Studio Phase Tutorial (Part #1)

By Jay Graydon

I offer this tutorial gratis for the San Luis Obispo County and LA County schools music departments. Please fell free to share with other schools and anyone you wish.

Further note this tutorial does not cover many basics needed for the novice recording engineer. If a novice, please ask your teacher questions as needed.

Introduction

We will be working with many aspects of phase/polarity in this tutorial series. I am confident you will find the information useful.

Part #1 is a full phase/polarity studio test. Boring for sure and the text is lengthy — but if you have a home studio or a pro studio, very important to perform the tests!!!

Even if you do not own a studio, you may some day so keep on hand and use when needed.

Part #1 is based upon analog routing that will most likely include digital gear as well but we will be working with analog inputs and outputs (no digital routing). If I have the time in the future, I will write part #2, which will deal with both digital and analog in tandem.

How To Use This Tutorial

There are two possibilities:

When we get into testing phase, simply read the section on the test you are performing at that time — reading further tests may cause confusion.

Note: In each test, there may be references to adapters and adapter cables you may need to read — that is the only section you should skip to as needed. The bottom line is that if reading the test sections and not performing the tests, this is similar to reading a gear manual that is loaded with too much information not needed at the time.

OK, let's say you are not testing a recording studio for phase but you want to understand the logic. In this case, when reading the phase tests sections, wade through the phase checker details and simply look for the logic within the text. Circle key details as to reread leading to a summarization of the logic.

Analog Verses Digital Recording Systems

Here are basic versions of audio paths.

The analog recording path

1. Source (mic, or a direct analog signal) routs into an analog mixer input.
2. The source signal is fed through the mixer to a recorder track input.
3. The recorder track output routs back to the mixer as to be monitored over the studio monitor speakers.

The digital recording path utilizing a digital recorder and built in mixer

1. Source (mic, or a direct signal non-digital signal) routs into an *analog to digital* converter.
2. If a digital source, the source routs into a digital mixer/recorder input.
3. The source signal is internally fed through the mixer to a recorder track input.
4. The recorder track output internally routs back to the mixer as to monitored.
5. Internal mixer output converts the signal to analog using *digital to analog* converter(s) as to be monitored over the studio monitor speakers.

The digital recording path utilizing a separate digital mixer and digital recorder

1. Source (mic, or a direct signal non-digital signal) routs into a mixer *analog to digital* converter.
2. If a digital source, the source routs into a digital mixer input.
3. The source signal from the mixer is digitally fed into a recorder track input.
4. The recorder track output is digitally routed back to the mixer as to monitored.
5. Mixer output converts the signal to analog using *digital to analog* converter(s) as to be monitored over the studio monitor speakers.

Combining an analog mixer and a digital recorder

1. Source (mic, or a direct analog signal) routs into an analog mixer input.
2. The source signal is fed through the mixer to a digital recorder track input.
3. The recorder track output routs back to the mixer using *digital to analog* converter(s) as to be monitored over the studio monitor speakers.

The Introduction Wrap Up

Yea, the above is just stock routing so why state. In this era of computer hard disk recording/built in mixer recording, most of the electronic path is internal so no need to think through the full audio path. Sadly, if the recording engineer begins study with this

medium and does not learn the analog routing path, at some point, this will cause problems. I assume that analog recording will have a resurgence at some point in time so best to learn the analog path thinking in full for that reason alone.

Phase and Polarity

You'll hear people talk using the terms phase and polarity to describe the same phenomenon. Technically speaking, phase usually is frequency-dependent (such as *comb filtering* issues), whereas polarity affects all frequencies equally (such as electronic path wiring).

Further regarding phase, there are two basic types of phase issues — one is based on electronic paths and the other is based on acoustic physics. The following section deals with electronic phase only.

In the context of this tutorial, polarity is technically more correct than phase, b will use phase because that is the term most recording engineers and musicians use.

We assume that every mic, cable, mixer electronic path, outboard gear, recorder electronic path, speaker cables, speakers and headphones are wired in such a way that keeps phase integrity intact (absolute phase). In the most basic wiring path, there is a "hot wire" (positive) and a ground wire (negative). Reversing this anywhere in the signal path will lead to inverted phase (inverse polarity).

With balanced lines, there are three leads ("hot," cold, and ground). According to an IEC standard, pin 1 is ground, pin 2 hot, and pin 3 cold (also called neutral). However, in an amazing fit of ignorance, some manufacturers wire pin 3 hot and pin 2 cold. This inherently reverses the phase when connected to any equipment that is properly wired.

When combining any two sound sources — speakers, mixer modules, whatever — it's important that they be in phase. As a classic example, assume you have a sharp drum sound (like a bass drum) going through a set of stereo speakers. When the bass drum is hit (kicked with the "beater"), the speakers should push air outward, which we perceive as sound. However, if the wires going to the speakers are reversed, then the speaker will pull air inward at initial attack.

Generally, it was considered that when listening to a speaker by itself, reversing the phase didn't make any audible difference. However, preserving absolute phase *does* make a difference, and that when you hear something like a kick (bass) drum or the bass instrument, it doesn't sound right unless it's pushing air toward you at the initial attack, as mentioned in " Accidental blind absolute phase test." there are many valid reasons to retain a proper phase relationship anyway, so why not?

There is no disagreement, though, that combining sound sources that are out of phase with each other can be a big problem. For example, if one of the speakers in a stereo system is out of phase with respect to the other, then as one is pushing air, the other will be pulling it. Like any other *out of phase* waves, they cancel.

This needn't just happen at the output stage. Mics and direct boxes can be wired out of phase, two mixer channels could be out of phase with respect to the other and so on. Anything wired incorrectly throughout the electronic chain could be the culprit.

The bottom line is this — most important that the total recording path from the mics through the monitor speakers are wired "in phase" (absolute phase). After performing the tests in this section (performing wiring fixes if needed), your total recording path will be *in phase* (absolute phase)! Also, when adding any new gear or wire (cables), borrowed gear, or rental gear, always test the phase before recording!

Discovering the sound of "out of phase" signals

Before we get into phase test procedures, most important to hear how *out of phase* signals degrades the sound. We will start with a total phase reversal (one of two channels reversed in phase) and then reverse the phase on both channels.

One of Two Speakers Intentionally Wired Reverse Phase

Set your mixer monitor mode as to monitor a CD or any recorded information you prefer. In any case, make sure the sound source has some common information regarding both (stereo) channels in "center position" (such as bass drum, bass, snare drum, etc.) Easy to discover this fact when playing the sound source as you will be sitting equally between both speakers.

We mention using a previously recorded CD for the following example. If using another source, simply replace.

1. Play an 8 bar section of a well-recorded CD and note this section. This CD should be a recording with a wide frequency range.
2. Now switch off the speakers stereo power amp.

3. Reverse the wires going to one of the speakers (swap the + and - wires either at the speaker or amplifier). Make sure to note which speaker (or power amp channel) has been reversed.
4. Switch the speaker's stereo power amp back on.
5. Play the noted CD 8 bar section.

You will notice that the sound is very strange. The bass frequencies will virtually disappear (very small sounding) and the overall sound is difficult to listen to meaning it with bother your ears. If this is the sound you hear, keep in mind the problem is caused by one speaker cabinet pushing air outward (correct phase) while the other is pulling air inward (inverted phase) thus causing common signal waveform cancellation. (Common signal means a sound source that is mixed equally to both stereo channels such as lead vocal, bass, bass (kick) drum, snare drum, etc.). If that was the sound you heard before reversing the speaker wire in step #3, one of the speakers was previously wired out of phase. In either case, here is what to do.

- If your speaker system was originally "in phase" before switching the speaker wire (or power amp speaker wire) in step #3, switch off the speakers stereo power amp and swap back the + and - speaker connection to their original connection.
- If your system was originally "out of phase" before switching the speaker wire (or power amp wire), in step #3, leave the swapped wiring for now.

In any case, you have the speakers wired as to allow for "common phase" but the phase may not be absolute! This will be explained below, "Both stereo channels wired reverse phase."

(Note: if your speaker system uses powered speakers (the speaker power amps are "built in"), if you are testing a studio monitor system, you need a way to reverse the phase on one of the two channels. If using a mixer that includes phase switches, plug the sound source (CD, whatever) into two mixer channels and reverse the phase on one channel. Simply flip the phase switch on one mixer-input channel when listening.

Another option would be to un-patch one of the two cables between the sound source (stereo system, or mixer) and speakers — replace with a cable that reverses the phase. If the cable is balanced (three wires), on one connector end, reverse pin 2 and 3 wires. If an unbalanced line, on one connector end, reverse the hot and ground pin. (If not clear on this, see section, "Wiring Adapter Cables/Testing Pre Existing Adapters/Adapter Cables.")

In either case, perform the above test. Mark this cable as reversed phase as to not accidentally use it unless needed for reversing phase).

Both Speakers Intentionally Wired Reverse Phase

1. Play an 8 bar section of a well-recorded CD and note this section played. This CD should be a recording with a wide frequency range.
2. Now switch off the speakers stereo power amp.

3. Reverse the wires going to both of the speakers (swap the + and - wires either at the speaker or amplifier).
4. Switch the speaker's stereo power amp back on.
5. Play the noted CD 8 bar section.

When both stereo channels are reversed from the stereo system speaker terminal outputs to the speaker terminal inputs, the sonic problem is not nearly as bad as one of the speakers reversed in phase. Even so, the audio will not sound as good in comparison to absolute phase (correct wiring throughout the audio path). In this case, both speaker cabinets are not pushing air forward at initial attack. Instead, the speaker cabinets are pulling air inward at initial attack causing a slight loss of low end frequency level as well as low frequency "punch" (impact).

Again, this type of common inverted phase is difficult to hear at first. Repeat the above 5 steps until you notice a difference.

When you notice a difference before or after swapping both speaker wires, (plus (+) and minus (-) wires), perform the following.

- If your speaker system was originally "in phase" before switching the speaker wires (or power amp speaker wires) in step #3, switch off the speakers stereo power amp and swap back the + and - speaker connection to their original connection.
- If your system was originally "inverted phase" before switching the speaker wires (or power amp wires), in step #3, leave the swapped wiring for now.

In any case, the following tests will prove absolute phase.

Before we get into the tests, consider the following, as this is a serious matter!

Regarding home stereo systems, stereo systems in stores, novice home recording studios, etc, if the amp to speaker connectors use individual screw on wire terminals (typical), if not installed by someone that knows how wire is coded, a wild guess is at least 10% of all such systems in the world have a reversed phase problem (out of phase) let alone inverted phase. The reason is simple — many consumers do not read manuals in full and may not understand how speaker wire is coded. With that in mind, when connecting speaker wire, *out of phase* will be in play on one of two speakers or both connections will be *inverted phase*. If more than two speakers are connected (separate speaker selection channel, multiple speakers using the same terminals, or a home theater set up), the odds of incorrect phase connections become higher.

Most likely, the audio novice/consumer who connected the speaker wires will not know a problem exists!

Note over the years I have heard *out of phase* problems in many stores, etc. For years, I told the person in charge there was a wiring problem and explained what to do. Just trying to help out.

Lets test phase!

There is only one correct way to test for absolute phase, which is to use a phase checker system. We recommend the LA Audio SCV-PC80KKII Phase Checker. The following is the contact information.

LA Audio SCV-PC80KKII Phase Checker
Contact info: Pro Sound International 305 River Road Tullytown, PA. 19007
Tel: 215-949-8300. Fax: 215-949-8400.
www.ProSoundInt.com. e-mail: Sales@ProSoundInt.com

My tests used the LA Audio SCV-PC80KKII Phase Checker. If using another brand phase checker, simply adapt. Note phase checkers all are basically the same.

PC 80 phase checker functions

The following are full details regarding the PC 80 phase checker. If you are using another phase tester, skip to the next section “World Wiring Standards”.

The PC 80-phase checker consists of two small battery powered units. One is the “emitter” which sends a signal in one of two ways — either electronically (through a cable), or via a little speaker. The other unit is the “receiver” which receives the signal in one of two ways — either electronically (through a cable), or via a built in or external mic. The receiver has two LEDS — one is green which shows the signal is in phase and the other is red which shows out-of-phase.

When testing phase, refer to the following.

The Emitter has a male XLR, on/off switch, level control, and hot pin switch (2 is on top and 3 is on the bottom). It also has a speaker for mic tests.

The receiver has a female XLR, on/off switch, hot pin switch (2 is on top and 3 is on the bottom) and a 3 way input switch — left is INT MIC, center is LINE and right is EXT MIC. There is a RED and GREEN LED for phase. RED lights up when OUT OF PHASE and GREEN lights up when IN PHASE.

If a 3 wire XLR cable is plugged into each unit, you set the hot pin switch on both units to the same hot pin. Let's say that is pin 2. If that wire is connected on both ends, the green phase LED lights up. Now switch both units to pin 3 hot and if that wire is connected on both ends, the green phase LED lights up. This is showing that both pins 2 and 3 are wired correctly. Pin one is not in play in this situation.

Let's say that pins 2 and 3 were reversed in the cable. In that case, neither LED lights up IF the ground wire (pin 1) is attached on both ends. Now if the ground wire (pin 1) were not attached on one or both ends, the RED out of phase LED would light up. This shows the ground wire is not allowing signal flow.

The above set up is the concept and mow for are all of the possibilities. I used jumper cables for this layout but in the following text, I tested using the NEVE V2 mixer, recorders, etc.

Unless mentioned in other tests, best to se the Emitter level (volume control) full up. Set receiver to line.

Pins 1, 2 and 3 connected correctly on both units.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = Green LED (in phase)
- Hot pin switch on Emitter and Receiver set to pin 3. Result = Green LED (in phase)
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = neither LED lights.
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = neither LED lights.

Pin 1 connected correctly on both units BUT pins 2 and 3 are reversed on the Receiver.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = neither LED lights.
- Hot pin switch on Emitter and Receiver set to pin 3. Result = neither LED lights.
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = Green LED! This is not showing correct phase BUT is showing that pin 2 and 3 are reversed. More on this strange result soon.
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = Green LED This is not showing correct phase BUT is showing that pin 2 and 3 are reversed. More on this strange result soon.

Pins 2 and 3 connected correctly on both units BUT pin 1 is disconnected.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = Green LED (in phase)
- Hot pin switch on Emitter and Receiver set to pin 3. Result = Green LED (in phase)
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = RED LED (out of phase)
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = RED LED (out of phase)
- The logic must be that this is the way to find out if pin 1 is not connected on at least one connector.

Pins 2 and 3 reversed on both units BUT pin 1 is disconnected.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = RED LED (out of phase)
- Hot pin switch on Emitter and Receiver set to pin 3. Result = RED LED (out of phase)
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = Green LED! This is not showing correct phase BUT is showing that pin 2 and 3 are reversed.
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = Green LED This is not showing correct phase BUT is showing that pin 2 and 3 are reversed.

Pins 1 and 3 connected correctly on both units BUT pin 2 is disconnected.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = neither LED lights. In this case, noting pin 2 is disconnected on at least one end.
- Hot pin switch on Emitter and Receiver set to pin 3. Result = Green LED (in phase)
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = neither LED lights.
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = neither LED lights.
- Note that disconnecting pin 1 shows the same results.

Pins 1 and 2 connected correctly on both units BUT pin 3 is disconnected.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = Green LED (in phase)
- Hot pin switch on Emitter and Receiver set to pin 3. Result = neither LED lights. In this case, noting pin 3 is disconnected on at least one end.
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = neither LED lights.
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = neither LED lights.
- Note that disconnecting pin 1 shows the same results.

Pins 1 and 2 are reversed and pin 3 is correct on both units.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = neither LED lights
- Hot pin switch on Emitter and Receiver set to pin 3. Result = Green LED (in phase)
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = neither LED lights.
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = neither LED lights.

Pins 1 and 3 are reversed and pin 2 is correct on both units.

1. Hot pin switch on Emitter and Receiver set to pin 2. Result = Green LED (in phase)
2. Hot pin switch on Emitter and Receiver set to pin 3. Result = neither LED lights
3. Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = neither LED lights.
4. Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2. Result = neither LED lights.

Pin 1 goes to pin 2, pin 2 goes to pin 3 and pin 3 goes to pin 1.

- Hot pin switch on Emitter and Receiver set to pin 2. Result = neither LED lights
- Hot pin switch on Emitter and Receiver set to pin 3. Result = neither LED lights
- Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = neither LED lights.
- Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2.
- Result = Green LED showing that pin 3 and 2 are reversed.

Pin 1 and 2 tied together and pin 3 is correct on both ends.

5. Hot pin switch on Emitter and Receiver set to pin 2. Result = neither LED lights
6. Hot pin switch on Emitter and Receiver set to pin 3. Result = Green LED showing that pin 3 is connected.
7. Hot pin switch on Emitter set to pin 2, and Receiver set to pin 3. Result = neither LED lights.
8. Hot pin switch on Emitter set to pin 3, and Receiver set to pin 2.
9. Result = neither LED lights.

World Wiring Standards

Regarding a three wire path (most mics/cables, some mixers. some recorders, etc.), in the beginning of this section we mentioned, “According to an IEC standard, pin 1 is ground, pin 2 hot (positive), and pin 3 cold (neutral). However, in an amazing fit of ignorance, some manufacturers wire pin 3 hot and pin 2 cold. This inherently reverses the phase when connected to any equipment that is properly wired.”

Since the world standard is “pin 2 hot”, we will consider this to be the “norm” for our three wire tests (as well as adapter cable wiring for two wire tests). If by chance your studio is wired pin 3 hot, we will explain what to do as you read on.

Recording Studio Phase Tests

Important: in any of the following phase tests, if you find phase problems that require wiring fixes, if you are not comfortable regarding soldering, call a tech as to perform the fix.

The home studio through the pro studio have many things in common — mics, direct boxes, mixer, recorder(s), outboard gear, one or more speaker monitor system(s), headphone system(s), and possibly a synth/sampler array. The more complex the set up, the odds increase regarding phase problems. We will explain in full.

No matter if a home studio through the pro studio, the studio uses cables with connectors as to patch components together. There are three basic wiring configurations.

1. Two-wire cable: this is an unbalanced signal-wiring configuration, which utilizes a hot wire (positive), and a shielded ground wire (negative). Typically, the connectors are either 1/4” TS (tip-sleeve) phone plugs or RCA connectors.

- Regarding a male 1/4” TS phone connector, the tip should be the “hot” (positive) wire and the inner sleeve should be the shielded ground (negative) wire.
- Regarding a female 1/4” TS phone connector, the inner most contact should be the “hot” (positive) and the other contact point should be the shielded ground (negative) wire.
- Regarding a male RCA connector, the protruding tip should be the “hot” (positive) wire and the outside circular shell should be the shielded ground (negative) wire.
- Regarding a female RCA connector, the inner contact point should be the “hot” (positive) wire and the outside circular shell should be the shielded ground (negative) wire.

2. Three wire cable: this is a balanced signal wiring configuration which utilizes a hot wire (positive), an neutral wire (neutral), and a shielded ground wire (negative). Three

typical connectors are used — either XLR connectors, 1/4" TRS (tip-ring-sleeve) three wire phone connectors, or TT patch bay cables.

XLR cable wiring: Regarding both male and female XLR connectors, pin #1 equals the shielded ground wire. Pin #2 equals the hot wire (typically a red or white wire). Pin 3 equals the neutral wire (typically a black wire).

1/4" TRS three wire male phone connectors: The outer tip equals the hot wire (typically a red or white wire). The middle ring equals the neutral wire (typically a black wire). The inner sleeve equals the shielded ground wire.

1/4" TRS three wire female phone connectors:
The inner most connection equals the hot wire (typically a red or white wire). The middle connection equals the neutral wire (typically a black wire). The outer most connection equals the shielded ground wire.

TT three wire patch bay connectors:

This is the same configuration as the 1/4" TRS three wire phone connectors.

Important: Remember that the world standard is pin 2 hot so that is the reason we think of pin 2 hot regarding wiring color code. In the case of two identical family three wire connectors on each end (such as two XLR connectors using either a male and female or any combination), all that matters is the shielded ground wire is used for pin #1 and the other two wire colors match pins #2 and #3 respectively.

3. Three wire cable using a three wire connector on one end and a two wire connector on the other end: if your studio set up includes adapter cables that are three wire connectors to two wire connectors, typically, the neutral wire ties to the ground wire on the two wire connector end. This will be explained in the section, "Wiring adapter cables/Testing Pre Existing Adapters/Adapter Cables" and such adapter cables will need to be tested within that section before testing other cables or gear.

Regarding either balanced (three wire) or unbalanced (two wire) cables, the odds are fairly good that such cables are wired correctly but always test as to make sure!

Testing Cables

From this point on, the order of testing is important as to discover absolute phase throughout the recording path — if you skip over a section, a phase problem may exist in the skipped section making things most difficult as to find where the phase was reversed!

Two important considerations when testing cables.

- Other than mic cables not in use, when pulling cables as to test from the mixer, recorder, outboard gear, power amp inputs, etc., make sure you know where to patch back in. As to avoid confusion, wrap a piece of artist tape on the cable and label with a pen — simply note their patch points before pulling the patch.
- Only test one cable at a time! You may think you would save time testing more than one cable at a time (patched into each other) but here is the reason for not doing so —if chaining cables together for testing, even if the PC 80 showed correct phase, if two cables have incorrect wiring, the phase is reversed on one cable and then reversed back on the other but you would not know both cables are reversed in phase!

Two wire cable phase test

You will need adapters or adapter cables for this test — see “Wiring Adapter Cables/Testing Pre Existing Adapters/Adapter Cables” for details and use the corresponding adapter cables as needed for the cables to be tested. Most important that the adapter/adapter cables have been tested as explained in that section before using!

1. When testing either 1/4” TS phone connectors or RCA connector cables, plug their respective adapters or adapter cables into PC80 emitter and receiver (or other brand phase tester). Plug the cable to be tested into the adapter connectors.
2. Power up both the PC 80 emitter and receiver and set the level volume control on the PC80 emitter to full right (full level).
3. Set the PC80 receiver upper left switch (input selection) to “line”.
4. Switch both the PC 80 emitter and receiver “hot pin” to “pin 2” hot. (Remember that in the adapter wiring section, we used pin 2 as the hot pin. If your studio also uses 3 wire connectors and your studio is wired pin 3 hot, your adapter cables would be wired pin 3 hot so set the emitter and receiver “hot pin” to “pin 3” hot and adapt regarding the following).
5. On the receiver, you should see the green “LED” indicator showing “in phase.” If all is well, check all other cables one at a time. If any cable does not show the green LED, steps #6, #7, and #8 will explain what to do. Further, if not seeing the green LED light when testing the first cable, check a few more cables to see if the test results are the same. If so, there is a problem with one or more cables — again, steps #6, #7, and #8 will explain what to do.
6. If in step #5 the red LED lit, the cable is wired “reverse phase.” If this is the case, you need to re-wire the cable as to correspond to the correct connections as explained in the next step.
7. The fix is to open up both cable connectors and take a look. In this case, the ground wire and hot wire are reversed on one end — find the connector that has the shielded stranded wire (the wire that totally surrounds the inside coated wire) which must be soldered to the hot pin. Un-solder both the hot and ground connections on this connector. Now solder the hot pin wire to the tip connection and then the shielded ground to the ground connection. If you are not comfortable regarding soldering, either have a tech re-wire or go to any audio repair shop and have their tech re-wire.

8. If in step #5, if neither the green or red LED lights, one or both wires are not connected on one or both connector ends. The fix is to open up both cable connectors and take a look. If a wire is obviously not connected, simply re-solder. If that's not the problem, two possibilities — either a "cold solder joint", or a broken wire not visible. First re-solder the connections on both connector ends. If that is not the fix, cut off the wire about an inch before a connector end, strip the wires, un-soldier the old cut off connections soldier the wires on the connector as mentioned. If that is not the fix, do the same on the other connector end. If still a problem, the cable has a wire break somewhere within the cable — best to throw away the cable as hunting down the wire brake is a time waster.

Note: in steps #7 and #8 above, if the connectors are molded (you can't open up, two choices — either cut off the connectors as mentioned and solder on new connectors, or throw away the cable.

After testing all two wire cables, either all proved to be absolute phase or you have corrected the wiring problem.

Note: if you will not fix any wiring problem now, until fixing the problem, put a piece of red tape on the connector end that has incorrect wiring — red tape is used as a reminder a problem exists. Don't use red taped cable until the wiring problem is corrected!

If you will test three wire cables, read on — if not, skip to "Speaker phase test."

Three wire cable phase test

Note: if testing other than XLR cables, you will need adapters or adapter cables so see section “Wiring Adapter Cables/Testing Pre Existing Adapters/Adapter Cables” for details and use the corresponding adapter cable as needed for the cables to be tested. Most important that the adapters or adapter cables have been tested as explained in that section before using!

1. Plug the XLR cable to be tested into both the PC80 emitter and receiver. Note if testing 1/4” TRS three wire phone connectors or TT connectors, plug the necessary adapters/adapter cables into PC80 emitter and receiver. Plug the cable to be tested into the adapter connectors.
2. Power up both the emitter and receiver and set the level volume control on the PC80 emitter to full right (full level).
3. Set the PC80 receiver upper left switch (input selection) to “line”.
4. Switch both the emitter and receiver “hot pin” to “pin 2” hot. On the receiver, you should see the green LED indicator showing “in phase.”
5. Now switch both the emitter and receiver “hot pin” to “pin 3” hot. On the receiver, you should see the green LED indicator showing “in” (phase).
6. If all is well, check all other cables one at a time. When testing the first cable, if not seeing the green “in” LED light in steps #4 and #5, test a few more cables to see if the results are the same. Remember that if using adapter cables for 1/4” TRS phone connectors or TT connectors, they have been tested so they should not be the problem. The following bulleted information will explain what to do. Also, the following bulleted information needs to be considered for any cable that does not test correctly as mentioned in steps #4 and #5.

In steps #4 and #5, if the PC 80 receiver red LED lights, there is a serious wiring problem. The fix is to open up both cable connectors and look at the wire color code and pin-out connections.

1. If using XLR connectors, on both connector ends, pin 1 should be the ground wire (the stranded shield wire that totally surrounds the inside coated wires — this wire doesn’t have a color wrapping). Pin 2 and pin 3 colors need to match on both connector ends. (Pin 2 would typically be a red or white-coated wire and pin three may be a black coated wire or another color). With that in mind, since there is a wiring problem find the wires that do not correspond regarding the just mentioned information on one connector end. Un-solder the incorrect pins and re-solder as to match the connector end with the correct wiring. Remember that the shielded wire must be connected to pin 1 on each connector and the wires connected to pin 2 and pin 3 need to match on each connector end.

2. If using 1/4" TRS connectors, the same concept applies. The ground wire (the stranded shield wire that totally surrounds the inside coated wires) needs to be soldered to the sleeve connection. The other two connections regarding their colors need to match on both connector ends.
3. If using an XLR connector on one end and a 1/4" TRS or TT on the other end, you need to know the basic pin-out wiring of your studio as we are using two different types of connectors — either pin 2 hot (likely) or pin 3 hot (unlikely). You may also use a few cables as adapter cables that have intentional reversed phase wiring (as to reverse phase in a pinch). In that case, you would label such cables and test accordingly. Since pin 2 hot is the standard, we will use for the example. (If your studio is wired pin 3 hot (unlikely), in the following, reverse pin 2 and pin 3 on the XLR end). Pin 1 on the XLR connector relates to the inner sleeve on the TRS connector — pin 2 on the XLR connector relates to the "tip" connection on the TRS or TT connector — pin 3 on the XLR connector relates to the "ring" (the middle connection on the TRS or TT connector).
4. After the fix, test again as to make sure all is well.

Again In steps #4 and #5 above, if not seeing the green LED light on one or both PC 80 hot pin settings, one or more wiring connections are not connected.

1. Open up both connector ends and look at the connections. If a wire is obviously not connected, simply re-solder. If you do not see any wire not connected, two possibilities — either a "cold solder joint", or a broken wire not visible. Keep in mind the above wiring configurations as explained in the above bulleted section. *Note that the tester is not looking at the shied so if lifted on one end intentionally, no problem regarding the test.*
2. First re-solder the connections on both connector ends. If that is not the fix, cut off the wire about an inch before a connector end, strip the wires, un-soldier the old cut off connections and soldier the wires on the connector. If that is not the fix, do the same on the other connector end. If still a problem, the cable has a wire break somewhere within the cable — best to throw away the cable as hunting down the wire brake is a time waster.
3. After the fix, test again as to make sure all is well.

Note: in the above bulleted section fixes, if the connectors are molded (you can't open up, two choices — either cut off the connectors and solder on new connectors, or throw away the cable.

After testing all cables, either all proved to be absolute phase, or you have corrected the wiring problem.

Note: if you will not fix any wiring problem now, until fixing the problem, put a piece of red tape on both connector ends — red tape is used as a reminder a problem exists. Don't use red taped cable until the wiring is corrected!

Speaker Phase Test

Remember we are testing in a specified order — after testing all cables, the speaker phase test is next. The first thing to do is to make sure the speaker wires are wired correctly so check out the following sidebar, “Speaker wiring”).

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Sidebar: Speaker wiring

When wiring speakers to an external power amp, on both the speaker and power amp, wire the left and right speakers individually to their corresponding power amp speaker terminals with the following in mind.

There are three basic types of speaker wire regarding the way +(positive) and - (negative) wires are noted.

Clear coating. If using speaker wiring with a clear coating, you will notice a sliver and a gold wire. Gold is used for the + connections and sliver is used for the - connections. When connecting (or checking the connections) make sure that gold wire is connected to the power amp and speaker + (positive) connections and the silver wire is connected to the - (negative) connections. Note: the color scheme may vary — decide which color will be used for the + and - connections and attach as mentioned.

Color-coded. If using speaker wiring coated with a non-transparent color, you will notice separate colors used for the two wires. The + (positive) wire may be either red or white and the - (negative) wire will most likely be black. When connecting (or checking the connections), make sure that the red or white wire is connected to the power amp and speaker + connections and the black wire is connected to the - (negative) connections. Note: the color scheme may vary — decide which color will be used for the + and -connections and attach as mentioned.

Zip cord: Zip cord is the nickname for wire used for “wall current” but can also be used for speaker cable. The heavier the gauge the better. We recommend using 14 gauge or lower. Zip cord does not easily show which wire is which but does offer a physical way to discover — there is a notched ridge on one side. At cable end, rub a finger on one side and then the other. The side that is ridged is used for the + connections. The smooth side is used for the - connections. When connecting (or checking the connections), make sure that the ridge side wire is connected to the power amp and speaker + (plus) connections and the smooth side wire is connected to the - (minus) connections.

Note: if you care about quality sonics, best to use a speaker cable that is designed to allow for a full frequency bandwidth as well as frequency time alignment. We prefer Planet Wave speaker cable. By the way, their audio cable is far superior as well.

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Be very careful when performing this test, as you will be patching the PC 80 emitter directly into the power amp or powered speaker input! If you do not carefully follow the procedure, you risk blowing up the speakers!

1. Turn off the speaker power amp(s) or powered speakers.

2. If using an external power amp, make sure the speaker wires from the power amp to both speakers are wired correctly. (See above sidebar, “Speaker wiring”).
3. Patch a three wire XLR connector cable (previously tested above proving a correct matched pin-out on both connector ends) into the PC80 emitter and patch its output into one channel of the speaker power amp or the powered speaker. If the power amp or powered speakers requires 1/4” TS phone connectors or TRS 1/4” phone connectors for its inputs, use a tested adapter cable. (See section “Wiring Adapter Cables/Testing Pre Existing Adapters/Adapter Cables”). Lets test the left channel or powered left speaker as to start.
4. On the power amp, or powered speaker input, if there is a volume control, set to its lowest level as to start.
5. Set the PC80 emitter output gain OFF as to start. To do so, turn the pot counter clockwise (full left) — most important if the power amp or powered speakers do not have volume control(s)!
6. Power up the PC 80 emitter and set the hot pin to pin 2 as to start. Consider the following “A” or “B” options as per your set up:

A. If your speaker/power amp or powered speakers do not have volume controls, power up the speaker power amp or the left powered speaker — if the pulse created by the emitter is causing a very loud “spike” (which may blow up speaker components), immediately power down the power amp or powered speaker! If this is the case, there is a problem regarding the PC 80-volume control — the odds are very good this will not be the case but we need to mention as a safety precaution.

Let’s assume that all is well meaning you are not hearing a loud spike — you are probably not hearing the emitter pulse, just a bit of noise. Now slowly and very carefully turn the emitter volume control clockwise as to arrive at a medium volume listening level. If not hearing the emitter pulse after barely turning up the emitter level, power down the power amp or powered speaker and switch the emitter to pin 3 hot. In this case, go back to step #5. If you are hearing the signal, your adapter cable/studio would be wired pin 3 hot. When all is well, slowly turn up the PC80 emitter level to a comfortable listening level.

B. If your speaker/power amp or powered speakers have volume controls, you have set to the lowest level possible. Now slowly and very carefully, turn the PC 80 emitter volume control clockwise. You should barely hear the emitter pulse after arriving at full level. Now slowly turn up the power amp or powered speaker volume until arriving at a comfortable listening level.

If you are not hearing the emitter pulse after turning up the power amp or powered speaker volume just a bit, at this point, power down the power amp or powered speakers and switch the emitter to pin 3 hot. In this case, go back to step #5. If you're hearing the signal, your adapter cable/studio would be wired pin 3 hot. When all is well, slowly turn up the PC80 emitter level to a comfortable listening level.

Important: regarding "A" and "B" options, if the emitter hot pin needed to be switched to pin 3 hot as to hear signal, if your studio is not wired pin 3 hot as well as adapter cables (if needed), there is a wiring problem. Best to test the cable again before moving on within this test. If a wiring problem, fix or replace with another cable and start the test over. Remember that we assume pin 2 is the hot pin selected on the emitter regarding the following. If pin 3 hot, adapt.

Discovering the speaker power amp hot pin

Now time to discover the power amp or powered speaker "hot pin" wiring as well as checking individual speaker phase. Your monitor speakers will typically include two or three sound drivers (possibly more if a big monitor system). A two-way system could be designed in one of two ways — either a woofer and a mid range/tweeter combination driver, or a woofer/mid range combination and tweeter. A three way system includes a woofer, a mid range driver, and a tweeter driver.

Important: regarding a two way speaker system, if the tweeter is not also the mid range driver, in some cases the tweeters may be reversed in phase — the phase reversal may be a time alignment issue decided by the designers. Most important to check your speaker manual as to find out if the mid range frequencies are being generated by the woofer or tweeter. Look for the bandwidth meaning if the woofer specs shows it reaches up around 2 kHz or higher, it is passing mid range signals. If so, you will use woofer as to test when we mention to test phase using the mid range driver. If not, you will use the tweeter/mid range combination driver when we mention to test phase using the mid range driver.

Regarding a three-way speaker system (or more drivers), in some cases the tweeters or woofers may be reversed phase — again, the phase reversal may be a time alignment issue decided by the designers. In any case, the mid range driver would not be reverse phase so we will test that driver first.

(Note: regarding the possibility of woofers wired reversed phase at the factory, we hope not as this would hurt “low end punch.” The odds are very good the woofers would not be wired in such a fashion. If the test shows both woofers are reversed in phase, call the manufacture and find out!!! A few of the three way speaker systems we have tested reversed the tweeter phase only which is not a problem regarding “punch” (tweeters produce frequencies that are not felt as major air movement in comparison to woofers).

You now have the PC 80 emitter set up — the following will use the PC 80 receiver as to discover speaker phase.

1. Power up the PC 80 receiver and switch it’s upper left switch to “INT MIC”.
2. The PC 80 receiver has an internal mic, which is mounted at the upper rear end of the receiver, covered by a black grill screen. This mic is used to hear the pulse created from the PC80 emitter which is being sent to the speaker. As to position the PC80 receiver speaker towards the studio monitor speaker, place the PC80 receiver in either hand with the internal mic pointing directly towards the mid range driver. Note if the speaker includes a grill cloth that is removable, best to remove. If the speaker grill cloth is not removable, and if you can’t see each speaker component through the grill cloth, use a flashlight as to look into the grill cloth for PC80 hand held placement.
3. What are you seeing on the PC80 receiver LED? If a green light (in phase), the hot pin on the power amp is pin 2 hot. If a red light (out of phase), on the PC80 emitter, switch the hot pin to pin 3. You should now see the green LED light up (in phase). In any case, you have discovered the power amp or powered speaker phase regarding the mid range driver. (Note: if any confusion meaning the LED lights are vacillating, one of two possible problems — you may be holding the PC80 receiver too far away from the speaker. If not the case, slightly turn up the PC80 emitter volume or speaker power amp volume and test again).
4. Now test the rest of the speaker drivers in the same manner. If a two-way speaker system that has the mid range/tweeter driver mounted in the middle of the woofer, position the PC 80 receiver between the mid/tweeter driver and the bottom of the woofer so the receiver does not hear sonic information from the mid/tweeter driver. Remember that if using a three way speaker system, the tweeter or woofer may be reversed phase but the mid range driver is what we are using as to base the phase discovery upon. Also, regarding a three-way system, two of the three speakers should be the same phase. If not, call the speaker manufacture as to find out how the speakers are wired for phase.
5. Now test the other monitor speaker using the same procedure.

You now know what speakers show “in” or “out” phase. Both speaker cabinet’s individual corresponding speakers should show the same results. Whether they do or not, write down your findings in your studio notebook. (If they do not match in phase, see, “speaker phase problems.”)

Assuming the speakers matched in phase as just mentioned, most likely, the mid drivers and woofers are matched in phase and possibly the tweeters are reverse phase. In any

case, the mid drivers will show correct phase as long as the speaker wires are wired correctly (externally or internally). So if when testing, if the mid range drivers showed correct phase, the odds are good “pin 2” was selected on the PC80 receiver. If not, then “pin 3” was selected showing correct phase — in your studio note book, write down which pin is *hot* regarding the speaker power amp input or powered speaker input as this will be most important regarding following tests!

You have also noted each speaker phase if different meaning if the tweeters showed reverse phase, make sure to note in your studio note book. Here’s why — if you get the speakers “re-coned” at some point in time, you would once again test the phase and would want to make sure they were wired correctly — your notes will surly come in handy! At this point, if all is well, skip down to “Headphone system phase test.”

Speaker phase problems

Totally “out of phase.” If each of the speaker driver components in both speaker cabinets prove to be reversed phase in comparison, you have a total “out of phase” problem. Let’s find out where the problem exists.

1. Since you have tested the cable used from the PC80 emitter to the power amp (or powered speaker) input, the cable is not the problem. This leaves three other possible options.
2. If using an external power amp, check the speaker wiring again (as explained in the above sidebar, “Speaker wiring.” This is usually the problem at this point in testing.
3. If the speaker wiring proves to be OK, the power amp needs to be checked as one channel may be reversed internally at the input or speaker terminal connectors. In the case, if you are not a tech, take the amp into an amp shop and have a tech perform the test. The same goes for powered speakers meaning take to a tech.
4. If using an external power amp and the power amp proves to show correct phase on both channels, the individual speaker component wiring/speaker crossover wiring are all that remains regarding the problem at hand. Time to phone the speaker factory and find out whom they recommend regarding a service facility.

Partially out of phase. If any of the speakers in each cabinet did not match each other’s corresponding partner in phase, again, the problem must be caused by incorrect internal speaker/crossover wiring. Time to phone the speaker manufacture and find out whom they recommend regarding a service facility.

After problems have been corrected, repeat the speaker phase test procedures as to make sure all is well.

Headphone System Phase Test

If your headphone system uses an external power amp, might as well check now since the test is almost identical regarding the speaker test. First test the headphone power amp in the same fashion. Now test the headphones in a similar fashion as the speakers

were tested. The difference is to hold the PC80 receiver internal mic as close as possible to the headphone diaphragms, one side at a time, and note the phase.

A few other things to do —if using headphone mult boxes, check all outputs with one set of headphones. Now check all other headphones. Note that if your headphone mult boxes use two wire speaker cable as to connect to the power amp (instead of the three wire cables used for mics, etc. which you have previously tested in the cable test), all cables need to be checked individually after checking one mult box and one set of headphones. Simply swap out another cable and test.

Note: when performing the headphone phase test, check your power amp manual as to see if the amp requires a load. If a tube amp, you must have a load across the outputs. In this case, a load means a headphone must be plugged in before powering up the power amp. If you are using a mult box for headphones, leave one set plugged in when testing others. The sonic leakage will not affect the phase test.

Possible problems. If most or all headphones show one side is out of phase, the odds are good that the wiring problem is caused from the power amp output into the main headphone connector. Check the wiring. If all is well, if using a headphone “mult” box, the problem may be internal wiring.

If only one or a few headphones test incorrectly, the problem would be incorrect wiring on the headphone connector.

Note: If your headphone system is powered through your mixer (the mixer includes a headphone power amp), do the test after testing the mixer in full (which is the following test). In this case, you will have proven the mixer hot pin so simply send the emitter signal through a mixer module (set to the proven mixer hot pin) and test the headphones as explained above.

Mixer phase tests

The first test is to discover the mixer hot pin. As to do so, we will use a similar test as performed in the “Speaker Phase Test.”

Very Important:

- When performing the “speaker phase test” (using the mid-range driver as the speaker to prove the hot pin), if using XLR connector cables or a 3 wire adapter cable (balanced line), you had noted the hot pin (most likely pin 2). If using a mixer that utilizes balanced line (three wire connectors), check your mixer manual as to find out which pin is wired as the hot pin for inputs and outputs (most likely pin 2). In the following test, if the test proves to be the same hot pin discovered in the speaker test regarding the mixer monitor output channels, great! If not, most important to re-wire the cables from the mixer monitor outputs to the speaker power amp or powered speakers as to match phase.
- If using two wire adapter cables for the “speaker phase test,” if a phase problem (unlikely), you have corrected the wiring. In the following test, if the mixer outputs do not match in phase, the odds are very good the problem is within the mixer path internal wiring.
- Keep in mind that all your cables have been tested proving correct wiring. If phase problems are discovered in the following, the odds are very good the cables are not the cause. This does not mean the cables may be the cause (the cable may have a cold solder joint or a wiring break) which is easily discovered — simply use other tested cables before calling a tech. We will not mention again in this section so please keep in mind.
- If in any of the following patching procedures, if your mixer uses connectors for inputs and outputs that are not XLR’s, you will need to use adapter/adapter cables. We will not mention using such adapters so patch in when needed. Remember that such adapter cables need to be wired and tested as explained in section, “Wiring adapter cables/Testing Pre Existing Adapters/Adapter Cables”.

Note: most mixers have two level controls associated with each input mixer module — one volume control is a “in line fader” that is mounted on the bottom of each module. We will call this volume control the “big fader.” The other volume control is typically a rotary pot style fader (inexpensive through mid line mixers) or a smaller “in line fader” (upper end mixers) which is typically mounted above the big fader. Typically, both faders can be switched as to be used for an input source such as a mic or line input, or a recorder track return.

We will first test using the big fader path so when patching the PC 80 emitter into the line input as mentioned in step #6 below, make sure to patch into the main line input, not the monitor input (typically the *recorder return* input).

Note that digital mixers have analog inputs for mics and possibly analog insert patch points. If so, most important to test. Simply adapt to the following.

Testing The Mixer Monitor Left And Right Channel Stereo Outputs

1. After performing the speaker phase test, you powered down (switched off) the speaker power amps (or powered speakers) and then plugged back in the mixer monitor output connectors to their respective power amp inputs (or powered speaker inputs). If not, do so.
2. If the speaker power amps (or powered speakers) have volume controls, set to the position you normally use.
3. With the speaker power amps (or powered speakers) still switched off, switch off (power down) all gear except for the mixer.
4. If your mixer includes a patch bay, unplug any patch cords that are not needed to complete the basic monitor path — not patches that plug into patch bay connectors from the rear of the patch bay. As to make that point clear, if your mixer does not have wires *hard wired* to the patch bay, but instead uses connectors at the rear of the patch bay, do not pull those connections.
5. With the mixer monitor volume control muted, power up the speaker power amps (or powered speakers).
6. Patch the cable from the PC80 emitter into channel line input #1 on your mixer. If your mixer utilizes a patch bay and does not allow direct patching into the line input mentioned, patch into line input #1 on the patch bay.

The patching is complete. The emitter is plugged into mixer module #1's line input. Time to set up mixer module #1 and other mixer controls as to send the emitter signal through the mixer path which finally reaches the monitor speakers.

7. On mixer module #1, if there is a mode switch which allows either a mic or line input choice, set to line input.
8. On mixer module #1, there will be one or two trim level controls. If two trim level controls, one would be used for a mic preamp and the other for a line-input source. We will eventually be testing the mic mixer path for phase so no matter if one or two trim level controls, set to zero dB.
9. On mixer module #1, there will be a pan pot for the big fader monitor path and set to center position. The PC emitter signal will equally rout to both stereo left/right outputs.
10. On mixer module #1, bring up the big fader to the unity gain point (typically 3/4ths up on the fader throw — just look for the zero dB number etched next to the fader).
11. On mixer module #1, if there are any switches that rout the signal to EQ, etc., switch out for now.
12. The mixer will have a master stereo volume control (not to be confused with the monitor volume control). Set to unity gain.

13. Make sure the mixer master function mode is switched to the mode which allows signal to pass through mixer line input modules. As to make this clear, we don't want the mixer switched to a monitoring mode such as a CD player, DAT recorder, etc.

The mixer path routing/switching are set up so time to set up the PC 80 emitter.

14. Power up the emitter and set the level to maximum level (turn the volume control full clockwise).
15. Set the emitter "hot pin" to pin 2 hot as to start.
16. Unmute the monitor speakers and with the mixer monitor volume set to minimal level, creep up the volume until hearing the PC 80 emitter signal at a normal listening level.

Note: if not hearing the emitter pulse signal, turn down the mixer volume control to minimum level and revisit all of the above set up information as to make sure your routing/switching is correct.

If using two wire adapters, you should hear the emitter no matter if the phase is correct or reversed. Remember that you are using adapter cables that have tested correctly using pin 2 as the hot pin. If not hearing the emitter signal, the routing and/or patching is not correctly set up.

If using three wire connectors, if you are sure the routing is correct and not hearing the emitter signal, switch the emitter to pin 3 hot and creep up the mixer monitor level. If now hearing the signal, the mixer is pin 3 hot. If this is not the same hot pin proven in the speaker test, there is a phase wiring problem between the mixer outputs and speaker power amp inputs. If so, best to correct the wiring problem before moving on to the next portion of the test.

If not hearing the emitter signal after switching to pin 3 hot, the routing and/or patching is not correctly set up.

Now time to set up the PC 80 receiver and test for phase.

17. Power up the PC 80 receiver and switch it's upper left switch to "INT MIC".
18. The PC 80 receiver internal mic (INT MIC) is mounted at the upper end of the receiver. If not clear on its location, look for a small circular black grill screen. The PC 80 receiver internal mic is used to hear the pulse created from the PC80 emitter which is being sent to the mixer monitor speaker. As to position the PC80 receiver speaker towards the studio monitor speaker, place the PC80 receiver in either hand with the internal mic pointing directly towards the center of the mid range driver. (If using a two-way speaker system, refer to section "Speaker Phase Test/Discovering the speaker power amp hot pin" and look for "important'). Note if the speaker includes a grill cloth that is removable, best to remove. If the speaker grill cloth is not removable, and if you can't see each speaker component through the grill cloth, use a flashlight as to look into the grill cloth for PC80 hand held placement position.
19. By the way, the PC 80 receiver hot pin setting does not matter — the PC 80 receiver's mic will be just looking for sound pressure — air moving forward equals "in phase" (the green LED lights) — air moving towards the rear of the driver equals "out-of-phase" (the red LED lights).

Remember that we have the PC 80 emitter set to pin 2 hot (or pin 3 hot if the original speaker phase test proved pin 3 hot (unlikely) on the speaker power amp or powered speakers). Also, you have checked your mixer manual as to note the hot pin (balanced line wiring).

In any case, if seeing the green LED lit (in phase), all is well.

If seeing the red light (out of phase), there may be a wiring problem. Before that is fact, mute the mixer monitor volume and go back to step #6 and plug the PC 80 emitter into mixer module #2's line input and revisit the test. If the test proves the same results, there is a wiring problem so call a qualified tech.

Important: when testing, if the LED lights are vacillating (green and red), one of two possible problems — you may be holding the PC80 receiver too far away from the mid range speaker driver. If not the case, slightly turn up the mixer monitor volume and test again.

Also, if by chance, your speakers are positioned very close to each other meaning within less than a foot (highly unlikely), leakage may be a possibility causing vacillating. As to eliminate that possibility, go back to step #9 and pan mixer module #1's pan pot full left — you will now only hear the PC 80 emitter signal on the left monitor speaker hence eliminating the leakage problem. If that solved the vacillating problem, in the next paragraph, you need to go back to step #9 and pan to full right.

Now test the right monitor speaker in the same fashion. If the phase does not prove to be the same, there is a wiring problem. If so, call a qualified tech.

Note: if your studio includes other speaker monitor systems, test in the same fashion. Also, if your mixer is designed to allow for surround sound monitoring, in step #9 above, set mixer module #1's pan pot to allow the signal to rout to all speakers.

In conclusion, the odds are very good the speakers power amp or powered speakers matched phase regarding the mixer outputs (most likely pin 2 hot). If not, you have fixed any wiring problems.

Testing the Mixer Main Stereo Outputs

Your mixer will include at least one main stereo (left and right) output (possibly more) as to send to a 2-track analog or digital recorder for mixing. Your mixer may also have more outputs for mixing applications such as 5.1 surround. In any case, test all of the mixer outputs.

As to make sure the following routing and mixer mode switching is set up properly, leave the monitor speakers on as to monitor the PC 80 emitter signal but keep the following in mind.

1. When doing requested patch changes, mute the monitor speakers until the patching is complete.
2. Set the mixer monitor level to minimum — just enough level as to hear the PC 80 emitter pulse.

Remember that we are testing in order so you are still set up regarding the above test (Testing The Mixer Monitor Left And Right Channel Stereo Outputs). If not, start from step #1 through step #13. For this test and many others, we will not use the monitor speakers/PC 80 receiver internal mic as to test but instead the PC 80 receiver will be set up as to receive the signal electronically.

Again, you are set up through step #13 from the above test. We will now use letters instead of numbers as to avoid number confusion regarding the previous test.

The mixer path routing/switching are set up so time to set up and patch the PC 80 receiver.

3. In the above test using a three-wire connector (XLR or a three-wire adapter), the odds are good that the hot pin proved to be pin 2 hot. Whatever the proven hot pin, set both the PC 80 emitter and receiver to the same hot pin as to start. Keep in mind that if you are using two wire adapter cables, you had wired up as pin 2 hot so set both the PC 80 emitter and receiver to pin 2 hot.
4. Your mixer will have at least one main stereo output patch point which is used to send to a 2-track recorder, etc. On the back of the mixer, using a tested cable, patch the left main stereo output into the PC 80 receiver input. If your mixer utilizes a patch bay and does not allow direct patching from the rear of the mixer, use the patch point

on the patch bay. If the mixer allows both patch points (the rear of the mixer and the patch bay), test both one at a time.
5. On the PC 80 receiver, set the upper most switch to “line”.
6. Power up the receiver and set the level to maximum level (turn the volume control full clockwise).
7. Un-mute the monitor speakers and with the mixer monitor volume set to minimal level, creep up the volume until just slightly hearing the PC 80 emitter.

If you are not hearing the PC 80 emitter signal through the monitor speakers, one of three possibilities:

- The mixer is not set to the correct monitoring mode.
- The patching is not correct.
- Highly unlikely but the cable(s) (or adapter cable(s)) may be faulty.

In any case, mute the monitor speakers and check the three mentioned possibilities in the above order.

When hearing the PC 80 emitter signal through the monitor speakers, all is well. In review so far, the emitter is plugged into mixer module #1’s line input and the mixer main stereo left output is plugged into the PC 80 receiver input.

On the PC 80 receiver, are you seeing the green “in phase” LED lit? The red LED lit? Neither LED lit? The following will explain but keep in mind that you have proven the speaker power amp (or powered speakers) hot pin and have both the PC 80 emitter and receiver set to the noted hot pin, most likely pin 2. If pin 3 proved to be the hot pin so far, in the following, on both the emitter and receiver, swap pin 2 with pin 3.

The green LED is lit (three wire cables)

If using XLR connectors, or three wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, if pin 2 proved to be the hot pin when testing the mixer monitor phase, all is well. If not seeing the green LED lit, switch both the emitter and receiver to pin 3 hot. If you now see the green LED lit, there is a wiring problem within the mixer. In this case, call a qualified tech.

Assuming the green LED was lit when both the PC 80 emitter and receiver were set to pin 2 hot, now switch both to pin 3 hot. You should once again see the green LED lit (if not, the neutral wire is not connected — see Neither LED is lit for details).

Now check the mixer main stereo right output in the following manner.

1. Mute the mixer monitor speakers.
2. Undo the patch from the mixer's left channel main stereo output and plug into the mixer's right channel main stereo output.
3. Un-mute the mixer monitor speakers.

You should be seeing the same results as mentioned when testing the left channel. If not, there is a mixer-wiring problem so call a qualified tech.

The green LED is lit (two wire cables)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, the mixer phase proves correct. No need to note as this is a two-wire situation meaning the mixer path is showing both the hot and ground pins match phase.

Now check the mixer main stereo right output in the following manner.

1. Mute the mixer monitor speakers.
2. Undo the patch from the mixer's left channel main stereo output and plug into the mixer's right channel main stereo output.
3. Un-mute the mixer monitor speakers.

You should be seeing the same results as mentioned when testing the left channel. If not, there is a mixer wiring problem so call a qualified tech.

The red LED is lit (three wire cable)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, there is a serious wiring problem! The ground and hot wires are reversed and the neutral wire is not connected somewhere in the path. Test mixer module #2 in the same fashion. As to do so, mute the monitor speakers and patch the PC 80 emitter's output into mixer module #2's line input. Un-mute the monitor speakers and test. After testing, you know if the problem is local (one mixer module) or global (the main mixer stereo path). In any case, call a qualified tech and explain your test results in full.

After fixing the problem, before the tech leaves your studio, best to test again as to make sure all is well. Repeat the test in full and you should now see the green LED lit so go back to "The green LED is lit *(three wire cables*" and test the right channel as mentioned.

You should be seeing the same results as mentioned when testing the left channel. If not, since the tech is performing the test, no problem finding the wiring problem as it would be the same.

The red LED is lit (two wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, the mixer phase is reversed somewhere in the path. Test mixer module #2 in the same fashion. As to do so, mute the monitor speakers and patch the PC 80 emitter's output into mixer module #2's line input. Un-mute the monitor speakers and test. After testing, you know if the problem is local (one mixer module) or global (the main mixer stereo path). In any case, call a qualified tech and explain your test results in full.

After fixing the problem, before the tech leaves your studio, best to test again as to make sure all is well. Repeat the test in full and you should now see the green LED lit so go back to "The green LED is lit *(two wire cables)*" and test the right channel as mentioned.

You should be seeing the same results as mentioned when testing the left channel. If not, since the tech is performing the test, no problem finding the wiring problem as it would be the same.

Neither LED is lit (three-wire cable)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, the odds are very good the set-up/patching in not correct — check and test again. Remember that you should be hearing the PC 80 emitter signal through the monitor speakers. If you are sure the problem is not the set-up/patching, call a qualified tech. If the green LED lights, the wire representing pin 2 within the mixer path is not completing its path! Test mixer module #2 in the same fashion. As to do so, mute the monitor speakers and patch the PC 80 emitter's output into mixer module #2's line input. Un-mute the monitor speakers and test. After testing, you know if the problem is local (one mixer module) or global (the main mixer stereo path). In any case, call a qualified tech and explain your test results in full.

After fixing the problem, before the tech leaves your studio, best to test again as to make sure all is well. Repeat the test in full and you should now see the green LED lit so go back to "The green LED is lit (*three wire cable(s)"* and test the right channel as mentioned.

You should be seeing the same results as mentioned when testing the left channel. If not, since the tech is performing the test, no problem finding the wiring problem as it would be the same.

Neither LED is lit (two wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, the odds are very good the set-up/patching in not correct — check and test again. Remember that you should be hearing the PC 80 emitter signal through the monitor speakers. If you are sure the problem is not the set-up/patching, call a qualified tech. If the problem requires a tech, after fixing the problem, before the tech leaves your studio, best to test again as to make sure all is well. Repeat the test in full and you should now see the green LED lit so go back to "The green LED is lit (*two wire cable(s)"* and then test the right channel as mentioned.

You should be seeing the same results as mentioned when testing the left channel. If not, since the tech is performing the test, no problem finding the wiring problem as it would be the same.

At this point, you have proven correct phase or fixed problems!

Important: how did you patch the PC 80 emitter and receiver into the mixer when performing the above test? Did you use the connectors on the back panel of the mixer, or the mixer patch bay? If the mixer allows only one place to plug in (patch), skip down to the next section. If the mixer allows both patch points (rear mixer connectors analog with patch bay connectors) revisit the above test — the only difference is to use the other patch point. I.e., if you patched the PC 80 receiver directly into the connectors on the back panel of the mixer, simply use the patch bay patch points.

Keep in mind it is possible the mixer patch bay may be wired incorrectly VS the connectors on the back of the mixer. When testing using the other patch possibility, if the phase does not match in comparison to the previous test (using the other patching possibility), call a qualified tech.

Testing The Mixer Input Modules In Full

Remember that we are testing in order and up to this point, you have proven correct phase and/or fixed any phase wiring problems so time to test all paths on each mixer input module.

Typically, a mixer module will include a line input, a monitor input (typically used for a multi recorder track returns), a mic input, and possibly an insert patch point (for effects). All should be tested for phase.

Important: Again, if your mixer has a patch bay and/or you have access to rear mixer panel patching as well, when performing the following mixer tests, you will need to test each patching possibility. After testing all mixer input modules, if you patched the PC 80 receiver directly into the connectors on the back panel of the mixer, simply use the patch bay patch points and test again. Keep in mind it is possible the mixer patch bay may be wired incorrectly VS the connectors on the back of the mixer. When testing using the other patch possibility, if the phase does not match in comparison regarding the previous patching, call a qualified tech.

Note: when performing any of the following tests, if not seeing the green or red LED lit on the PC 80 receiver, the odds are good the mixer is not set to the proper mixer monitor mode. If you are sure the monitor mode is set properly, there is a wiring problem within the mixer path.

1. If the studio is powered up, other than the mixer, turn off all gear in the studio as well as the speaker power amps — turn the speaker power amps off first! All we want powered up is the mixer.
2. If your mixer includes a patch bay, unplug any patch cords that are not needed to complete the basic monitor path — not patches that plug into patch bay connectors from the rear of the patch bay. As to make that point clear, if your mixer does not have wires *hard wired* to the patch bay, but instead uses connectors at the rear of the patch bay, do not pull those connections.
3. Patch the PC80 emitter into channel line input #1 on your mixer. If your mixer utilizes a patch bay and does not allow direct patching into the line input mentioned, patch into line input #1 on the patch bay.
4. Your mixer will have a main stereo output patch point which is used to send to two track recorders, etc. Patch the left output into the PC 80 receiver input. Again, if your mixer utilizes a patch bay and does not allow direct patching into the line input mentioned, simply patch the main left stereo output into the PC 80.

The patching is complete. The emitter is plugged into mixer module #1's line input and the mixer main stereo left output is plugged into the PC 80 receiver input. Time to set up mixer module #1 and other mixer controls as to send the emitter signal through the mixer path which finally reaches the PC 80 receiver.

5. On mixer module #1, if there is a mode switch which allows either a mic or line input choice, set to line input.
6. On mixer module #1, there will be one or two trim level controls. If two trim level controls, one would be used for a mic preamp and the other for a line-input source. We will eventually be testing the mic mixer path for phase so no matter if one or two trim level controls, set to zero dB.
7. On mixer module #1, there will be a pan pot for the big fader monitor path and set to the center position. The PC emitter signal will equally rout between both stereo left/right outputs.
8. On mixer module #1, bring up the big fader to the unity gain point (typically 3/4ths up on the fader throw — just look for the zero dB number etched next to the fader).
9. On mixer module #1, if there are any switches that rout the signal to EQ, etc., switch out for now.
10. The mixer will have a master stereo volume control (not to be confused with the monitor volume control) so set to unity gain.
11. Make sure the mixer master function mode is switched to the mode which allows signal to pass through mixer line input modules. As to make this clear, we don't want the mixer switched to a monitoring mode such as a CD recorder, etc.

The mixer path switching is set up so time to set up the PC 80 and test phase.

12. Power on both the PC 80 emitter and receiver.
13. On the emitter, set the level to maximum level (turn the volume control to full clockwise).
14. On the receiver, set the upper most switch to “line”.
15. Set both the emitter and receiver “hot pin” to pin 2 hot as to start.
16. On the PC 80 receiver, are you seeing the green “in phase” LED lit? The red LED lit? Neither LED lit? The following will explain.

The green LED is lit (three wire cables)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, now switch both the emitter and receiver to pin 3 hot. You should once again see the green LED lit (if not, either the hot or neutral wire is not connected — see Neither LED is lit for details). If seeing the green LED lit, this proves the mixer path is showing both pin 2 and 3 are matched in phase but does not prove the mixer hot pin.

We will prove the mixer hot pin shortly but before doing so, check the mixer right output first in the following manner.

1. If by chance the speakers are powered up (they shouldn’t be), turn off.
2. Undo the patch from the mixer left channel main stereo output to PC 80 receiver.
3. Plug in the cable which was previously patched into the mixer left channel main stereo output.
4. Unplug the cable used for the mixer right channel main stereo output.
5. Plug the cable from the PC 80 receiver into the mixer right channel main stereo output.

You should be seeing the same results as mentioned when testing the left channel. If not, there is a mixer wiring problem so call a qualified tech. Assuming all is well; here’s what to do next.

Remember you have checked your mixer manual as to find out which pin is used for the hot pin (probably pin 2). In any case, lets make sure performing a simple test that uses the PC 80 emitter as in the Speaker Phase Test.

Remain set up as you are but with one patch change — unplug the PC 80 receiver from the mixer stereo right output and plug in the cable which was previously patched into the mixer right channel main stereo output. Now revisit the Speaker Phase Test with the following in mind.

- Instead of patching the PC 80 emitter into the speaker power amp, leave it patched into the mixer.
- Make sure the mixer monitor outputs are plugged into the speaker power amp(s) (as normally set up).
- Follow instructions regarding the PC 80 emitter use the emitter positioned in front of the left speaker mid range driver.
- Remember that you have both the PC 80 emitter and receiver set to pin 2 hot. If the green LED lights, the mixer is pin two hot. If the red LED lights, pin 3 is hot. Note the hot pin in your studio notebook.

The green LED is lit (two wire cables)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, the mixer phase proves correct. No need to note as this is a two-wire situation meaning the mixer path is showing both the hot and ground pins match phase.

Now test the right mixer stereo output channel in the following manner.

- If by chance the speakers are powered up (they shouldn't be), turn off.
- Undo the patch from the mixer left channel main stereo output to PC 80 receiver.
- Plug in the cable which was previously patched into the mixer left channel main stereo output.
- Unplug the cable used for the mixer right channel main stereo output.
- Plug the cable from the PC 80 receiver into the mixer right channel main stereo output.

You should see the same results meaning the green LED is lit. If not, there is an out-of-phase problem created within the mixer path — call a qualified tech.

The red LED is lit (three-wire cable)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, there is a serious wiring problem! The ground and hot wires are reversed and the neutral wire is not connected somewhere in the path. Test mixer module #2 in the same fashion as well as a few more mixer input modules. After testing, you know if the problem is local (one mixer module) or global (the main mixer stereo path). In any case, call a qualified tech and explain your test results in full.

After fixing the problem, before the tech leaves your studio, best to test again as to make sure all is well. Repeat the test in full and you should now see the green LED lit so go back to "The green LED is lit" and then test the right channel. After doing so, keep reading as to test the mixer hot pin using a modified Speaker Phase Test.

The red LED is lit (two-wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, the mixer phase is reversed somewhere in the path. Test mixer module #2 in the same fashion as well as a few more mixer input modules. After testing, you know if the problem is local (one mixer module) or global (the main mixer stereo path). You will need to call a qualified tech in either case but might as well test the right channel as to see if the problems match.

1. If by chance the speakers are powered up (they shouldn't be), turn off.
2. Undo the patch from the mixer left channel main stereo output to PC 80 receiver.
3. Plug in the cable which was previously patched into the mixer left channel main stereo output.
4. Unplug the cable used for the mixer right channel main stereo output.
5. Plug the cable from the PC 80 receiver into the mixer right channel main stereo output.

Keep in mind there is a problem when testing the left channel. If the red LED lit as in the left channel test, at least the problem follows. In any case, make note of your findings and call a qualified tech.

Neither LED is lit (three-wire cable)

If using XLR connectors, or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, see "Note" below. If the green LED lights, the wire representing pin 2 within the mixer path is not completing its path! Test mixer module #2 in the same fashion as well as a few more mixer input modules. After testing, you know if the problem is local (one mixer module) or global (the main mixer stereo path). In any case, you will need to call a qualified tech but might as well test the right channel as to see if the problems match.

1. If by chance the speakers are powered up (they shouldn't be), turn off.
2. Undo the patch from the mixer left channel main stereo output to PC 80 receiver.
3. Plug in the cable which was previously patched into the mixer left channel main stereo output.
4. Unplug the cable used for the mixer right channel main stereo output.
5. Plug the cable from the PC 80 receiver into the mixer right channel main stereo output.

Keep in mind there is a problem when testing the left channel. If the problem matches or not, make note as to explain to your tech.

Neither LED is lit (two-wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, see "Note" below. If seeing the green LED, the adapter cable must be wired pin 3 hot. Remember for our tests, we are using pin 2 hot. If your studio and adapter cables are wired pin 3 hot, again, adapt regarding this and following tests — when we mention setting the PC 80 emitter and receiver units to pin 2 hot, simply set to pin 3 hot as to start and always use the opposite hot pin settings we mention.

Now test the right channel in the following manner.

1. If by chance the speakers are powered up (they shouldn't be), turn off.
2. Undo the patch from the mixer left (or right) channel main stereo output to PC 80 receiver.
3. Plug in the cable which was previously patched into the mixer left channel main stereo output.
4. Unplug the cable used for the mixer right channel main stereo output.
5. Plug the cable from the PC 80 receiver into the mixer right channel main stereo output.

If not pin 3 hot regarding your studio wiring path, there is a problem when testing the left channel. If the problem matches or not, make note as to explain to your tech.

Note: for both two and three wire connectors, if neither LED lights switched to either pin 2 or pin 3 hot on both the emitter and receiver, again, the odds are very good the set-up/patching in not correct — check and test again. If you are sure the problem is not the set-up, call a qualified tech.

At this point, you have proven correct phase or fixed problems!

Important: how did you patch the PC 80 emitter and receiver into the mixer when performing the above test? Did you use the connectors on the back panel of the mixer, or the mixer patch bay? If the mixer allows only one place to plug in (patch), skip down to the next section. If the mixer allows both patch points (rear mixer connectors analog with patch bay connectors) revisit the above test — the only difference is to use the other patch point. I.e., if you patched the PC 80 directly into the connectors on the back panel of the mixer, simply use the patch bay patch points.

Keep in mind it is possible the mixer patch bay may be wired incorrectly VS the connectors on the back of the mixer. When testing using the other patch possibility, if the phase does not match in comparison to the previous test (using the other patching possibility), call a qualified tech.

You have completed the test for mixer module #1. Yea, as boring as it is, you get the idea — patch into each mixer module line input one at a time and test. If not seeing the green LED light at any point, note your findings and call a qualified tech.

Testing all mixer module monitor inputs

Use the same test, “Testing The Mixer Input Modules In Full” and instead of patching into the line input, patch into the mixer monitor input.

Testing all mixer module mic inputs

A typical studio set up usually includes either mic patch bays (in a separate room other than the control room) or one or more extension mic input boxes. If such options are available, if you can test the mixer mic inputs using the connectors on the rear of the mixer (not *hard wired* to the mixer patch bay), test those inputs first. If your mixer patch bay allows mic input patch points, test second. Finally, if you have mic bays in the studio or remote mic boxes, test last.

Some of the following set up is redundant but needed as to make sure all is OK in set up land.

No need to change settings on the PC 80 emitter and receiver as we will set the mic input mixer module trim pots to deal with the emitter line level output.

1. Some mixers share a trim level for both mic and line inputs. If so, you are set up as they were set to zero dB in an earlier test. If a separate trim (preamp) control for mic inputs, we had also mentioned to set to zero dB. In any case, all mixer input module trim pots should be set to zero dB.
2. All big faders on each input module should be set to unity gain as used in a previous test. If not, set to zero dB (typically 3/4th's up on the fader throw).
3. All mixer input module pan pots should be set to center position.
4. Make sure the PC 80 emitter and receiver are powered up.
5. Switch the master mixer monitor mode as to allow the mic inputs to be active regarding routing through the mixer stereo path using the big faders as the volume control. It is possible that the mic mode may need to be individually switched on each mixer module — if so, switch each mixer module to mic mode.
6. Plug the PC 80 emitter into module #1's mic input and note the phase — you should see the PC 80 receiver green LED lit. If not, test module #2 in the same fashion. If not seeing the green LED lit, check your set up in full. If you are confident the set up is OK, there is a phase problem — call a qualified tech.
7. Now patch the PC 80 emitter into mixer module #2's mic input in the same fashion. You should see the green LED lit. If not, as usual, note your findings and call a qualified tech.

You get the idea — patch into each mixer module mic input one at a time and test. If not seeing the green LED light at any point, note your findings and call a qualified tech.

Testing mixer module busses and direct mixer module outputs

Your mixer will have “busses” typically used to send to the multi track recorder. Also, some mixers allow a direct output on each module, which may be used to patch directly into a recorder input.

Again, if the output patch points show up on a patch bay as well as the mixer rear panel, test each.

We will set up similar regarding testing a mixer module line input.
If your mixer has a direct output on each mixer module, we will test first.

Testing the module direct outputs

1. Set the big fader volume controls on all mixer input modules to unity gain (typically 3/4th’s up on the fader throw).
2. Set the mixer master mode to allow the mixer input modules to send signal to the direct output — this may not be a global setting meaning you may need to individually switch on each input mixer module.
3. Plug the PC 80 emitter into mixer module #1’s line input.
4. Plug mixer module #1’s direct output into the PC 80 receiver input and note the phase — you should see the PC 80 receiver green LED lit. If not, test module #2 in the same fashion. If not seeing the green LED lit, check your set up in full. If you are confident the set up is OK, there is a phase problem — call a qualified tech.
5. Plug the PC 80 emitter into mixer module #2’s line input.
6. Plug mixer module #2’s direct output into the PC 80 receiver input. You should see the green LED lit. If not, as usual, note your findings and call a qualified tech.

7. You get the idea so test the rest of the direct outputs in the same fashion one at a time. If not seeing the green LED light at any point, note your findings and call a qualified tech.

Testing the bus outputs

1. Set the big fader volume controls on all mixer input modules to unity gain (typically 3/4th's up on the fader throw).
2. Set all mixer module pan pots to center position (just to be safe).
3. Set the mixer master mode to allow the mixer input modules to send signal to the busses — this may not be a global setting meaning you may need to individually switch each input mixer module.
4. There will be a submaster volume control for each bus — set all to unity gain. If no unity gain mark, set to maximum level.
5. On mixer module #1, select bus #1.
6. Plug the PC 80 emitter into mixer module #1's line input.
7. Plug bus #1's output into the PC 80 receiver input and note the phase — you should see the PC 80 receiver green LED lit. If not, test module #2 in the same fashion. If not seeing the green LED lit, check your set up in full. If you are confident the set up is OK, there is a phase problem — call a qualified tech.
8. Now select bus #2 output on module #1.
9. Plug bus #2's output into the PC 80 receiver input and note the phase as explained in step #7.
10. Test all the busses in the same fashion meaning use mixer module #1 for the input source and simply select the next bus to be tested and patch into the PC 80 receiver accordingly.

Remember that we are not leaving any stone unturned! We might assume that all bus outputs will match the test performed on module #1. As to make sure, go back to step #5 but plug the PC 80 emitter into mixer module #2 and repeat the test — check all mixer modules in the same fashion. Yea, this is a time burner but most important to discover phase throughout the mixer path!

So what is the outcome of the test? If all proved to be the same phase discovered when testing the line inputs, great. If not call a qualified tech.

Testing mixer module auxiliary busses

As with the tests so far, we will set up similar regarding testing a mixer module line input.

If your mixer has a direct output on each mixer module, we will test first.

Mixers include one or more auxiliary busses (“aux” busses) typically used for effects (reverb, etc.) as well as the headphone monitor system. Each mixer-input module will have one or more aux bus send volume control(s). Each aux bus return will typically have a section on the mixer that mixes the signal with the rest of the monitor program material. Regarding aux returns for headphone systems, they typically allow a mode as to monitor through the mixer monitor path. No need to get into major detail regarding usage of aux sends, as we just want to test the phase.

Again, if the aux bus output patch points show up on a patch bay as well as the mixer rear panel, test each.

1. Set the big fader volume controls on all mixer input modules to unity gain (typically 3/4th’s up on the fader throw).
2. Set the mixer master mode switch to line input mode. You know, the mode used to test the line inputs. This mode should allow the aux sends to be active. If not, check your mixer manual.
3. There will be a master volume control for each aux bus return — set to unity gain. If no unity gain mark, set to 3/4ths up.
4. If the aux sends do not *normal* to the stereo mixer monitor bus, assign.
5. Some aux sends may be designed to send using a pan pot (a stereo application). If so, set the pan pot to center.
6. On mixer module #1, (as well as all other mixer input modules), whether one or more aux send volume control(s), set to maximum level.
7. Plug the PC 80 emitter into mixer module #1’s line input.
8. Plug aux bus #1’s output into the PC 80 receiver input and note the phase — you should see the PC 80 receiver green LED lit. If not, test module #2 in the same fashion. If not seeing the green LED lit, check your set up in full. If you are confident the set up is OK, there is a phase problem — call a qualified tech.
9. If the aux send has a pre/post switch, switch to the other mode and note the phase as explained in step #8 above.
10. If more than one aux bus, plug aux bus #2’s output into the PC 80 receiver input and note the phase. Again, if the aux send has a pre/post switch, switch to the other mode and note the phase. You get the drift — if not seeing the green LED lit, call a qualified tech.
11. If more aux busses, test all the aux busses in the same fashion meaning use mixer module #1 for the input source and simply select the next bus to be tested and patch the PC 80 receiver accordingly.

Remember that we are not leaving any stone unturned! We might assume that the aux bus outputs will match the test performed on module #1. As to make sure, go back to

step #7 but plug the PC 80 emitter into mixer module #2 and repeat the test — check all mixer modules in the same fashion. Yea, this is a time burner but most important to discover phase throughout the mixer path!

Important: not yet finished with the test if your mixer has aux bus return inputs (which is likely). This will be cake as you are set up meaning do not change any mixer settings in the above test.

1. Aux returns may be stereo (as to use with stereo reverbs, etc.). If so, set all pan pots to center.
2. Set the aux return level(s) to maximum.
3. Plug the PC 80 emitter into mixer module #1's line input.
4. Plug the PC 80 receiver into the main mixer stereo left output channel and note the phase.
5. Now plug the PC 80 receiver into the main mixer stereo right output channel and note the phase.
6. If more aux busses, repeat steps #4 and #5.

As usual, if the PC 80 receiver green LED is lit, all is well — if not, call a qualified tech.

Testing Outboard Gear

Most every studio will include outboard gear such as compressors, delay lines, reverbs etc. Some effects will need to be tested using its bypass mode such as reverbs, flangers, or any unit that messes with phase integrity. When testing delay lines, set to minimum delay.

If you have not tested cables used to patch in such units to and from your mixer, you need to do so (see section, "Testing Cables"). Note that if the outboard gear cables are hard wired to the mixer patch bay, when testing the cables, simply patch the PC 80 emitter into the patch bay patch point and patch the effect cable into PC 80 receiver.

Since we are testing in a specific order, if your mixer uses three wire connectors, you have proven the mixer hot pin. When testing outboard gear, if three wire connectors are used, best to check their manuals as to note the hot pin before starting the test. If the hot pin mixer path and outboard gear unit(s) do not match, you will need to rewire the cables used to and from the mixer as to achieve correct phase.

We will perform two tests — one will test the outboard gear locally, and the other will use the mixer/monitor speaker included within the path.

Testing the outboard gear locally

Remember that you have proven correct phase through the mixer path and have noted the mixer hot pin. As usual, we assume pin 2 has proven to be the mixer hot pin. If not, simply switch to pin 3 when we mention pin 2 and adapt in the following.

If the outboard gear cables are accessible (not hard wired to a mixer patch bay), test first and then test using the mixer patch bay points.

1. Plug the PC 80 emitter into the outboard unit input.
2. Plug the outboard output into the PC 80 receiver.
3. Power up both the PC 80 emitter and receiver.
4. On the emitter, set the level to maximum level (turn the volume control to maximum clockwise). (Note that if testing outboard mic preamps, best to lower the level to around 1/3rd up).
5. On the receiver, set the upper most switch to “line”.
6. Set both the emitter and receiver “hot pin” to pin 2 hot as to start.
7. On the effect, if it has volume controls, set to unity gain. If unity gain markings are not noted, simply set the input and/or output volume controls to around 3/4ths up.
8. On the receiver, are you seeing the green “in phase” LED lit? The red LED lit? No LED lit? The following will explain.

The green LED is lit (three wire cables)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, now switch both the emitter and receiver to pin 3 hot. You should once again see the green LED lit (if not, either the hot or neutral wire is not connected — see Neither LED is lit for details). If seeing the green LED lit, this proves the outboard unit path is showing both pin 2 and 3 are matched in phase but does not prove the hot pin. As to find the hot pin, see “Testing the outboard gear using the mixer” for details.

The green LED is lit (two wire cables)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, the outboard unit phase proves correct. No need to note as this is a two wire situation meaning you just proved the hot and ground signal path are wired correctly.

The red LED is lit (three-wire cable)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, there is a serious wiring problem! The ground and hot wires are reversed and the neutral wire is not connected somewhere in the path. Call a qualified tech.

The red LED is lit (two-wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, the outboard unit phase is reversed somewhere in the path. Call a qualified tech.

Neither LED is lit (three-wire cable)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, see "Note" below. If the green LED lights, the wire representing pin 2 is not completing its path! Call a qualified tech.

Neither LED is lit (two-wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, see "Note" below. If seeing the green LED lit, the adapter cables must be wired pin 3 hot. If so, make sure to set the emitter and receiver to pin 3 hot on both PC 80 units for further testing. If your studio is not wired pin 3 hot, make sure to rewire the adapter cables as soon as possible. Until fixing the cable wiring, put a piece of white artist tape on the adapter cables stating pin 3 is hot.

Note: for both two and three wire connectors, if neither LED lights when switched to either pin 2 or pin 3 hot on both the emitter and receiver, the odds are very good the set-up/patching in not correct — check and test again. If you are sure the problem is not the set-up, call a qualified tech.

Test all other outboard gear using the above test.

Testing the outboard gear using the mixer

If testing two wire outboard gear and no problems (or problems have been fixed), no need to perform this test so skip down to “Testing the recorder path.”

If using three-wire outboard gear, if any wiring problems, you have fixed — this test is used as to discover the hot pin.

This test will send the emitter signal to the outboard unit either patching directly into the outboard unit or through the mixer patch bay and the PC 80 receiver will be patched as in line input tests.

Remember that you have proven correct phase through the mixer path and have noted the mixer hot pin. As usual, we assume pin 2 has proven to be the mixer hot pin. If not, simply switch to pin 3 when we mention pin 2 and adapt in the following.

1. Make sure your mixer monitor volume control is muted or full off.
2. Plug the outboard input cable into the PC 80 emitter. If you need to patch into the outboard input using the mixer patch bay, do so.
3. Plug the outboard unit output cable (or patch bay point) into mixer module #1’s line input.
4. On mixer module #1, if there is a mode switch, which chooses either a mic or line input, set to line input.
5. On mixer module #1, there will be one or two trim level controls. If two trim level controls, one would be used for a mic preamp and the other for a line-input source. If one is dedicated regarding the line trim, or just one trim pot, set to zero dB.
6. On mixer module #1, there will be a pan pot for the big fader path — set to the full left pan position.
7. On mixer module #1, bring up the big fader to the unity gain point (typically 3/4ths up on the fader throw — just look for the zero dB number etched next to the fader).
8. On mixer module #1, if there are any switches that rout the signal to EQ, etc., switch out.
9. The mixer will have a stereo master volume control (not to be confused with the monitor speaker volume control) so set to unity gain. In this case, unity gain may be full up.
10. Make sure the mixer master function mode is switched to the mode which allows signal to pass through mixer input modules. As to make this clear, we don’t want the mixer switched to a monitoring mode such as a cassette recorder, etc.

Patching is complete so time to set up the PC 80 emitter and outboard gear levels (if volume controls exist).

11. On the outboard gear unit, if it has volume control(s), set to unity gain. If unity gain markings are not noted set the input and/or output volume controls to around 3/4ths up.

12. Power up the PC 80 emitter and set the level to maximum level (turn the volume control to maximum clockwise).
13. Set the PC 80 emitter “hot pin” to pin 2 hot as to start.
14. Unmute the mixer monitor volume control and slowly turn up as to hear the pulse at a medium listening level.

Now time to set up the PC 80 receiver and test phase.

15. Patch mixer module #1’s direct output into the PC 80 receiver input. If not a mixer module direct output, assign mixer module to a bus (let’s use bus #1) and patch into the PC 80 receiver input.
16. Power up the PC 80 receiver and set the upper most left switch to “line”.
17. Set the PC 80 receiver to pin 2 hot as to start.

(Note, here is another way to set up the receiver that could be used in many tests.

- Set the PC 80-receiver upper left switch to “INT MIC”.
- Set the PC 80 receiver to hot pin 2 as to start.
- The PC 80 receiver has an internal mic, which is mounted, at the upper end of the receiver covered by a black grill screen. This mic is used to hear the pulse created from the PC80 emitter which is being sent to the speaker. As to position the PC80 receiver speaker towards the studio monitor speaker, place the PC80 receiver in either hand with the internal mic pointing directly in front of the mid range driver. (In a two-way system, the mid driver would also be the tweeter). Note: if the speaker includes a grill cloth that is removable, remove. If the speaker grill cloth is not removable and if you can’t see each speaker component through the grill cloth, use a flashlight as to look into the grill cloth for PC80 hand held placement).

Important: if using three wire cable/connectors for both the mixer and speaker monitor path, you are wired as to use the same hot pin. Again, we assume that pin 2 is hot regarding the mixer/monitor speaker path — if not, switch both the PC 80 emitter and receiver to pin 3 hot and adapt. If any outboard unit does not match the same hot pin in the following, call a tech.

Keep in mind we are only testing three-wire outboard gear.

The green LED is lit

The outboard gear hot pin is pin 2. Keep in mind that you have checked your outboard gear manual as to find out which pin is used for the hot pin. If pin 3 is noted as the hot pin (not pin 2), there is an internal wiring problem within the outboard unit. If so, call a qualified tech. As usual, note the hot pin in your studio notebook.

The red LED is lit

The outboard unit is reverse phase. Switch the PC 80 receiver to pin 3 hot. You should now see the green LED lit. Again, keep in mind that you have checked your outboard gear manual as to find out which pin is used for the hot pin. If pin 3 is noted as the hot pin (not pin 2), there is an internal wiring problem within the outboard unit. If so, call a qualified tech. As usual, note the hot pin in your studio notebook.

No LED is lit

(If using the receiver in mic INT MIC mode (the noted option), If so, the level sent to the monitor speakers is too low or the receiver is not positioned close enough to the speaker mid range driver.

TESTING THE RECORDER PATH

We will test a multi track recorder first. See “testing other recorder formats” for 2 track recorders, etc.

This test requires recording the PC 80 emitter signal to all recorder tracks. After recording the emitter signal, each recorder track output will be tested. You have tested the cables to and from the recorder and have tested the mixer path in full. If using three wire cables, you have a common hot pin at this point (probably pin 2 hot). Here we go.

Note: some recorders may use a multiple wire connectors such as an ELCO connector. If so, you have not yet tested so go to section “Wiring and Setting Up The PC 80 As A Continuity Tester” — this will allow you to use the PC 80 as a continuity tester. Look in your recorder manual as to find out how the multiple pin connectors are wired and test in a similar fashion as you would test adapter cables. The idea is to make sure all pins match regarding the connectors used on each cable end. Remember that we assume pin 2 is hot for our tests. If not, meaning if your mixer path and recorder path is pin 3 hot, simply adapt in the following test. In this case, you will be patching the PC 80 emitter and receiver using the mixer patch bay. We will not mention such connectors below but they will typically relate to three wire connectors.

For this test, we will record the PC 80 emitter signal first and check each track output for phase when playing back the recorded emitter pulse.

1. Make sure your mixer monitor volume control is muted or full off.
2. Plug the PC 80 emitter into mixer module #1’s line input.
3. Power up the PC 80 emitter, set to pin 2 hot, and set the level control to full up.
4. On mixer module #1, if there is a mode switch, which chooses either a mic or line input, set to line input.
5. Switch mixer module #1 to the mode that allows mixer module #1’s big fader to send signal to recording busses.
6. Assign mixer module #1 to all recording busses. Example, if your mixer has eight busses, select all eight.
7. On mixer module #1, there will be one or two trim level controls. If two trim level controls, one would be used for a mic preamp and the other for a line-input source. If one is dedicated regarding the line trim, or just one trim pot, set to zero dB.
8. On mixer module #1, there will most likely be a pan pot for the recording bus path. If so, set to center.
9. If there is submaster volume controls for the recording busses, set to unity gain.
10. On mixer module #1, bring up the big fader to the unity gain point (typically 3/4ths up on the fader throw — look for the zero dB number etched next to the fader).
11. On mixer module #1, if there are any switches that rout the signal to EQ, etc., switch out.
12. The mixer will have a master volume control (not to be confused with the monitor volume control) so set to unity gain. In this case, unity gain may be full up.

13. Make sure the mixer master function mode is switched to the mode which allows the multi track recorder return signal to be passed through the mixer monitor circuit. As to make this clear, we don't want the mixer switched to a monitoring mode such as a cassette recorder, etc.

The patching is complete so time to record the signal to all recorder tracks at once.

Important: if your mixer has eight recording busses and you have more recorder tracks (such as 16 or more), after recording the first eight tracks, simply patch each of the eight bus outputs into record inputs 9 through 16 after performing the following. If this is the case, make sure to not record over previously recorded emitter tracks.

1. Set all recorder tracks to *record ready*. Remember that if you have more recorder tracks than busses, only put tracks into *record ready, which* will be recorded upon at this point.
2. You should see the PC 80 emitter pulse signal on the recorder meters. If the signal is going past zero dB on the meters, back down on the level using mixer module #1's big fader. A safe level would be between -10 dB and -4 dB. (Note if an analog recorded, zero dB would be best).
3. No need to monitor the emitter pulse through the recorder at this point meaning keep the mixer monitor speaker level muted.
4. If using tape or a hard disk recorder, make sure to not record over any recorded information you want to keep!
5. Now put the recorder into *record mode* and record about one minute.
6. Rewind the recorder. Playback a few seconds as to make sure the emitter signal was recorded on all tracks selected. If not seeing signal on the recorder track meters, the odds are very good the recorder master monitor mode is switched to input mode.
7. Take all tracks out of *record ready* and turn off the PC 80 emitter.
8. Again, if your mixer has less recording busses than recorder tracks, read "important" above.

Time to check the recorder playback phase one track at a time. After testing track #1 below, test track 2 (and so on) in the same fashion. Also, if you can access the recorder return patch points directly from the recorder outputs as well as the patch bay, test both possibilities.

1. Patch recorder track #1's output into the PC 80 receiver input.
2. Power up the PC 80 receiver and set the upper most left switch to "line".
3. Set the PC 80 receiver to pin 2 hot.
4. Play the recorded from the beginning of the recorded emitter pulse.

What are you seeing on the PC 80 receiver?

The green LED is lit (three wire cables)

If using XLR connectors or a three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 receiver, the recorder track tested is pin 2 hot. Keep in mind that you have checked your recorder manual as to find out which pin is used for the hot pin. If pin 3 is noted as the hot pin (not pin 2), there is an internal wiring problem within the recorder. If so, call a tech. As usual, note the hot pin in your studio notebook.

The green LED is lit (two wire cables)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter, the recorder track phase proves correct. No need to note as this is a two wire situation meaning you just proved the hot and ground signal path are wired correctly.

The red LED is lit (three-wire cable)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, there is a serious wiring problem! The ground and hot wires are reversed and the neutral wire is not connected somewhere in the path. Call a qualified tech and explain your test results.

After fixing the problem, before the tech leaves your studio, best to test again as to make sure all is well. Repeat the test in full and you should now see the green LED lit.

The red LED is lit (two-wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, the recorder track phase is reversed somewhere in its internal path. If so, call a qualified tech.

Neither LED is lit (three-wire cable)

If using XLR connectors or three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, see “Note” below. If the green LED lights, the wire representing pin 2 within the mixer path is not completing its path! Call a qualified tech.

Neither LED is lit (two wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector ends) plugged into the PC 80 emitter and receiver, switch both the emitter and receiver to pin 3 hot. If not seeing the green LED lit, see “Note” below. If seeing the green LED lit, the adapter cables must be wired pin 3 hot. If so, make sure to set the emitter and receiver to pin 3 hot on both PC 80 units for further testing. If your studio is not wired pin 3 hot, make sure to rewire the adapter cables as soon as possible. Until fixing the cable wiring, put a piece of white artist tape on the adapter cables stating pin 3 is hot.

Note: for both two and three wire connectors, if neither LED lights when switched to either pin 2 or pin 3 hot on both the emitter and receiver, the odds are very good the set-up/patching in not correct — check and test again. If you are sure the problem is not the set-up, call a qualified tech.

Now test all other recorder tracks.

Testing Other Recorder Formats

When testing two track recorders such as cassette, DAT, etc., the test is basically the same as the above. The only difference is to NOT assign mixer module #1 to tracking busses — instead, set the mixer mode as to send the signal to the main stereo bus. This will send the signal to the main stereo bus output, which sends to the two-track recorder. If the recorder needs to be patched in, patch from the main stereo bus outputs. Other than that, follow the above procedures in full.

Note: if testing a home stereo system recorder (any recorder format) that allows recording on one channel at a time, simply patch the PC 80 emitter into one recorder channel at a time and record. If the recorder will not allow to record one channel at a time (some cassette recorders, etc.), as to record on both tracks at once, you need to use a shielded "Y" cord that supplies signal to both recorder inputs. Two wire shielded "Y" cords are available in most audio stores.

Regarding the "Y" cord, remember that home stereo gear typically uses RCA male connectors on both cable ends. (The "Y" cord needed will have three male RCA connectors). Test the "Y" cord for phase (the phase should prove correct). On the PC 80 emitter, use a XLR to RCA female adapter cable and plug the single end "Y" cord RCA connector into the RCA female connector. On the "Y" end, plug one RCA connector into the left recorder channel input, and the other into the right channel input.

After recording, patch the PC 80 receiver into one recorder output at a time and test. Read the above section for more details regarding setting up the PC 80 emitter and receiver as well as what is discovered during the test.

Testing Mics And Direct boxes

Extremely important: I have never tested a mic that was pin 3 hot. If your studio is wired pin 3 hot, you have an inverted phase problem!!! In this case, most important to read "Microphone Phase Tutorial Part One — Dealing with Phase/Polarity Issues"

I would have mentioned this test after testing cables but I held off for one reason — if some of your mics or direct boxes require phantom power from the mixer, the mixer path needed to be tested first. Lets test mics and then direct boxes.

Note: if you have condenser mics requiring phantom power, if your mixer does not supply phantom power, you will have outboard phantom power supplies for such mics. The patching will be covered in step #2 below.

As to keep things simple, we will test all mics using the same test.

1. Make sure your mixer monitor volume control is muted or full off.
2. Plug a mic into mixer module #1's mic input. If a condenser mic requiring phantom power, if the mixer does not supply phantom power, patch the mic into the outboard phantom power supply and patch it's output into mixer module #1's mic input.
3. Set mixer module #1 to mic mode.
4. On mixer module #1, there will be one or two trim level controls. If two trim level controls, one would be used for a mic preamp and the other for a line-input source. If one is dedicated regarding the mic trim, or just one trim pot, set to zero dB.
5. On mixer module #1, there will be a pan pot for the big fader path — set to the full left pan position.
6. On mixer module #1, bring up the big fader to the unity gain point (typically 3/4ths up on the fader throw — just look for the zero dB number etched next to the fader).
7. On mixer module #1, if there are any switches that rout the signal to EQ, etc., switch out.
8. The mixer will have a master volume control (not to be confused with the monitor volume control) so set to unity gain. In this case, unity gain may be full up.
9. Make sure the mixer master function mode is switched to the mode which allows signal to pass through mixer input modules. As to make this clear, we don't want the mixer switched to a monitoring mode such as a cassette recorder, etc.
10. Now patch the PC 80 receiver into the left mixer stereo output. Note that we are not patching in the PC 80 emitter — it will be used as a sonic generator using its internal speaker.

The patching is complete so lets test.

1. Power up both the PC 80 emitter and receiver and set both to pin 2 hot. (Actually, the hot pin setting does not matter on the emitter but always best to set to the same hot pin as to avoid confusion).
2. Set the PC 80 receiver's upper left switches to "line."
3. Now hold the mic in on hand and the PC 80 emitter in the other. Position the mic diaphragm directly over the emitter speaker, about a 1/2-inch above.
4. On the mixer stereo left meter; you should be seeing a signal level. If the signal is showing a level over zero dB, back down the level on mixer module #1. A good working level would be between -10 and -4 dB. If testing an analog recorder, zero dB is fine).

On the PC 80 receiver, what are you seeing?

The green LED is lit (three wire cables)

If using XLR connectors or a three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, the mic hot pin is pin 2. You have checked your mic manual as to find out which pin is used for the hot pin. If pin 3 is noted as the hot pin (not pin 2), there is an internal wiring problem within the mic. If so, call a tech. As usual, note the hot pin in your studio notebook.

The green LED is lit (two wire cables)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter, the mic phase proves correct. No need to note if this is a two wire situation meaning you proved the hot and ground signal path are wired correctly.

The red LED is lit (three-wire cable)

If using XLR connectors or a three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, switch the PC 80 emitter and receiver to pin 3 hot. If now seeing the green “in phase” LED lit, the mic hot pin is pin 3. You have checked your mic manual as to find out which pin is used for the hot pin. If not pin 3, there is a wiring problem within the mic. If so, call a tech. As usual, note the hot pin in your studio notebook.

The red LED is lit (two-wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, the phase is reversed within the internal mic wiring. If so, call a tech.

Neither LED is lit (two or three wire cable)

Make sure that you are seeing signal on the mixer left stereo meter — best to see the level between -10 and -4 dB. If not, start the test over and make sure you have followed the routing in full. If you are seeing signal on the left stereo mixer meter, the odds are good the path is not set up correctly regarding the mixer output to the PC 80 receiver.

Testing Direct Boxes

Extremely important: I have tested direct boxes that were pin 3 hot. If your studio is wired pin 2 hot, you have an inverted phase problem!!! Best to change the hot pins on the direct box if this is the case,

The test is very similar regarding the mic test but as to make sure things are clear, we will explain in full.

Note: if one or more of you direct boxes requiring phantom power, if your mixer does not supply phantom power, you will have outboard phantom power supplies for such mics. The patching will be covered in step #3 below.

1. Make sure your mixer monitor volume control is muted or full off.
2. Plug the PC 80-emitter output into the direct box input. Typically, a direct box input requires a two-wire connector such as a 1/4" TS phone connector so use an adapter cable.
3. Plug the direct box three-wire connector output into mic into mixer module #1's mic input. If the direct box requires phantom power, if the mixer does not supply phantom power, patch the direct box output into the outboard phantom power supply and patch it's output into mixer module #1's mic input. Note that some direct boxes are line level output — if so, we will explain as needed.
4. Set mixer module #1 to mic mode. If the direct box output is line level, set mixer module #1 to line input mode.
5. On mixer module #1, there will be one or two trim level controls. If two trim level controls, one would be used for a mic preamp and the other for a line-input source. If one is dedicated regarding the mic trim, or just one trim pot, set to zero dB. If the direct box is line level output, if one is dedicated regarding the line trim, or just one trim pot, set to zero dB.
6. On mixer module #1, there will be a pan pot for the big fader path — set to the full left pan position.
7. On mixer module #1, bring up the big fader to the unity gain point (typically 3/4ths up on the fader throw — just look for the zero dB number etched next to the fader).
8. On mixer module #1, if there are any switches that rout the signal to EQ, etc., switch out.
9. The mixer will have a master volume control (not to be confused with the monitor volume control) so set to unity gain. In this case, unity gain may be full up.
10. Make sure the mixer master function mode is switched to the mode which allows signal to pass through mixer input modules. As to make this clear, we don't want the mixer switched to a monitoring mode such as a cassette recorder, etc.
11. Now patch the PC 80 receiver into the left mixer stereo output.

The patching is complete so lets test.

1. Power up both the PC 80 emitter and receiver and set both to pin 2 hot.

2. Set the PC 80 receiver's upper left switch to "line."
3. Set the PC 80 emitter level control to full up.
4. On the mixer stereo left meter, you should be seeing a signal level. If the signal is showing a level over zero dB, back down the level on the PC 80 emitter. A good working level would be between -10 and -4 dB.

On the PC 80 receiver, what are you seeing?

The green LED is lit (three wire cables)

If using XLR connectors or a three-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, this is not a common patching situation. As mentioned, most all direct boxes are designed to see two wire connectors. If by chance your direct box/boxes accepts three wire input connectors which are balanced line inputs (check the direct box manual as to make sure), instead of reading the following LED test information, go back to the section, "Testing the mixer channel main stereo outputs" and read from "*The green LED is lit (three wire cables)."* Only read three-wire cable information.

The green LED is lit (two to three wire cables)

As mentioned, the odds are good the direct box uses a two-wire configuration for its input and a three-wire configuration for its output. In this case, the direct box hot pin is pin 2. You have checked your direct box manual as to find out which pin is used for the hot pin three wire output. If pin 3 is noted as the hot pin (not pin 2), there is an internal wiring problem within the direct box. If so, call a tech. As usual, note the hot pin in your studio notebook.

The green LED is lit (two wire cables)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, the outboard unit phase proves correct. No need to note as this is a two wire situation in full meaning you proved the hot and ground signal path are wired correctly.

The red LED is lit (two to three wire cables)

Remember as mentioned above, the odds are good the direct box uses a two-wire configuration for its input and a three-wire configuration for its output. The red LED lit is not logical in this situation — the direct box hot pin is most likely pin 3 but neither LED should light. See "Neither LED is lit" for details.

The red LED is lit (two-wire cable)

If using two-wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, the phase is reversed within the internal mic wiring. If so, call a tech.

Neither LED is lit (two to three wire cables)

The direct box hot pin is most likely pin 3. As to make sure, set both the PC 80 emitter and receiver to pin 3 hot. If not seeing the green LED light, set the PC 80 emitter to pin 2 hot and set the receiver to pin 3 hot. If seeing the red LED, pin 3 is hot but a wiring problem exists within the direct box internal wiring. In any case, you have checked your direct box manual as to find out which pin is used for the hot pin three wire output. If pin 3 is noted as the hot pin (not pin 2), there is an internal wiring problem within the direct box. If so, call a tech. As usual, note the hot pin in your studio notebook. If not seeing either LED lit, see “note” below.

The red LED is lit (two-wire cable)

If using two wire adapter cables (wired pin 2 hot on the XLR connector end) plugged into the PC 80 emitter and receiver, one of two possibilities: there is a set up problem. See “note” below first. If the set-up is OK, one or both wires are not connected internally within the direct box. In this case, call a qualified tech.

Note: if you are still not seeing any LED lit, make sure that you are seeing signal on the mixer left stereo meter — best to set the level between -10 and -4 dB using mixer module #1’s big fader. If you are not seeing any level, start the test over and make sure you have followed the routing in full. If you are seeing signal on the left stereo mixer meter, the odds are good the path is not set up correctly regarding the mixer output to the PC 80 receiver.

Other gear

If your studio includes synthesizers, samplers, etc., you can test samplers using the outboard gear test but the rest can't be tested since their signal source is fixed. In that case, best to check their manuals as to discover the hot pin (three wire configuration) and use the PC 80 as a continuity tester for the wiring "from and to" the mixer. If a two wire configurations, use the PC 80 as to make sure the hot and ground pins are wired correctly.

Home Stereo Phase Test

Might as well test since the odds are very good you have a home stereo system. This test is simple so lets get going.

1. Test all of the patch cables used to patch gear into the home stereo power amp. In most cases, such patch cords will have RCA connectors on both ends. You will need adapter cables as to patch the PC 80 emitter and receiver so see section, "Wiring Adapter Cables " for details.
2. Now go to section, "Testing Cables."
3. Now go to section, "Speaker Phase Test"

During any of the above, adapt when needed regarding your home stereo set up. Also, if your home stereo incorporates recorders, see section, "Testing Other Recorder Formats."

Wiring Adapter Cables

Since the PC80 uses XLR connectors, if testing cables that do not have XLR connectors on both ends, you will need adapter connectors or adapter cables as to test phase. You may already have such adapter/ adapter cables. If not, you could wire up (as we will mention) or you could use store bought shielded wire adapter cables as to save the wiring hassle.

Regarding store bought adapters or adapter cables, if you can't open up the connectors (molded connectors onto the wires) as to view the wiring configuration to note which wire relates to which pin on both ends, you need to use a continuity tester as to check how the adapter or adapter cables are wired. A few options: you could use the PC 80 as a continuity tester (explained below), a voltmeter, or a simple light continuity tester. If so, see section, "Testing Pre Existing Adapters/Adapter Cables" as to note the wiring configuration.

When testing, note the hot pin. Keep in mind that for all phase tests above, we are using the current world standard which is pin 2 hot — on the XLR connector end, pin 2 is wired as the hot pin in relation to the connector hot pin on the other end of the cable (or adapter). In this era, store bought adapters/adapter cables will most likely are wired pin 2 hot.

Regarding wiring adapters, instead, best to wire up adapter cables as they will surely be used at some point in time for outboard gear, etc. Remember that we consider pin 2 hot as the standard so we will wire in that fashion. If your studio uses pin 3 hot (unlikely) keep that in mind regarding the following and adapt. If you are not comfortable regarding soldering, if you do not have a studio tech, go to any audio repair shop and have a tech perform the wiring.

Since adapter cables will typically be used for patching gear together (when connectors are not of the same family), decide on a cable length that suits your needs. Also, use high quality cable such as Planet Wave cable.

Wiring Two Wire Connector Adapter Cables

Typical two wire connectors are either 1/4" TS phone connectors (tip and sleeve) or RCA connectors. Might as well use a three-wire cable since the other end of the cable will use a three wire XLR connector (as to plug into the PC 80).

1/4" TS phone connectors

In most cases, a 1/4" TS (tip-sleeve) phone connector patch cord will have male connectors on both ends. You need to wire up two cable adapter cables — one with a female XRL connector on one end and a female 1/4" TS phone connector on the other end. The 2nd adapter will need a male XRL connector on one end and a female 1/4" TS phone connector on the other end.

Regarding a female 1/4" TS phone connector, keep in mind the inner most contact should be the "hot" (positive) and the other contact point should be the shielded ground (negative) wire. If this is confusing, plug in a male connector — the male tip equals the "inner most contact."

Wire in the following manner:

1. For both adapter cables, on the XLR connector end, solder the stranded shield wire to pin #1. Solder the red or white wire to pin #2 connection. Solder the black wire to pin #3 connection. Keep in mind the color-code may be different. In any case, note the wire color used for pins #2 and #3.
2. On the 1/4" TS phone connector end, solder the stranded shielded wire (pin #1 on the XRL connector) to the sleeve (ground) connection as well as the wire used for pin #3 on the XLR connector. Solder the wire used for pin #2 on the XLR connector to the "tip" connection.

If you will be testing 1/4" TS phone connector cables that have a male and female connector on each end, you will need to wire up a 3rd cable. Wire up a male XLR connector cable on one end and a male 1/4" TS phone connector on the other end as described in steps #1 and #2. Also, see "note" below.

If you will be testing 1/4" TS phone connector cables that have female connectors on each end, you will need to wire up the cable as mentioned in the paragraph above along with another. Wire up a female XLR connector cable on one end and a male 1/4" TS phone connector on the other end as described in steps #1 and #2. Also, see "note" below.

Note: regarding a male 1/4" TS phone connector, keep in mind the tip should be the "hot" (positive) wire and the inner sleeve should be the shielded ground (negative) wire.

RCA connectors

In most cases, a RCA phone connector patch cord will have male connectors on both ends. You need to wire up two cable adapter cables — one with a female XRL connector on one end and a female RCA connector on the other end. The 2nd adapter will need a male XRL connector on one end and a female RCA connector on the other end.

Regarding a female RCA connector, keep in mind the inner circle contact point should be the “hot” (positive) wire and the outside circular shell should be the shielded ground (negative) wire.

Wire in the following manner:

1. For both adapter cables, on the XLR connector end, solder the stranded shield wire to pin #1. Solder the red or white wire to pin #2 connection. Solder the black wire to pin #3 connection. Keep in mind the color-code may be different. In any case, note the wire color used for pins #2 and #3.
2. On the RCA connector end, solder the stranded shielded wire (pin #1 on the XLR connector) to the ground connection as well as the wire used for pin #3 on the XLR connector. Solder the wire used for pin #2 on the XLR connector to the inner circle connection.

If you will be testing RCA cables that have a male and female connector on each end, you will need to wire up a 3rd cable. Wire up a male XLR connector cable on one end and a male RCA connector on the other end as described in steps #1 and #2. Also, see “note” below.

If you will be testing RCA cables that have female connectors on each end, you will need to wire up the cable as mentioned in the paragraph above along with another. Wire up a female XLR connector cable on one end and a female RCA connector on the other end as described in steps #1 and #2. Also, see “note” below.

Note: Regarding a male RCA connector, keep in mind the protruding tip should be the “hot” (positive) wire and the outside circular shell should be the shielded ground (negative) wire.

If testing any other two-wire cables that use connectors such as mini patch cord cables, etc., follow the above procedures.

Wiring Three Wire Adapter Cables

1/4" TRS (tip-ring-sleeve) phone connector

In most cases, a 1/4" TRS (tip-ring-sleeve) phone connector patch cord will have male connectors on both ends. You need to wire up two cable adapter cables — one with a female XRL connector on one end and a female 1/4" TRS phone connector on the other end. The 2nd adapter will need a male XRL connector on one end and a female 1/4" TRS phone connector on the other end.

Regarding a 1/4" TRS three wire female phone connector, keep in mind the inner most connection equals the hot wire, the middle connection equals the neutral wire, and the outer most connection equals the shielded ground wire. If this is confusing, plug in a male connector — the tip equals the "inner most connection."

Wire in the following manner:

1. For both adapter cables, on the XLR connector end, solder the stranded shield wire to pin #1. Solder the red or white wire to pin #2 connection. Solder the black wire to pin #3 connection. Keep in mind the color-code may be different. In any case, note the wire color used for pins #2 and #3.
2. On the 1/4" TRS phone connector end, solder the stranded shielded wire to the sleeve connection. Solder the red or white wire to pin #2 "tip" connection. Solder the black wire to pin #3 "middle ring" connection. Keep in mind the color-code may be different. In any case, note the wire color used for pins #2 and #3.

If you will be testing 1/4" TRS phone connector cables that have a male and female connector on each end, you will need to wire up a 3rd cable. Wire up a male XLR connector cable on one end and a male 1/4" TRS phone connector on the other end as described in steps #1 and #2. Also, see "note" below.

If you will be testing 1/4" TRS phone connector cables that have female connectors on each end, you will need to wire up the cable as mentioned in the paragraph above along with another. Wire up a female XLR connector cable on one end and a male 1/4" TRS phone connector on the other end as described in steps #1 and #2. Also, see "note" below.

Note: regarding a 1/4" TRS three wire male phone connector, keep in mind the outer tip equals the hot wire, the middle ring equals the neutral wire, and the inner sleeve equals the shielded ground wire.

TT patch bay cables

In most cases, such a patch cable uses male connectors on both ends. You need to wire up two cable adapter cables — one with a female XRL connector on one end and a female TT connector on the other end. The 2nd adapter will need a male XRL connector on one end and a female TT connector on the other end.

Regarding a TT three wire female connector, keep in mind the inner most connection equals the hot wire, the middle connection equals the neutral wire, and the outer most connection equals the shielded ground wire. If this is confusing, plug in a male connector — the tip equals the “inner most connection.”

Wire in the following manner:

1. For both adapter cables, on the XLR connector end, solder the stranded shield wire to pin #1. Solder the red or white wire to pin #2 connection. Solder the black wire to pin #3 connection. Keep in mind the color-code may be different. In any case, note the wire color used for pins #2 and #3.
2. On the TT connector end, solder the stranded shielded wire to the sleeve connection. Solder the red or white wire to pin #2 the “ring” connection. Solder the black wire to pin #3 connection. Keep in mind the color-code may be different. In any case, note the wire color used for pins #2 and #3.

If you will be testing TT cables that have a male and female connector on each end, you will need to wire up a 3rd cable. Wire up a male XLR connector cable on one end and a male TT connector on the other end as described in steps #1 and #2. Also, see “note” below.

If you will be testing TT cables that have female connectors on each end, you will need to wire up the cable as mentioned in the paragraph above along with another. Wire up a female XLR connector cable on one end and a male TT connector on the other end as described in steps #1 and #2. Also, see “note” below.

Note: Regarding a TT three wire male connector, keep in mind the outer tip equals the hot wire, the middle ring equals the neutral wire, and the inner sleeve equals the shielded ground wire.

Testing Pre Existing Adapters/Adapter Cables

Note: if you wired adapter cables as mentioned in the above section, best to test as well just to make sure you wired properly. (By the way, the following test could also be used for testing all cables used in your studio but using the PC 80 saves time.)

When testing adapter cables, the concept is to discover how the XLR connectors are wired in relation to the adapter/adapter cables. For the test, we will use the PC 80 similar to a continuity tester.

Note: if you have a volt meter or a continuity test light, either will make the test easier as such testers have probes used for their test points. If not, the PC 80 will do the job.

Wiring And Setting Up The PC 80 As A Continuity Tester

You need a male and female XLR connector and three wires (about a foot long) — since this is not an audio test, any type of wire will do but best to use standard “zip” cord (18 gauge). Strip off about 1/2” on each wire as to have bare wire.

1. Soldered one wire to pin #1 on both XLR connectors. This completes the PC 80 ground path.
2. Soldered one wire to pin #2 on the male XLR connector and leave the other end loose. On the loose end, twist the wire tightly and then heat up with the soldering iron. Now add a small amount of solder as to make stiff. This wire is not yet connected to anything.
3. Soldered one wire to pin #2 on the female XLR connector and leave the other end loose. On the loose end, twist the wire tightly and then heat up with the soldering iron. Now add a small amount of solder as to make stiff. This wire is not yet connected to anything.
4. Plug the two XLR connectors into the emitter and receiver.

You are wired as to test so lets set up the PC 80 emitter and receiver.

1. Power up both the PC 80 emitter and receiver.
2. On the emitter, set the level to maximum level (turns the volume control to maximum clockwise).
3. On the receiver, set the upper most switch to “line”.
4. Set both the emitter and receiver “hot pin” to pin 2 hot.
5. Now touch and hold both bare wires from the emitter and receiver XLR connectors as to make contact.
6. You should see the green “in” (phase) light lit up.

The PC 80 is now set up as a continuity tester and you are ready to test!

Continuity Adapter/Adapter Cable Test

Remember that we mentioned there are three tools as to test continuity — the PC 80, a voltmeter, or a test light.

Using the PC 80 for the continuity test. Again, you are ready to test. When testing adapter/adapter cables for continuity, if the continuity proves correct, the green LED “in” (phase) will light. Note: when we mention “probes” in the following, substitute with the bare soldered twisted wire ends.

Using a volt/ohm meter for the continuity test. Power up the volt/ohm meter and set the to continuity mode. As to make sure the volt/ohm meter is set to the correct mode, simply touch and hold the two test probes together (as to make contact). If the meter shows a positive voltage (some volt/ohm meters produce a tone) you are ready to test.

Using a test light for the continuity test. As to make sure the battery and bulb are working, simply touch and hold the two test probes together (as to make contact). If the light is lit, you are ready to test. If not, the battery and/or bulb needs to be replaced.

No matter what continuity tester you are using for the following test, you know the tester is functioning as to test. When testing adapter/adapter cables for continuity, when the connector pins match, you will see the same results as when touching the two probes (or wires) together (as mentioned above).

Remember we are testing adapter/adapter cables, which will be plugged into the PC 80 as to test cables that do not have XLR connectors on both ends. The reason for the test is to discover the hot pin and other pins in relation to the XLR and adapter connector.

Note: if testing female adapter connectors, if you can’t unscrew the outer housing (a molded connector) as to touch the contact points, you need to use a non-wired male connector of the same style which can be opened up — unscrew the outer housing and plug into the female jack to be tested. When instructed to put the test probe onto a contact point, simply use the contact on the connector point that corresponds.

In the following, we will mention to put the tester probes onto contact points. Is using the PC 80, you are using bare wires. In this case, “probe” means the bare wire.

Adapter/adapter cable female XLR connector on one end and a two wire connector on the other end

1. On the XLR connector end, put one of the probes into pin #1 slot and apply slight sideways or up/down pressure as to insure contact.
2. On the two wire connector, put the other probe on the ground point — if testing a male 1/4" TS, place and hold the probe on the barrel jack partition closest to the rear of the connector. If testing a female 1/4" TS which is opened up, place and hold the probe on the closest tap near the rear of the connector. If testing a male RCA connector, place and hold the probe on the outer circle. If testing a female RCA connector, which is opened up, place and hold the probe on the connector point that surrounds the outer rim.
3. If using the PC 80, on the receiver, you should see the green LED lit. If using a volt (ohm) meter, you should see the meter or digital readout showing a positive voltage, or hear a tone. If using a test light, the bulb will light. In any case, if not noting continuity, there may be a wiring problem. We say "may be a wiring problem" as some adapter cables intentionally "lift the ground wire" on one connector end as to prevent possible "ground loops". We need to check the rest of the wiring before this will become clear.
4. Put one of the probes into pin 2 slot on the XLR connector and apply slight sideways and/or up/down pressure as to insure contact.
5. On the two wire connector, place and hold the other test probe on the tip — if testing a male 1/4" TS, place and hold the probe on the tip of the connector. If testing a female 1/4" TS which can be opened up, place and hold the probe on the contact point that is protruding. If testing a male RCA connector, place and hold the probe on the protruding contact. If testing a female RCA connector who can be opened up, place and hold the probe on the protruding contact.
6. If using the PC 80, on the receiver, you should see the green LED. If using a volt (ohm) meter, again, you should see the meter or digital readout showing a positive voltage, or hear a tone. If using a test light, the bulb will light. In any case, If not noting continuity, pin 2 is not the "hot" pin on the XLR connector. Easy to check you would simply pull the probe inserted into pin 2 on the XLR connector and place into pin 3. If this proves continuity, pin 3 is the XLR connector hot pin regarding the two-wire connector. Make note of the hot pin on the XLR connector (pin 2 or 3) and label the adapter cable on the XLR connector. Most important to note the hot pin on the XLR end as to set the PC 80 units to noted hot pin for all phase tests!
7. In any case, you have discovered the hot pin. For example, let's say the hot pin is "pin 2" on the XLR connector end. Now test pin 3. On the XLR end, insert the test probe into pin 3. Now place and hold the other probe onto the ground point on the 2-wire connector (as explained in step 2). The odds are fairly good this wire is tied to the ground connection on the two-wire connector.

Considerations:

- If in steps #2 and #3, if you did not note continuity (the ground connection), if all other connections prove continuity, the odds are good the ground was lifted intentionally on

one connector end. If this is the case, make sure to label the adapter/adapter cable stating the ground is lifted. In this case, there may be problems when performing phase tests — best to use adapter/adapter cables that have the ground path wired.

- Other than the above possibility regarding a lifted ground, if not seeing continuity when testing other wiring, you may have a bad cable or totally incorrect wiring. Before deciding this is fact, repeat the test as you may have not made solid connections when holding the probes against the connector positions mentioned.
- If you are still having problems after a second test, repeat the test again and when holding the probe on either two wire connector point, move the probe on the XLR connector end to all pin possibilities. If you note continuity that is not logical regarding wiring, best to wire up adapter cables as mentioned in the beginning of this section.

If no problems or they have been corrected, you know now know how the adapter/adapter cables are wired. Again, most important to note the XLR hot pin as well as how the other two wires are connected on the XLR end.

Male XLR connector on one end and a two wire connector on the other end

This is the same as the above — the only difference is you need to hold one probe against male XLR pin points. At first, you will think this is strange trying to hold the probes on both connectors but no problem — you will quickly discover the technique.

Hopefully, the hot pin proves to be the same on both the female and male XLR ends. If not, this will add confusion regarding testing cables and gear. If this is the case, best to wire up adapter cables as mentioned in the beginning of this section.

Female XLR connector on one end and a three wire connector on the other end

The odds are good you are testing a 1/4” TRS phone connector or a TT patch bay cable. If not, adapt regarding the following information.

1. On the XLR connector end, put one of the probes into XLR connector pin 1 slot and apply slight sideways or up/down pressure as to insure contact.
2. On the other three wire connector, put the other probe on the ground connection — if testing a male 1/4” TRS or TT male connector, place and hold the probe on the barrel jack partition closest to the rear of the connector. If testing a female 1/4” TRS that is opened up, place and hold the probe on the closest tap near the rear of the connector.
3. If using the PC 80, on the receiver, you should see the green LED lit. If using a volt (ohm) meter, again, you should see the meter or digital readout showing a positive voltage, or hear a tone. If using a test light, the bulb will light. In any case, if not noting continuity, there may be a wiring problem. I say “may be a wiring problem” as some adapter cables intentionally “lift the ground wire” on one connector end as to prevent possible “ground loops”. We need to check the rest of the wiring before this will become clear.
4. Put one of the probes into pin 2 slot on the XLR connector and apply slight sideways and/or up/down pressure as to insure contact.
5. On the other three wire connector, place and hold the other probe on the hot tip — if testing a male 1/4” TRS or TT, place and hold the probe on the tip of the connector. If testing a female 1/4” TRS that is opened up, place and hold the probe on the closest tap near the rear of the connector.
6. If using the PC 80, on the receiver, you should see the green LED lit. If using a volt (ohm) meter, again, you should see the meter or digital readout showing a positive voltage, or hear a tone. If using a test light, the bulb will light. In any case, if not noting continuity, pin 2 is not the “hot” pin on the XLR connector. Easy to check you would simply pull the probe inserted into pin 2 on the XLR connector and place into pin 3. If the continuity proves correct, pin 3 is the hot pin regarding the three-wire adapter connector. Make note of the hot pin on the XLR connector (pin 2 or 3) and label the adapter cable on the XLR connector. Most important to note the hot pin on the XLR end as to set the PC 80 units to noted hot pin for all phase tests!
7. You have discovered the hot pin. Let’s say that this is pin #2 on the XLR end. Now test pin #3 on the XLR end by inserting the probe into pin #3. Now place and hold the other probe on the “ring” point of the three-wire connector. Note this is the middle isolated point on the connector. If testing a female connector which can be opened), this would be the contact point between the hot and ground points.

Considerations:

- If in steps #2 and #3 you did not see continuity when testing pin 1 ground connection, if all other connections prove continuity, the odds are good the ground was lifted intentionally on one connector end. If this is the case, make sure to label the adapter/adapter cable stating the ground is lifted. In this case, there may be problems when performing phase tests — best to use adapter/adapter cables that have the ground path wired.
- Other than the above possibility regarding a lifted ground, if not seeing continuity when testing other wiring, you may have a bad cable or totally incorrect wiring. Before deciding this is fact, repeat the test as you may have not made solid connections when holding the probes against the connector positions mentioned.
- If you are still having problems after a second test, repeat the test again and when holding the probe on either two wire connector point, move the probe on the XLR connector end to all pin possibilities. If you note continuity that is not logical regarding wiring, best to wire up adapter cables as mentioned in the beginning of this section.

If no problems or they have been corrected, you know now know how the adapter/adapter cables are wired. Again, most important to note the XLR hot pin as well as how the other two wires are connected on the XLR end.

Male XLR connector on one end and a three wire connector on the other end

This is the same as the above — the only difference is you need to hold one probe against male XLR pin points. At first, you will think this is strange trying to hold the probes on both connectors but no problem — you will quickly discover the technique.

Hopefully, the hot pin proves to be the same on both the female and male XLR ends. If not, this will add confusion regarding testing cables and gear. If this is the case, best to wire up adapter cables as mentioned in the beginning of this section.

The Adapter/Adapter Cable “Rap” Up

If your studio uses three wire XLR connectors within the gear chain, the odds are good pin 2 is the hot pin. If not, pin 3 is hot. In either case, you want the adapter/adapter cables to match hot pins for all phase tests when using such adapter/adapter cables.

If your studio uses two wire connectors only, or in combination with three wire connectors, make sure that the adapter/adapter cables hot pins match. If not, best to wire up matching adapter/adapter cables as to match.

Tutorial “Rap” Up

If you have gotten through this tutorial and performed tests as per your set up, be proud!!! You have taken the time to check/fix wiring as to get your studio healthy in phase/polarity land!!!