64	W65	W66
1, 2	OPEN				0Ω	OPEN	
3, 4	0Ω				0Ω	OPEN	
5, 6, 7, 8	0Ω		OPEN		0Ω	OPEN	0Ω
9, 10, 11, 12	0Ω		OPEN		OPEN	0Ω	

CHANNEL	PCB Ass'y	INPUT S3 POSITION A	B	C	PARTS NO. R33	R34	R35	R36	R37	R38	R39	R40	R41	U3	C17	C18	C19	C20	C22	C50
1, 2	A	MIC	INST	(RMX)	(NOT MOUNTED)															
3	B	MIC	PHONO	(RMX)	0Ω	47k	4.7k	47k	560k	1k	100k	1k	10k	NJM2041DD	0.0015 (J)	0.0047 (J)	22/25V	10/16V	22/25V	82p
4	C																			
5, 6, 7	D	MIC	LINE	(RMX)	22k	2.2k	(NOT MOUNTED)				100k	1k	10k	NJM2041DD	(NOT MOUNTED)			10/16V	22/25V	82p
8	E																			
9	F	MIC	LINE	2TR A (L)																
10				2TR A (R)																
11				2TR B (L)																
12	G			2TR B (R)																

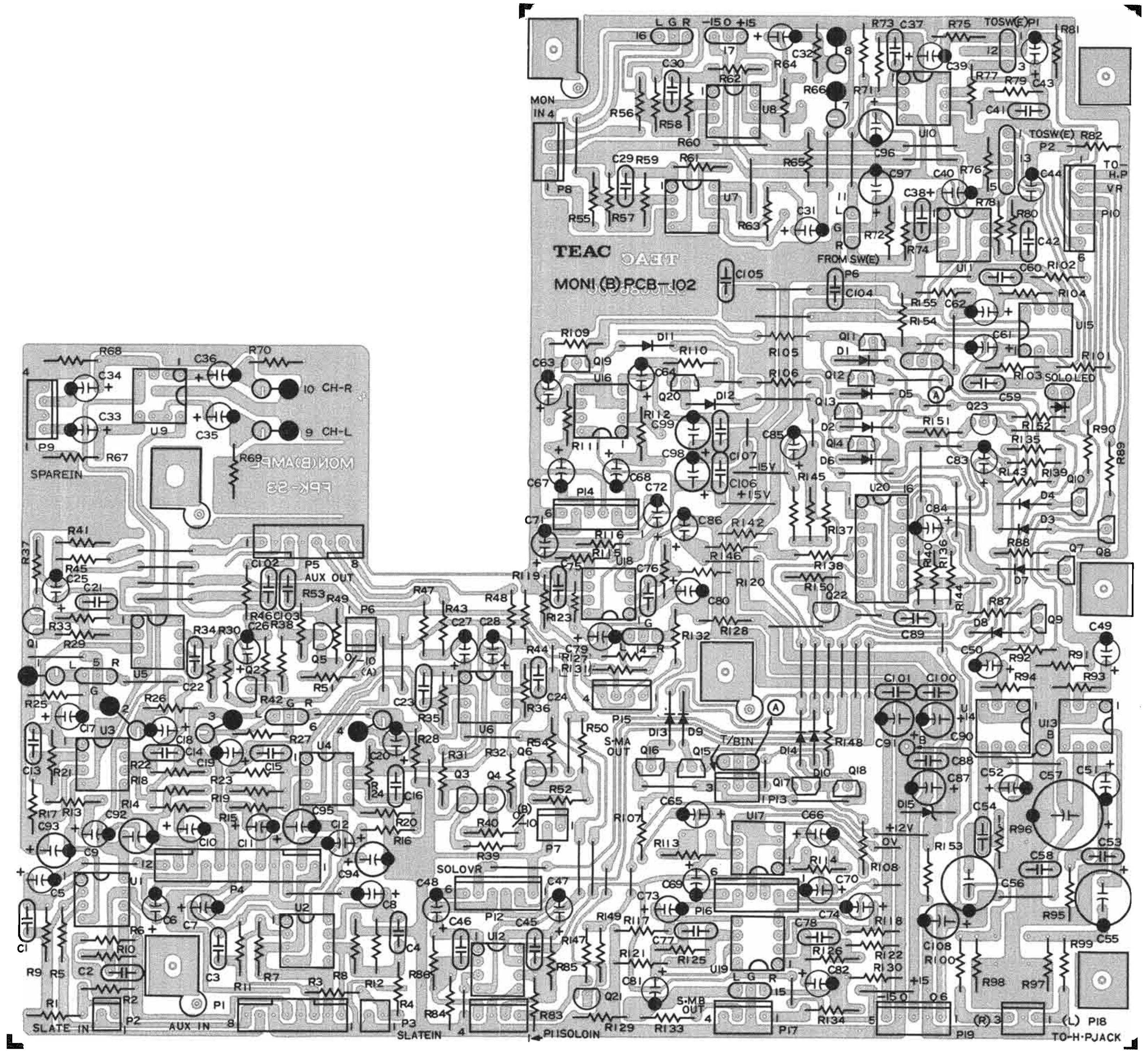
CONNECTION

CHANNEL	①	②	③	④	⑤	⑥	⑦	⑧	⑨	CHANNEL
1	IN/OUTPUT (A) PCB P4 of CH. 1	IN/OUTPUT (A) PCB P2 of CH. 1	IN/OUTPUT (A) PCB P3 of CH. 1	MOTHER (B) PCB P30	INPUT AMPL. PCB P2 of CH. 2	INPUT AMPL. PCB P3 of CH. 2	SW (B) PCB P5 of CH. 2	MOTHER (B) PCB P1	INPUT AMPL. PCB P1 of CH. 2	1
2	IN/OUTPUT (A) PCB P4 of CH. 2	IN/OUTPUT (A) PCB P2 of CH. 2	IN/OUTPUT (A) PCB P3 of CH. 2	MOTHER (B) PCB P32	INPUT AMPL. PCB P2 of CH. 3	INPUT AMPL. PCB P3 of CH. 3	SW (B) PCB P5 of CH. 3	MOTHER (B) PCB P2	INPUT AMPL. PCB P1 of CH. 3	2
3	IN/OUTPUT (A) PCB P4 of CH. 3	IN/OUTPUT (A) PCB P2 of CH. 3	IN/OUTPUT (A) PCB P3 of CH. 3		INPUT AMPL. PCB P2 of CH. 4	INPUT AMPL. PCB P3 of CH. 4	SW (B) PCB P5 of CH. 4	MOTHER (B) PCB P3	INPUT AMPL. PCB P1 of CH. 4	3
4	IN/OUTPUT (A) PCB P4 of CH. 4	IN/OUTPUT (A) PCB P2 of CH. 4	IN/OUTPUT (A) PCB P3 of CH. 4		MOTHER (B) PCB P13	MOTHER (A) PCB P1	MOTHER (A) PCB P2	MOTHER (B) PCB P4	MOTHER (B) PCB P14	4
5	IN/OUTPUT (A) PCB P4 of CH. 5	IN/OUTPUT (A) PCB P2 of CH. 5	IN/OUTPUT (A) PCB P3 of CH. 5		INPUT AMPL. PCB P2 of CH. 6	INPUT AMPL. PCB P3 of CH. 6	SW (B) PCB P5 of CH. 6	MOTHER (B) PCB P5	INPUT AMPL. PCB P1 of CH. 6	5
6	IN/OUTPUT (A) PCB P4 of CH. 6	IN/OUTPUT (A) PCB P2 of CH. 6	IN/OUTPUT (A) PCB P3 of CH. 6		INPUT AMPL. PCB P2 of CH. 7	INPUT AMPL. PCB P3 of CH. 7	SW (B) PCB P5 of CH. 7	MOTHER (B) PCB P6	INPUT AMPL. PCB P1 of CH. 7	6
7	IN/OUTPUT (A) PCB P4 of CH. 7	IN/OUTPUT (A) PCB P2 of CH. 7	IN/OUTPUT (A) PCB P3 of CH. 7		INPUT AMPL. PCB P2 of CH. 8	INPUT AMPL. PCB P3 of CH. 8	SW (B) PCB P5 of CH. 8	MOTHER (B) PCB P7	INPUT AMPL. PCB P1 of CH. 8	7
8	IN/OUTPUT (A) PCB P4 of CH. 8	IN/OUTPUT (A) PCB P2 of CH. 8	IN/OUTPUT (A) PCB P3 of CH. 8		MOTHER (B) PCB P15	MOTHER (A) PCB P3	MOTHER (A) PCB P4	MOTHER (B) PCB P8	MOTHER (B) PCB P16	8
9	IN/OUTPUT (A) PCB P4 of CH. 9	IN/OUTPUT (A) PCB P2 of CH. 9	IN/OUTPUT (A) PCB P3 of CH. 9		INPUT AMPL. PCB P2 of CH.10	INPUT AMPL. PCB P3 of CH.10	SW (B) PCB P5 of CH.10	MOTHER (B) PCB P9	INPUT AMPL. PCB P1 of CH.10	9
10	IN/OUTPUT (A) PCB P4 of CH.10	IN/OUTPUT (A) PCB P2 of CH.10	IN/OUTPUT (A) PCB P3 of CH.10		INPUT AMPL. PCB P2 of CH.11	INPUT AMPL. PCB P3 of CH.11	SW (B) PCB P5 of CH.11	MOTHER (B) PCB P10	INPUT AMPL. PCB P1 of CH.11	10
11	IN/OUTPUT (A) PCB P4 of CH.11	IN/OUTPUT (A) PCB P2 of CH.11	IN/OUTPUT (A) PCB P3 of CH.11		INPUT AMPL. PCB P2 of CH.12	INPUT AMPL. PCB P3 of CH.12	SW (B) PCB P5 of CH.12	MOTHER (B) PCB P11	INPUT AMPL. PCB P1 of CH.12	11
12	IN/OUTPUT (A) PCB P4 of CH.12	IN/OUTPUT (A) PCB P2 of CH.12	IN/OUTPUT (A) PCB P3 of CH.12		MOTHER (B) PCB P17	MOTHER (A) PCB P5	MOTHER (A) PCB P6	MOTHER (B) PCB P12	MOTHER (B) PCB P18	12


MOTHER (A) PCB-126 (1/2)
LED (A) PCB-157
METER AMPL. PCB-102
JACK PCB-104
MOTHER (B) PCB-127 (1/2)
SW (C) PCB-209
IN/OUTPUT (A) PCB-138
INPUT AMPL. PCB-137
SW (A) PCB-211
SW (B) PCB-212
1 ch.
2 ch.
3 ch.
4 ch.
5 ch.
6 ch.
7 ch.
8 ch.
9 ch.
10 ch.
11 ch.
12 ch.


MOTHER (A) PCB-126 (2/2)
MOTHER (B) PCB-127 (2/2)
MONITOR AMPL. (C) PCB-103
POWER SUPPLY PCB
IN/OUTPUT (C) PCB
BUSS AMPL. PCB-103
IN/OUTPUT (B) PCB-143
MONITOR AMPL. (B) PCB-102
MONITOR AMPL. (A) PCB-101
SW E PCB
SW D PCB
TALKBACK PCB-111

3-8. MONITOR AMPL. B PCB Ass'y



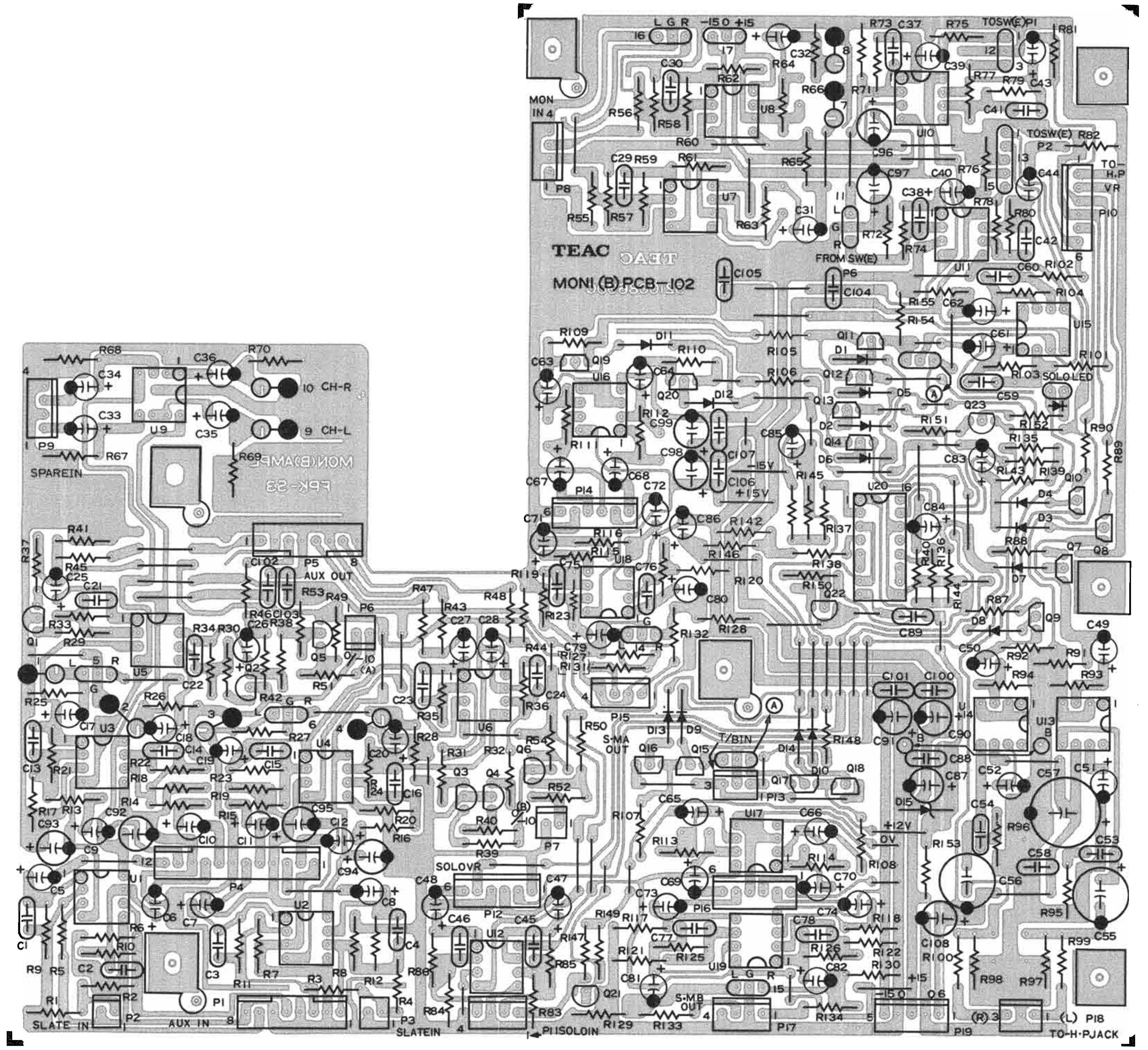
MONITOR AMPL. B PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	5200086900	PCB Ass'y
	5210086900	PCB
		IC'S
U1~U4	5220407000	TL072CP
U5, U6	5220414400	NJM4556D
U7~U11	5220416600	NJM2041DD
U12	5220407000	TL072CP
U13, U14	6048649000	NJM386D
U15	5220416600	NJM2041DD
U16, U17	5220407000	TL072CP
U18, U19	5220416600	NJM2041DD
U20	5220020000	TC4049BP
		TRANSISTORS
Q1~Q4	5230775000	2SB-2878B
Q5, Q6	5145150000	2SA-1015GR
Q7~Q20	5232007000	2SK-304 (EF)
Q21~Q23	5145151000	2SC-1815GR
		DIODES
D1~D14	5143118000	1S2473HJ
D15	5042281000	WZ120, Zener
		CARBON RESISTORS All resistors are rated ±5% tolerance at 1/4W.
R1~R4	5181514000	22kΩ
R5~R8	5181538000	220kΩ
R9~R12	5181514000	22kΩ
R13~R16	5181522000	47kΩ
R17~R24	5181532000	120kΩ
R25~R28	5181522000	47kΩ
R29~R32	5181506000	10kΩ
R33~R36	5181510000	15kΩ
R37~R44	5181522000	47kΩ
R45~R48	5181458000	100kΩ
R49, R50	5181522000	47kΩ
R51, R52	5181506000	10kΩ
R53, R54	5181522000	47kΩ
R55, R56	5181514000	22kΩ
R57, R58	5181538000	220kΩ
R59, R64	5181514000	22kΩ
R65, R66	5181522000	47kΩ
R67, R68	5181530000	100kΩ
R69, R70	5181522000	47kΩ
R71, R72	5181538000	220kΩ
R73, R74	5181514000	22kΩ
R75~R78	5181522000	47kΩ
R79, R80	5181526000	68kΩ
R81, R82	5181522000	47kΩ
R83, R84	5181538000	220kΩ

REF. NO.	PARTS NO.	DESCRIPTION		
R85, R86	5181502000	6.8kΩ		
R87~R90	5181482000	1kΩ		
R91, R92	5181522000	47kΩ		
R93, R94	5181530000	100kΩ		
R95, R96	5181434000	10Ω		
R97, R98	5181482000	1kΩ		
R99, R100	5181410000	1Ω		
R101, R102	5181524000	56kΩ		
R103, R104	5181514000	22kΩ		
R105~R108	5181518000	33kΩ		
R109~R114	5181540000	270kΩ		
R115~R118	5181530000	100kΩ		
R119~R122	5181506000	10kΩ		
R123~R126	5181510000	15kΩ		
R127~R130	5181522000	47kΩ		
R131~R134	5181458000	100Ω		
R135~R138	5181526000	68kΩ		
R139~R148	5181530000	100kΩ		
R149~R151	5181506000	10kΩ		
R152	5180066000	220Ω	(1/2W)	
R153	5183582000	150Ω Nonflammable		
R154, R155	5181522000	47kΩ		
R156, R157	5181514000	22kΩ		
		CAPACITORS		
C1~C4	5054382000	Dip Mica	22pF	
C5~C8	5260163452	Elec.	22μF	25V
C9~C12	5260162550	Elec.	10μF	16V
C13~C16	5054740000	Dip Mica	10pF	
C17~C20	5260163452	Elec.	22μF	25V
C21~C24	5054758000	Dip Mica	82pF	
C25~C28	5260163452	Elec.	22μF	25V
C29, C30	5054382000	Dip Mica	22pF	
C31, C32	5260163452	Elec.	22μF	25V
C33, C34	5260162550	Elec.	10μF	16V
C35, C36	5260163452	Elec.	22μF	25V
C37, C38	5054382000	Dip Mica	22pF	
C39, C40	5260163452	Elec.	22μF	25V
C41, C42	5054382000	Dip Mica	22pF	
C43, C44	5260163452	Elec.	22μF	25V
C45, C46	5054382000	Dip Mica	22pF	
C47, C48	5260163352	Elec.	22μF	16V
C49~C52	5260162550	Elec.	10μF	16V
C53, C54	5054738500	Myler	0.047μF	
C55, C56	5173079000	Elec.	1000μF	6.3V
C57	5173080000	Elec.	1000μF	10V
C58	5054204000	Ceramic	0.01μF	50V
C61, C62	5260163452	Elec.	22μF	25V
C63~C66	5260162550	Elec.	10μF	16V
C67~C70	5260163452	Elec.	22μF	25V

REF. NO.	PARTS NO.	DESCRIPTION		
C71~C74	5260162550	Elec.	10μF	16V
C75~C78	5054758000	Dip Mica	82pF	
C79~C82	5260163452	Dip Mica	22pF	25V
C83	5260160750	Elec.	1μF	16V
C84	5260161150	Elec.	2.2μF	50V
C85, C86	5260160750	Elec.	1μF	50V
C87	5260165252	Elec.	47μF	25V
C88, C89	5054204000	Ceramic	0.01μF	50V
C90~C99	5260165252	Elec.	47μF	25V
C100~C107	5054204000	Ceramic	0.01μF	50V
C108	5260165052	Elec.	47μF	10V
		CONNECTOR PLUGS		
P1	5122132000	8P		
P2, P3	5122126000	2P		
P4	5122136000	12P		
P5	5122132000	8P		
P6, P7	5122126000	2P		
P8, P9	5122128000	4P		
P10	5122130000	6P		
P11	5122128000	4P		
P12	5122130000	6P		
P13	5122127000	3P		
P14	5122130000	6P		
P15	5122128000	4P		
P16	5122130000	6P		
P17	5122128000	4P		
P18	5122127000	3P		
P19	5122129000	5P		

3-8. MONITOR AMPL. B PCB Ass'y



MONITOR AMPL. B PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION		
	5200086900	PCB Ass'y		
	5210086900	PCB		
IC'S				
U1～U4	5220407000	TL072CP		
U5, U6	5220414400	NJM4556D		
U7～U11	5220416600	NJM2041DD		
U12	5220407000	TL072CP		
U13, U14	6048649000	NJM386D		
U15	5220416600	NJM2041DD		
U16, U17	5220407000	TL072CP		
U18, U19	5220416600	NJM2041DD		
U20	5220020000	TC4049BP		
TRANSISTORS				
Q1～Q4	5230775000	2SB-2878B		
Q5, Q6	5145150000	2SA-1015GR		
Q7～Q20	5232007000	2SK-304 (EF)		
Q21～Q23	5145151000	2SC-1815GR		
DIODES				
D1～D14	5143118000	1S2473HJ		
D15	5042281000	WZ120, Zener		
CARBON RESISTORS All resistors are rated ±5% tolerance at 1/4W.				
R1～R4	5181514000	22kΩ		
R5～R8	5181538000	220kΩ		
R9～R12	5181514000	22kΩ		
R13～R16	5181522000	47kΩ		
R17～R24	5181532000	120kΩ		
R25～R28	5181522000	47kΩ		
R29～R32	5181506000	10kΩ		
R33～R36	5181510000	15kΩ		
R37～R44	5181522000	47kΩ		
R45～R48	5181458000	100kΩ		
R49, R50	5181522000	47kΩ		
R51, R52	5181506000	10kΩ		
R53, R54	5181522000	47kΩ		
R55, R56	5181514000	22kΩ		
R57, R58	5181538000	220kΩ		
R59, R64	5181514000	22kΩ		
R65, R66	5181522000	47kΩ		
R67, R68	5181530000	100kΩ		
R69, R70	5181522000	47kΩ		
R71, R72	5181538000	220kΩ		
R73, R74	5181514000	22kΩ		
R75～R78	5181522000	47kΩ		
R79, R80	5181526000	68kΩ		
R81, R82	5181522000	47kΩ		
R83, R84	5181538000	220kΩ		
R85, R86	5181502000	6.8kΩ		
R87～R90	5181482000	1kΩ		
R91, R92	5181522000	47kΩ		
R93, R94	5181530000	100kΩ		
R95, R96	5181434000	10Ω		
R97, R98	5181482000	1kΩ		
R99, R100	5181410000	1Ω		
R101, R102	5181524000	56kΩ		
R103, R104	5181514000	22kΩ		
R105～R108	5181518000	33kΩ		
R109～R114	5181540000	270kΩ		
R115～R118	5181530000	100kΩ		
R119～R122	5181506000	10kΩ		
R123～R126	5181510000	15kΩ		
R127～R130	5181522000	47kΩ		
R131～R134	5181458000	100Ω		
R135～R138	5181526000	68kΩ		
R139～R148	5181530000	100kΩ		
R149～R151	5181506000	10kΩ		
R152	5180066000	220Ω	(1/2W)	
R153	5183582000	150Ω	Nonflammable	
R154, R155	5181522000	47kΩ		
R156, R157	5181514000	22kΩ		
CAPACITORS				
C1～C4	5054382000	Dip Mica	22pF	
C5～C8	5260163452	Elec.	22μF	25V
C9～C12	5260162550	Elec.	10μF	16V
C13～C16	5054740000	Dip Mica	10pF	
C17～C20	5260163452	Elec.	22μF	25V
C21～C24	5054758000	Dip Mica	82pF	
C25～C28	5260163452	Elec.	22μF	25V
C29, C30	5054382000	Dip Mica	22pF	
C31, C32	5260163452	Elec.	22μF	25V
C33, C34	5260162550	Elec.	10μF	16V
C35, C36	5260163452	Elec.	22μF	25V
C37, C38	5054382000	Dip Mica	22pF	
C39, C40	5260163452	Elec.	22μF	25V
C41, C42	5054382000	Dip Mica	22pF	
C43, C44	5260163452	Elec.	22μF	25V
C45, C46	5054382000	Dip Mica	22pF	
C47, C48	5260163352	Elec.	22μF	16V
C49～C52	5260162550	Elec.	10μF	16V
C53, C54	5054738500	Myler	0.047μF	
C55, C56	5173079000	Elec.	1000μF	6.3V
C57	5173080000	Elec.	1000μF	10V
C58	5054204000	Ceramic	0.01μF	50V
C61, C62	5260163452	Elec.	22μF	25V
C63～C66	5260162550	Elec.	10μF	16V
C67～C70	5260163452	Elec.	22μF	25V
C71～C74	5260162550	Elec.	10μF	16V
C75～C78	5054758000	Dip Mica	82pF	
C79～C82	5260163452	Dip Mica	22pF	25V
C83	5260160750	Elec.	1μF	16V
C84	5260161150	Elec.	2.2μF	50V
C85, C86	5260160750	Elec.	1μF	50V
C87	5260165252	Elec.	47μF	25V
C88, C89	5054204000	Ceramic	0.01μF	50V
C90～C99	5260165252	Elec.	47μF	25V
C100～C107	5054204000	Ceramic	0.01μF	50V
C108	5260165052	Elec.	47μF	10V
CONNECTOR PLUGS				
P1	5122132000	8P		
P2, P3	5122126000	2P		
P4	5122136000	12P		
P5	5122132000	8P		
P6, P7	5122126000	2P		
P8, P9	5122128000	4P		
P10	5122130000	6P		
P11	5122128000	4P		
P12	5122130000	6P		
P13	5122127000	3P		
P14	5122130000	6P		
P15	5122128000	4P		
P16	5122130000	6P		
P17	5122128000	4P		
P18	5122127000	3P		
P19	5122129000	5P		

INPUT AMPL. A through G Ass'y (Included SW A PCB and SW B PCB.)

REF. NO.	PARTS NO.	DESCRIPTION
	5200086201	PCB A Ass'y (Chan. 1, 2)
	5200086211	PCB B Ass'y (Chan. 3)
	5200086221	PCB C Ass'y (Chan. 4)
	5200086231	PCB D Ass'y (Chan. 5, 6, 7)
	5200086241	PCB E Ass'y (Chan. 8)
	5200086251	PCB F Ass'y (Chan. 9, 10, 11)
	5200086261	PCB G Ass'y (Chan. 12)
	5200086201	PCB

IC'S

REF. NO.	PARTS NO.	DESCRIPTION
U1	5220407000	TLO72CP
U2	5220414400	NJM4556D
U3	5220416600	NJM2041DD
U4	5220417000	LM393P
U5, U6	5220407000	TLO73CP
U7	5220414400	NJM4556D
U9, U10	5220414400	NJM4656D

TRANSISTORS

REF. NO.	PARTS NO.	DESCRIPTION
Q1, Q2	5145119000	2SC-1844F
Q3, Q4	5145151000	2SC-1815GR

DIODES

REF. NO.	PARTS NO.	DESCRIPTION
D1 ~ D4	5143118000	1S24T3HJ

CARBON RESISTORS

All resistors are rated ±5% tolerance, 1/4W and of carbon type unless otherwise noted.

REF. NO.	PARTS NO.	DESCRIPTION	
R1	5181482000	1kΩ	
R2	5181454000	68Ω	
R3	5181482000	1kΩ	
R4	5181491000	2.4kΩ	
R5, R6	5181506000	10kΩ	
R7	5241152200	47kΩ	1% Metal Film
R8, R9	5241149800	4.7kΩ	1% Metal Film
R10	5181458000	100Ω	
R11	5181448000	39Ω	
R12	5181546000	470kΩ	
R13	5241152200	47kΩ	1% Metal Film
R14, R15	5241150600	10kΩ	1% Metal Film
R16, R17	5181530000	100kΩ	
R18	5181500000	5.6kΩ	
R19	5241148600	1.5kΩ	1% Metal Film
R20	5181486000	1.5kΩ	
R21	5241148600	1.5kΩ	1% Metal Film
R22	5181522000	47kΩ	
R23	5181498000	4.7kΩ	
R24	5181482000	1kΩ	
R25	5181506000	10kΩ	
R26	5181522000	47kΩ	
R27	5181522000	47kΩ	
R28, R29	5181462000	150Ω	
R30	5181530000	100kΩ	

REF. NO.	PARTS NO.	DESCRIPTION	
R31	5181506000	10kΩ	
R32	5181510000	15kΩ	
R33	5181514000	22kΩ	
R34	5181522000	47kΩ	
R34	5181490000	2.2kΩ	
R35	5181498000	4.7kΩ	
R36	5181522000	47kΩ	
R37	5181548000	560kΩ	
R38	5181482000	1kΩ	
R39	5181530000	100kΩ	
R40	5181482000	1kΩ	
R41	5181506000	10kΩ	
R42	5181522000	100kΩ	
R43	5181458000	100Ω	
R44	5181530000	100kΩ	
R45	5181515000	24kΩ	
R46	5181516000	27kΩ	
R47	5181530000	100kΩ	
R48	5181458000	100Ω	
R49	5181516000	27kΩ	
R50	5181522000	47kΩ	
R51	5181456000	560Ω	
R52	5181538000	220kΩ	
R53, R54	5181506000	10kΩ	
R55, R56	5181499000	5.1kΩ	
R57, R58	5181506000	10kΩ	
R59, R60	5181507000	11kΩ	
R61, R62	5181506000	10kΩ	
R63, R64	5181513000	20kΩ	
R65 ~ R67	5181506000	10kΩ	
R68	5181510000	15kΩ	
R69	5181522000	47kΩ	
R70	5181458000	100Ω	
R71 ~ R78	5181514000	22kΩ	
R79, R80	5181530000	100kΩ	
R81, R82	5181506000	10kΩ	
R83, R84	5181510000	15kΩ	
R85 ~ R88	5181514000	22kΩ	
R89 ~ R93	5181476000	560Ω	
R94 ~ R97	5181530000	100kΩ	
R98, R99	5181514000	22kΩ	
R100	5181530000	100kΩ	
R101, R102	⚠ 5183566000	33Ω	Nonflammable
R103, R104	5181434000	10Ω	
R105	5181522000	47kΩ	
R106	5181522000	47kΩ	
R107, R108	5181458000	100Ω	
R109 ~ R111	5181522000	47kΩ	

CAPACITORS

REF. NO.	PARTS NO.	DESCRIPTION			
C1, C2	5260163652	Elec.	22μF	50V	
C3, C4	5054744000	Dip Mica	100pF		
C5	5170006000	Dip Mica	68pF		
C6	5054878500	Mylar	0.001μF		
C7	5260072700	Bipolar	470μF	16V	
C9	5170006000	Dip Mica	68pF		
C10, C11	5260165252	Elec.	47μF	25V	
C12, C13	5260163452	Elec.	22μF	25V	
C14	5260162550	Elec.	10μF	16V	
C15	5260165152	Elec.	47μF	16V	
C17	5054896500	Mylar	0.0015μF		5%
C18	5054891500	Mylar	0.0047μF		5%
C19	5260163352	Elec.	22μF	16V	
C20	5260162550	Elec.	10μF	16V	
C21, C22	5260163452	Elec.	22μF	25V	
C24	5260160750	Elec.	1μF	50V	
C25	5260162550	Elec.	10μF	16V	
C26	5054479500	Mylar	0.051μF		5%
C27	5054897500	Mylar	0.018μF		5%
C28	5054891500	Mylar	0.047μF		5%
C29	5054888500	Mylar	0.0018μF		5%
C30	5172827000	Polyst.	910pF		
C31	5172816000	Polyst.	330pF		
C33, C34	5260162550	Elec.	10μF	16V	
C35	5260163452	Elec.	22μF	25V	
C36, C37	5260162550	Elec.	10μF	16V	
C38, C39	5260163452	Elec.	22μF	25V	
C40 ~ C43	5260162550	Elec.	10μF	16V	
C44, C45	5260163452	Elec.	22μF	25V	
C46, C47	5260166052	Elec.	100μF	16V	
C48 ~ C53	5054758000	Dip Mica	82pF		
C54, C55	5054204000	Ceramic	0.01μF	50V	
C56 ~ C58	5054758000	Dip Mica	47pF		
C59, C60	5260165252	Elec.	47μF	25V	
C61	5054204000	Ceramic	0.01μF	50V	

VARIABLE RESISTORS

REF. NO.	PARTS NO.	DESCRIPTION	
VR1	5282706700		5kΩ (RD) + 10kΩ (A)
VR2 ~ VR4	5283504402		10kΩ (BP) + 100kΩ (30C) × 2
VR5	5284006400	Slide	10kΩ (C)
VR6, VR7	5283504200		10kΩ (A) + 5kΩ (A, C)
VR8	5282408600		5kΩ (A, C)
VR9	5280001102	Semi-fixed	20kΩ (B)

SWITCHES

REF. NO.	PARTS NO.	DESCRIPTION
S1, S2	5132037000	Lever, SLR522
S3 ~ S5	5132036000	Lever, SLR523
S6	5300029400	Push, SUJ30
S7	5300029800	Push, SUJ50
S8	5300029700	Push, SUJ60

CONNECTOR PLUGS

REF. NO.	PARTS NO.	DESCRIPTION
P1	5122151000	8P
P2	5122150000	7P (RED)
P3	5122151000	8P
P4, P5	5122155000	12P
P6	5122149000	6P

MISCELLANEOUS

REF. NO.	PARTS NO.	DESCRIPTION
	5210086300	PCB-211, SW (A)
	5210086400	PCB-212, SW (B)
	5122373000	Connector Socket, 2P
LED1 ~ LED6	5225006900	LED, PR3432S

Components Mounted Chart

○ : Mounted
– : Not Mounted

PCB Ass'y		A	B	C	D	E	F	G
CHANNEL		1, 2	3	4	5, 6, 7	8	9, 10, 11	12
REF. NO.	U3	–	○	○	○	○	○	○
	R33	–	–	–	○	○	○	○
	R34	–	47k	47k	2.2k	2.2k	2.2k	2.2k
	R35	–	○	○	–	–	–	–
	R36	–	○	○	–	–	–	–
	R37	–	○	○	–	–	–	–
	R38	–	○	○	–	–	–	–
	R39	–	○	○	○	○	○	○
	R40	–	○	○	○	○	○	○
	R41	–	○	○	○	○	○	○
	C16	–	○	○	–	–	–	–
	C17	–	○	○	–	–	–	–
	C18	–	○	○	–	–	–	–
	C19	–	○	○	–	–	–	–
	C20	–	○	○	○	○	○	○
	C22	–	○	○	○	○	○	○
	C50	–	○	○	○	○	○	○

MOTHER B PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	5200088100	PCB Ass'y
	5210088100	PCB

IC'S

REF. NO.	PARTS NO.	DESCRIPTION
U1, U2	5220416600	NJM2041DD

CARBON RESISTORS

All resistors are rated ±5% tolerance at 1/4W.

REF. NO.	PARTS NO.	DESCRIPTION
R1 ~ R4	5181514000	22kΩ
R5	5181530000	100kΩ
R6	5181484000	1.2kΩ
R7	5181506000	10kΩ
R8	5181482000	1kΩ
R9	5181526000	68kΩ
R10	5181482000	1kΩ
R11	5181506000	10kΩ
R12	5181530000	100kΩ
R13	5181484000	1.2kΩ
R14	5181506000	10kΩ
R15	5181482000	1kΩ
R16	5181526000	68kΩ
R17	5181482000	1kΩ
R18	5181506000	10kΩ
R19, R20	5183566000	33kΩ

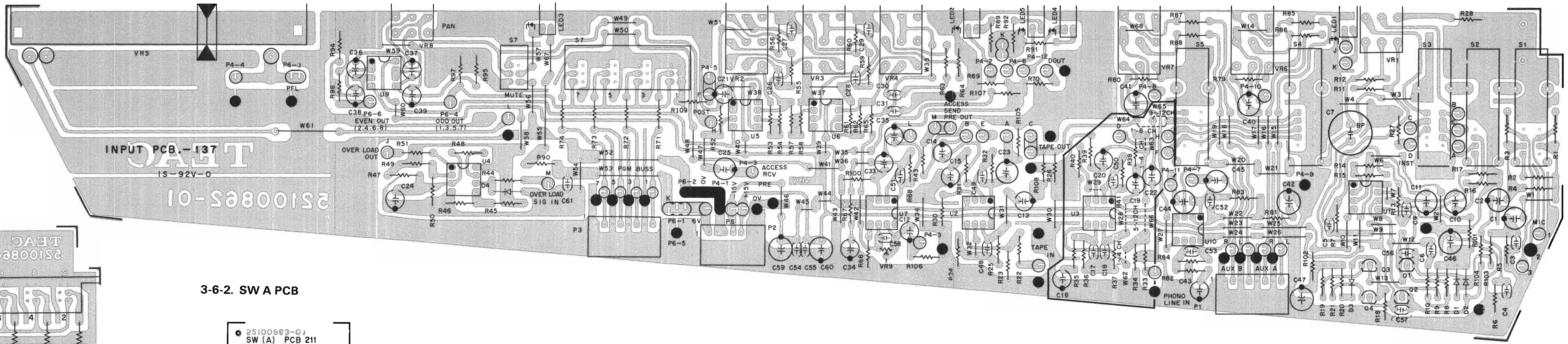
CAPACITORS

REF. NO.	PARTS NO.	DESCRIPTION		
C2	5054758000	Dip Mica	82pF	
C3	5260163352	Elec.	22μF	16V
C5	5054758000	Dip Mica	82pF	
C6	5260163352	Elec.	22μF	16V
C8	5054758000	Dip Mica	82pF	
C9	5260163352	Elec.	22μF	16V
C11	5054758000	Dip Mica	82pF	
C12	5260163352	Elec.	22μF	16V
C13, C14	5260165252	Elec.	47μF	25V
C15, C16	5054204000	Ceramic	0.01μF	50V

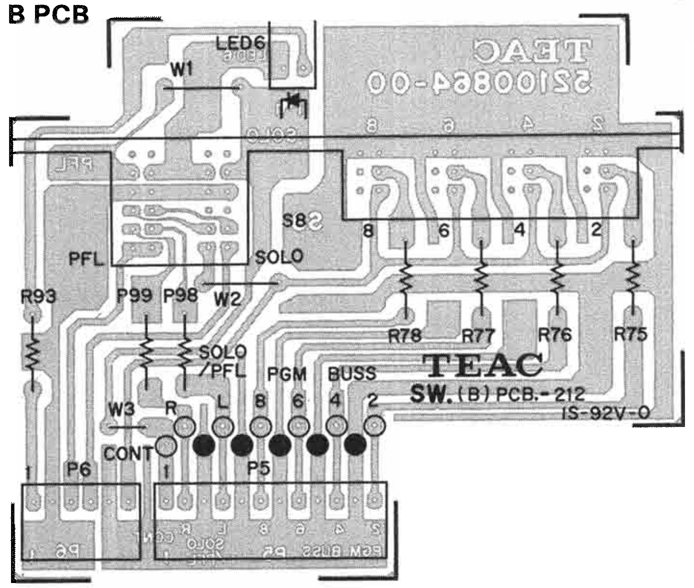
CONNECTOR PLUGS

REF. NO.	PARTS NO.	DESCRIPTION
P1 ~ P12	5122126000	2P
P13	5122304000	7P (RED)
P14	5122189000	8P (BLK)
P15	5122304000	7P (RED)
P16	5122189000	8P (BLK)
P17	5122304000	7P (RED)
P18, P19	5122189000	8P (BLK)
P20	5122132000	8P
P21	5122193000	12P (BLK)
P22	5122309000	12P (RED)
P23	5122128000	4P
P24	5122131000	7P (BLK)
P25	5122130000	6P
P26, P27	5122189000	8P (BLK)
P28	5122304000	7P (RED)
P29	5122302000	5P (RED)

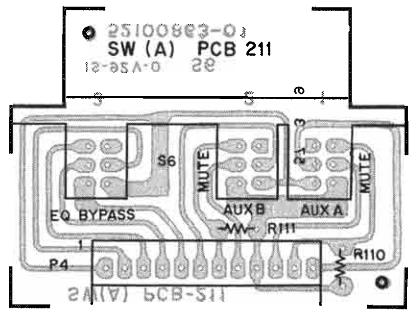
3-6. INPUT AMPL. A through G Ass'y



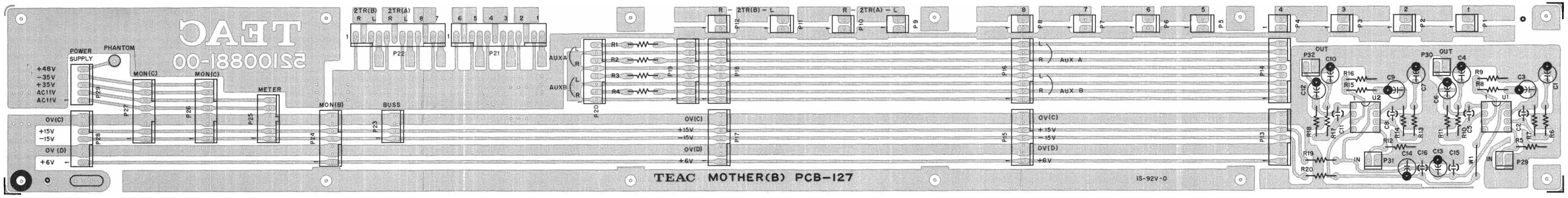
3-6-1. SW B PCB



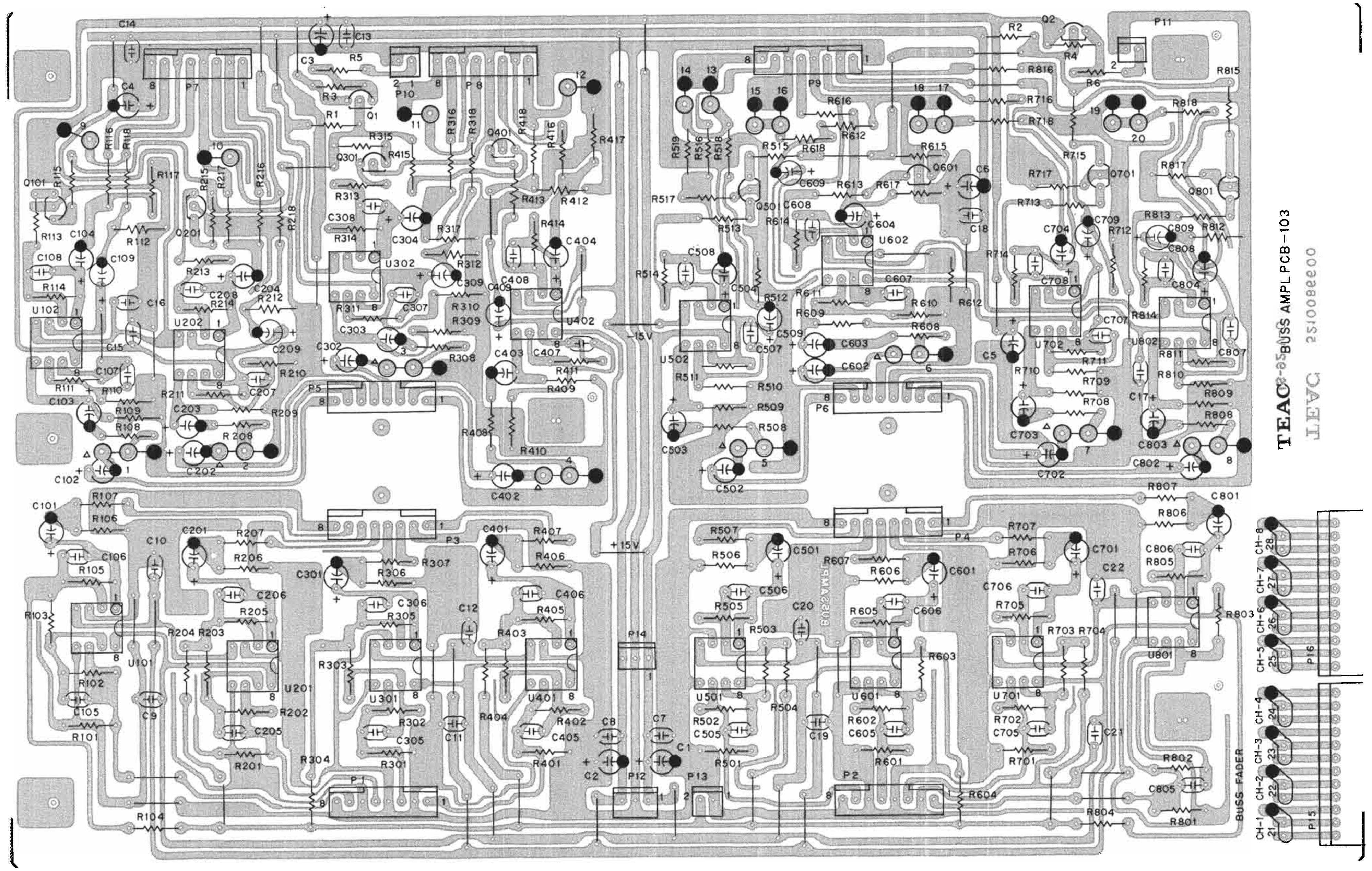
3-6-2. SW A PCB



3-7. MOTHER B PCB Ass'y



3-5. BUSS AMPL. PCB Ass'y



BUSS AMPL. PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	5200086600	PCB Ass'y
	5210086600	PCB

IC'S

REF. NO.	PARTS NO.	DESCRIPTION
U101, U201	5220414400	NJM4556D
U301, U401	5220414400	
U501, U601	5220414400	
U701, U801	5220414400	
U102, U202	5220414400	NJM4556D
U302, U402	5220414400	
U502, U602	5220414400	
U702, U802	5220414400	

TRANSISTORS

REF. NO.	PARTS NO.	DESCRIPTION
Q1, Q2	5145150000	2SA-1015GR
Q101, Q201	5230775000	2SC-2878B
Q301, Q401	5230775000	
Q501, Q601	5230775000	
Q701, Q801	5230775000	

CARBON RESISTORS

All resistors are rated ±5% tolerance at 1/4W.

REF. NO.	PARTS NO.	DESCRIPTION
R1 ~ R4	5181522000	47kΩ
R5, R6	5181506000	10kΩ
R101, R201	5181514000	22kΩ
R301, R401	5181514000	22kΩ
R501, R601	5181514000	22kΩ
R701, R801	5181514000	22kΩ
R102, R202	5181514000	22kΩ
R302, R402	5181514000	22kΩ
R502, R602	5181514000	22kΩ
R702, R802	5181514000	22kΩ
R103, R203	5181514000	22kΩ
R303, R403	5181514000	22kΩ
R503, R603	5181514000	22kΩ
R703, R803	5181514000	22kΩ
R104, R204	5181514000	22kΩ
R304, R404	5181514000	22kΩ
R504, R604	5181514000	22kΩ
R704, R804	5181514000	22kΩ
R105, R205	5181514000	22kΩ
R305, R405	5181514000	22kΩ
R505, R605	5181514000	22kΩ
R705, R805	5181514000	22kΩ
R106, R206	5181522000	47kΩ
R306, R406	5181522000	47kΩ
R506, R606	5181522000	47kΩ
R706, R806	5181522000	47kΩ
R107, R207	5181458000	100Ω
R307, R407	5181458000	100Ω
R507, R607	5181458000	100Ω
R707, R807	5181458000	100Ω

REF. NO.	PARTS NO.	DESCRIPTION
R108, R208	5181482000	1kΩ
R308, R408	5181482000	1kΩ
R508, R608	5181482000	1kΩ
R708, R808	5181482000	1kΩ
R109, R209	5181530000	100kΩ
R309, R409	5181530000	100kΩ
R509, R609	5181530000	100kΩ
R709, R809	5181530000	100kΩ
R110, R210	5181506000	10kΩ
R310, R410	5181506000	10kΩ
R510, R610	5181506000	10kΩ
R710, R810	5181506000	10kΩ
R111, R211	5181510000	15kΩ
R311, R411	5181510000	15kΩ
R511, R611	5181510000	15kΩ
R711, R811	5181510000	15kΩ
R112, R212	5181530000	100kΩ
R312, R412	5181530000	100kΩ
R512, R612	5181530000	100kΩ
R712, R812	5181530000	100kΩ
R113, R213	5181506000	10kΩ
R313, R413	5181506000	10kΩ
R513, R613	5181506000	10kΩ
R713, R813	5181506000	10kΩ
R114, R214	5181510000	15kΩ
R314, R414	5181510000	15kΩ
R514, R614	5181510000	15kΩ
R714, R814	5181510000	15kΩ
R115, R215	5181522000	47kΩ
R315, R415	5181522000	47kΩ
R515, R615	5181522000	47kΩ
R715, R815	5181522000	47kΩ
R116, R216	5181458000	100Ω
R316, R416	5181458000	100Ω
R516, R616	5181458000	100Ω
R716, R816	5181458000	100Ω
R117, R217	5181522000	47kΩ
R317, R417	5181522000	47kΩ
R517, R617	5181522000	47kΩ
R717, R817	5181522000	47kΩ
R118, R218	5181458000	100Ω
R318, R418	5181458000	100Ω
R518, R618	5181458000	100Ω
R718, R818	5181458000	100Ω

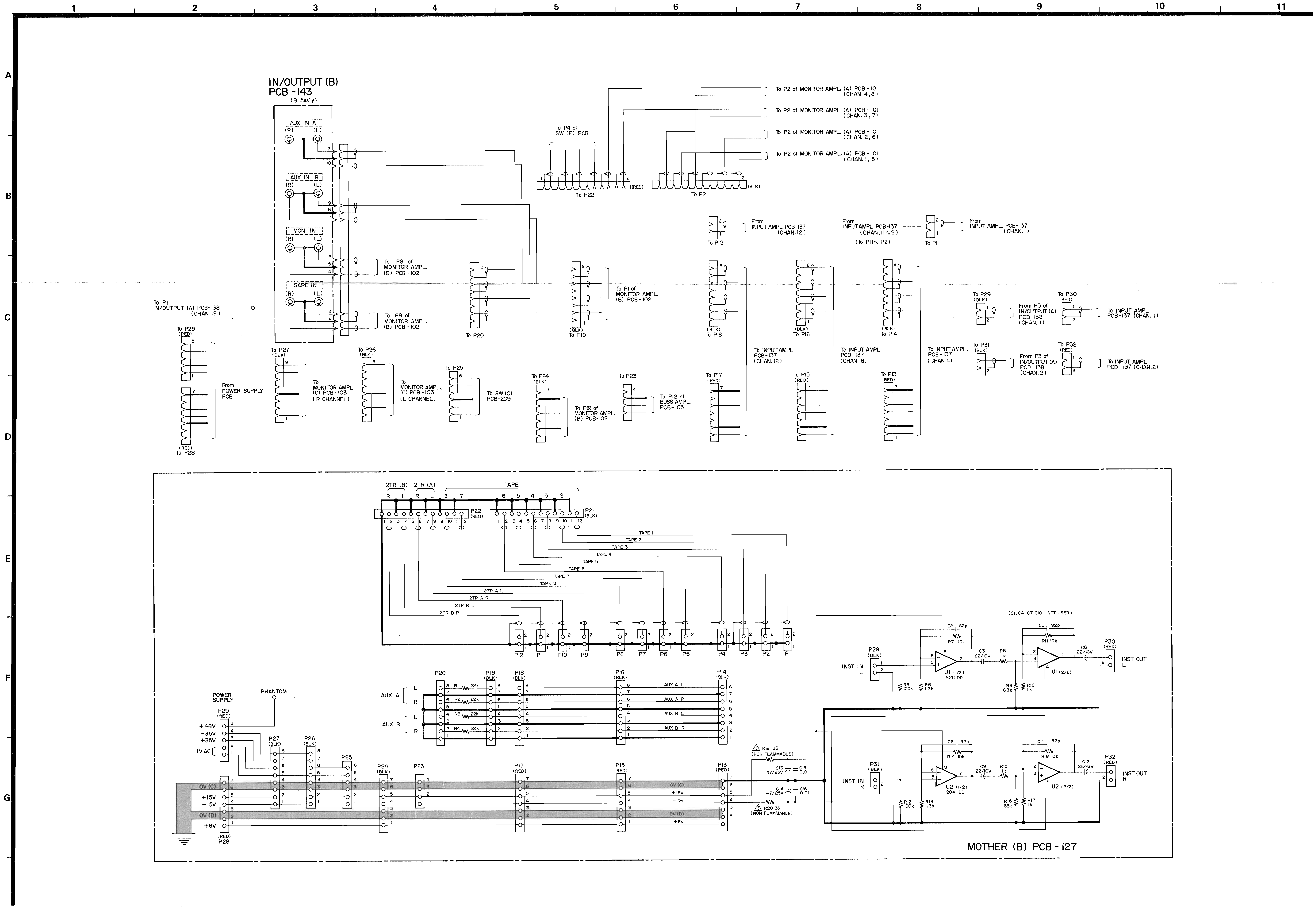
CAPACITORS

REF. NO.	PARTS NO.	DESCRIPTION		
C1 ~ C6	5260165252	Elec.	47μF	25V
C7 ~ C22	5054204000	Ceramic	0.01μF	50V
C101, C201	5260163452	Elec.	22μF	25V
C301, C401	5260163452	Elec.	22μF	25V
C501, C601	5260163452	Elec.	22μF	25V
C701, C801	5260163452	Elec.	22μF	25V
C102, C202	5260162550	Elec.	10μF	16V
C302, C402	5260162550	Elec.	10μF	16V
C502, C602	5260162550	Elec.	10μF	16V
C702, C802	5260162550	Elec.	10μF	16V
C103, C203	5260162550	Elec.	10μF	16V
C303, C403	5260162550	Elec.	10μF	16V
C503, C603	5260162550	Elec.	10μF	16V
C703, C803	5260162550	Elec.	10μF	16V
C104, C204	5260163452	Elec.	22μF	25V
C304, C404	5260163452	Elec.	22μF	25V
C504, C604	5260163452	Elec.	22μF	25V
C704, C804	5260163452	Elec.	22μF	25V
C105, C205	5054758000	Dip Mica	82pF	
C305, C405	5054758000	Dip Mica	82pF	
C505, C605	5054758000	Dip Mica	82pF	
C705, C805	5054758000	Dip Mica	82pF	
C106, C206	5054742000	Dip Mica	47pF	
C306, C406	5054742000	Dip Mica	47pF	
C506, C606	5054742000	Dip Mica	47pF	
C706, C806	5054742000	Dip Mica	47pF	
C107, C207	5054758000	Dip Mica	82pF	
C307, C407	5054758000	Dip Mica	82pF	
C507, C607	5054758000	Dip Mica	82pF	
C707, C807	5054758000	Dip Mica	82pF	
C108, C208	5054758000	Dip Mica	82pF	
C308, C408	5054758000	Dip Mica	82pF	
C508, C608	5054758000	Dip Mica	82pF	
C708, C808	5054758000	Dip Mica	82pF	
C109, C209	5260163452	Elec.	22μF	25V
C309, C409	5260163452	Elec.	22μF	25V
C509, C609	5260163452	Elec.	22μF	25V
C709, C809	5260163452	Elec.	22μF	25V

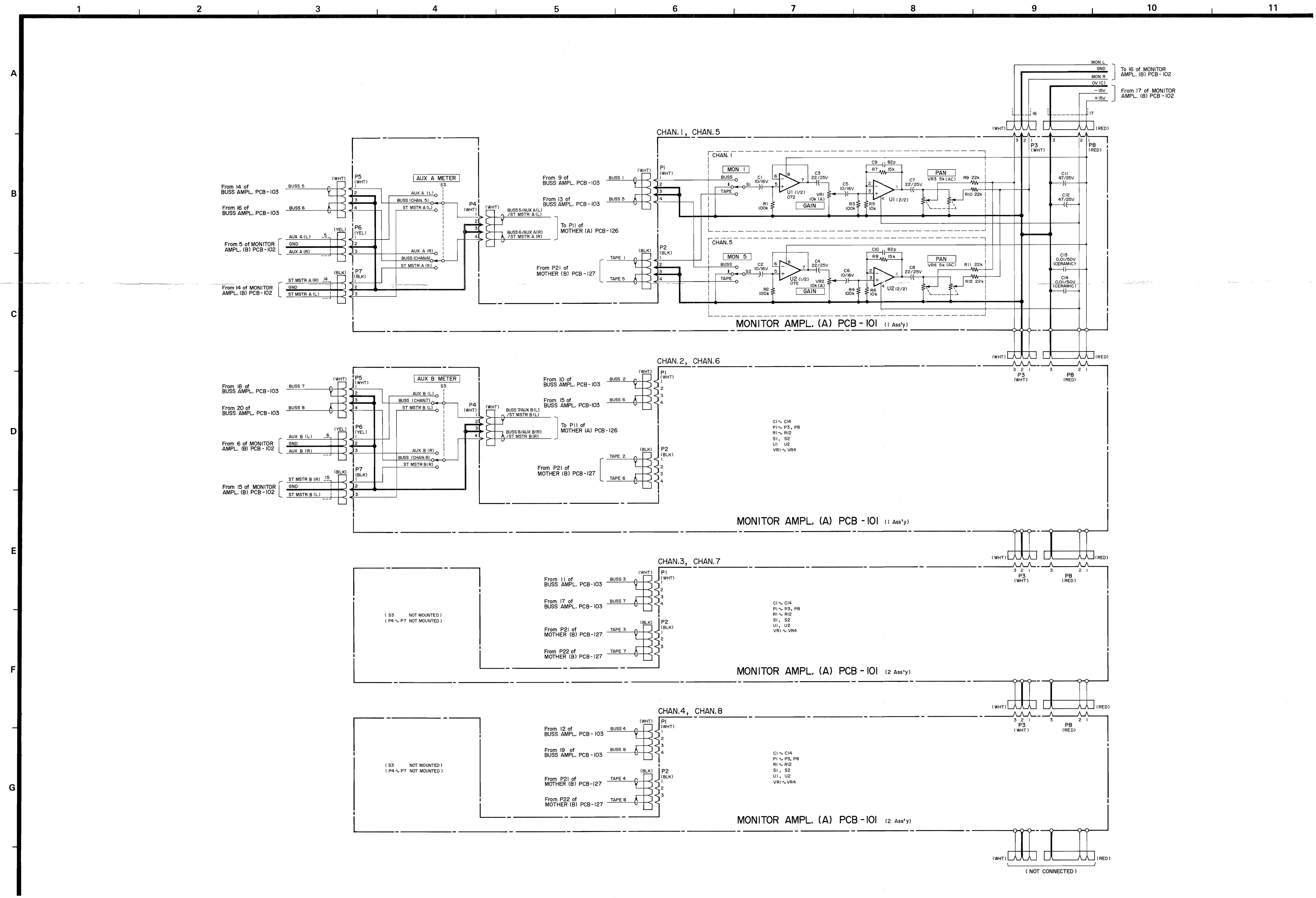
CONNECTOR PLUGS

REF. NO.	PARTS NO.	DESCRIPTION
P1 ~ P9	5122132000	8P
P10 ~ P11	5122126000	2P
P12	5122127000	3P
P13	5122126000	2P
P14	5122127000	3P
P15, P16	5122155000	12P

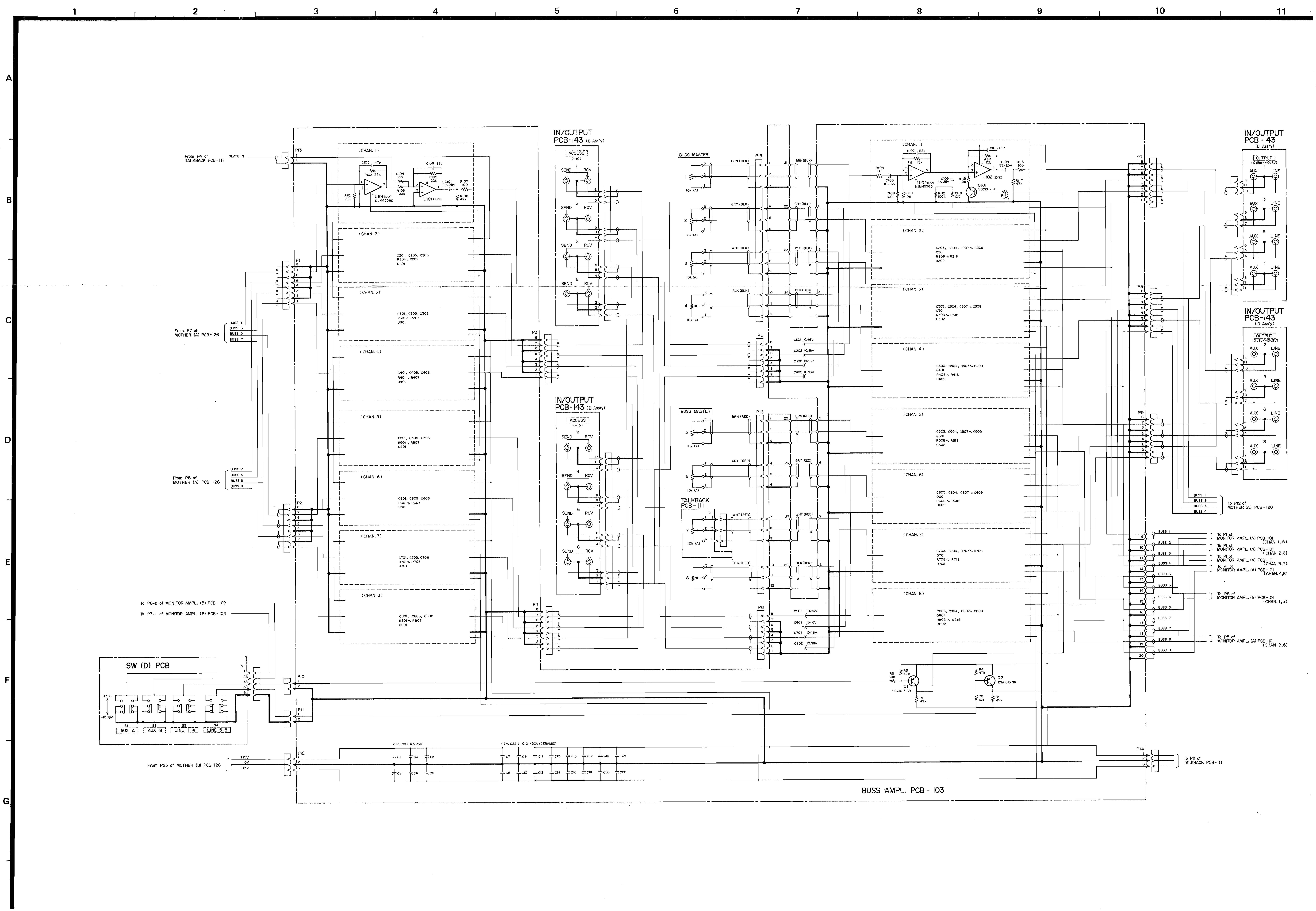
4-7. Mother (B) PCB

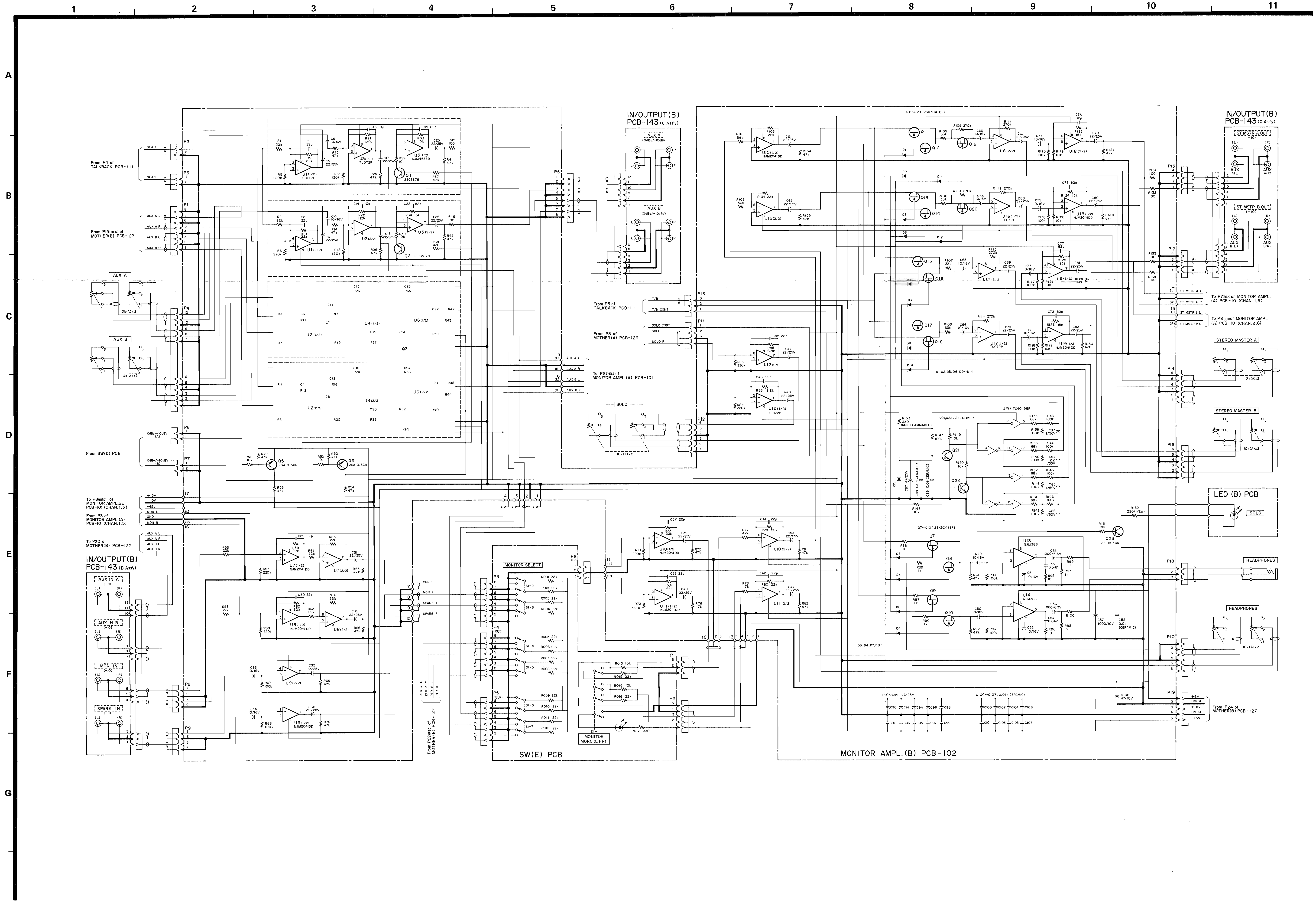


4-8. Monitor Ampl. (A) PCB

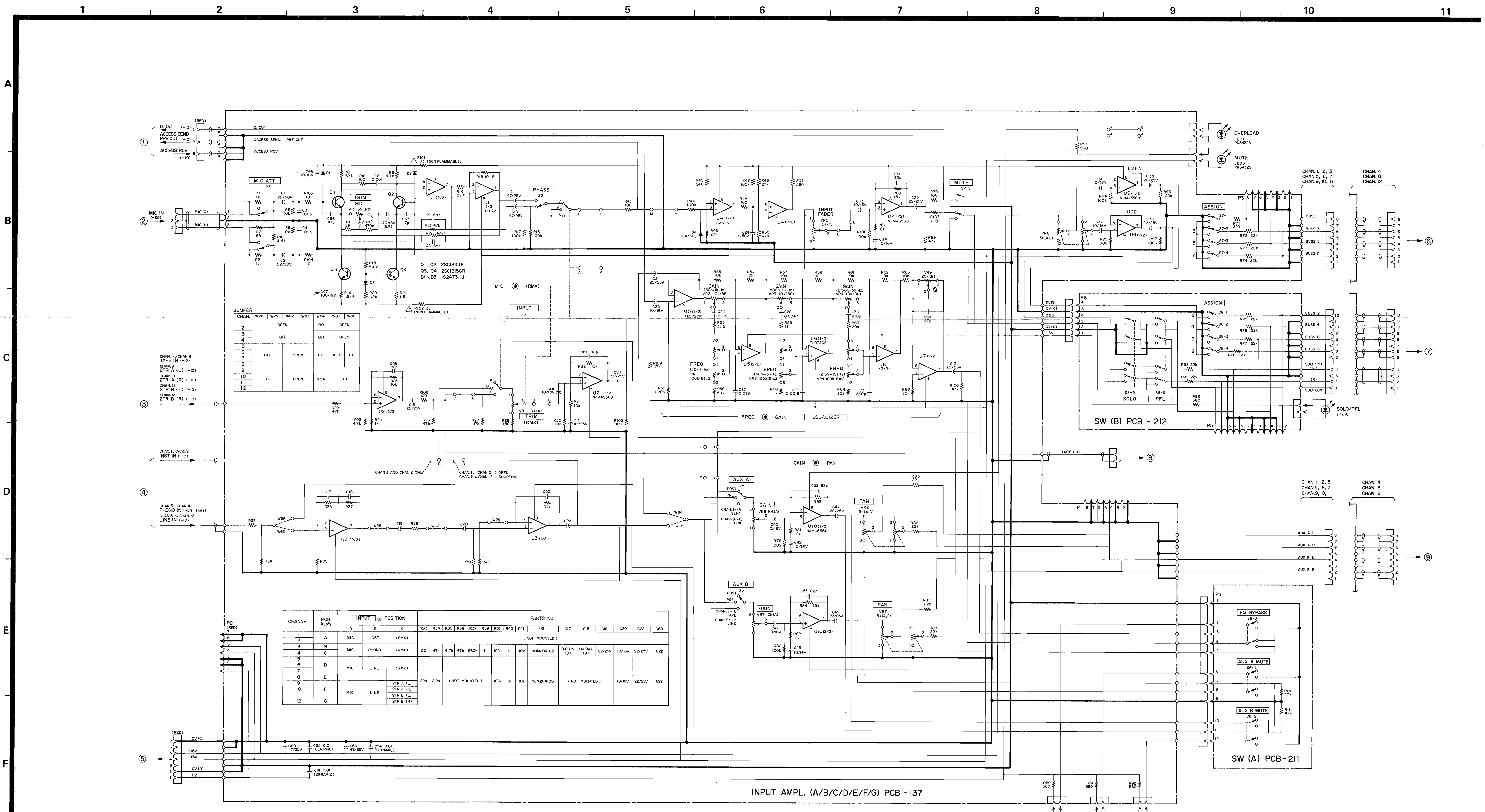


4-9. Buss Ampl. PCB




IN/OUTPUT(B) PCB-143 (C Ass'y)
IN/OUTPUT(B) PCB-143 (B Ass'y)
From P4 of TALKBACK PCB-111
From P19(BLK) of MOTHER(B) PCB-127
From SW(D) PCB
LED (B) PCB
STEREO MASTER A
STEREO MASTER B
HEADPHONES
MONITOR SELECT
SW(E) PCB
MONITOR AMPL.(B) PCB-102
From P24 of MOTHER(B) PCB-127

4-11. Input Ampl. (A/B/C/D/E/F/G) PCB



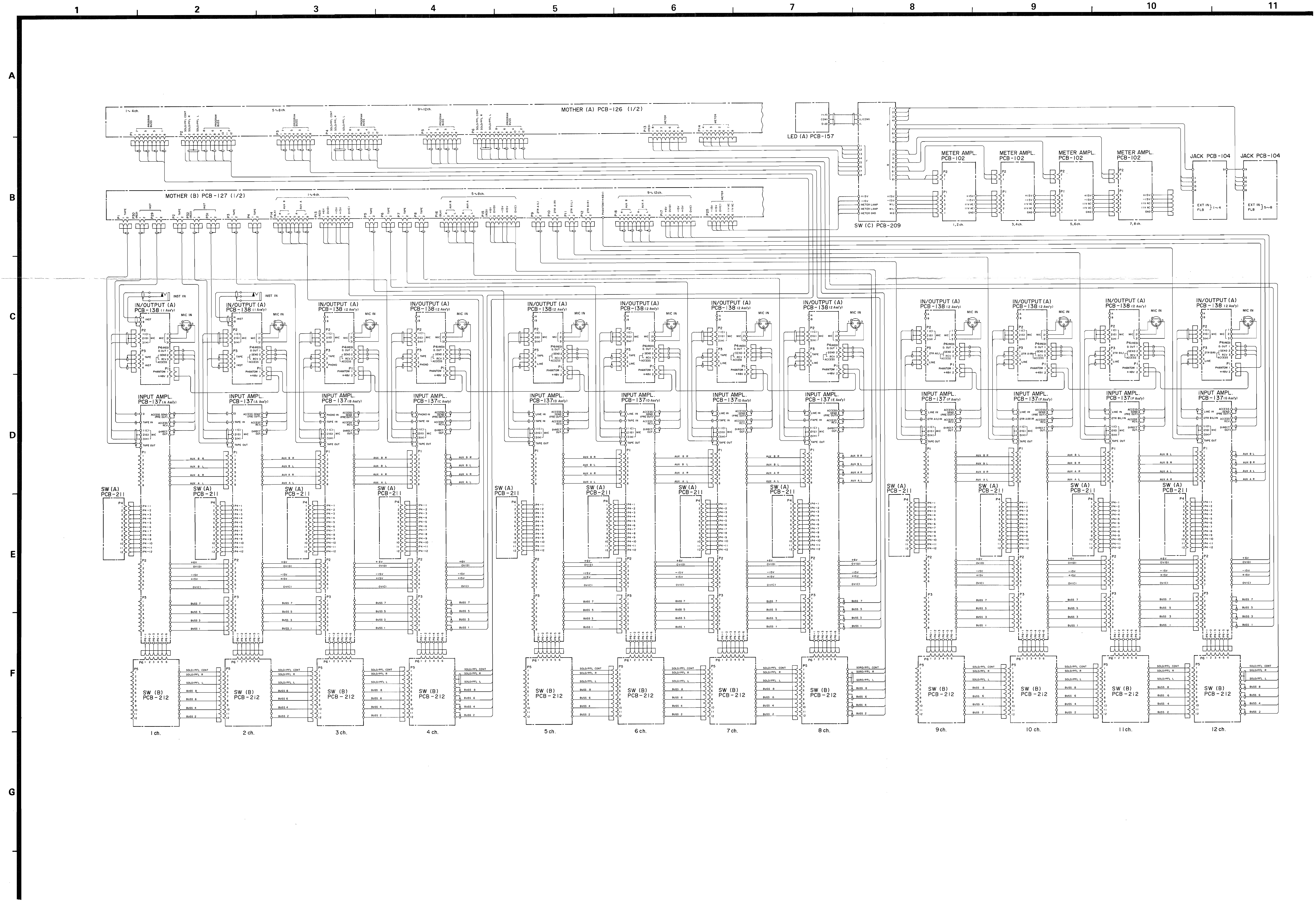
JUMPER

CHAN.	W28	W29	W62	W63	W64	W65	W66
1	OPEN				0Ω	OPEN	
2							
3	0Ω				0Ω	OPEN	
4							
5	0Ω		OPEN		0Ω	OPEN	0Ω
6							
7							
8							
9	0Ω		OPEN		OPEN	0Ω	
10							
11							
12							

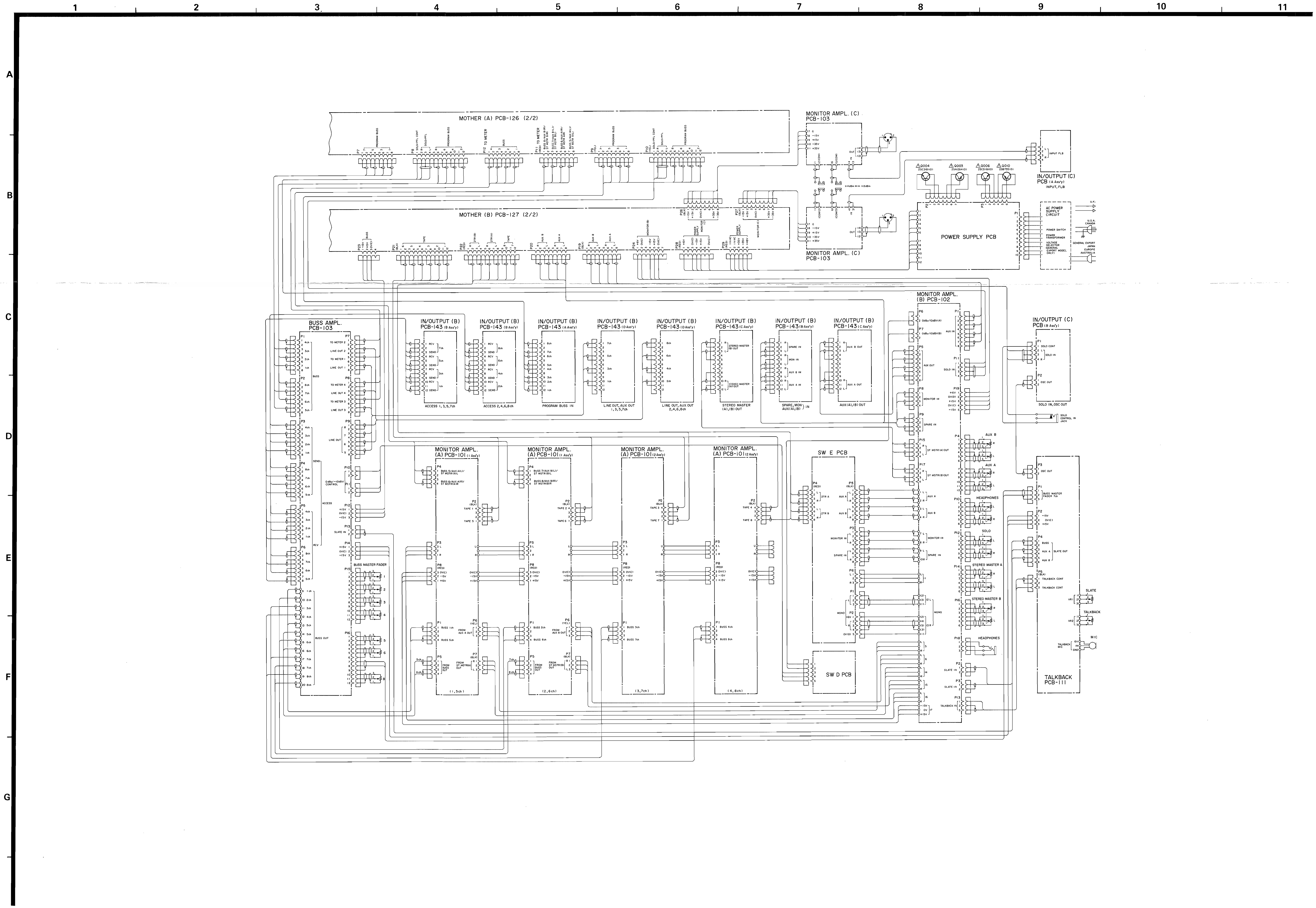
CHANNEL	PCB Ass'y	INPUT S3 POSITION			PARTS NO.															
		A	B	C	R33	R34	R35	R36	R37	R38	R39	R40	R41	U3	C17	C18	C19	C20	C22	C50
1	A	MIC	INST	(RMX)	(NOT MOUNTED)															
2																				
3	B	MIC	PHONO	(RMX)	0Ω	47k	4.7k	47k	560k	1k	100k	1k	10k	NJM2041DD	0.0015 (J)	0.0047 (J)	22/25V	10/16V	22/25V	82p
4	C																			
5	D	MIC	LINE	(RMX)	22k	2.2k	(NOT MOUNTED)				100k	1k	10k	NJM2041DD	(NOT MOUNTED)			10/16V	22/25V	82p
6																				
7																				
8	E																			
9	F	MIC	LINE	2TR A (L)																
10				2TR A (R)																
11				2TR B (L)																
12	G			2TR B (R)																

CONNECTION

CHANNEL	①	②	③	④	⑤	⑥	⑦	⑧	⑨	CHANNEL
1	IN/OUTPUT (A) PCB P4 of CH. 1	IN/OUTPUT (A) PCB P2 of CH. 1	IN/OUTPUT (A) PCB P3 of CH. 1	MOTHER (B) PCB P30	INPUT AMPL. PCB P2 of CH. 2	INPUT AMPL. PCB P3 of CH. 2	SW (B) PCB P5 of CH. 2	MOTHER (B) PCB P1	INPUT AMPL. PCB P1 of CH. 2	1
2	IN/OUTPUT (A) PCB P4 of CH. 2	IN/OUTPUT (A) PCB P2 of CH. 2	IN/OUTPUT (A) PCB P3 of CH. 2	MOTHER (B) PCB P32	INPUT AMPL. PCB P2 of CH. 3	INPUT AMPL. PCB P3 of CH. 3	SW (B) PCB P5 of CH. 3	MOTHER (B) PCB P2	INPUT AMPL. PCB P1 of CH. 3	2
3	IN/OUTPUT (A) PCB P4 of CH. 3	IN/OUTPUT (A) PCB P2 of CH. 3	IN/OUTPUT (A) PCB P3 of CH. 3		INPUT AMPL. PCB P2 of CH. 4	INPUT AMPL. PCB P3 of CH. 4	SW (B) PCB P5 of CH. 4	MOTHER (B) PCB P3	INPUT AMPL. PCB P1 of CH. 4	3
4	IN/OUTPUT (A) PCB P4 of CH. 4	IN/OUTPUT (A) PCB P2 of CH. 4	IN/OUTPUT (A) PCB P3 of CH. 4		MOTHER (B) PCB P13	MOTHER (A) PCB P1	MOTHER (A) PCB P2	MOTHER (B) PCB P4	MOTHER (B) PCB P14	4
5	IN/OUTPUT (A) PCB P4 of CH. 5	IN/OUTPUT (A) PCB P2 of CH. 5	IN/OUTPUT (A) PCB P3 of CH. 5		INPUT AMPL. PCB P2 of CH. 6	INPUT AMPL. PCB P3 of CH. 6	SW (B) PCB P5 of CH. 6	MOTHER (B) PCB P5	INPUT AMPL. PCB P1 of CH. 6	5
6	IN/OUTPUT (A) PCB P4 of CH. 6	IN/OUTPUT (A) PCB P2 of CH. 6	IN/OUTPUT (A) PCB P3 of CH. 6		INPUT AMPL. PCB P2 of CH. 7	INPUT AMPL. PCB P3 of CH. 7	SW (B) PCB P5 of CH. 7	MOTHER (B) PCB P6	INPUT AMPL. PCB P1 of CH. 7	6
7	IN/OUTPUT (A) PCB P4 of CH. 7	IN/OUTPUT (A) PCB P2 of CH. 7	IN/OUTPUT (A) PCB P3 of CH. 7		INPUT AMPL. PCB P2 of CH. 8	INPUT AMPL. PCB P3 of CH. 8	SW (B) PCB P5 of CH. 8	MOTHER (B) PCB P7	INPUT AMPL. PCB P1 of CH. 8	7
8	IN/OUTPUT (A) PCB P4 of CH. 8	IN/OUTPUT (A) PCB P2 of CH. 8	IN/OUTPUT (A) PCB P3 of CH. 8		MOTHER (B) PCB P15	MOTHER (A) PCB P3	MOTHER (A) PCB P4	MOTHER (B) PCB P8	MOTHER (B) PCB P16	8
9	IN/OUTPUT (A) PCB P4 of CH. 9	IN/OUTPUT (A) PCB P2 of CH. 9	IN/OUTPUT (A) PCB P3 of CH. 9		INPUT AMPL. PCB P2 of CH.10	INPUT AMPL. PCB P3 of CH.10	SW (B) PCB P5 of CH.10	MOTHER (B) PCB P9	INPUT AMPL. PCB P1 of CH.10	9
10	IN/OUTPUT (A) PCB P4 of CH.10	IN/OUTPUT (A) PCB P2 of CH.10	IN/OUTPUT (A) PCB P3 of CH.10		INPUT AMPL. PCB P2 of CH.11	INPUT AMPL. PCB P3 of CH.11	SW (B) PCB P5 of CH.11	MOTHER (B) PCB P10	INPUT AMPL. PCB P1 of CH.11	10
11	IN/OUTPUT (A) PCB P4 of CH.11	IN/OUTPUT (A) PCB P2 of CH.11	IN/OUTPUT (A) PCB P3 of CH.11		INPUT AMPL. PCB P2 of CH.12	INPUT AMPL. PCB P3 of CH.12	SW (B) PCB P5 of CH.12	MOTHER (B) PCB P11	INPUT AMPL. PCB P1 of CH.12	11
12	IN/OUTPUT (A) PCB P4 of CH.12	IN/OUTPUT (A) PCB P2 of CH.12	IN/OUTPUT (A) PCB P3 of CH.12		MOTHER (B) PCB P17	MOTHER (A) PCB P5	MOTHER (A) PCB P6	MOTHER (B) PCB P12	MOTHER (B) PCB P18	12



MOTHER (A) PCB-126 (1/2)
MOTHER (B) PCB-127 (1/2)
LED (A) PCB-157
SW (C) PCB-209
METER AMPL. PCB-102
JACK PCB-104
IN/OUTPUT (A) PCB-138
INPUT AMPL. PCB-137
SW (A) PCB-211
SW (B) PCB-212
1 ch.
2 ch.
3 ch.
4 ch.
5 ch.
6 ch.
7 ch.
8 ch.
9 ch.
10 ch.
11 ch.
12 ch.



MOTHER (A) PCB-126 (2/2)
MOTHER (B) PCB-127 (2/2)
MONITOR AMPL. (C) PCB-103
IN/OUTPUT (C) PCB
POWER SUPPLY PCB
AC POWER SUPPLY CIRCUIT
BUSS AMPL. PCB-103
IN/OUTPUT (B) PCB-143
MONITOR AMPL. (B) PCB-102
IN/OUTPUT (C) PCB
MONITOR AMPL. (A) PCB-101
SW E PCB
SW D PCB
TALKBACK PCB-111

BLOCK DIAGRAM