

**KISS-BOX RTP-X
RTP-MIDI EXTENSION
USER'S MANUAL**

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1 - Introduction

RTP-X is an hardware expansion module, designed to be installed in hardware synthesizers or any audio systems, in order to make them directly RTP-MIDI compliant. It can be installed in almost any host system, as long as this system has a MIDI 1.0 interface available (with DIN connectors).

RTP-X is built around a powerful 400MHz processor, offering more than 800MIPS of computation power. This guarantees extremely low latencies (less than 100 microseconds).

The module does not require any software modification in the host system itself, and does not interfere with native MIDI capabilities of the host system, which remain available.

RTP-X can be used directly in any RTP-MIDI setup. No RTP-MIDI setup manager software is required with most of RTP-MIDI setups, since RTP-X uses a standard mechanism to signal itself to other RTP devices on the network. It appears automatically to Mac OS X and Windows machines. It does not require any proprietary driver to be installed in computers, since RTP-X complies with RTP-MIDI standard, which is supported natively in most common operating systems.

2 - What is RTP-MIDI?

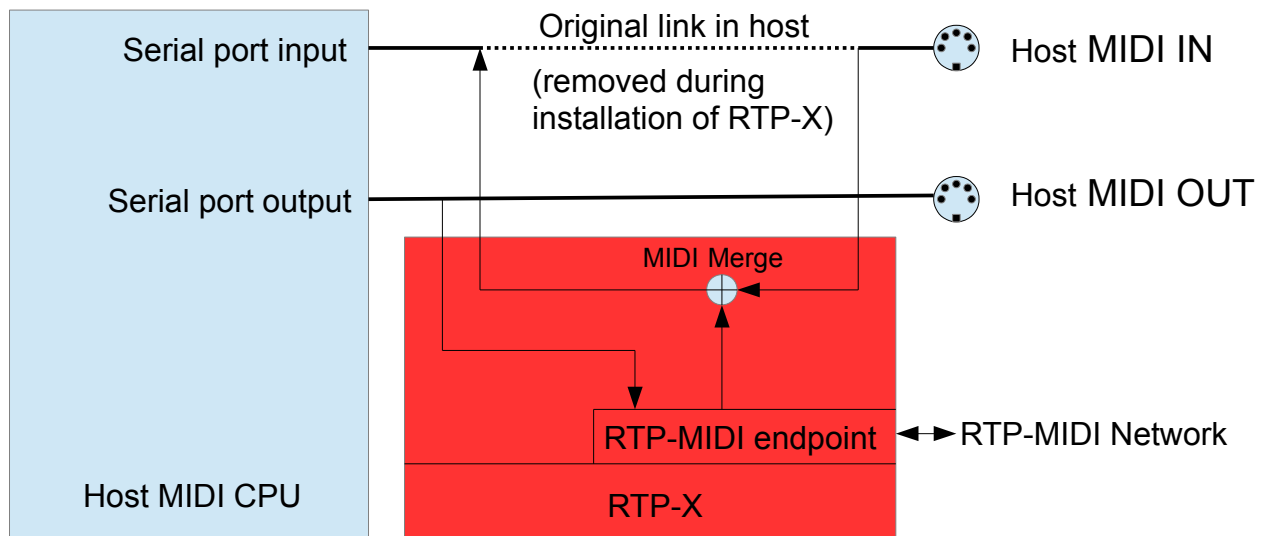
RTP-MIDI is a worldwide open standard, listed in RFC documents (RFC4695 / RFC6295). This guarantees that anybody can use RTP-MIDI without needing to pay any license and ensures that no company can claim RTP-MIDI to be its proprietary product. It is based on the well-known RTP protocol (listed as RFC3550 standard), which is based in turn on standard IP stack. This allows any RTP-MIDI product to use standard networks components.

RTP-MIDI does not necessarily relies on Ethernet and can be used over wireless links (iPad is using RTP-MIDI in this way). However, the use of Ethernet guarantees extremely low latency over the complete network.

RTP-MIDI benefits from all RTP advantages, like clock synchronization, detection of loss packets, etc... Moreover, RTP-MIDI provides a recovery mechanism, which allows a receiver to detect missing informations due to lost packets. This innovating mechanism allows to recover MIDI data without needing any retransmission.

RTP-MIDI is natively supported in Mac OS X since 2006, and free Windows drivers are now available for all Windows platforms from XP to Seven, in 32 and 64 bits versions.

3 - RTP-X integration



The diagram shows you how the RTP-X integrates itself in a MIDI host system (synthesizer, master keyboard, mixing desk, etc.). As you can see, the host system will keep all of its native MIDI capabilities, the RTP-X being designed to act transparently over the MIDI streams going inside and outside the host system.

The RTP-X being a RTP-MIDI session participant, it presents itself on the RTP-MIDI network as a single MIDI IN and single MIDI OUT endpoint.

The only physical change required in the host system is the removal of an electrical link between the host MIDI IN and the host microprocessor serial port. MIDI data received by the host are sent to the RTP-X (rather than being sent directly to the host microprocessor), where they are merged with the MIDI received on the RTP-MIDI endpoint.

The MIDI stream generated by the host is sent also to the RTP-X, which transmits it transparently to the RTP-MIDI network.

The RTP-X accepts up to 8 sessions in parallel, which means that it can be used by 8 other session participants on the network.

Note that the RTP-X accepts also to merge System Exclusive data coming from different session participants **at the same time**. Thus, there is no risk of System Exclusive data corruption in case two or more participants would need to send SYSEX data at the same time to the host system in which the RTP-X is installed.

4 - Installation in CME keyboards (UF and VX series)

CME keyboards (UF and VX series) are prepared to receive expansion boards like the RTP-X. The RTP-X can be equipped with a specific front panel for these keyboards upon request, simplifying as much as possible the mechanical installation.

Before installing the RTP-X board in the CME keyboard, **switch the keyboard off and disconnect the power supply connector from the keyboard.**

Step 1 : remove the plastic cover on the keyboard back panel. Take care not to loose any of the screws, you will need them to install the RTP-X.

Step 2 : take the grey cable(s) with white connector which are visible inside the keyboard. You will find two small connectors in the UF keyboards (a 2 ways connector, and a 4 ways connector), and only one connector (8 ways) in the VX keyboards

Step 3 : locate the male connectors on the RTP-X board (J1, J2 and J3 marking on the PCB). Connect the cables coming from the keyboard to the corresponding ones on the RTP-X board (J1 is for VX keyboards, J2 and J3 are for UF keyboards)

Before installing the RTP-X inside the keyboard, make sure that jumper J6 is on EXT POWER position. **Do not put the jumper on 5V position with CME keyboard, otherwise you will destroy the RTP-X board.**

Step 4 : insert the RTP-X assembly inside the expansion slot of the keyboard, taking care not to pull on the cables

Step 5 : re-install the screws removed at step 1

You can now go directly to chapter 5 to configure and use your RTP-X

5 - Installation in non pre-equipped systems

5.1 - Host system prerequisites

Before installing RTP-X module in a host system, please verify the following points:

- The RTP-X module shall be installed only by a qualified technician.
- The host system shall be able to provide a power supply source from 9 to 15 volts DC, minimum 100mA. It is also possible to use the host system 5V DC power supply (must be regulated source)
- If possible, get the host system's schematics (typically from service manual)
- Do not forget that modification of your host system will void the warranty. Check your work as often as necessary.

If you have any doubt or any question related to RTP-X installation in your host device, do not hesitate to contact Kiss-Box. We will do our possible to help you to install your module without any risk for your host system.

5.2 - Package content

The RTP-X box shall contain:

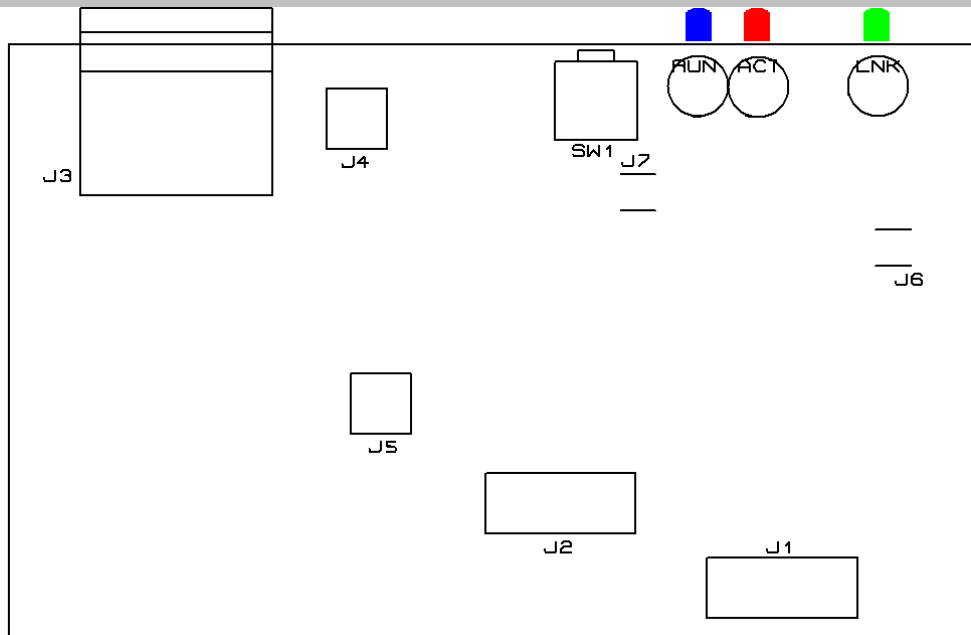
- One plastic bag with electrostatic protection containing the RTP-X board assembly
- One connector pre-fitted with cables (can be a rainbow colored cable assembly, or a cable with sticker with wire identification)
- One optional plastic bag with front panel
- One printed sticker with host system cutting dimensions

Do not remove the RTP-X from its bag until you are ready to install it in the host system!

When you are ready to pick up the RTP-X board, touch a metallic surface connected to earth, in order to eliminate all static charges in your body.

Always handle the RTP-X module by the printed circuits edge. Never touch any component on the board!

5.3 - Front panel description



1 - Ethernet RJ45 connector. Receives the RJ45 network cable coming from network switch, using 10 or 100Mbps link.

2 - Reset / Special mode button. A short pressure on this button resets the RTP-X board, a long pressure will perform a factory reset. When the button is hold during startup, a special mode ("bootloader mode") is activated.

3 - RTP activity LED. This LED blinks in different patterns to signal the different RTP-MIDI activities detected by the RTP-X.

4 - Network activity LED. This LED blinks when the RTP-X transmits data to the network.

5 - Network LINK activated LED. This LED activates when a valid 10 or 100 Mbps Ethernet link is detected with the remote device (typically the network switch)

5.4 - Mechanical installation

The RTP-X can be delivered with various model of front panel, prepared specifically for hosts (iCON keyboards, CME keyboards, Yamaha CSxR synthesizers, etc...). Contact Kiss-Box to check if a specific front panel is available for your host system. These prepared panels will avoid you to drill openings in your host system since they install into already existing expansion slots.

If there is no prepared front panel for your host system (typically if the host does not have any reserve expansion slot), then you will need to cut an opening by yourself.

The sticker provided in the package will help you to cut an opening of correct size in your host enclosure.

The RTP-X is normally installed using the standard front panel, which holds the card by two brackets on left and right sides of the main PCB.

If the base printed circuit board is too wide for your host system, you can break with pliers the two lateral chunks with the screw brackets (PCB width will then be reduced to 82mm). You must then use the three holes on the base PCB to hold the boards in the host system. *Think twice before doing this! There is no way back once the PCB is reduced.*

If your host system already has a place for an expansion slot, Kiss-Box can provide you a prepared front panel which installs everything in the host system without needing to cut any opening in it.

If the host system does not have any expansion slot provided by the manufacturer, please follow the next instructions precisely.

5.4.1 - Opening the host system

If you have the host system's service manual, following its instructions to open the system cabinet and access the electronic boards inside.

Otherwise, you will need to locate all screws looking to the system carefully. Put all screws in a safe place, and do not hesitate to put a piece of paper with annotations on it to remember where each screw will go back when you will close the cabinet after installation.

5.4.2 - Choosing a location for the RTP-X

The RTP-X can be installed almost anywhere in the host system. However, it is preferable to install it as near as possible to the original MIDI interface, in order to keep the wires between the system's electronic boards and the RTP-X as short as possible.

Make sure that the RTP-X module will not touch any other electronic parts inside the cabinet.

Avoid to install the RTP-X near a power supply or heat sources. Since the RTP-X is a microprocessor based device, it can generate electrical high frequency noise. We recommend you to keep the RTP-X as far as possible from analog boards to avoid any unexpected magnetic coupling.

5.4.3 - Mechanical work

- Put the template sticker at chosen location for RTP-X.
- Before starting any mechanical work, protect the best as you can the electronic boards inside the host system. If possible, the best thing is to remove all electronics boards. Otherwise, protect them with a paper sheet (do not use plastic film, since it can generate destructive static electricity. Avoid also metal film, which can create short-circuits if there are some backup batteries on the host circuit boards)
- Drill two 3mm holes on left and right side, at the (X) marks
- Drill a pre-cut hole on each corner of the material removal area (marked with // on the sticker)
- Using a small saw, cut the cabinet between the four holes
- When the central hole is done, use a fine file to clean the hole borders and remove sawing material
- Clean the two lateral holes too

When all mechanical work is done, take time to clean carefully your host system. Make sure that nothing remains from the mechanical work, especially if the host's cabinet is made of metal. **Check twice!**

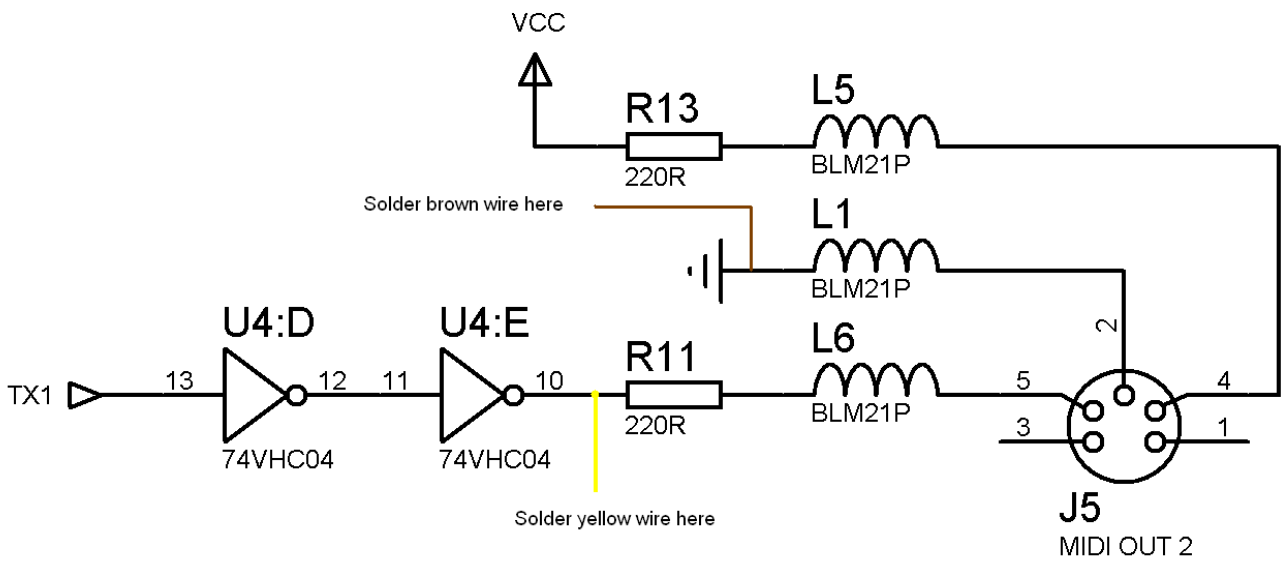
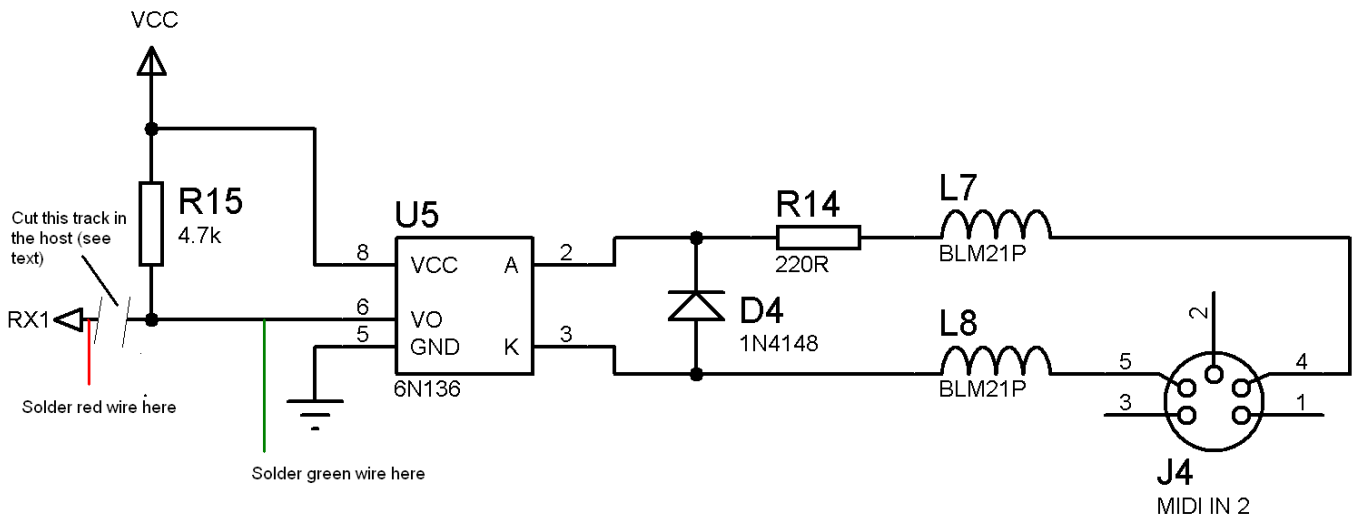
5.5 - Electrical installation

Connection between the host system electronic boards and the RTP-X module is done using a pre-assembled female connector with rainbow colored wires. This connector will go into J5 connector on the RTP-X module.

Do not connect the header on the RTP-X board until all connections are done within the host system!

The following schematic is intended to give you a global view of how the RTP-X shall be integrated in an existing MIDI device. Each MIDI device has a different schematic, so take time to check where are the differences between the schematic given here (which comes from a real device, by the way...) and the schematics of the device you intend to equip with the RTP-X.

In case of doubt, do not hesitate to contact technical support of Kiss-Box. Of course, we can not provide any schematics, but we can check if what you intend to do is correct (so please, come to us with your schematics, not only a photo of your device...)



5.5.1 - Host MIDI IN original link removal

The only change requested in the host to install the RTP-X is the removal of the link between the MIDI IN line and the serial port. This connection has to be removed, otherwise incoming MIDI data on the DIN socket will conflict with data generated by RTP-X (data received by RTP-MIDI).

Locate the optocoupler near the MIDI IN DIN connector. These are generally components marked 6N135, 6N136, 6N137, 6N138, PC900, etc.. and look like a 6 or 8 pins integrated circuit (we provide you hereafter a picture of a typical MIDI IN optocoupler).

You can refer to the MIDI 1.0 standard hardware schematics to help you to understand how to locate components.

Near the optocoupler, you will normally find a pull-up resistor (from 280 to 1000 ohms typically), connected to the optocoupler on one side, and to +5V power supply on the other side.

You shall keep the connection between the optocoupler and the resistor, but you must cut the link between the resistor and the serial input component (typically the microcontroller or a UART, like 16C450, 6850, 8250, etc..)

Locate the copper track going from the optocoupler to the microprocessor or serial port chip. You will need to solder one wire either on the resistor or the optocoupler, and another wire on the serial input pin.

Using a small cutter blade, simply cut the copper track (for example, near the resistor). Check with an ohmmeter that the copper track is completely cut. **Be extremely careful not to cut any other copper track!**

5.5.2 - Soldering wires to host system electronic boards

5.5.2.1 - Green wire (J5 connector / pin 5) - HOST_MIDI_IN

Solder the green wire coming from the RTP-X cabling harness to the resistor/optocoupler common point. You can solder the wire on the resistor lead, resistor pad or the optocoupler pad. We do not recommend that you solder the wire directly to the copper track, since this will not resist to vibrations.

5.5.2.2 - Red wire (J5 connector / pin 2) - HOST_UART_RX

Solder the red wire coming from the RTP-X cabling harness to the serial input of microprocessor/serial adapter. You can solder the wire to the resistor lead or resistor pad. Once again, we do not recommend that you solder the wire directly to the copper track, since this will not resist to vibrations.

5.5.2.3 - Yellow wire (J5 connector / pin 4) - HOST_MIDI_OUT

Locate the link between the MIDI output buffer (generally a 74xx04, 74xx07 or 74xx541 component, where xx is 2 or 3 letters, like LS, HC, HCT, etc..) and the MIDI OUT DIN connector. You will find a 220 ohms resistor installed between the output buffer and the MIDI connector. Solder the yellow wire on the resistor pad or lead, on the side going to the buffer, **not the side going to the DIN connector!**

5.5.2.4 - Brown wire (J5 connector / pin 1) – GROUND

Solder the brown wire on a ground point within the host system. Take care to use an electrical ground connection, not a mechanical ground (also called "protective earth" or "shielding ground"). Electrical ground is generally labelled "0V" or "VSS" on electronic boards.

5.5.2.5 - Blue wire (J5 connector / pin 6) – POWER SUPPLY

Solder the blue wire on a power supply line within the host system.

PLEASE REFER TO NEXT CHAPTER FOR DETAILS ABOUT POWER SUPPLY OF RTP-X!

An error in power supply connection may damage or destroy the RTP-X!

5.5.3 - RTP-X 5V power supply option

The RTP-X is normally powered from a 9V to 15V external power supply, typically coming from the host main power supply. This power supply shall be correctly filtered, which is normally the case for most synthesizers and keyboard power supply.

If the host can not provide this voltage, but has a regulated 5V power supply, it can be used to power the RTP-X directly.

Take an extreme care if you choose that solution : the 5V power supply must absolutely be regulated. Any voltage greater than 5.25V can destroy the RTP-X. If voltage drops under 4.75V, the RTP-X will not work properly.

The cable header pinout remains the same as for 9/15V sources, the 5V power supply shall be connected directly to the blue wire.

If you choose to use the 5V power supply option, move J6 to "+5V" position.

6 - Software configuration

6.1 - Installation check-up

When the RTP-X has been installed in the host system, check a last time that you followed exactly all instructions. It's always better to loose 5 minutes to check something which is already good, rather than going too fast and destroy electronic components because of a small error.

Do not connect the RTP-X cable header to the RTP-X board yet.

Switch on the host system and check that nothing wrong happens. In case of smoke, weird noise or odor, switch off immediately the system and search for the error. The most common error at this level is a short-circuit between solder joint where the RTP-X cable connect to the host electronic modules.

If the system starts properly, switch it off and carefully insert the cable header in the RTP-X mating connector.

Switch on again the host system. Once again, check carefully that everything is ok in the host, which must start correctly.

The blue LED on the RTP-X module shall blink every second when the system is powered. Otherwise, it means that the processor can not start properly. Check if power supply is correctly configured.

If everything is fine, you can connect a network cable on the RJ45 connector. The LINK LED will light as soon as a valid Ethernet signal is detected (the cable must be connected to a switch or a computer on the other side). You may see the red LED blinking a few time when the cable is connected (this depends on network configuration however. Do not be alarmed if the red LED stays off when the network cable is connected)

Using a small tool or a pen tip, depress the SW1 push-button and hold it until the blue LED stops to blink. This will reset the RTP-X to factory default values.

6.2 - RTP-X configuration

The only configuration needed by the RTP-X is assigning an IP network address. This configuration is performed using the Kiss-Box Editor, which is available for free on Kiss-Box website, on the download page (<http://www.kiss-box/downloads>). The Kiss-Box Editor is available both for Windows and Mac OSX platforms.

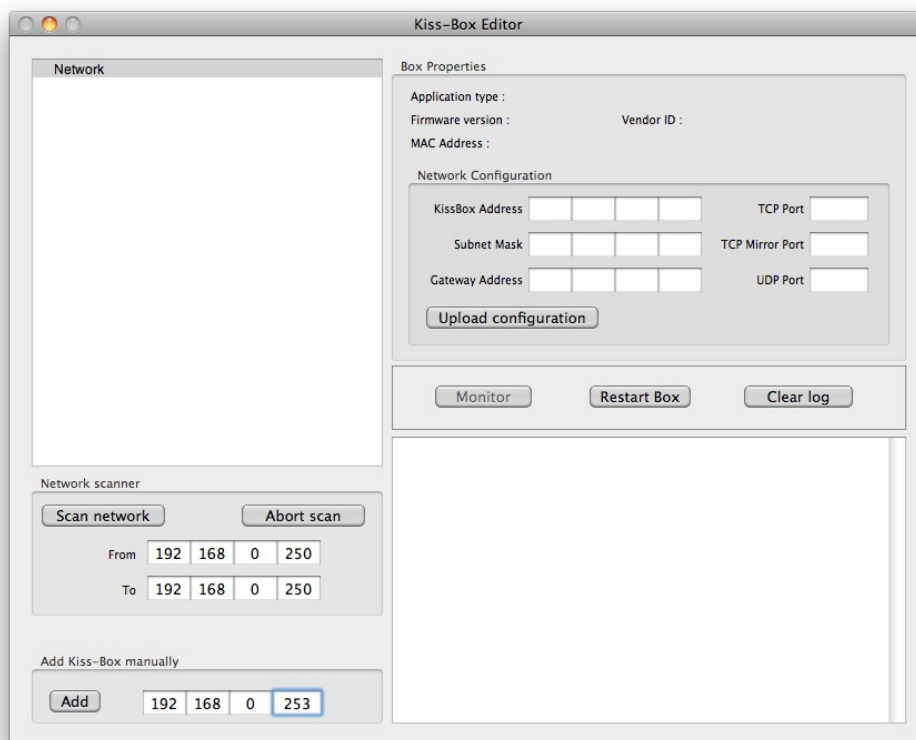
WARNING: the RTP-X requires a Kiss-Box Editor of minimum version 10.5!

Install the Kiss-Box Editor on your computer and make sure that your computer is configured to have its network adapter to be in 192.168.0.x/255.255.255.0 subnet domain (for example, your computer can be at 192.168.0.6). Do not use address 192.168.0.253 for your computer, since this address is used by default for factory reset of all Kiss-Box products.

If you do not know how to configure the network adapter of your computer, you can refer to the numerous tutorials available on Internet. We have also put a complete video tutorial on the Kiss-Box channel on YouTube.

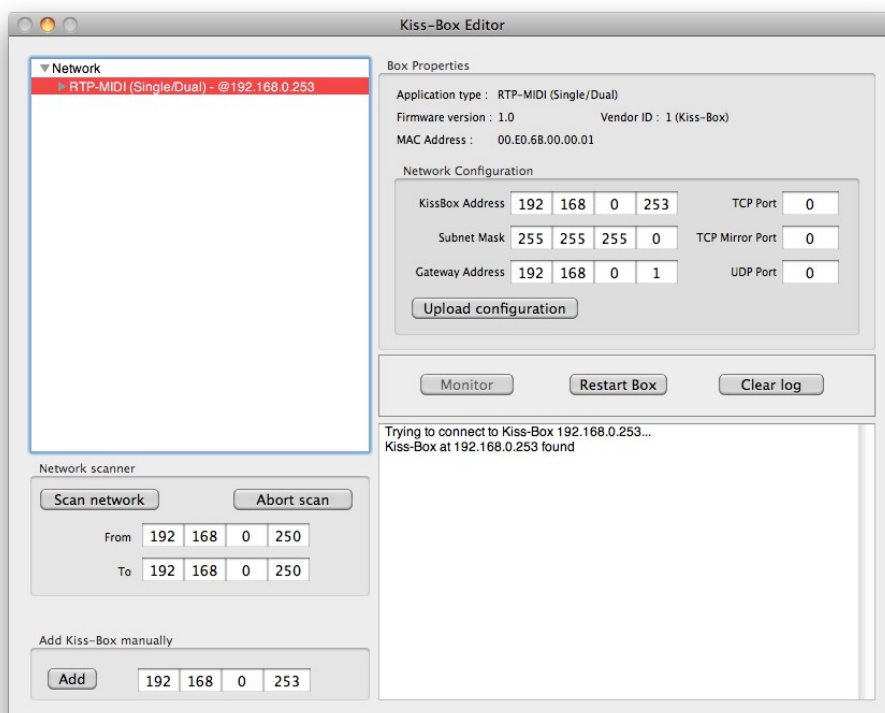
If not already done, connect the RTP-X to the network. Make sure that the green LED is lit, otherwise it means that your connection is not correct (check especially if the RJ45 connector is well inserted on both side on the network cable).

Start the Kiss-Box Editor. You will then see the main page, as on the screenshot below.



Enter the following address in the "Add Kiss-Box manually" zone (like on the screenshot), then click on the "Add" button. The Kiss-Box Editor will then display in the log window on the right side of the screen "Trying to connect to Kiss-Box 192.168.0.253". After a few seconds, you should see the line "Found Kiss-Box 192.168.0.253" appearing, which indicates that the Kiss-Box Editor has located the RTP-X on the network.

Click on the arrow on the "Network" line on the upper left zone. You will then see the following indication in the tree display "RTP-MIDI (Single / Dual) - @192.168.0.253". Click on this line to display the network parameters of the RTP-X, like in the following screenshot.



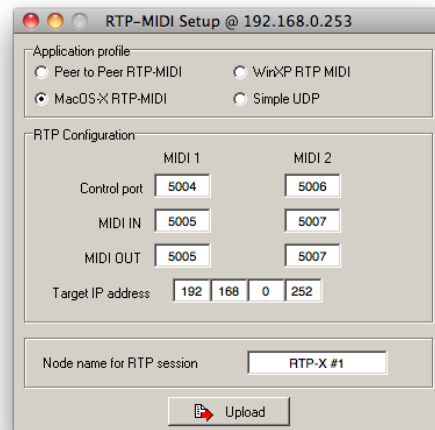
Locate the "KissBox address" line in the "Network Configuration" box. Enter the IP address you want for the RTP-X module, then click the "Upload configuration" button. We recommend you to keep the default subnet mask

and IP subnet, otherwise the RTP-X will become unreachable until you reconfigure your computer to use the same subnet as the RTP-X.

Using the default subnet (192.168.0.xx / 255.255.255.0) allows you to install up to 255 devices (computers or RTP-MIDI devices) on the same network, which covers most of the needs, even for big setups.

NOTE: setting IP address to 0.0.0.0 will activate the DHCP / ZeroConf mode. In this mode, if a DHCP server is found, the RTP-X will get the IP address assigned by the server. If no DHCP server is available, the RTP-X will automatically switch to ZeroConf mode, and assign itself an IP address in the ZeroConf domain (169.254.xx.xx / 255.255.0.0). Using the DHCP/ZeroConf mode requires to have a mDNS/Bonjour compliant session initiator on the network, since the IP address used by the RTP-X will not be known by the user. It is then ighly recommended to set a meaningful Session Name (see below) to identify the RTP-X module on the network.

If you double-click on the RTP-MIDI line in the tree, you will get the following window:



This window gives access to more detailed parameters of the RTP-X module.

Do not change the Application Profile (it is ignored by the RTP-X moreover), this is used for some specific RTP-MIDI devices.

The RTP-MIDI configuration shall not be changed (the values are computed automatically by the RTP-X), these values are also ignored by the RTP-X. If you want to configure your RTP-MIDI session initiator manually, you will need the port numbers given in this window (along with the IP address entered on the main window)

The "Node Name for RTP session" is the name which will be displayed by the RTP-MIDI driver configuration panel (transmitted using mDNS protocol, using the AppleMIDI class for Bonjour service)

6.3 - Session initiator configuration

The RTP-X can not be a session initiator, it can only act as a session participant. This mean that the session shall be initiated externally, typically by a RTP-MIDI driver (Max OSX and Windows RTP-MIDI drivers are session initiators)

Please refer to Kiss-Box RTP-MIDI configuration guide and/or video tutorial on Kiss-Box channel on YouTube to know how to create a RTP-MIDI session with the RTP-X.

7 - RTP-MIDI implementation table

Internal timebase resolution : 100 microseconds

Number of RTP-MIDI endpoints : 1

Maximum number of parallel RTP-MIDI sessions : 8

RTP-MIDI session initiator : No

Supports static IP addressing, DHCP and ZeroConf protocols

RTP-MIDI session control : AppleMIDI session protocol

System Exclusive buffer size : 1024 bytes in both direction

8 - Document revisions

Date	Auteur	Version	Description
10/02/2012	B.Bouchez	0.1	First draft

This document has been prepared and PDF rendered using the marvelous OpenOffice Writer software.

For more information about OpenOffice, go to <http://www.openoffice.org>.