A GUIDE TO THE EURO-SERGE MODULAR SYNTHESIZER

Original documentation from

AN INTRODUCTION TO THE SERGE MODULAR MUSIC SYSTEM

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and

INTRODUCTION TO THE USE OF THE SERGE MODULAR MUSIC SYSTEM

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(in alphabetical order...)

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Paul Young

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Year of the Euro-Serge Dog

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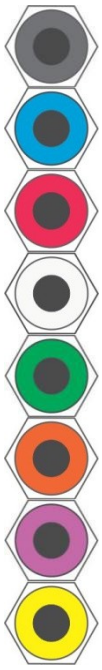
ABOUT THIS MANUAL

This manual is an instruction and users manual for the Euro-Serge Modular Synthesizer. It is intended to serve two purposes:

1. A self-tutorial instruction manual for those who have never used a synthesizer before and for those who have used a synthesizer, but not a Euro-Serge, before.

2. A User's Reference Manual and Guide that provides information on how to use each module, how to interconnect modules to produce certain effects and how to interconnect the Euro-Serge with other devices.

This manual is arranged into the following sections:



The Introduction (Book 1)

Self-Teaching Patches #1 (Book 2)

The Theory of Electronic Music (Book 3)

Self-Teaching Patches #2 (Book 4)

System Modules (Book 5)

So What Does It Sound Like? (Book 6)

Euro-Serge Catalogue (Book 7)

Appendices (Book 8)

If you have never used a synthesizer before it is strongly suggested that you read 'The Introduction' and 'Self-Teaching Patches #1' sections, working out the patches as you go. If you are confused at this point, don't worry, keep going. These exercises will give you the basis for understanding the explanations in subsequent chapters.

If you have used a synthesizer, but not a Euro-Serge, the patches worked through in 'Self-Teaching Patches #2' provide a good working knowledge of the basic modules of the Euro-Serge. If you are already familiar with the Serge/Euro-Serge system, specific information on the different modules and how to patch them together can be found in the sections 'Self-Teaching Patches #2' and 'System Modules'.

For information on interfacing to other equipment, refer to the 'Appendices'.

This manual comprises eight chapters which exist as eight separate PDF files. These files are all placed on, and should, ideally, be accessed from, the internet for easy access to ensure that you have the latest copy.

This manual makes extensive use of hyperlinks for animated graphics, module specific datasheets and links to other chapters, all of which will require internet access.

All chapters are easily accessed from page 2 of this chapter. At the end of each chapter is a link to the next chapter so you need only need to remember/store a link to The Introduction.

This manual refers to the 4mm version of the Euro-Serge modules as this affords the user the best Serge experience. 4mm connectors are also more robust and offer a more reliable connection.

However, all of these modules are available with 3.5mm jacks and are identical in appearance to the 4mm versions.

Most banana patch cables are stackable, while most 3.5mm cables are not. If you are using non-stackable cables, a multiple jack module such as our ASM324 Xpander will be required.

Figure 1.1 A StackCable 3.5mm stackable patch lead

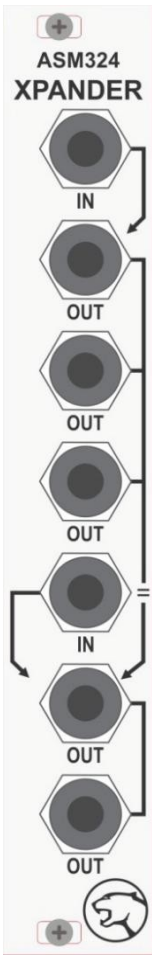


Figure 1.2

When referring to controls on modules such as pots or jacks we will enclose the 'name' or 'label' for that item in square braces, for example [RISE] and [VC IN].

FOREWORD by Serge Tcherepnin

The main difference between Moog, Buchla, ARP, Roland, Oberheim, Sequential Circuits, EMS and the like, and the Serge, is in the intent. Moog and co. designed their electronics to fit a simple concept of what makes musical sounds - pitch, duration, amplitude envelope, timbre. Their electronics had, as a primary goal, control of these basic features of musical sound.

When it I was my turn, I was far more interested in the electronics of modules than to any sort of idea about making musical sound. In 1965, for example, I was taking Japanese transistor radios and attaching capacitors, photo-cells, finger resistive pads, to as many of the sensitive solder traces as I could discover that made howling, squealing, clicking sounds out of the Transistor radio's speaker. I made several of these early "synthesizers" using ultra mini banana jacks and patch cords with which to patch external components, and sent a few to my brother who made music with them!

Later upon my return to the US, I fell in with a group of artists at Yale named "Pulsa" who had designed a sort of audio synthesizer around RTL logic ICs. This was a raucous synthesizer, featuring mostly square waves and no filters, not really "musical' in the sense that Moog and co. meant, yet it was a joy, a harbinger of what I would later want to do, free the electronics so that it could speak for itself rather than be enslaved to pre-conceived concepts of what musical sounds are like.

Shortly after, in 1968, I fell in with Mort Subotnick who had a Series 100 Buchla. The Buchla's modules made me realise how much more interesting his modules would be, if he had made available to the user the "hidden" sub-functions making up a module. In a sense, dissecting a Buchla module, I could do the same stuff I did with a Japanese transistor radio.

This was the guiding principle of the early Serge: make available electronic functions that are interesting in themselves, though seemingly "un-musical". Thus modules like the positive slew, negative slew, peak and trough, comparators, processors and wave shapers, etc. came into existence.

Serge Tcherepnin - 2018

INTRODUCTION

A SYNTHESIZER is a musical instrument, which means that it is a tool for making music. With any tool there are two things to learn: what it is that is being made AND how to use the tool to help in its making. In this case you have to learn about the structure and the nature of the music you are making, whether it be electronic, rock, jazz, classical or what-have-you, AND how to use a synthesizer. However, these two things, the music and the instrument, are highly inter-related. Take the piano for instance, which would not have been developed unless there already existed a certain kind of music (chordal, many voiced). And yet, once developed, the piano changed the kind of music written and played. It is unlikely that Rags would have been developed if there had been no piano.

The same is true for the synthesizer. It was developed originally in the Sixties as a response to certain kinds of music that was already being written and played (tape collage, 'classical electronic' and certain kinds of jazz), yet it soon changed the music for which it was built. Before long it found its way into other kinds of music, such as pop and rock. So of course each of these kinds of music changed the synthesizer as well. There is now, for instance, a 'phaser' available on most synthesizers - a device that electronically duplicates certain rock and roll recording techniques.

All of this is to say that a synthesizer is best understood within the context of the music in which it is to be played. A good way to learn about synthesizers is to listen to records and tapes of other synthesizer players, to go to concerts of electronic music and to read books available on the subject. In the beginning imitation is a good idea so that one can learn what is considered good standard practice, what is fresh and new, and what is a cliché.

The Voltage Controlled Modular Electronic Music Synthesizer (the instrument's full name) exists in two worlds at the same time: the world of electronics and the world of sound. Although the objective is to produce music, a little of both these worlds must be conquered to be able to use the synthesizer to its full potential. This is because, as will be explained in more detail later, the synthesizer is not really one instrument, but rather, an assembly of smaller ones (modules) which can be hooked together (patched) to create many different larger instruments. The synthesizer player really is, in part, an instrument builder, and just as an electronic organ designer must know something about electronics, acoustics and music, so must a good synthesizer player.
However, you do not need to know much about either electronics or acoustics to use the synthesizer to make good music. The synthesizer itself is an excellent teacher of both simple acoustics and elementary electronics.

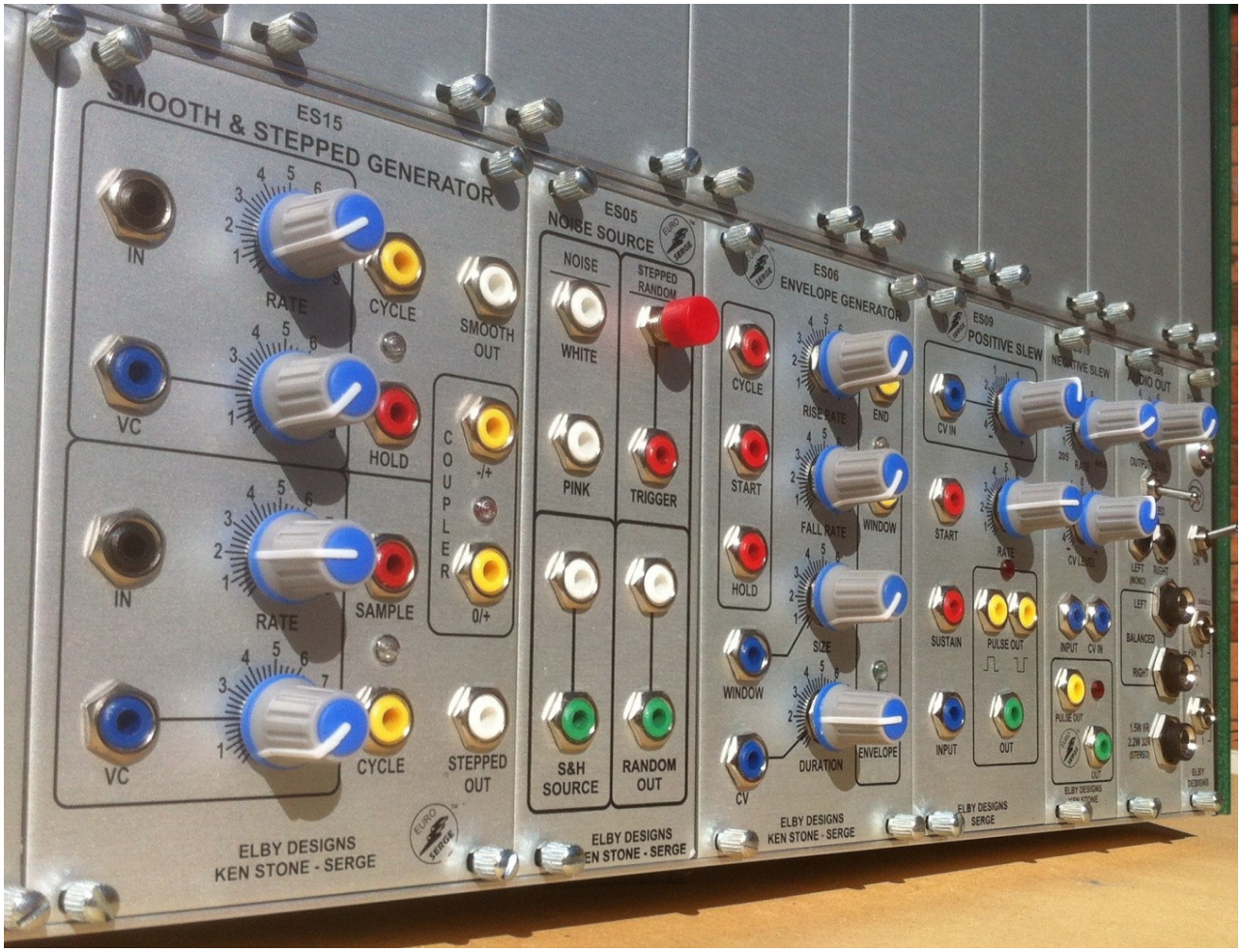


Figure 1.3 - A Starter Euro-Serge System

AMP AND SPEAKER

The Euro-Serge System does not contain its own amplifier or speaker so it must be connected to such a system to hear any sound. Below are the most common systems and where the Euro-Serge connects to them.

STEREO COMPONENT SYSTEM

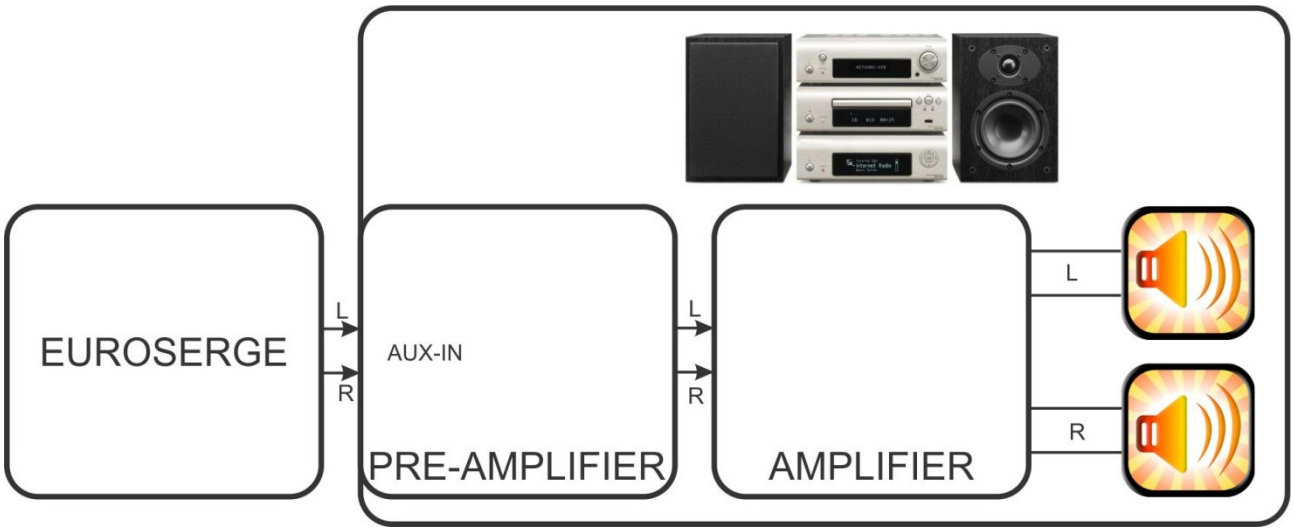


Figure 1.4

This is, probably, the most common home stereo system (though sometimes the preamplifier and amplifier are integrated into a single larger component).

The Euro-Serge should be connected to the AUX-IN inputs (or any other suitable LINE LEVEL input) at the back of the preamplifier. The Euro-Serge can be thought of as another component, comparable in level to that of a reel-to-reel tape recorder, MP3 player or CD player. Remember to have both speakers hooked up and to switch the controls on the front of the preamplifier to AUX-IN. Keep the volume down until you have a good sense of the loudness of the Euro-Serge so that you don't overdrive your speakers. Most speakers are built for classical music sound spectra.

Synthesizers are able to produce sounds that have far more energy in the 'high' end and can damage speakers if care is not taken. If there is a headphone output you can use it to listen to the Euro-Serge without the speakers. Since it is 'stereo' you can listen to two voices separately by connecting one voice to the left AUX-IN and one to the right AUX-IN.

POWER AMPLIFIER

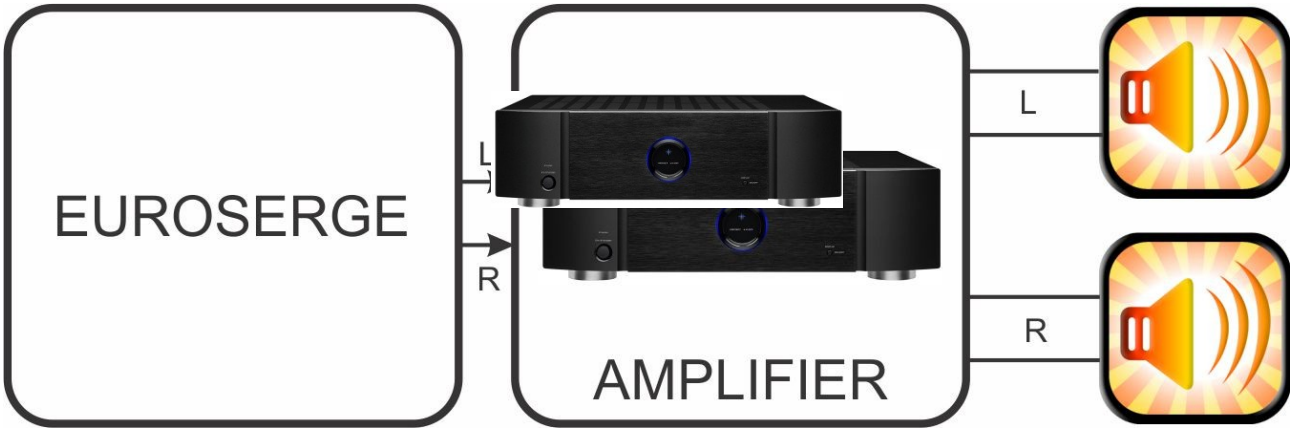


Figure 1.5

Sometimes in a studio situation the Euro-Serge will be directly connected to a power amplifier. This is not recommended for home use. When this configuration is used, the only controls for the volume are on the Euro-Serge itself so it is important that they be kept at appropriate levels so as not to damage the speakers.

STAGE AMPLIFIER/SPEAKER (ROCK AND ROLL AMPLIFIER)

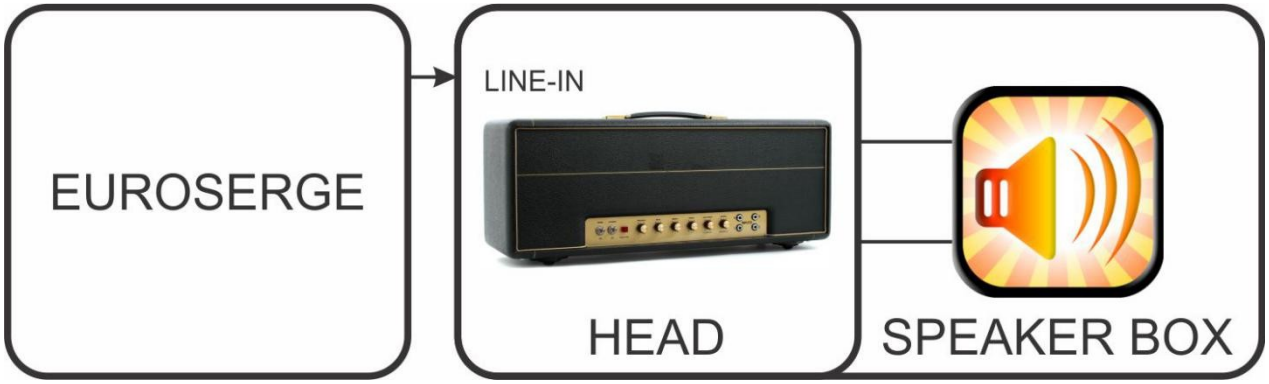


Figure 1.6

If you are using a stage or 'rock and roll' type amplifier/speaker the Euro-Serge should be plugged Into the HI-Level or Line Level input.

CONNECTING CORDS

Cords are used to connect between the various modules on the synthesizer, and also to connect the Euro-Serge to other electronic devices. Every connector on the end of a cord or on a device has both a Type and a Gender, (male or female). Only connectors of the same type and of opposite gender can be connected together. Below are the connectors commonly found in electronic sound equipment.

THE AC CONNECTOR

Figure 1.7

This is the 'power' plug and is used, almost exclusively, to get 120/240 volt AC current out of the wall. If your equipment is not working the first thing to check is whether everything is plugged in. Many AC power plugs have a third prong. This is the ground connection. Unfortunately not all AC jacks have a hole to accommodate this prong so an AC adaptor must be used. However in most cases grounding is not required.

Another problem that arises with AC connectors is that you usually end up with far more males than females. One solution to this is a power-board which accepts a number of plugs and also has the advantage of allowing the user to turn everything off at once. Most power-boards also have a fuse which can protect your system from damage. If nothing goes on at all, check to see that the fuse is still good.

Figure 1.8 – A Switched Power Board

THE RCA OR PHONO CONNECTOR

Figure 1.9 – RCA Male (left) and Female (right) Connectors

The jacks on the back of most home stereo systems are RCA female. Note that the males of this species have little skirts around them that grip the outside of the females, make sure that these grip tightly by bending in these skirts just slightly. The skirt is the 'ground' while the pin in the centre is 'hot' and carries the signal. Since they are often used in stereo situations, they often come in a joined pair. When using such a pair make sure that the correct ends are used.

THE PHONE CONNECTOR (Audio)

These are the plugs that are found on the end of guitar cords and the jacks that are found on the front of rock amps, (They are also the jacks found in old-fashioned phone systems and hence their name).

Figure 1.10 3.5mm (top) and 6.35mm (bottom) jack plugs
There are two sizes in common use:-

1. 1/4" (6.35mm) is the original size. These are commonly used for head-phones, guitar leads, line-level audio and are used in many of the larger 5U format modular systems (bottom of the picture)

2. 3.5mm (1/8") is the smaller mini-jack which in recent times has become the replacement 'phone' connector for portable devices. These are commonly used in 3U format modular systems and on the output modules of Euro-Serge systems (top of the picture)

The shaft of the plug is divided by a narrow insulator band. The smaller section of the shaft ('tip') is the signal, or 'hot', while the larger section ('sleeve') is ground.

A stereo version is also available with two insulating bands on its shaft. In the stereo version, the smaller two segments carry the signal, while the larger section is ground.

Figure 1.11 Stereo jack plugs

The stereo phone will only work when used with a jack made to handle this type of plug. Typically an instrument input is mono, while a headphone out is stereo.

4MM (BANANA) CONNECTORS

Within the Euro-Serge system almost all patching and connecting is done with banana plugs, which are so named because of their curious shape. These connectors are not grounded or 'shielded', that is, there is no wrapping of wire mesh around the central wire.

Figure 1.12

The cords are usually colour-coded by length. In the Euro-Serge system we have the following cords:-

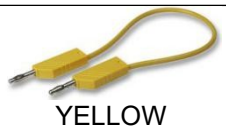
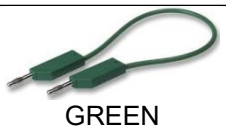
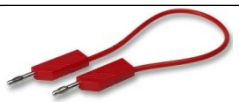
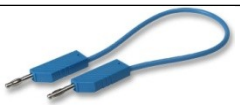
				
BLACK	YELLOW	GREEN	RED	BLUE
15cm	30cm	60cm	90cm	120cm

Figure 1.13 ELBY Design 4mm Patch Leads

BARE WIRE

This type of connection is usually only found between amplifier and speaker. Always make sure that the speakers are connected to the amplifier before turning the amplifier on. If the system is a stereo system, make sure that 'phase' is maintained by connecting both speakers identically. One of the strands is marked to make this simpler.

Figure 1.14

CANNON (XLR) CONNECTORS

The cannon connector is most often found on microphone cords. It is a 'balanced' connector with two signal lines and a ground.

Note that the male's prongs are within a skirt and that this should not be confused with a female connector.

Figure 1.15 - Female Inline Plug (left) and Male Panel Socket (right)

The cannon connector clasps shut and a button or lever must be pressed to disconnect them.

CINCH-JONES

Often found on power supplies, speaker wires and trigger cables because of its inability to be connected backwards. This type of connector is used for wires that need to be connected and disconnected frequently.

Figure 1.17 – Female Inline Socket (left) and Male Inline Plug (right)

MTA (MOLEX) CONNECTORS

MTA (mass termination assemblies) are a type of connector that is usually used for internal connections since they are not frequently disconnected. In the larger 4U and 5U formats the larger 0.156" version are commonly used while in smaller systems the smaller 0.1" versions are common.

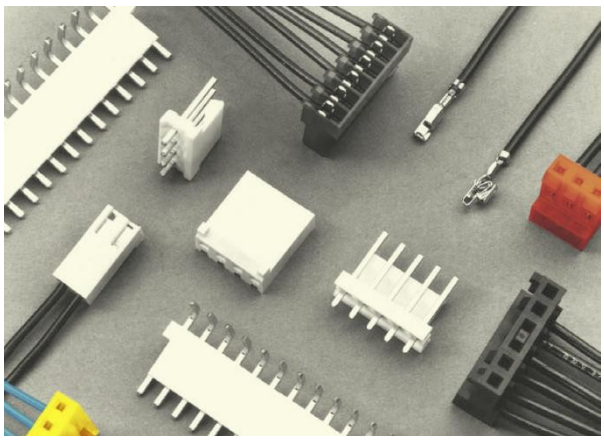


Figure 1.18

ADAPTORS

At times it will be necessary to patch between a jack of one type and a jack of another type. There are two ways to solve this problem. The first is with a cord with two different kinds of plugs on the ends, and the second is with an adaptor.

Cords with two different plugs can be purchased or can be assembled without much skill. When making such cords be sure that the grounds of the two plugs are connected together and the signal parts of the plugs are connected together.

Figure 1.19 – A Typical Adaptor Cord

Perhaps the most common way of dealing with the problem is with adaptor plugs. These are small devices with a plug of one type on one side and a socket of another type on the other side.

Figure 1.20 - A 3.5mm (socket) to 6.35mm (barrel) Adaptor

When purchasing or asking for an adaptor be sure to specify not only the type of jack/plug needed, but also the gender.

While it is possible to stack one adaptor on another, or to place them in elaborate combinations with various kinds of cords, it is wise to remember that the more connections one has the more likely something will go wrong. In fact, this problem is so common that if no sound is coming out of your system, right after checking to make sure that everything is plugged in, check the adaptors.

In the long run it is worthwhile to purchase the correct cords and adaptors for the job. You will find that they are easy to lose and a box for them comes in handy. You lay also find that you lose fewer of them if you can mark them in sole personal fashion.

DC POWER CONNECTORS

There are two styles of DC Power connector in common use in the modular synthesizer world being the barrel connector and what is often referred to as a MIC connector. The Barrel Connector is a 2-pin connector and commonly found on external power supplies used to get power from the mains in to your system. The MIC connector comes in a range of multi-pin configurations with 2-, 3- and 4-pin found in regular use.

Figure 1.21 – Barrel Plug (female - left) and Socket (male - right)

Figure 1.22 – MIC Plug (female – left) and Socket (male – right)

DIN CONNECTOR

This connector is the standard connector for MIDI, a standard that describes a communication protocol, digital interface and electrical connectors that connect a wide variety of electronic musical instruments.

Figure 1.23 – DIN Plug (male – left) and Socket (female – right)

THE ADVANTAGES OF BANANA JACKS AND PATCH CORDS

One request often received from people who have not had "hands on" experience with 4mm systems (Serge, Cat Girl Synth for example) is to replace the banana jacks with other types of jack, specifically, 3.5mm mini-jacks. Usually the person is worried about patch incompatibility with other equipment, or is just used to a particular type of patch cord.

One of the advantages of banana jacks is that they never, specifically, require the use of "multiples". Since the patch cords are stackable, a single output can be sent to a number of input jacks without needing a special multiple-jack adaptor. This is especially important in the Euro-Serge synthesizer since there are a lot patchable functions and sub-functions. If you look closely at the modules, you will notice a lot of jacks. While not every jack will be used in every patch, patches in the system tend to get a little more complex than other systems which have more limited module functions.

Another advantage of the banana patch cord system is the superior reliability of the moulded banana patch cords and the design of the plug and socket. You are always assured of a firm contact to the jack..... There is a large are of contact from plug to jack, providing a positive mechanical connection. The cords themselves are colour-coded according to length so finding the right length patch cord is easy. Also, the heavily insulated wire used on the banana patch cords make them less tangle-prone than the other types of wire.

The banana patch cords are single-wire (but multiple strands) and unshielded. This is fine in a Euro-Serge synthesizer since all output impedances are very low, and the distance between patch points is usually quite short.

Most Euro-Serge modules designed for connecting to the ‘outside world’ will usually have alternative types of audio connectors such as mini-jacks, RCA, XLR and 1/4" phone jacks.

When patching between modules across different systems that use different connectors (typically 3.5mm and 6.35mm jacks) it is best to have a multiple jack connector such as our ASM324 Xpander (this is suitable for banana-3.5mm conversion, or other adaptors for other styles of connector. This allows the use of banana patch cords within the Euro-Serge synthesizer, yet allows easy hook-up to other gear with no new cables or expensive (and troublesome) inline adaptors required.

THE EURO-SERGE SYSTEM

While the Euro-Serge may look like a single machine, it is actually a collection of much smaller devices or, as they shall be called from now on, MODULES. This explains the word Modular in the full title: Voltage Controlled Modular Electronic Music Synthesizer. Except for the internal power supply wires which supply them with the power necessary to operate, each module is COMPLETELY independent. They are no more interdependent than your TV and your toaster are when plugged into the same AC wall socket. Unless hooked together with PATCH cords these modules remain independent and can be used separately. But the real interest of the synthesizer lies in hooking these modules together.

Unlike the original Serge System, each module in the Euro-Serge is physically independent allowing the user total control of what modules are used and where they go. Out of necessity due to space constraints, some of the Serge Modules are broken in to individual modules. An example is the Wave Multipliers (VCM) which is now 3 separate modules in the Euro-Serge.

Figure 1.24 - A typical Euro-Serge module

In general, most Euro-Serge modules are not very deep (typically no more than 60mm) allowing them to be installed into shallow cases (sometimes referred to as skiffs). These shallow systems are more easily transported.

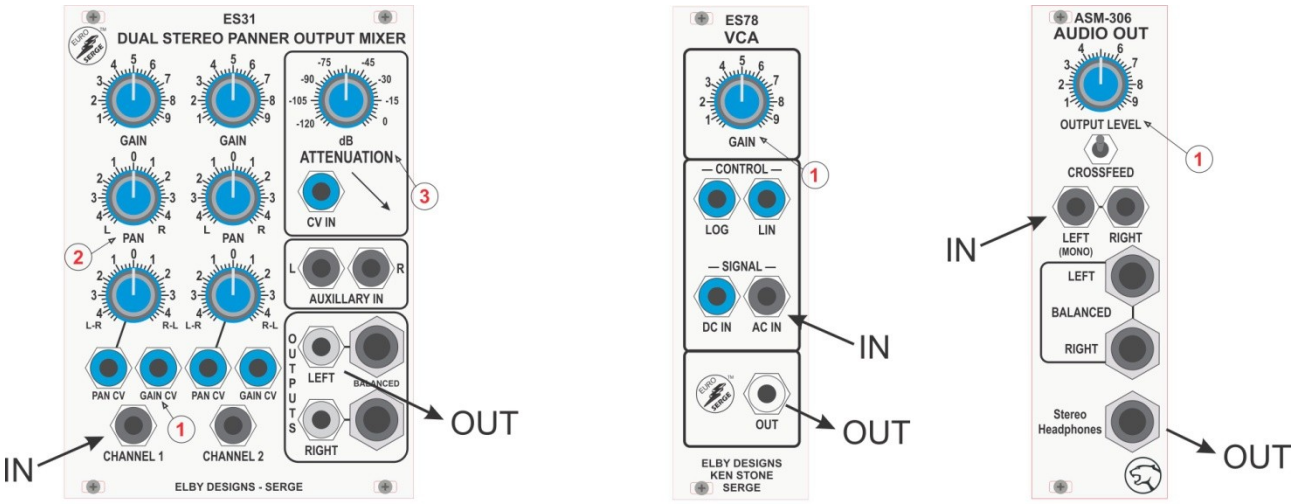
Figure 1.25 - Behind a typical Euro-Serge module.

Learning about a synthesizer is learning about what each module does separately and what they do when all hooked together.

Doug Lynner gives us an introductory visit to the Euro-Serge System

CONNECTING THE EURO-SERGE TO SPEAKERS/AMP

In all Euro-Serge systems there is at least one module whose function is to connect the Euro-Serge to the amp/speaker system. These are called 'output modules' because they take the signals from the Euro-Serge and OUTPUT them to the speaker and amps. Output modules have inputs that accept banana plugs from the other modules on the Euro-Serge and have either mini-phone, phone, XLR or RCA outputs. These non-banana connectors can go directly to the amp/speaker system. Below are diagrams of the various modules that serve this function. Each diagram is labelled to show where to 'input' into the module and where to take the 'output' from. The output cord goes to the amp/speaker system. Under each diagram are instructions for setting the dials or POTS (short for potentiometer) on the module. It is important that these instructions be followed at this point. In particular, no cords other than those listed should be patched to the output module. In the following section this module is referred to as the Output Module.



1 [GAIN CV] fully right
2 [PAN] fully left
3 [ATTENUATION] fully right

1 [GAIN] fully right

1 [OUTPUT LEVEL] fully right

Figure 1.23 - Euro-Serge 'Output Modules'

If the Euro-Serge is not already on, flick the power switch ON now. The amp should be turned all the way down.

You are now ready to make your first electronic sound, which will also test whether all the inter-connections so far are good.

After the sound, the theory.....

Chapter 2
Self-Teaching Patches #1