DIGI KEYER II

*micro*HAM

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1 - FEATURES AND FUNCTIONS

- **No serial or parallel port required:**
    - just one USB cable between your computer and DIGI KEYER II
    - Fully integrated: Sound Radio Control, true FSK, CW and PTT
    - Computer sound card is not used

- **Complete "Computer <-> Radio" electrical isolation**
    - transformer isolation between sound circuits and radio
    - optical isolation between USB port and of ALL digital signals:
        Radio Control, CW, PTT, FSK, PA PTT, & LNA PTT

- **Standard Sound Device - no custom drivers:**
    - The microHAM CODEC is an industry standard device recognized by
        Windows, Mac OS X and LINUX. There are no custom device drivers
        to install and no compatibility problems with your favorite applications.
    - Sound card connection for micro2R

- **Integrated control port for all radios: CI-V, FIF-232, IF-232, RS-232**
    - fully supports Elecraft, Icom, JRC, Kenwood, Ten-Tec, and Yaesu radios

- **Dual Channel Receive:**
    - supports dual receive with transceivers like the Icom 7800, Yaesu FT-9000,
        FT-5000, FT-2000, FT-1000D/MP/Mark V, Kenwood TS-2000, and Elecraft K3.
    - independent, front panel level controls for each receiver

- **Front Panel Level Adjustments:**
    - Pots for Transmit level, Main Receiver level and Sub receiver level
    - no need to fumble with Windows Mixer to control levels

- **Integrated K1EL WinKey™ chip with extended capabilities**
    - front panel speed knob
    - nine (9) user programmable memories
    - internal paddle buffer for improved reliability.
    - PS/2 keyboard support for direct CW generation.
    - PS/2 keyboard/keypad support for instant CW message playback
    - PS/2 keyboard/keypad CW work without a computer connection
    - auto PTT
    - selectable side tone
    - all parameters are stored in EEPROM and reloaded on power up

- **FSK keying output**
    - capable of sending 5/6/7/8 bits and 1/1.5/2 stop bits
    - PS/2 keyboard support for direct FSK transmission without a computer
    - PS/2 keyboard support for instant FSK message playback
    - PS/2 keyboard works without a computer connection

- **Sound card Right channel audio detector and FSK/CW driver**
    - FSK output for FLDIGI "pseudo-FSK" and cocoaModem OOK mode
    - Provides a "hard keyed" CW output for software that generates only audio (sidetone) CW

- **Independent keying buffers for Power Amplifier and LNA switching**
    - *extended range solid state output for low voltage T/R lines or QSK*
    - *relay isolated output for vintage PA with negative voltage T/R lines*
    - *Bypass LNA before activating both PTT circuits for EME or scatter*

- **Footswitch input with programmable functions**
    - *programmable PTT activation delay in 1ms steps*
    - *selectable muting of CW and/or FSK when footswitch is closed*

- **Squelch input for signaling to computer**
    - *two inputs, one is active low, second is active high*
    - *ideal for Echolink and remote interfacing applications*

- **No external power adapter (where the radio provides auxiliary power)**
    - *No noisy DC to DC converters*
    - *USB and Sound chip are powered from the computer USB port*
    - *Controller is powered from transceiver or transceiver power supply*

- **Strong immunity from RFI**
    - *integrated chokes and filters for best RFI immunity*
    - *advanced shielding and circuit design to suppress RFI generation*

- **Input/Output connectors**
    - *Computer: USB, Radio: DB15, Paddle: 6.3 mm, Sub RX: 3.5mm*
    - *Footswitch: RCA, PA PTT: RCA, LNA PTT: RCA, PTT IN: RCA,*
    - *PS/2: MiniDIN6, u2R: 2x3.5mm*

- **Metal/Aluminum case, powder coated and silk screened**
- **Free firmware/software upgrades via internet**
- **165 mm (w) x 110 mm (d) x 44 mm (h)**

2 - IMPORTANT WARNINGS

**You must set the CAT level jumpers inside the DIGI KEYER II
before using it for the first time.**

**If you power DIGI KEYER II from an external power supply ALWAYS
check the polarity of the external 13.8 V supply.**

**DO NOT use the same external power supply for DIGI KEYER II and
your transceiver unless DK II receives power from the transceiver.**

**If your radio includes upgradeable firmware,
DO NOT perform any upgrade through DIGI KEYER II.**

3 - PANEL DESCRIPTION

FRONT PANEL
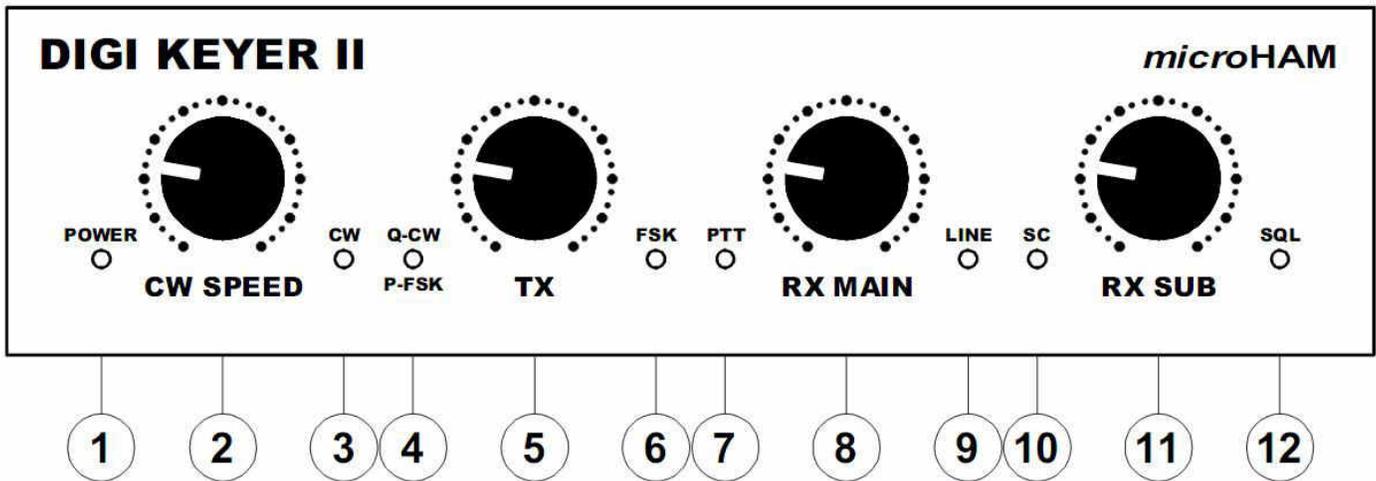
(1) – POWER
YELLOW color indicates when power is applied to the "Radio" connector.

(2) – CW SPEED
WinKey speed control. Range (MIN, MAX) is defined by software

(3) – CW
LED flashes with CW output

(4) – Q-CW/P-FSK
LED flashes with Right channel Audio output when properly configured for ON/OFF Keying

(5) – TX
Transmit Audio Level

(6) – FSK
LED flashes with FSK output. On indicates "closed" regardless of mark/space polarity.

(7) – PTT
LED lights when PTT is active

(8) – RX MAIN
Adjusts receive audio level from the main receive (left) channel.

(9) – LINE
LED lights the sound card Line input is selected and flashes when the mic input is selected.

(10) – SC
LED lights when an application opens the internal sound card for output.

(11) – RX SUB
Adjusts receive audio level from the sub- receive (right) channel.

(12) - SQL
LED light when SQUELCH is open (if supported by the transceiver)

REAR PANEL

All connectors for connecting the computer, radio and accessories are located on the rear panel.
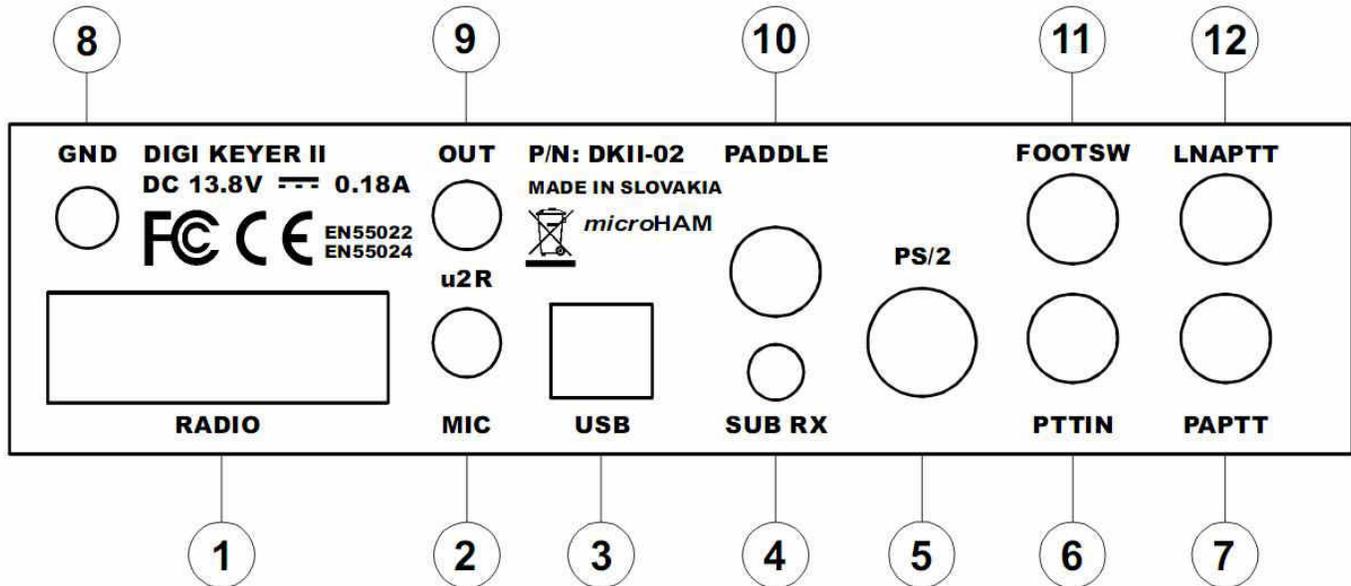
(1) RADIO: DB15F connector for radio interconnection – a detailed description is in Appendix A

(2) MIC: 3.5mm jack for microphone input from *micro2R*

(3) USB: USB B connector for computer connection. Connect the supplied USB A-B cable.

(4) SUB RX: 3.5mm jack for connecting audio from a second receiver

(5) PS/2: MiniDIN6 for PS/2 keyboard, PS/2 numeric keypad, resistive Keypad, or Aux CI-V output.

(6) PTTIN: RCA for PTT Out (Amplifier PTT) from transceiver.

(7) PA PTT: PTT output for Power Amplifier
Ground during transmit, TIP – Signal, SHELL - Ground

If the jumper is in the SS position, the switching transistor (open collector) is connected to the PA PTT jack. The transistor can switch up to 45V/0.8A. This position is appropriate for modern Power Amplifiers with electronic keying. Check the manual of your amplifier to be sure the power requirements do not exceed the transistor rating. If the requirements exceed transistor rating set the jumper to the RE position - this position connects the relay contact to the output jack. Maximum rating for the relay is: 48V AC/DC @ 1A.
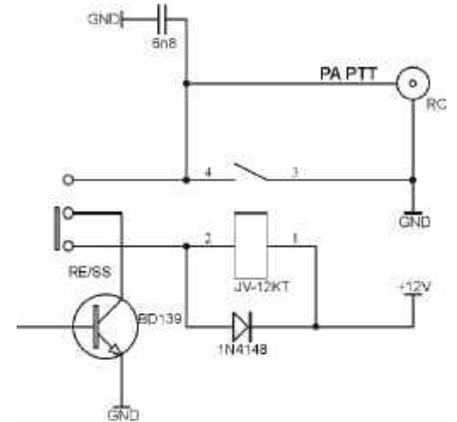
NOTE: The RE/SS labels are **REVERSED** in DIGI KEYER II.
The picture below shows jumpers in the RE position.

TIP: If you are not sure about the keying voltage of your Power Amplifier or LNA, use the RE position.

TIP: the RE/SS jumpers are located on the edge of the circuit board in front of the PA PTT and LNA PTT jacks.

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(8) GND: Terminal for connection to station ground.

(9) OUT: 3.5mm jack for output to *micro*2R

(10) PADDLE 6.3mm (1/4") stereo female for paddle input.
            TIP: DIT   RING: DAH   SLEEVE: GND
            NOTE: The paddle sense can be reversed using Router settings

(11) FOOTSW: input for optional foot switch (manual PTT)

(12) LNA PTT: PTT output for controlling Low Noise Preamplifier or Receive antenna switching.
            See PAPTT for jumper assignments and specifications.

4 - INSTALLATION

Installing DIGI KEYER II consists of several steps:
   1) prepare DIGI KEYER II to work with your radio
   2) installing the necessary driver software for your operating system
   3) configure the microHAM CODEC and USB Device Router for Windows (if applicable).

Preparing DIGI KEYER II for Use

1. Remove the top cover from DIGI KEYER II and set the CAT jumpers as shown in the following chart. The CAT interface jumpers must be configured to select the proper level for each radio type.

RS-232 levels:
    all transceivers with RS-232 CAT interfaces.
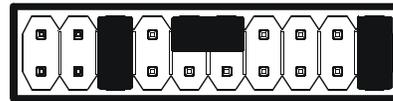
RS232

IF-232 levels:
    Kenwood: TS-140, 440, 450, 680, 690, 711, 790, 811, 850, 940, 950
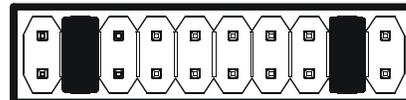
IF232

FIF-232 levels:
    Yaesu FT-100, 736, 747, 757GXII, 767, 817, 840, 857, 890, 897, 900, 980, 990, 1000, 1000D
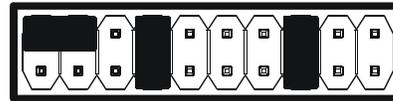
FIF232

CI-V levels:
    Icom: all transceivers
    TenTec: all transceivers with 3.5mm jack
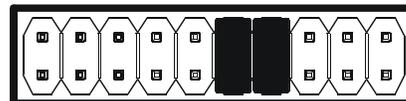
CI-V
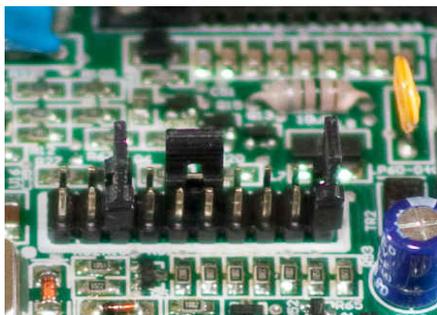
NOTE: the CAT interface is **not configured** at the factory. Jumpers are shown configured for RS232 levels.

2. For Icom transceivers, install the ICVOX jumper located behind the PTT IN jack. Otherwise, connect your transceiver PTT Out (linear) to the PTT IN jack using the appropriate cable.

3. Connect your amplifier PTT (if used) to the PA PTT jack and set the PA PTT RE/SS jumpers appropriately.

4. Connect your keyer paddles to the **PADDLE** jack.

5. If you use a foot switch, connect the foot switch to the **FOOTSW** jack.

6. Plug the DB15M on the radio cable set into the DB15 (RADIO) connector on the rear panel of DIGI KEYER II and connect each connector from the cable set to the appropriate jacks at the rear panel of your transceiver. Each connector on the radio interface cable is marked same as the matching jack on your transceiver.

**7.** If the radio cable ends with leads for external power, connect these leads to a 12-16V DC power supply. *Be sure to observe the proper polarity*.

   NOTE: *DO NOT use the same power supply as the transceiver.*

8. Locate but do not connect the USB cable from DIGI KEYER II to your computer.

   NOTE: If you will be installing on a Windows computer, skip to page 9.

Mac OS X INSTALLATION

1. Insert the microHAM CD in your CDROM/DVD drive and navigate to Drivers/OS-X or use your web browser to go to http://www.ftdichip.com/Drivers/VCP.htm and down load the latest driver image for OS-X.

2. Open FTDIUSBSerialDriver_v2_2_18.dmg by clicking on it.

3. For OS-X 10.4, 10.5 or 10.6 open FTDIUSBSerialDriver_10_4_10_5_10_6 and follow the instructions to install.

4. Plug in the USB cable

5. Turn on the radio or external power supply.

6. Follow the instructions for your software to configure the application to work with DigiKEYER II.

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MICROSOFT WINDOWS INSTALLATION
Installing *micro*HAM USB Device Router

To install Router click on the **Install USB Device Router** link on the installation CD or download the most recent installation package from the web site: www.microHAM.com/downloads.html.

If you download an updated package, right click on "urouter_release_xx_xx.exe" (xx_xx is version) and choose "Run as administrator" to start installation.

The Windows setup utility will start and ask into which folder Router and its supporting files should be installed. Note: unless you have a very strong reason to install Router elsewhere, please accept the default location.

When the Router installation is completed, click "Finish" to launch Router for the first time.   Then plug in the USB cable and proceed to configure Router for your station and software.

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Configuring *micro*HAM CODEC

Windows will automatically install the USB Audio Device driver to support the *micro*HAM CODEC in DIGI KEYER II.

Windows automatically selects any newly installed audio device as the default device for Sound Playback and Sound recording. This is undesirable as Windows Sounds would be played through DIGI KEYER II and onto the air!
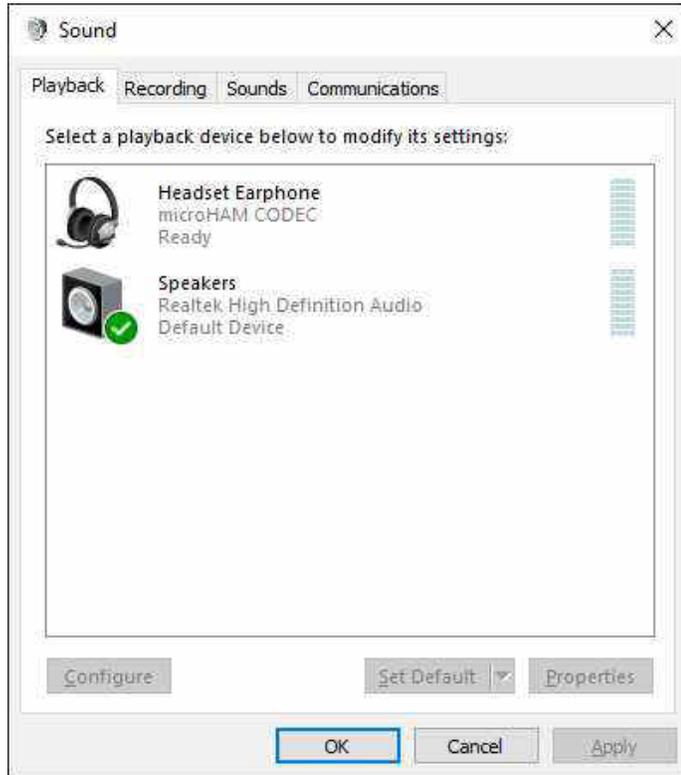
Open "Sound" in the Control Panel or right click on the Speaker icon on the Taskbar and select "Playback." Reset the Default device for Sound Playback to Speakers of your computer's primary sound device. Reset the Default Communications Device (if it is shown) to Speakers of your computer's primary sound device.
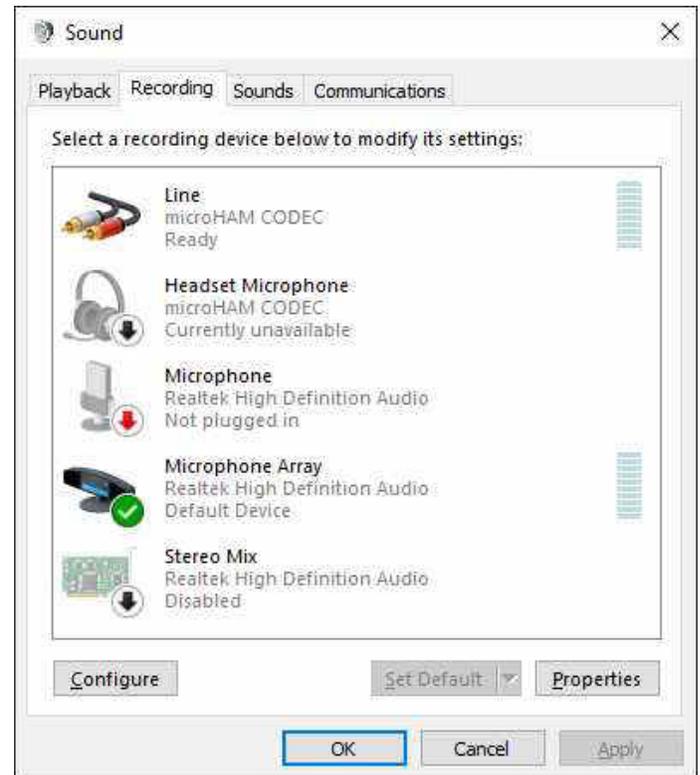
Select "Recording." Reset Default Device and Default Communications Device to an input on the internal (primary) sound card in your computer. Reset the Default Communications Device (if it is shown) to an input on your computer's primary sound device.

Unless you are installing Digikeyer II with *micro*HAM micro2R, right click on "Headset Microphone (microHAM CODEC)" and select Disable.

Double click on "Line" microHAM CODEC device, click on Advanced tab and verify that Default Format is set to 2 channel.

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Configuring *micro*HAM USB Device Router

The microHAM USB Device Router (Router) program provides a Windows compatible *configuration tool* for *micro*HAM USB Devices and *software interface* to other Windows applications (loggers, digital mode software, etc.). The software interface is provided as *Virtual Serial Ports.*

To configure and use DIGI KEYER II with Windows compatible application programs it is necessary to have installed the USB driver, started the Router, and applied power to DIGI KEYER II by turning on the attached radio or external power supply. Router is then configured to match the requirements of the application (logger or digital mode) software.

DIGI KEYER II Status

When the USB driver is installed correctly and DK II is powered from a radio or external 12V DC supply Router will show a device tab with a   GREEN check beside the device name.

When Router shows a YELLOW "X" instead of a green ✓, it means the USB driver is correctly installed but DK II is not receiving power from the radio or external supply.

When Router shows a RED "X" instead of a green ✓, it means the device is disconnected and Router does not see the USB part of DK II.

This happens when the USB cable is unplugged or the USB driver is not correctly installed.

Initial Setup

Router must be used to configure DK II for proper operation. The device configuration tabs are used to setup each part of the DK II – virtual ports for communicating with the application (Ports), audio levels, PTT, WinKeyer, keyboard operation, stored CW/FSK messages and System configuration.

Creating and Using Virtual Serial Ports

microHAM Router provides a set of virtual serial ports which allow Windows applications (loggers and digital software) to work with DK II just as they would work with "real" (hardware) serial ports.

In order to use these virtual Ports, you must first create the ports and then assign a function (radio control, PTT, CW, FSK, etc.) to each virtual port.

DO NOT define a port that is already in use (for example, COM1 or COM2 which are hardware ports on many motherboards) or a virtual port used by another USB device. Even though Router will not allow using a COM port number which is already present in the system (like hardware COM ports or internal modems), sometimes these ports are hidden. If a device which also uses virtual serial ports (external USB devices, bluetooth devices, mobile phones, PDA etc ...) is not connected to the computer when creating virtual ports in Router, the ports can overlap and will not work properly when you connect such device.

<u>**IMPORTANT WARNING:**</u> Before you start creating virtual COM ports, attach all external devices you use with the computer and allow them to connect to the system. Restart Router and then create the virtual COM ports.

Virtual ports are created from the Virtual Port menu.

Create - Creates virtual COM ports. It is possible to select more than one port at a time by holding the *Ctrl* key on keyboard and clicking on COM port numbers. Creating virtual ports may take a long time (several tens of seconds), be patient.

Delete - Deletes any single virtual port.

Delete All - Deletes all previously created virtual ports.

Do not delete a virtual port until all applications using that port have been closed.
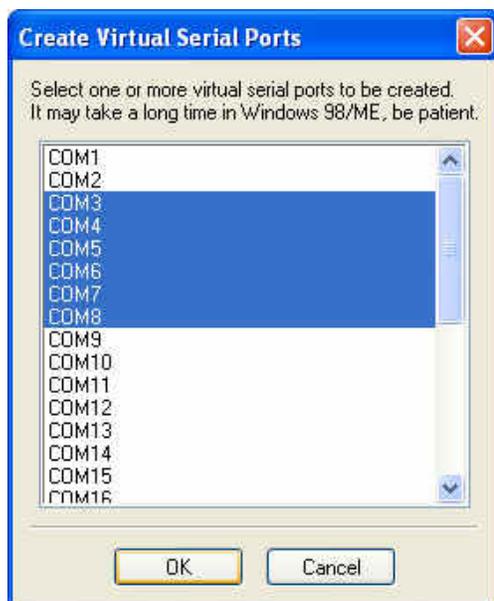
TIP: It is possible to select multiple ports at one time by holding *Control* key on keyboard and clicking on the COM port numbers.

TIP: If you have uninstalled another device which used virtual ports and Router does not offer the released COM port number, you will need to reset the virtual port bus. You can do this by deleting all the virtual ports at once. Select "Virtual Port | Delete All" and create the ports again. Any missing port number should appear.

TIP: Do not create more virtual ports than your applications require. Extra ports only tie up system resources and make Router load more slowly.

5 - *micro*HAM USB DEVICE ROUTER
ROUTER MENU

Default Router Settings: used to completely reset Router to factory (default) settings.
"Default" removes all device tabs and deletes all stored configuration data, including all user presets. from the Windows Registry.

TIP: DK II can be reset to the factory configuration by selecting **Default Router Settings** followed by **Device | Store as Power-up Settings** to save the defaults to the keyer's memory.

Restore Router Settings: used to restore settings from a _urs_ file created by the backup command.
A _urs_ file can be used only with the device for which it was generated (the file contains the unit serial number) on a computer with same port assignments.

WARNING: Restoring a backup replaces all current Router settings including presets, **use it carefully!**

Backup Router Settings: used to create backup _urs_ file.
This file contains Router settings (including Presets) for all devices defined in Router.

Options | General
- *Load Router on Start-up:* when checked, Router will start automatically each time the computer is started or rebooted.
- *Start Router Minimized:* when checked, Router will started minimized

Options | Band Map: - Does not apply to DIGI KEYER II -
Customizable band edge boundaries used to drive the band data output. BCD codes can be customized for driving antenna switches or bandpass filter control.

Options | Digital Band Map: - Does not apply to DIGI KEYER II -
Customizable band boundaries for the digital mode operation. These settings are used for the (optional) automatic selection of audio switching and PTT mode based on operating frequency. Careful selection of the "Digital band" is necessary for transceivers which do not have a special mode for AFSK operation or do not report the mode in the computer command set. This primarily effects Kenwood and TenTec transceivers although it applies to some older Icom and Yaesu radios.

Options | Audio Devices:
- *Don't use audio devices:* when checked, Router does not use audio devices and the settings on the Audio Mixer and DVK tabs have no effect.
- *Manually* **assign audio devices:** when checked, Router will allow the user to select audio devices (sound card) in the appropriate fields at Audio Mixer tab and will actively control the audio devices
- *Automatically* **assign microHAM audio devices:** when checked, Router will automatically assign proper audio device of the same name if multiple microHAM interfaces of the same kind are connected to the one computer.

Options | DVK: - DVK is not supported by DIGI KEYER II -
- *Voice message time limit:* maximum time for each voice message up to 120 seconds.
- *Sample rate:* sampling frequency used during recording and playback of voice messages.
- *Sample size:* sampling size used during recording of voice messages. Sampling size primarily effects audio quality of the messages. 16bit samples provide higher quality than 8bit.

Options | USB:
- *Noise immunity:* selects how many times an undelivered USB packet will be repeated before the USB device is disconnected from the operating system.
- *Response time:* selects how long the USB chip in a device will wait for additional data before sending data to the operating system.

Minimize: Clicking this will minimize Router to the system tray at the bottom right corner of the Windows Taskbar (the "System Notification Area").

TIP: When Router is minimized you can restore it by double-clicking on the Router tray icon.   You can also restore Router by double-clicking on the Router icon on the desktop or restarting Router from the Programs menu.

Exit: Clicking on this item will terminate Router.

> **NOTE:** when Router is terminated, application software will be unable to communicate with DIGI KEYER II and the radio.

PRESET MENU

The requirements of each program are different and each one may handle radio control, CW and PTT in its own way. In some cases what works for one application may not work properly with another. To get maximum performance from CW Keyer, you may wish to customize the settings for each application.

For easy switching among applications, Router supports up to 12 user definable **Presets**. Different configurations can be stored in these presets and recalled almost instantly simply by clicking on the preset button.

Each preset contains the settings for all devices connected to, and controlled by, Router. For example, if Router controls a *micro*KEYER, a DIGI KEYER II and a USB Interface, each preset remembers the settings for all devices including the assignment of COM ports and the contents of all sub-tabs except the FSK/CW Messages and DVK tabs.

> **NOTE:** Presets do not appear until they have been saved by the user using Preset | Save as. Example configurations for several popular loggin and digital programs are availble in Router's Help menu. Use "Help | Download Documents" if the setup guides are not available or are incomplete.

There are three ways to apply a preset once it is created:

1. Click on **Preset** and select the desired preset from the pull-down menu.

2. Click on a preset button. To have buttons visible in Router, **Preset | Show Buttons** must be checked. When the settings from a preset are applied, a green light located in the preset button is lit. This green light is on ONLY when all settings in Router are same as those stored in the preset.

**3.** By right clicking on the system tray icon when the Router is minimized.

The presets and the current router configuration are stored to the registry when Router is closed and recalled when Router is loaded.

Save as - Saves the current Router settings to a preset for future use.

Rename - Allows renaming of an existing preset.

Delete - Delete chosen preset.

**Show buttons** - When checked, Router shows the preset buttons.
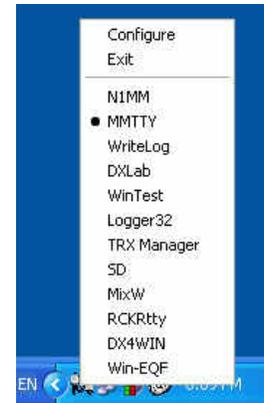
DEVICE MENU

Router can control several devices. This allows configuring the settings for all connected devices at one time by using the Presets.

Each device has its own tab (page) in the main Router notebook. The content of a device tab depends on device type. Adding a device is automatic the first time Router detects a supported device (USB driver). Once detected, a device remains in Router even though device is disconnected. Each device is identified by product identification number and a unique serial string.

Rename – Creates a custom device name. This is useful if two or more devices are connected to the Router. For example CW KEYER, micro Keyer and USB Interface II can be renamed to more identifiable names as shown here..
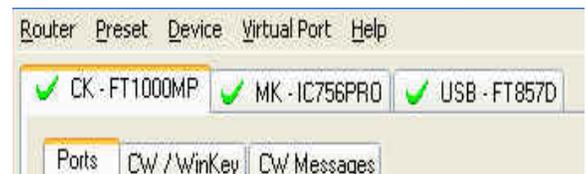
Delete - Removes a device from the Router. Only disconnected devices (those with a **RED** **"X"** on the device tab) can be removed. To disconnect a device from Router, unplug the USB cable from the computer or device.

Save Template - will save the current Router settings to template file.
>   When clicked, Router will open a standard File Save dialog window – the default location is *C:\Documents and Settings\All Users\Application Data\microHAM\cfg.* If a hypertext (*html)* or plain text (*txt)* documentation file of the same name as the template is present in the same directory, it will be associated with the template.

Load Template – will automatically configure Router from a template (*.*tpl* file).
>   When clicked, Router will open a standard File dialog – the default location is: *C:\Documents and Settings\All Users\Application Data\microHAM\cfg* - and the desired template can be chosen. When Router loads a template, it looks for an *html* or *txt* file with the same name as the template in the same directory. If such file is found, it is displayed.

>   **TIP:** Templates are a powerful tool for quickly configuring Router to work with a particular application. Template files are interchangeable between computers and are well suited for cloning setups when using the same application in multi-computer stations or for sharing custom setups between users.

Upload Firmware: *micro*HAM will occasionally release updates to the firmware in DIGI KEYER II. The update may support news feature in Router or improve application compatibility. The recent public

version of the firmware is always available from www.microHAM.com/downloads.html.

To update firmware, download the firmware file to your computer, then click on **Device | Upload Firmware.** A Windows file dialog will open; navigate to the directory into which you downloaded the firmware file and select the file.

TIP: When you upgrade Router, the upgrade will include the latest firmware file. The new firmware will be automatically uploaded to DIGI KEYER II when the new version of Router connects for the first time, you have just to allow the upgrade when prompted.

VIRTUAL PORT MENU

It is necessary to create several virtual serial ports (COM ports) in order for a Windows application (logging, control or digital mode program) to access microHAM devices.
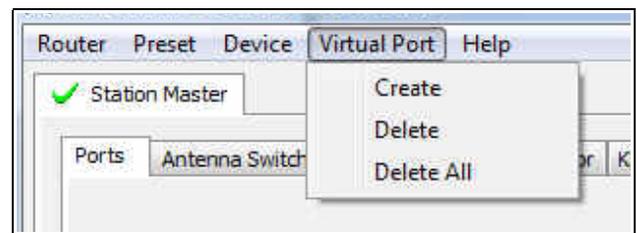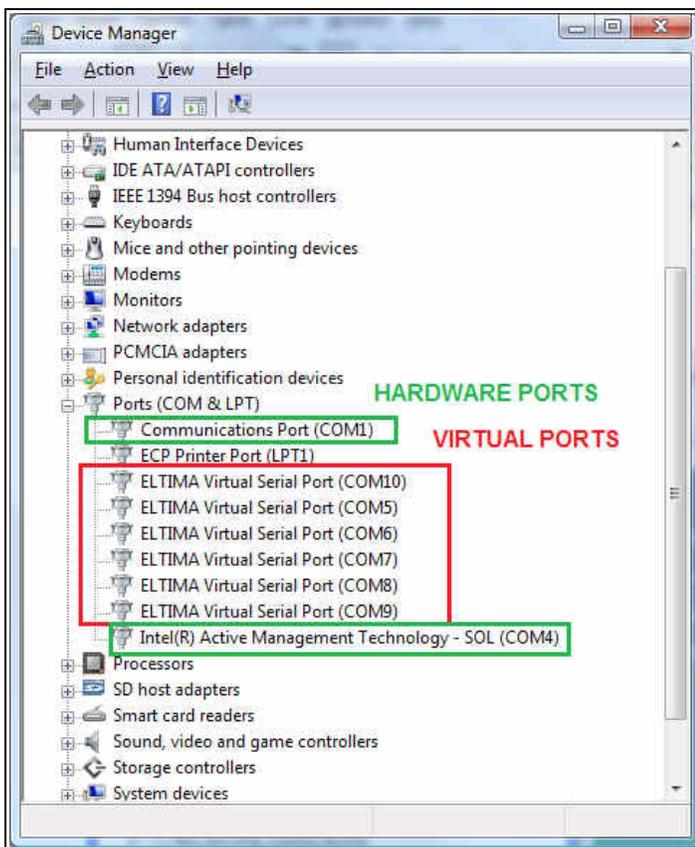
Create - Creates virtual COM ports. It is possible to select several ports at one time by holding the *Ctrl* key on the keyboard and clicking on COM port numbers. Creating a virtual port may take a while, be patient.

Delete - Deletes any single virtual port.

Delete All - Deletes all previously created virtual ports and resets Virtual Serial Port bus.

Do not delete a virtual port unless all applications using that port have been closed.

Virtual Serial Ports can be reviewed in Device Manager, under the ELTIMA folder.

NOTE: Properly working ports should not display an exclamation mark (!).

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HELP MENU

Manuals: Link to microHAM manuals located on your system.

Setup Guides: Link to software configuration guides for many common applications.

Cable Schematics: Link to cable diagrams.

Download Documents: Downloads microHAM documentation including updated manuals and setup guides. You may specify the products for which you want documentation.

> **NOTE: Download Documents** requires an Internet connection.

microHAM Home Page: Link to www.microHAM.com

microHAM Downloads Page: Link to www.microham.com/contents/en-us/d29.html

Show Tooltips: When checked, small, single line help is displayed below the mouse cursor.

Update Router: Download and install the most recent version of Router.

About: Shows the Router's internal version number

Change logs: Shows the Router and firmware changes.

DEVICE CONFIGURATION TABS

There are nine (9) tabs for configuring DIGI KEYER II. Each tab controls a part of the device functions. Any change is applied immediately to DIGI KEYER II. Changes in Messages are NOT applied automatically. To store them use buttons **Store** or **Store All**.

Ports - used to assign virtual ports to the DIGI KEYER II for use by applications.

Audio - used to configure on-off keying decoders (Q-CW/P-FSK) and CW side tone.

Audio Mixer – duplicates the Windows Mixer for DK II in Windows XP and 2000 only.

PTT – used to configure PTT outputs, timing and sequencer.

CW / WinKey – controls WinKey settings.

CW & FSK Messages – used to store and edit CW or FSK messages.

Keyboard - used to configure the optional PS/2 keyboard or Keypad.

System Settings – used to configure the optional Auxiliary CI-V output.

Ports Tab

Once the virtual ports have been created they must be associated with a specific device channel (e.g., Control, CW, PTT, etc.). These assignments should correspond to settings of the application software and must be configured first in Router then in the application (e.g., logging program, MMTTY, MixW, etc.).

Proper configuration of the port assignments in this tab is critical for integration with logging and digital mode softwre. Read the following information carefully.

DIGI KEYER II has eleven functions with indication of the state and settings applied by the host application

- **CAT** (uses RxD and TxD)
- **2nd CAT** (virtual "fork" for the main CAT channel)
- **FSK** (uses TxD and optionally RTS/DTR for PTT)
- **2nd FSK** (uses TxD and optionally RTS/DTR for PTT)
- **CW** (uses DTR or RTS)
- **PTT** (uses DTR or RTS)
- **2nd PTT** (uses DTR or RTS)
- **Foot Switch** (uses CTS, DCD, DSR or RING)
- **Squelch** (uses CTS, DCD, DSR or RING)
- **WinKey** (uses RxD and TxD)
- **Control** (uses RxD and TxD)

General note: Do not assign virtual ports to those functions which are not used by the application. It is unnecessary and only consumes resources.

CAT PORT & 2nd CAT PORT

The CAT channel is used by application software to control transceiver frequency, mode, T/R switching and many other parameters using a serial (CAT) protocol. Most modern radios implement some form of CAT but almost every radio implementation is different. The functions controlled by the computer depend on the particular application and radio.

> **NOTE:** The port number assigned in Router MUST match the port number assigned in the host application. First configure the virtual COM ports in Router then configure the application.

When a COM port is assigned in the Router but not in the application (or the application is not running) Router will indicate the channel is **closed**.

When an application opens the COM port assigned for control (usually at start-up), Router shows the channel as **open** and displays baud rate, data bits, parity and number of stop bits used by the application. For example, 4800 8N2 means: 4800 baud, 8 bits data length, parity = none, and two stop bits.

Data flowing through the CAT channel is indicated by two arrows. A green arrow indicates data flow from the application to the radio and a red arrow indicates data flow from the radio to the application.

> **TIP:** If the application provides for PTT (T/R) keying by radio control (CAT) turn this function OFF. PTT by CAT is not reliable because RFI can prevent the radio from switching back to receive. There is a dedicated T/R switching channel for this purpose called PTT.

> **NOTE:** If your radio does not support handshake (most do not). Configure DTR and RTS settings in your application program (logger) for Always On or Always Off. Do not select "Handshake."

For Router to determine the operating frequency and mode, it must know what radio (CAT protocol) being used. To select the radio, click the **Set** button, choose your radio in the **Radio** combo box, select communication speed in the **Baud rate** box, and set the CI-V address for Icom and some TenTec radios.

> **TIP:** Disable the Autobaud function in any Icom Radio used with Router. Configure the radio, Router, and your application software to operate at 9600 or 19200 baud.

Disable router queries – When this box checked, Router will not poll the radio for frequency and mode when that information is not available from the communication between the application and radio.

> **NOTE:** "Disable router queries" disables Router polling only when the port has been opened by an application program. When the virtual port is closed, Router always polls the radio to support the automatic switching functions of DIGI KEYER II. If it is necessary to disable all polling, select one of the "none" options in the Radio box.

WARNING: DO NOT select "Disable Router queries" unless you have a specific reason to do so. Router only polls for information that is not requested by the logger and does not interfere with logger polling. Disabling Router queries may result in incorrect frequency and/or mode decoding and can have a serious impact on overall operation.

PW1 on radio bus – When this box checked, Router periodically generates an Icom "CI-V Transceive" broadcast to keep the PW1 synchronized.

> **NOTE:** Check this box **only** if you have an IC-PW1 or other Icom compatible accessory physically connected in parallel with the transceiver. Do not check this box if the only connection is to the transceiver and the PW1 or other other accessory is connected to the accessory CI-V port (described later).

Tracking:

> **Tracking:** This function allows SDR oftware to track the transceiver attached to DK II.

> **NOTE:** For specific information, please refer to Appendix C.

The bottom two-thirds of the **Radio** window is a serial communication monitor. The monitor uses colors and tags to indicate which device is responsible for the data. Black queries (H1-TX or H2-TX) and gray radio responses (H1-RX or H2-TX) are from the "host" application (e.g., logger), H1 indicates the host application on the main CAT port, H2 is the host application on the 2nd CAT port. Green packets (R-TX and R-RX) are polls/responses from/to Router and not routed to the application.

Router monitors the communication when the host application performs control and polls the radio periodically for any missing information (VFO frequencies and mode). Because some applications do not poll the radio regularly or completely, Router must break this communication to update its internal state. In order to avoid confusing the application when Router polls the radio, data from the application is buffered and sent to the radio after Router receives a response to its query. If Router does not receive response to a poll within the time allowed or does not understand the response, it displays "oldest query discarded" but forwards all data to the virtual serial port to avoid confusing the application (logger).

Since USB transmits data in frames with a delay between frames, Router indicates frame boundaries with three dots (...). When a packet ends with three dots it means that the data continues in the next frame.

2nd CAT PORT

Beginning with version 7.0, Router provides unique control capability: the 2nd CAT Port is an intelligent data fork (software 'Y' connector) that allows a second application to share control of the radio. Router monitors when data is sent from each application and routes the radio's responses to the correct virtual port.

> **IMPORTANT:** Both applications must use same communication parameters (baud rate, data length, parity and number of stop bits) for proper operation!

Neither CAT port has priority. Polls/commands from the application are processed alternately. In order to avoid collisions and confusion due to unexpected data, responses from the radio are returned only to the application that generated the command. Unsolicited data such as automatic frequency/mode updates (Icom "transceive" packets or "Auto-information" data from Kenwood, Elecraft and recent Yaesu transceivers) is forwarded to both CAT ports.

Due to physical limitation of data channel throughput and the controller capabilities in various transceivers, there are several important rules which must be observed.

- Combined data from both applications must not exceed maximum throughput of the radio control port and transceiver controller. In other words, the polling rate from one application may need to be decreased to provide data space for the second application and vice versa.

- Applications must be tolerant of delayed responses from the radio. Each application must wait for the radio to respond when the another application is communicating with the radio.

- Due to protocol deficiencies in handling VFO split commands with many transceivers (particularly Icom), split mode must be initiated and ended by only one application and manual split control (from the front panel of the radio) should not be used.

> **NOTE:** Despite extensive testing using various combinations of applications for the CAT and 2nd CAT ports, *micro*HAM cannot guarantee proper operation with every potential combination of applications.

FSK & 2nd FSK PORTS

The FSK channel is used by the application program to send the FSK keying signal. FSK is used primarily for RTTY. It is very important to understand the difference between FSK and AFSK.

FSK is a digital (On/Off) signal from the computer serial port (or an external modem). This signal is used in the transceiver to generate a frequency shift. FSK must be supported by the transceiver (this mode is commonly labeled RTTY or FSK).

AFSK is a analog (audio) signal generated by the computer sound card (or external modem) used in the transceiver modulation circuits for operating digital modes as RTTY, PSK31, AMTOR etc. Computer sound card generated AFSK or PSK does not require special transceiver support and can be used in the LSB, USB or FM mode of the transceiver. Some radios have dedicated modes for AFSK (generally labeled PKT or DATA) with special features.

> *It is very important to properly adjust the audio drive level of an AFSK system so as to not overdrive the first transmit audio amplifier stage in the transceiver and produce a wide, distorted signal, full of intermodulation products. It is important to appreciate that distortion generated at this point due to overdrive CANNOT be reduced or eliminated by the reduction of the microphone gain control – it is the signal level that must be adjusted to be about the same as would be expected from a microphone. The microphone gain control then becomes a form of transmit power control.*

> *An initial indication of proper audio drive level can be seen on the ALC meter of the radio. Provided that there is NO audio processing in circuit and that the microphone gain control is in its normal operating position, then, if the ALC does not show or just starts to indicate during transmission, the signal is likely to be clean. It is also important is to turn off the microphone compressor, ANY transmit audio equalizer, AND transmit DSP when AFSK is used. DO NOT use any form of digital modulation (sometimes called "Transmit DSP") with AFSK or PSK. Some transceivers bypass these circuits automatically when signal is routed to the rear audio jack instead of the microphone jack, but some do not (for example, the TS-850).*

> *Edited by Geoff Anderson, G3NPA*

TIP: If your transceiver supports FSK use it for RTTY whenever possible. In many transceivers RTTY (FSK) mode provides improved receiver filtering and is the only way to guarantee a clean RTTY signal no matter how the microphone gain or compressor (processor) is set on your transceiver.

When a COM port is assigned in Router but not in the application program (or the application is not running), Router will indicate the channel is **closed**.

When an application opens the COM port, Router will indicate the channel is **open** and display baud rate, number of data bits, parity and number of stop bits in use. For example, 45 5N1.5 means: 45 Baud, 5 data bits, no parity, 1.5 stop bits.

The second FSK port is useful when operating split with radios that have two receivers (e.g., FT-1000, FT-2000, FT-9000, K3, Orion or IC-7800). The second instance of the RTTY program should specify "right channel" for its audio source and should be configured to use the 2nd FSK port for its FSK output.

Radios without a second receiver can use the 2nd FSK port for a second RTTY program with a different decoding algorithm to provide diversity decoding and transmit from either program.

TIP: If you see a baud rate other than 45.5 baud (e.g., 4800 or 9600), the application is NOT configured correctly for FSK RTTY operation.

PTT: The virtual port used for FSK can also support PTT (required by MMTTY). When you use MMTTY, select the PTT box and RTS will used for PTT. Do not use the FSK port for any other function.

Invert: Some transceivers lack the ability to set the sense of the FSK input. If you cannot set the proper sense, check the invert box. This is normally necessary only with the TenTec Omni V, Omni VI and Kenwood TS-940.

Strict bps: Some programs rely on the the FSK port for proper PTT timing; they drop PTT (unkey) when the FSK port buffer is empty. With virtual ports, this may cause PTT to drop before the contents of a message (macro) are complete. 'Strict bps' disables the virtual port buffering and transmits one character at a time to the output. Due to the additional overhead, FSK output will be slightly slower but operation will be more reliable.

To test FSK operation from the computer to the radio, click on **Test** button with no port assigned or the port closed. The Test button will generate "RY" two times.

CW PORT

By its very nature, USB is not well suited to transfer the real time events required for CW keying. In addition to the latency inherent in the USB protocol, delays due to CPU load, internal Windows message processing (inter-process communication) and data flow from another peripherals sharing same the USB root hub can result in transmitted characters that are garbled. To minimize these unwanted operating system effects Router uses a specially developed oversampling and prediction algorithm to assure the smoothest possible transfer of control signal events over USB. Using these techniques, CW keying in the Router is, in most cases, usable up to 50 WPM if the application generates keying signals accurately and does not consume 100% of CPU time at the highest priority class.

Router allows assigning a virtual serial port for software CW using DTR or RTS signals. The DTR* and RTS* are identical to DTR/RTS except that the output is inhibited for one second after the COM port is opened. RTS*/DTR* should only be used with programs that cause unwanted key-ups during startup.

TIP: More applications use DTR for CW than RTS.

When an application opens the COM port (usually at start-up), Router will indicate the channel is **open.**

The state of the CW channel is indicated by a red arrow. If port is opened, it does not mean that it is properly configured. The red arrow will light in time with the transmitted CW when the port is properly configured.

To test CW operation, click on the **Test** button with no port assigned or the port closed.

PTT & 2ⁿᵈ PTT PORTS

The PTT channel is used for T/R switching of the transceiver, Power Amplifier and Low Noise Preamplifier (LNA). An internal T/R sequencer assures 100% protection against transmitting through the LNA or hot switching of the PA when the PTT channel is used for T/R switching. More information about T/R switching, DIGI KEYER II PTT outputs and the sequencer is provided under the Keying Tab (page 21).

Router allows assigning virtual serial ports for PTT using the DTR or RTS signals. DTR* and RTS* are identical to DTR/RTS except that the output is inhibited for one second after the COM port is opened and . should only be used with programs that cause unwanted key-ups during startup.

TIP: More applications use RTS for PTT than DTR**.**

The state of the PTT channel is indicated by a green arrow. If the port is opened, it does not mean it is properly configured. When the port is properly configured, the arrow will light during the entire transmission. To test PTT operation, click on the **Test** button with no port assigned or the port closed.

The 2ⁿᵈ PTT channel is identical to the primary PTT channel. 2ⁿᵈ PTT provides a way for a second application to key the radio if the primary application also controls PTT – for example, a logging program and CW reader/keyboard.

TIP: Always use serial PTT instead of the radio command PTT or VOX. It is the only way to assure proper sequencing of a Power Amplifier, LNA, or receive antenna switch.

To test PTT, click on the **Test** button with no port assigned or the port closed.

FOOT SWITCH

Even though many applications do not monitor the status of the foot switch and do not have the ability to perform specific functions base on closing or releasing the foot switch, we have decided to implement this feature to the Router. Hopefully sometime soon applications will be able to detect the foot switch status and use this this information for automating user functions like in the DOS based TRLog.

Router allows assigning a virtual serial port to the foot switch channel and selecting one of four available input control lines (CTS, DCD, DSR or RING).

NOTE: CTS is not available if the foot switch channel is shared with the radio control port. The state of the signal on the virtual port can be inverted by checking **inverted** box.

When a COM port is assigned for the foot switch but the application does not support foot switch status (or no application is running), Router reports the channel as **closed**.

When an application opens the COM port (usually at start-up), Router reports channel as **open.**

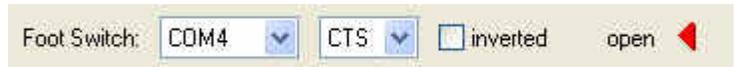When the foot switch is pressed, this state is indicated by a red arrow.

SQUELCH PORT

Even though most applications do not monitor the squelch and do not have the ability to perform specific functions based on its status, we have decided to include this feature in Router. Perhaps someday applications will be able to detect the squelch and use this information for automated functions like audio recording.

Router allows assigning a virtual serial port to squelch as CTS, DSR, DCD or RING.

When a COM port is assigned to the squelch channel in Router but not in the application (or no application is running), Router shows the channel as **closed**.

When an application opens the COM port (usually at start-up), Router shows channel as **open.**

When squelch is closed, this state is indicated by a red arrow.

WinKey PORT

WinKey is a unique external CW processor developed by Steve Elliot, K1EL. This CW processor supports paddle input like any other electronic keyer, offers many configuration options, and in addition converts ASCII data from the computer to Morse characters. This unique property assures perfectly timed CW output from the computer regardless of OS load. More detailed instruction for configuring WinKey is found in the description of the CW/WinKey tab.

When a COM port is assigned to WinKey in Router but not in the application program (or no application is running), Router reports the port **closed**.

When an application opens WinKey, (usually at start-up), Router shows the port **open** and displays settings used to configure COM port.

TIP: If you see settings other than 1200 8N#, the application is not configured correctly for WinKey. If the data rate is incorrect, Router will transfer data to to Winkey at 1200 baud. However, reliable operation is not guaranteed.

Data flow is indicated by two arrows. The green arrow indicates data flow from the application to WinKey and the red arrow indicates data flow from WinKey to the host application.

Test: Sends "Test" via Winkey when the channel unassigned or closed.

Mon: "WinKey Monitor" allows capturing communications between Router or the application and WinKey. Controls for the monitor include **Start, Stop, Clear** and **Save**.

WinKey Monitor should not be used under normal conditions. However, if there are problems with WinKey and a logger, it may be useful to **Start** a capture and close the window. When a problem is noticed, the window can be opened and the WK communications log **Saved** for analysis.

WinKey Monitor is circular – only the last 20 kilobytes or so will be saved in order to prevent creating very large files.

WK Monitor will display a description of each command from Router or the application and "decoded" response from WinKey. " If a line ends in three dots (...) it means that the command or response has been broken across two USB packets.

CONTROL PORT

The Control Port allows an application program (logger) that implements the microHAM Control Protocol to make use of DIGIKEYER II's CW and FSK message memories

When an application opens the control port, Router reports port as **open** and displays settings used to configure COM port.

Data flowing through the channel are indicated by two arrows. The green arrow indicates data flow from the application and a red arrow indicates data to the host application.

Mon: Opens a "Control Protocol Monitor" window to capture microHAM Protocol communications between a logger and Router. Controls for the monitor include **Start, Stop, Clear** and **Save**.

The Control Protocol Monitor should not be needed under normal conditions. However, if there are problems with a particular logger, it may be useful to **Start** a capture and close the window. When a problem is noticed, the window can be opened and the Control protocol log **Saved** for analysis.

The monitor log is circular – only the last 20 kilobytes or so will be saved in order to prevent creating very large files.

AUDIO TAB

In addition to providing for basic "Line Out" audio for digital mode operations, DIGI KEYER II has expanded capabilities to support the *microHAM* micro2R two radio controller and the special on/off keying modes (p-FSK and q-CW) of fldigi by W1HKJ. These enhanced capabilities are controlled from the Audio tab.

Use Q-CW: connects the right channel tone decoder to the CW output to allow audio tones to be used for "hard keyed" CW. This permits CW decoding software that only generates audio output to be used with the CW function in most rigs.

Use P-FSK: connects the right channel tone decoder to the FSK output. This allows the on/off keyed tone generated by fldigi to be used with the normal "RTTY" (FSK) mode of most rigs.

Sound Card: Displays the Mixer ID, Wave In ID and Wave Out ID for each input/output.

Side Tone: DIGI KEYER II includes an internal piezeo speaker for sidetone. The sidetone frequency can be selected from 338, 450, 675 and 1350 Hz. Sidetone can be enabled for all CW output or only manual (paddle) input.

PTT TAB

DIGI KEYER II has three (3) PTT outputs: PTT, PA PTT and LNA PTT. PTT is brought out to the DB15 Radio connector. PA PTT and LNA PTT are available on RCA connectors at the DIGI KEYER II rear panel.

PTT is normally wired to the radio Accessory jack and is used to switch the radio into transmit.

PA PTT is present at the DIGI KEYER II rear panel RCA jack and is designed for switching a power amplifier. PA PTT is enabled by checking the **PA PTT** box.

PA PTT will close before transceiver PTT by the time selected for PTT Lead tail and will open at the same time as the transceiver PTT.

LNA PTT is present at the DIGI KEYER II rear panel RCA jack and is designed for switching (bypassing) a low noise preamplifier (LNA) during transmit. LNA PTT is enabled by checking the **LNA PTT** box.

LNA PTT will close before the transceiver PTT by the time selected for PTT Lead and and will open after the transceiver PTT by the time selected for LNA PTT Tail.

PTT output generally follows the PTT inputs (PTT port, PTT In, Soundcard PTT and WinKey PTT). However, PTT behavior is configurable in CW Mode.   CW options are: PTT (normal operation), QSK (no transceiver PTT, PA PTT has no release delay), and Semi Break-in (no transceiver PTT, PA PTT includes release delay).

Sound card PTT: Enables automatic PTT when the sound card has been "opened" for output by the operating system.

PA PTT tail: delay between release of transceiver PTT and PA PTT.

LNA PTT tail: delay between release of transceiver PTT and PA PTT.

Invert: when checked, LNA PTT sense is reversed (closed in receive).

PTT lead: delay between closing PA PTT/LNA PTT and Transceiver PTT/CW output.

R/T delay: Defines the transceiver switching time from receive to transmit if PTT signal is issued at the beginning of the switching sequence.

PTT tail: how long the transceiver PTT is remains closed following the last CW element. PTT tail can be a fixed length from 10 to 2500 ms or proportional to the CW Speed.

FOOTSWITCH SEQUENCER

Additional functions can be associated with the footswitch. DIGI KEYER II recognizes when the footswitch is closed (pressed) or open (released) and can manipulate CW, FSK, and PTT.

Mute serial CW - if checked, serial CW (DTR or RTS) from an application program will be muted while the foot switch is pressed. If **Restore serial CW** is checked, CW will resume when the foot switch is released. If **Restore serial CW** is not checked, application generated CW will remain suppressed until the application releases PTT.

Mute serial FSK - if checked, the FSK ports will be blocked while the foot switch is pressed. If **Restore serial FSK** is checked, FSK will resume when the foot switch is released. If **Restore serial FSK** is not checked, FSK will remain suppressed until the application releases PTT.

CW / WinKey TAB

This tab provides the configuration for the WinKey based, internal CW keyer. A complete WinKey manual can be downloaded from: http://k1el.tripod.com/docfiles.html. Thanks to Steve Elliott, K1EL for this great product.

WinKey can be controlled by a logging program or operate in stand alone mode controlled by Router. Router controls the speed range, Paddle mode and other timing characteristics of WinKey. When an application opens WinKey, all buffer handling and speed changes are strictly under application control.

When WinKey is closed, the basic operating parameters can be adjusted on this tab. Every change is applied immediately.

Paddle Mode
- Iambic A (Curtis)
- Iambic B (Accu-keyer)
- Ultimatic (Single lever)
- Bug Keyer
    (Vibroplex emulation)

Priority – Ultimatic mode offers a choice if DIT or DAH priority for dual lever paddles. If no priority is selected, the keyer works in a "last paddle wins" mode.

Paddle set point - controls when WinKey begins looking for a new paddle press after sensing the current one. The default value is one dit time (50) and is adjustable in percent of a dit time.

Disable paddle memory – When checked, DIT (or DAH) insertion is disabled.

Swap paddles - Reverse paddle sense for left handed operation or improperly wired paddle.

Auto space - Keyer generates automatic character space.

CT space - Selects "contest" word space (six elements long instead of seven).

Speed pot min/max - Min/Max value of the front panel speed knob (9) in range 5 to 99 WPM.

Farnsworth speed – Sets the Farnsworth keying speed (10 to 99 WPM range, 0 disables this feature).

DIT / DAH - DIT/DAH ratio from 1:2 to 1:4 in hundreds. Accepted numbers are from 200 to 400.

Weighting - Weighting in percentage (from 10 to 90%).

1st extension - Extension of the first dit or dah in milliseconds (QSK only).

Keying compensation - Extension of each dit and dah in milliseconds (QSK only).

Allow logger control: - Special setting for diagnostics. **<u>Do not use</u>** unless instructed to do so by the factory.

CW MESSAGES TAB

On this tab you can define nine CW messages of up to 50 characters each which are stored in EEPROM. Each memory may have a programmable repeat delay and/or call another memory.

Commands which may be included in a memory are:

Merge:	merge two characters without a letter space – [M]AS will sound AS **.-...**
Cancel WPM:	restore speed set by the Speed pot.
Set WPM:	force speed to the selected value regardless of position of speed knob.
Set Key:	close CW output for selected time in seconds.
Set Wait:	wait selected seconds during playback.
Jump to:	used for looping a message or calling another message
Delay:	sets the delay in seconds before looping or calling another message
Test:	plays a message without storing it
Store:	saves one message to DIGI KEYER II memory
Store All:	saves all messages to DIGI KEYER II memory
Load from File:	loads all messages from file
Save to File:	saves all messages to file

Messages can also be saved and replayed using an external keyboard or numeric keypad attached to the **PS/2** jack. See: External Keyboard.

NOTE: Messages are not saved or loaded with Presets

FSK MESSAGES TAB

DIGI KEYER II allows defining nine messages of up to 50 characters each which are stored in non-volatile memory. Each memory may repeat with a programmable delay (loop) or call another memory (chain).

Commands which may be included in a memory are:

CR & LF: Insert Carriage Return/Line Feed

Jump to: used for looping a message or calling another message
Delay: sets the delay in seconds before looping or calling another message

Store: saves one message to DIGI KEYER II memory
Store All: saves all messages to DIGI KEYER II memory

Load from File: loads all messages from file
Save to File: saves all messages to file

Messages can also be saved and replayed also using an external keyboard attached to the **Remote** jack.

KEYBOARD TAB

The Keyboard Tab controls the operation of a PS/2 keyboard or numeric keypad connected to the PS/2 jack. It is also possible to define control functions for the numeric keypad. Custom controls are invoked by pressing and holding the asterisk key (*) with Numkey0-9.

<u>**General:**</u>

QWERTZ layout – configures the keyboard for a QWERTZ layout.

<u>**FSK from keyboard:**</u>

Diddle LETTERS: send the LETTERS character whenever there is nothing in the transmit buffer.

UOS: shift back to LETTERS case whenever a space is enountered in the transmit data.

Type ahead: enables type ahead when using a PS/2 keyboard. Characters are transmitted after a **space** (word mode) or when the buffer has reached its limit (16 characters).

<u>**CW from keyboard:**</u>

Type ahead: enables type ahead when using a PS/2 keyboard. Characters are transmitted after a **space** (word mode). or when the buffer has reached its limit (16 characters).

Speed Step: set the amount by which the Up/Down or NUM +/- keys change the CW speed.

<u>**Auto numbering:**</u>

Leading zero as T: sends leading zeros in contest report as T. For example 001 will be send as TT1.

Zero as T: sends all "zeros" in contest report as T. For example number 100 will be send as 1TT.

One as A: sends all "ones" in contest report as A. For example number 101 will be send as A0A.

Nine as N: sends all "nines" in contest report as N. For example number 199 will be send as 1NN.

Report 5NN: send 5NN before contest serial number.
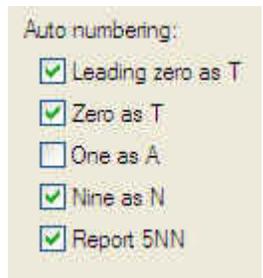
The PS2 and FH-2 sub-tabs allow assigning control functions to PS/2 and FH-2 style keypads.

SYSTEM SETTINGS TAB

System Power displays the input voltage at pin 1 of the Radio connector.

CI-V port settings: The CI-V port will emulate an Icom transceiver and "broadcast" the frequency data if Router can determine it by polling the rig or reading polling data from the logging program.   The transceive broadcast can be used to control peripherals that use Icom protocol.

There are five frequencies which can be broadcast: RX frequency, TX frequency, Operating frequency, VFO A frequency or VFO B frequency. In practice, operation of each setting depends on the transceiver and its CAT protocol. All options may not work with some transceivers.

Baud Rate: sets the baud rate for the CI-V broadcast

**Address:** sets the "from" CI-V address for the CI-V broadcast

6 - SETTING AUDIO LEVELS

There are three pots on DIGI KEYER II for adjusting audio levels.

The TX Pot adjusts the level of audio to the transmitter. The RX MAIN Pot provides adjustment of the audio from the radio (main receiver) to the sound card (computer) left channel. The RX SUB Pot provides adjustment of the audio from the radio (sub-receiver) or a second receiver to the sound card (computer) right channel.

> **IMPORTANT:** Many transceivers, including all Yaesu transceivers, MUST be switched to a special digital mode (DIG, PKT, DATA, USB-D/LSB-D etc.) to enable the rear panel line input!

1. Set the TX control on Digikeyer II to the 12:00 position.

2. On Router's Audio tab, click the "Sound Card" button.

3. On the "Audio Devices" window, select "Headset Earphone (microHAM CODEC)" in the Mixer and WaveOut boxes.
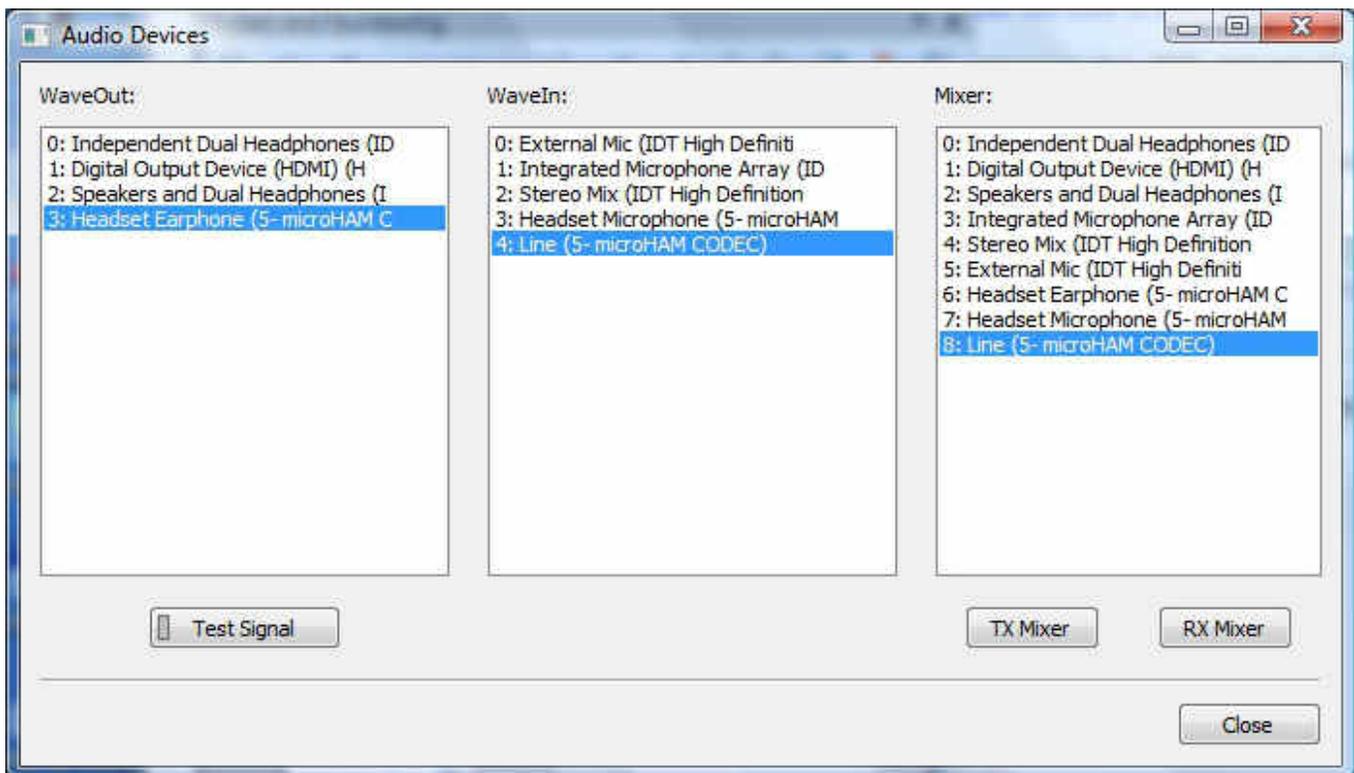
> **NOTE:** You may need the WaveOut and WaveIn indexes of the sound card to configure some programs. Make note of them or remember where you can find the "Sound Card ID" numbers.

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4. Click the TX Mixer button and select the "Headset Earphone" device in Windows Volume Mixer. If the Mixer does not appear, open the Windows Sound Control Panel and select the "Playback" tab.

5. Click the "Test Signal" button on the Audio Devices screen and verify that the VU Meter for "Headset Earphone (microHAM CODEC)" reaches maximum. If not, turn off the Test Signal, restart Router and return to step 1. Turn off the Test Signal.

6. Select the "Playback" tab in the Sound Control Panel
   - double click "Headset Earphone (microHAM CODEC)"
   - click Levels tab and unmute Headset Earphone
   - right click on the "Headset Earphone" slider and select decibels.
   - click Balance and set LEFT (1) to 0.0 dB and RIGHT (2) to +3.0 dB. If you do not plan to use "p-FSK" or "q-CW", set the right channel to -41 dB (0).

NOTE: to enable "p-FSK" or "q-CW" audio keying on the right channel, the Headset Earphone and right channel (2) level must be at +3.0 dB. The audio detector will not operate properly at any value below 90%.

7. Switch your transceiver to AFSK mode (PKT, DIG or DATA for Yaesu, LSB-D or USB-D for current Icom transceivers, RTTY or RTTY-R on K2 and USB or LSB for Kenwood, TenTec and older Icom transceivers). Do not select RTTY or FSK; they do not use the audio input.
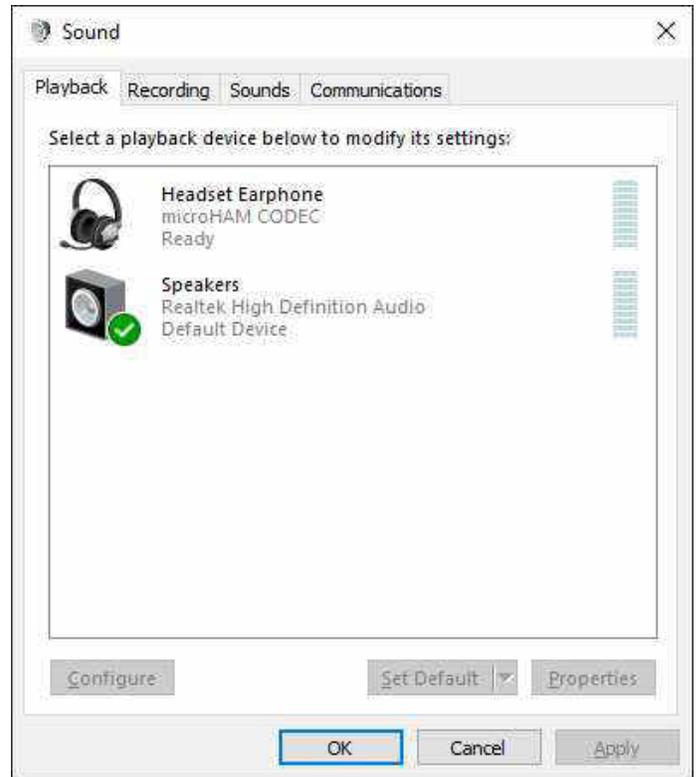
IMPORTANT: Many transceivers, including all Yaesu transceivers, MUST be switched to special digital mode (DIG, PKT, DATA, USB-D/LSB-D etc.) to enable the rear panel line input!

8. Click the "Test Signal" button and adjust the LEFT level for normal (rated) output on your transceiver while keeping the ALC meter as low as possible. Turn off the Test Signal.

NOTE: For the Elecraft K3 and other transceivers that have a separate "line In" control, do not adjust the LEFT slider. Instead, adjust the transceiver Line In level (mic gain) until the ALC shows the correct level.

9. Select the "Recording" tab in the Sound Control Panel
   - double click on "Line (microHAM CODEC)"
   - click Levels tab and unmute Line
   - set level slider to 0.0 dB and click "OK"

10. Adjust receive audio levels for your applications using the Rx Main and RX Sub controls.

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7 - EXTERNAL KEYBOARD/KEYPAD

NOTE: The keyboard or keypad must be PS/2. A USB device with PS/2 adapter will not work properly.

DIGI KEYER II includes the ability to generate CW/FSK or record and play CW/FSK messages using a keyboard or numeric keypad connected to the PS/2 jack. A numeric key pad will allow recording/playing CW messages, control CW speed (WPM) or play a serial number message. "Live" CW/FSK (RTTY) or storing FSK messages requires a full keyboard.

Switching modes:

The keyboard or keypad mode will follow the mode of the transceiver. If the radio is not computer controllable or its control protocol is not supported, the keyboard or keypad can be used to switch Router's mode if the "radio" selection is "no radio (mode selected manually)."

STATUS INDICATION				
NUM	*CAPS*	*SCROLL*	*play/rec*	*mode*
OFF	x	x	playback	
ON	x	x	recording	
x	OFF	OFF		CW
x	OFF	ON		DIGITAL
x	ON	OFF		FSK

Playing messages:

A message is started by pressing F1-F9 on the keyboard or 1-9 on the number pad. A message can be aborted with the ESC key or the zero key on the number pad. Messages may be made to repeat (loop) by pressing DEL (period) on the number pad while the message is playing. The default (minimum) wait time after ending a message before starting again is one second. The pause time may be set from 1 to 9 seconds by entering the desired delay immediately after pressing DEL. For example, 1 <DEL> 5 will start message number 1 and cause it to repeat with five a second delay. Pressing zero (0) will terminate a message loop.

Recording messages:

Recording is started (and stopped) by pressing NUM LOCK. To start recording, press NUM LOCK followed by the number of the message to be recorded. To abort a message without saving, press zero on the number pad or Escape. To end recording and save the message press NUM LOCK.

In CW, DK II stores characters as they are echoed from the internal WinKey: only those characters actually transmitted are stored. However, CW messages may be recorded from either paddles or the keyboard. The gap "|" and other WinKey commands cannot be entered from the keyboard but may be used in messages loaded from Router's CW/FSK Messages tab.

In FSK, all characters entered from the keyboard are stored.

std. key	Numeric Keypad			start/stop/description	CW mode	FSK mode
	NUM LOCK			start/stop recording of message (recording mode is indicated by NUM LED)	✓✓	✓
	NUM *			Tune (can be canceled by keys NUM 0 or ESC, or by the paddle)	✓	
ESC	NUM 0			playback: stop transmitting (message or any characters in buffer)	✓	✓
				recording: abort recording without storing the message		
F1-F9	NUM 1 – NUM 9			playback: start message playback	✓	✓
				recording: set message number		
	NUM DEL			playback: periodically repeat last message (default interval is 1 second, it can be changed by pressing the number on number pad)	✓	✓
				recording: no function		
	NUM /			Switch between "speed control mode" and "serial number mode" (serial number mode is indicated by SCROLL LED, if present)	✓	
ALT				When held allows setting the serial number		
PG UP	NUM +	WPM control		Increase CW speed (step defined by configuration)	✓	
UP		S/N mode		Increment number by one without transmitting	✓	
PG DN	NUM -	WPM control		Decrease CW speed (step defined by configuration)	✓	
DN		S/N mode		Decrement number by one	✓	
HOME	NUM ENTER	WPM control		Reset CW speed to pot (knob) value	✓	
ENTER		S/N mode		Transmit number with optional report and increase number by one (format defined by configuration)	✓	
ENTER				transmit CR and LF characters		✓
F10				Toggle PTT – alternative to foot switch	✓	✓
CAPS LOCK				Switch between CW mode and FSK mode (FSK mode is indicated by CAPS LED)	✓	✓
SPACE				transmit space (if "type ahead" mode is active all buffered characters are transmitted before this space)	✓	✓
|				transmit gap (one-half dit delay time), this character cannot be recorded to a message from keyboard – it may only be entered from Router	✓	
0-9 a–z "#$%&'()*+,-./:;<=>?@\				transmit character, if "CW type ahead" mode is active character is pushed to type ahead buffer to be transmitted after next space. Note: some special characters are mapped to standard prosigns (see WinKey manual)	✓	
0-9 A–Z !"$&='(),-./:;?				transmit character, if "FSK type ahead" mode is active character is pushed to type ahead buffer to be transmitted after next space		✓

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8 - System Considerations

DIGI KEYER II can be used with a wide variety of software. The capabilities of those packages will have large influence on the level of computing power needed to utilize DK II.

When used with Windows based contest logging applications like N1MM Logger Plus, Win-Test, and WriteLog or Windows based general logging applications like DXBase, DXLab Suite, DX4Win, Logger 32 and others, the microHAM control and interface application "*micro*HAM Router" must run with the application. Since both the logging program and microHAM Router are real-time applications, system performance will be dependent on both CPU speed and the amount of available RAM.

While *micro*HAM Router may run on slower computers, the minimum tested system is a 1.8 GHz Core2Duo processor, Windows 7, 1 GB RAM, CD-ROM, and USB 1.1 port. Whether Router can run as designed on slower machines with less memory and leave enough resources for application programs has not been determined. *micro*HAM Router is not supported on any 16 bit version of Windows (95, 98, ME, SE).

In order to provide sufficient performance for simultaneous operation of microHAM Router, a logging application, Internet connectivity and other accessory programs, the recommended system is a 2 GHz or faster multi-core CPU with Windows 8.1 or later, 4 GB RAM, CD-ROM, root USB 2.0 port, and a transceiver with supported control protocol and logger, control, or digital mode software.

9 - PACKAGE CONTENTS

The product includes DIGI KEYER II™, USB cable, RCA to RCA cable, and CD-ROM containing the microHAM USB Device Router program and documentation. If the shipment is incomplete, please contact us at the following address:

E-mail:

support@microham.com

fax :

+421 2 4594 5100

by Post:

microHAM s.r.o.
Nadrazna 36
90028 Ivanka pri Dunaji
SLOVAKIA

10 - WARRANTY

microHAM warrants this product for three (3) years. The product must not be modified in any way or the warranty is voided. Cables are warranted against defects in materials and workmanship for a period of 60 days.

What is covered: During the warranty, *micro*HAM, s.r.o., will repair or replace defective product at their sole discretion. You must send the unit postpaid with a copy of the original invoice to the distributor from whom you purchased the product. *micro*HAM will pay return shipping.

What is not covered: This Limited Warranty does not cover (1) correction of installation or software errors in the user's computer(s), (2) damage caused by misuse, negligence, user modifications or failure to follow the user manual, (3) connection to improper or excessive voltage or voltage surges, (4) the incorrect installation of any cables connected to the device by the user or (5) weather related storm, lightning or electrostatic discharge damage.

*micro*HAM USB Device Router (the software) is provided "as is" without guarantee of compatibility with any specific operating system, computer, peripheral or accessory.

microHAM assumes no liability or responsibility for damage to other devices or injuries to persons as a consequence of using our products.

If the terms of the above warranty are not acceptable, return the unit, all associated documents and accessories in the original unopened package, prepaid, to microHAM or to your supplier for refund less shipping and a restocking fee.

11 - SPECIFICATIONS

DIGI KEYER II is a multi-mode interface between computer and transceiver. It has been optimized for amateur digital modes and includes a high performance USB sound processor.

DIGI KEYER II is connected to the computer using a single A-B USB cable which is included.

The transceiver and DIGI KEYER II are connected by single radio cable terminated on one side by a DB15M and on the other side by the appropriate plugs for the specific transceiver. The cable carries power for DK II, audio, CAT control and keying. The appropriate transceiver interface cable is specified when DIGI KEYER II is purchased.

If a Windows PC running the "*micro*HAM USB Device Router" program is connected, DIGI KEYER II works as a computer interface and sound card. It transfers all control signals generated by the application program between the computer and transceiver. Software compatibility is provided by using virtual serial ports. Router monitors these virtual ports and transfers any data or commands by USB to the micro controller in DIGI KEYER II. DK II processes this data and sends it to the physical ports of transceiver as CAT, CW, and PTT functions.

The USB sound processor in DIGI KEYER II independently provides analog to digital conversion of audio from the transceiver and transfers it via USB to the computer where the operating system processes that data as a "sound card." The USB sound processor also receives digital audio from any applications running on computer and converts that data into audio signals to modulate the transceiver.

*micro*HAM Device Router is not required in order to enable the USB sound functions. The USB sound processor is supported directly by Windows, Mac OS X, and LINUX. It may be used by any application compatible with those operating systems.

Hardware Specifications

USB: USB 2.0 Full speed , USB 1.1 compatible

Power consumption: USB – less than 100mA; Transceiver – less than 200mA at 13.8V (max. 16V)

Radio Port: RxD, TxD – max. 57,600 Baud
       Levels: Jumpers selectable TTL, inverted TTL, open collector bus, RS232
CI-V Port: open collector bus – max. 9600 baud
CW: open collector, max 30V/400mA
FSK: open collector, max 30V/400mA
     – supports 5/6/7 bit data, 1/1.5/2 stop bits, up to 300 baud
PTT: open collector, max 30V/400mA
PA PTT/LNA PTT: selectable by internal jumper
     – open collector, max. 45V @ 0.8A
     – relay contact, max. 48V AC/DC @ 1A
Foot Switch: active when closed to ground, max load: 1 mA at 5V
PTT IN: active when closed to ground, max load: 1 mA at 5V

Audio Out: 16bit, max 48000sps, Zout: 600 Ohm, 1.5V p-p @max. settings, Left channel, AC coupled
Audio In: 16bit, max. 48000sps, Zin: 50K Ohm, max 4V p-p, dual channel (Stereo),
      60mV p-p for full scale @max. settings, AC coupled

Dimensions: W 165mm (6 1/2") x **H** 44mm (1 3/4") x **D** 110 mm (4 3/8")

Weight: 1100g (2.4 lbs.)

DECLARATION OF CONFORMITY

Federal Communications Commission Statement (USA)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European Union Declaration of Conformity

*micro*HAM, s.r.o. declares that the products:

Product Name: DIGI KEYER II

Conforms to the following Product Specifications:

EN 55022: 1998 Class B following the provisions of the Electromagnetic Compatibility Directive 89/336/EEC

APPENDIX A – CONNECTORS
Radio - DB15

Pin #	Label	Description
1	Power +13.5V	12 - 16V DC input
9	CAT IN	Control port input
2	CAT OUT	Control port output
10	SQL1	Level squelch input
3	SQL2	Impedance squelch input
11	PTT	PTT output "open collector"
4	CW	CW output "open collector"
12	AUX	reserved
5	FSK	FSK output "open collector"
13	AUDIO OUT S	Radio AUDIO input signal
6	AUDIO OUT GND	Radio AUDIO input ground
14	AUDIO IN MAIN S	Radio AUDIO output signal main receiver
7	AUDIO IN MAIN G	Radio AUDIO output ground
15	AUDIO IN SUB S	Radio AUDIO output signal sub receiver
8	AUDIO IN SUB G	Radio AUDIO output ground
SHELL	GND	Radio and power GND

PS/2 – miniDIN 6

Pin #	Label	Description
1	PS/2 DATA	TTL PS/2 DATA line
2	RESPAD	Input for resistive keypad, max.+5V/1mA
3	GND	Connected to the system ground and case.
4	+5 V	+5V output, max.100mA.
5	PS/2 Clock	TTL PS/2 CLOCK line
6	CI-V	Auxiliary CI-V output
SHELL	GND	Connected to system ground and case

APPENDIX B – RFI Considerations

A few guidelines to eliminate problems caused by RFI:

1. Proper grounding of all electronic equipment is critical. A modern station contains many, diverse, types of interconnected and interrelated equipment: transceiver, power amplifier, computer, control boxes, switch boxes, and power supplies. Each of these must be individually grounded with a separate connection to a single common ground point, thus forming a star ground connection.

    Proper grounding of computers, both "desktop" and laptop is often overlooked. A separate ground connection should be run from the computer to the station common ground point. The best place to ground a computer is a screw with a good connection to the case.   On a laptop, this is often the retaining screw on a D-sub connector (e.g, VGA output); on a "desktop" it is often the screws holding the power supply.

    It is absolutely important to prevent ground currents from flowing to the common ground point by way of the signal cable. If you use a microHAM "keyer," a good test is to remove the DB15/DB37 connector and USB cable from the keyer and measure the resistance from the shell of the DB15/DB37 to the shell of the USB cable. There should be NO MORE than FIVE (5) Ohms (and preferably less than TWO Ohms) between them.

    Note: many PC manufacturers fail to provide an adequate connection between the shell of the USB connector and the PC case. If this is the case, a connection can be established by bridging a folded piece of aluminum foil between the shell of the USB connector and the PC case.

2. Power all your equipment from a single wall outlet. The "safety ground" often exhibits excessive noise between power outlets - sometimes often due to other equipment powered from the same branch circuit. It is always better to avoid this source of noise/interference. It is also a good idea to check the power distribution for loose connections, reversed neutral/ground, open ground and other wiring problems.

3. Sometimes, the USB cable can be a source of RF interference - the cable might have inadequate shielding or the transceivers in PC might be improperly designed causing data flowing inside the cable to be reflected as a common mode current on the shield of the cable. This common mode current can radiate a significant "digital noise." If this is the source of your problems, it can be significantly reduced or eliminated using ferrite chokes on both ends of the cable. Two or three turns through a #31 mix FT240 toroid are better than the common snap-on ferrites of unknown mix.

4. Often, another cause of RFI problems is a common mode current flowing along the antenna feedline into the shack. It is a common misconception that the only thing required of a feedline is that it have low SWR. Unfortunately, a low SWR does not guarantee low common mode current. These common mode currents are conducted into the shack where they can radiate from the feedline, induce currents in any nearby metal object, and/or be conducted into the interconnected equipment. Common mode currents on a feedline are indicated by problems that differ in intensity from one band to another or from one end of the band to another, by problems that change when a feedline is moved or its length changed, where the problem moves from one piece of equipment to another based on band, and/or where the severity changes with transmit power level. The solution is to use common mode chokes to prevent the current from entering the shack. This topic has been given thorough treatment in recent works by W1HIS and K9YC.

    W1HIS: http://www.yccc.org/Articles/W1HIS/CommonModeChokesW1HIS2006Apr06.pdf
    K9YC: http://www.audiosystemsgroup.com/RFI-Ham.pdf

APPENDIX C – Tracking

NOTE: Tracking is experimental code for linking the transceiver frequency to a tracking receiver begun in Router 7.5.0. Bidirectional frequency tracking is not supported.
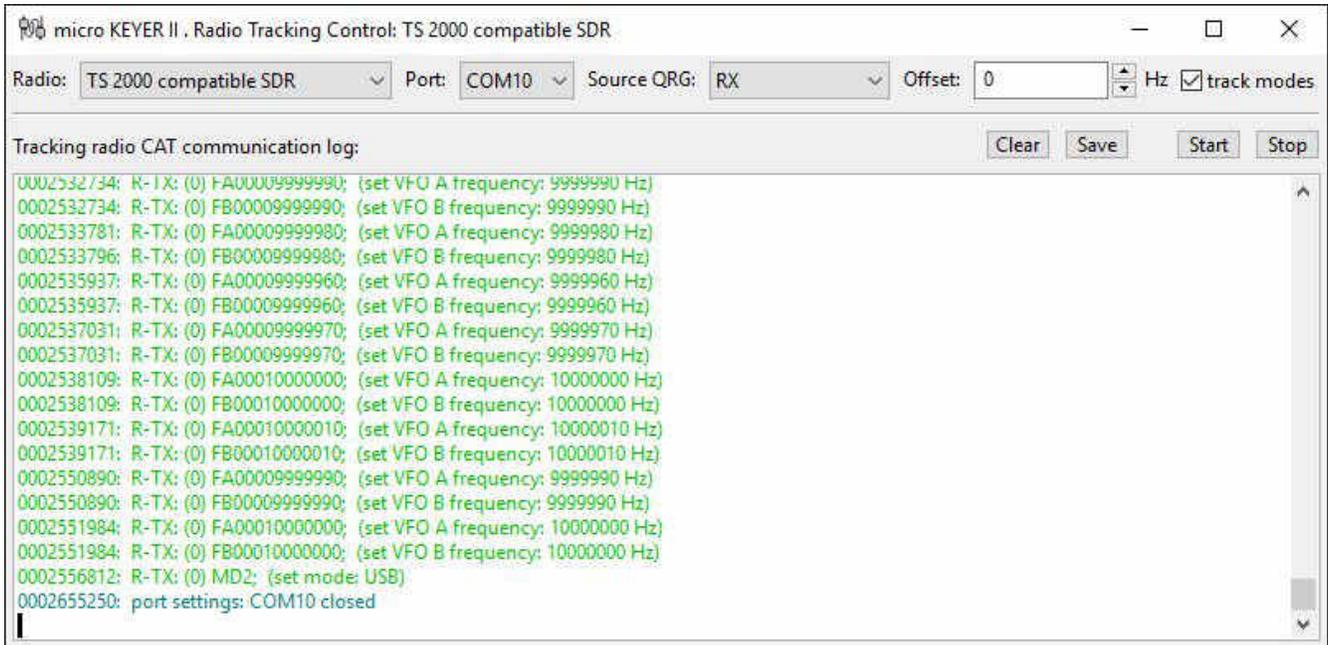
Radio: Specifies SDR receiver model. Current choices are Perseus and TS-2000 Compatible.

Port: Specifies COM port used to communicate with the SDR. Must be COM 10 for Perseus. The port must be defined as a "virtual serial port for router interface".

Source QRG: Specifies the frequency for the SDR to track. Where two sources are shown (e.g., VFO A, VFO B) the first source will be sent to the SDR in Receive and the second source in Transmit.

Offset: Frequency offset between the transceiver frequency and the frequency sent to the SDR. This is useful when the transceiver is used as an IF with a transverter. Default is 0Hz, resolution is 1Hz.

**Track modes:** Send mode as well as frequency to the SDR software.

The bottom two-thirds of the window is a serial communication monitor which displays the data sent to the SDR for diagnostic purposes. The log is a circular buffer; the size is set in Router | General.

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APPENDIX D – Cables and Bridges

Cables are Bridges are an experimental capability – *micro*HAM provides no support or warranty for the Cables and Bridges capability. These features are undocumented but relatively self-explanatory.

Cables (cross wired, aka "null modem" cable) create interconnected virtual ports which can be configured as a bus, point to point pair like com0com, or point to multi-point (star, splitter or combiner) - like VSPE. Applications may connect to each other using cables. For example, the Secondary CAT Serial Port in DXLab Suite's Commander may connect to one end of a cable and a software panadapter might connect to the other end of the cable. There is one exception, cables **_can not_** connect to any port used in Router's Ports tab.

The TX check box designates the port as a bidirectional port – the TxD line is active/connected. If the TX box is unchecked, the port is a "receive only" (listen) port like the "listen" leg of the "Y" cable used between a computer serial port and transceiver for devices like a SteppIR controller, "AT-Auto" tuner or some automatic power amplifiers.
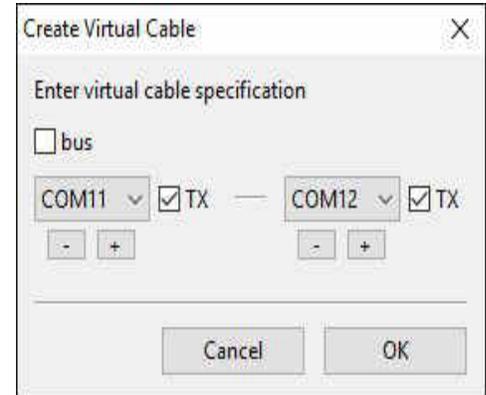
Bridges (straight "extender" cable) allow connecting any two (existing) ports - serial port to serial port, serial port to virtual port (cable), or virtual port (cable) to virtual port (cable) but again Bridges **_can not_** connect to any port used in Router's Ports tab.

The _only purpose_ of cables and bridges is to replace third party software serial splitters or software null modem connections like Com0com, DDutil, LP-Bridge, VSPE, etc. that may conflict with the Eltima VSPAX drivers used by *micro*HAM USB Device Router. In this regard, *micro*HAM USB Device Router provides a means to enable and configure the capabilities that exist in the Eltima VSPAX product.