*micro*KEYER: 2 Radio

MK2R+

*micro*HAM

Version 8.1
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TABLE OF CONTENTS

1 - FEATURES AND FUNCTIONS

General:
- single USB connection (advanced mode) with LPT port for compatibility with "classic standard"
- stand alone operation without computer
- support for independent settings for dissimilar radios
- optimized operation on each radio and dissimilar modes (R1=SSB, R2=CW)
- innovative dual sound card processing
- integrated dual USB sound core (MK2R+ only)
- 16 buttons/42 lights for ergonomic function control and status display
- compatible with most standard MS Windows based logging or control programs
- DOS mode compatibility with LPT port interface of DOS based contest loggers (CT, TR, NA)

Radio control:
- integrated level converter for both radios CI-V, FIF-232, IF-232, or RS-232
- up to 57600 Baud with handshake support
- fully supports most Icom, Kenwood, TenTec, Yaesu and other radios
- optical isolation of radio control port from computer

Keying:
- optical isolation of all keying signals from computer
- intelligent keying lockouts for both radios (Band lock, Busy lock, External lock)
- hardware support for "last one wins" or "first one wins" operation
- easy switching between manual and automatic control
- independent settings for dissimilar Power Amplifiers
- Hot Switch PA protection with user defined timing
- programmable PTT assertion delay in 1ms steps
- T/R sequencer with extended capabilities
- separately sequenced keying outputs for low noise amplifier or receive antenna control
- supports dual (one per radio) or single foot switch operation
- supports separate PTT for each radio with automatic TX focus control
- supports VOX and CAT T/R switching
- wide range solid state outputs for modern PA keying or QSK PA separately for each radio
- relay isolated outputs for negative or high voltage PA control for each PA

CW:
- integrated second generation K1EL WinKey2™
- front panel speed knob
- selectable side tone capabilities with "paddle side tone" function
- nine (9) user programmable memories
- application independent contest auto-numbering
- supports PS/2 keyboard for CW transmission with type ahead
- supports PS/2 keyboard or keypad for CW "memory keyer" and control
- PS/2 keyboard or keypad CW works without computer connection
- handles multiple CW sources: WinKey2, serial port and/or LPT port with steering

Digital (FSK/AFSK/PSK31):
- six transformers for DC isolation of sound card and radios
- selectable routing of radio outputs (VFO A/B) for each sound card channel
- low noise amplifiers for improved weak signal decoding
- front panel controls to optimize levels for each sound card channel
- front panel controls to optimize mic drive for each radio
- integrated high performance, low noise floor USB sound core (MK2R+ only)
- separate USB sound codec for digital modes (MK2R+ only)
- separate digital audio drive for each radio
- selectable sound card channel output/steering for digital audio
- application specific mono/stereo signal source handling
- dual FSK output
- supports data codes with 5/6/7/8 data bits and 1/1.5/2 stop bits
- unique, hot switch protected FSK keying
- separate PTT output for digital audio mode operation with microphone muting
- nine (9) user programmable memories (FSK)
- supports PS/2 keyboard FSK transmission with type ahead and diddle function
- supports PS/2 keyboard or keypad for FSK message playback and control
- PS/2 keyboard/keypad FSK works without computer connection

Voice (SSB/AM/FM):
- front panel headset jacks
- rear panel hand/desktop microphone jack
- front panel selection of connected microphones
- supports all microphone control functions for Radio1
- selectable preamplifier supports dynamic microphones with computer interface
- selectable preamplifier for using dynamic microphones with Icom radios
- customizable microphone routing for each state (VOX / computer PTT / foot switch) by radio
- customizable microphone routing for operation style (direct to radio / through sound card)
- Digital Voice Keyer with nine messages up to 120 seconds line and unlimited "banks"

Headphone (Receive) Audio:
- front panel headphones jacks, rear panel external speaker jack
- unique "multi-source" signal handling
- supports second sound card for audio review or "spot announcements"
- able to switch any of six (6) audio sources to either ear
  1. R1 VFOA   2. R1 VFOB   3. R2 VFOA   4. R2 VFOB
  5. Sound Card left channel   6. Sound Card right channel
- hardware support for independent receive audio selection by operating state
  1. R1=RX, R2=RX, TX focus=R1   2. R1=RX, R2=RX, TX focus=R2
  3. R1=TX, R2=RX   4. R1=RX, R2=TX   5. R1=TX, R2=TX
- hardware support for user defined "scenarios" handling (weak pileup, strong pileup, S&P, etc ...)
- front panel control of audio mix level
- configurable audio source (VFO A/B) for each sound card channel
- support for recording headphone audio (WYH - What You Hear)
- user selectable "delayed" headphone switching (100ms steps)
- independent front panel record level level control for each channel
- additional buttons for "classic" audio control R1/SPLIT/R2 or R1/MIX/R2
- easy switching between manual and automatic control

Other:

- configurable Accessory connection with dual BCD band data outputs
- user definable presets to recall all parameters for different control programs or contests
- all parameters are stored inside the box memory and reloaded after power up
- integrated chokes and filters for maximum RFI immunity
- Metal/Aluminum case, powder coated and silk screened
- Free, no time limit firmware/software upgrades via Internet

2 - IMPORTANT WARNINGS

ALWAYS check the polarity of the 13.8 V power supply.

When changing Radio #1, ALWAYS be sure the proper microphone for the radio is connected to the MK2R RJ45 MIC jack BEFORE connecting the DB37 RADIO cable.

If dissimilar radios are attached to MK2R or MK2R+, NEVER connect the microphone of the Radio #2 to the RJ45 microphone jack on the rear panel.

**If your radio supports firmware upload
DO NOT perform any radio upgrade through MK2R.**

Remember, under Windows, *micro*HAM USB Device Router must be running anytime the interface is used (not just for setup). If Router is not running, the virtual COM ports will disappear and the device cannot be accessed!

3 - PANEL DESCRIPTION
Front Panel
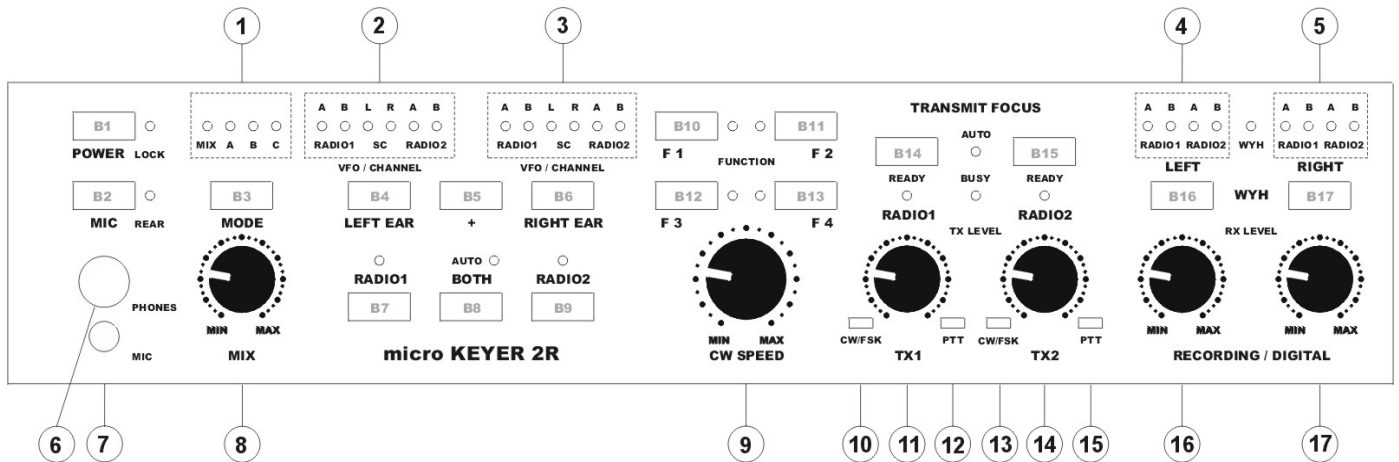
B1 – **POWER:** Turns MK2R/MK2R+ on or off. While in operation, a short press will lock or unlock the front panel. When locked, the LOCK light will illuminate.

B2 – **MIC:** Selects the microphone. When the REAR light is illuminated the microphone attached to rear panel RJ45 MIC jack is active. Otherwise, the front panel MIC jack (3.5 mm) is active.

B3 – **MODE:** Selects among the operating modes defined at the SO2R tab in Router. The mode is selected or deselected by pressing this button until the light representing the desired operating mode is flashing and allowing it to time out. The active mode(s) are indicated by the MODE lights.

(1) – MK2R MODE status
> MIX – Mix control is active.
> A – Mode A selected/active
> B – Mode B selected/active
> C – Mode C selected/active

B4 – **LEFT EAR:** Selects the audio source connected to the left ear of the headphones.

(2) – Left Headphone Status
> **RADIO1:**
>> A – indicates audio from VFO A of RADIO1 is connected to the left ear
>> B – indicates audio from VFO B of RADIO1 to connected to the left ear
> **SC:**
>> L – connects left channel audio from the unused sound card to the left ear
>> R – connects right channel audio from the unused sound card to the left ear
> **RADIO2:**
>> A – indicates audio from VFO A of RADIO2 is connected to the left ear
>> B – indicates audio from VFO B of RADIO2 is connected to the left ear

B5 – **+:** Used with the B4 and B6 buttons to add (mix) additional sources to the left or right headphones.

7

B6 – **RIGHT EAR:** Selects the audio source connected to the right ear of the headphones.

(3) – Right Headphone Status
    RADIO1:
        A – indicates audio from VFO A of RADIO1 is connected to the right ear
        B – indicates audio from VFO B of RADIO1 to connected to the right ear
    SC:
        L – connects left channel audio from the unused sound card to the right ear
        R – connects right channel audio from the unused sound card to the right ear
    RADIO2:
        A – indicates audio from VFO A of RADIO2 is connected to the right ear
        B – indicates audio from VFO B of RADIO2 is connected to the right ear

B7 – **RADIO1:** Disables automatic headphone switching if it was enabled (switch to manual mode) and connects both ears to RADIO1. Selecting the VFO connected to each ear is accomplished by holding the RADIO 1 button pressing the LEFT EAR (B4) and RIGHT EAR (B5) buttons. The selection will be saved in memory. By default the left ear is connected to VFO A (left channel) and the right ear is connected to VFO B (right channel).

B8 – **BOTH:** Disables automatic headphone switching if it was enabled (switch to manual mode) and connects one ear to each radio. Selecting the VFO connected to each ear is accomplished by holding the BOTH button and pressing the LEFT EAR (B4) and RIGHT EAR (B5) buttons. The selected assignment will be saved in memory. By default the left ear is connected to VFO A (left channel) of RADIO1 and the right ear is connected to VFO A (left channel) of RADIO2

B9 – **RADIO2:** Disables automatic headphone switching if it was enabled (switch to manual mode) and connects both ears to RADIO2. Selecting the VFO connected to each ear is accomplished by holding the RADIO2 button and pressing the LEFT EAR (B4) and RIGHT EAR (B5) buttons. The selection will be saved in MK2R memory. By default the left ear is connected to VFO A (left channel) of RADIO2 and right ear is connected to VFO B (right channel) of RADIO2

Pressing the RADIO1 (B7) and RADIO2 (B9) buttons at the same time enables automatic headphone switching (AUTO mode). If enabled, the yellow AUTO light above the BOTH button will be lit. Lights above the RADIO1 (B7) and RADIO2 (B9) buttons indicate receive focus. Headphone switching is based on the configuration options and application control signals described later.

NOTE: These buttons - RADIO1 (B7), BOTH (B8) and RADIO2 (B9) - are used for headphone control only and do not control transmit focus (select active transmitter).

B10-B13 – **FUNCTIONS F1-F4:** Store/Recall four independent hardware configurations or "scenarios." Pressing one of these buttons recalls a configuration. Pressing and holding a button stores the current state of MK2R/MK2R+ in that "memory." A light will illuminate adjacent to the active configuration.

B14 – **RADIO1 TRANSMIT FOCUS:** Selects transmission on RADIO1 and disables automatic control of transmit focus if it was enabled.

B15 – **RADIO2 TRANSMIT FOCUS:** Selects transmission on RADIO2 and disables automatic control of transmit focus if it was enabled.

The lights below the RADIO buttons indicate which radio is selected (has focus).

8

Pressing the RADIO1 (B14) and RADIO2 (B15) buttons at the same time enables automatic selection of transmit focus (AUTO mode) and illuminates the AUTO light. The lights below the RADIO1 (B14) and RADIO2 (B15) buttons indicate which radio has TX focus (will transmit in response to a PTT input). Transmit switching is based on the configuration options and application control signals described later.

B16 – **LEFT:** Selects the audio source connected to the left channel of SC 2 Line In (MK2R) or "USB Audio CODEC" (MK2R+).

(4) – Recording/Digital left channel audio status
> **RADIO1:**
>> A – indicates fixed level audio from MAIN of RADIO1 is connected to the left channel.
>> B – indicates fixed level audio from SUB of RADIO1 is connected to the left channel.
> **RADIO2**:
>> A – indicates fixed level audio from MAIN of RADIO2 is connected to the left channel.
>> B – indicates fixed level audio from SUB of RADIO2 is connected to the left channel.

B17 – **RIGHT:** Selects the audio source connected to the right channel of SC 2 Line In (MK2R) or "USB Audio CODEC" (MK2R+).

(5) – Recording/Digital right channel audio status
> **RADIO1**:
>> A – indicates fixed level audio from MAIN of RADIO1 is connected to the right channel.
>> B – indicates fixed level audio from SUB of RADIO1 is connected to the right channel.
> **RADIO2:**
>> A – indicates fixed level audio from MAIN of RADIO2 is connected to the right channel.
>> B – indicates fixed level audio from SUB of RADIO2 is connected to the right channel.

Pressing the LEFT (B16) and RIGHT (B17) buttons at the same time enables WYH (What You Hear). The WYH light will illuminate and headphone audio will be connected to the Recording/Digital input - left ear to left channel and right ear to right channel.

> **NOTE:** Do Not Use WYH during Digital operation (RTTY/PSK/etc.). This will result in headphone audio being sent to the digital demodulators. Performance will be compromised when adjusting the headphone level for operator comfort.

(6) – PHONES: Output for operator headphones
> Connector: 6.3mm (1/4") stereo
> TIP – Left   RING – Right   SHELL – Common

(7) – MIC: Microphone input (headset microphone)
> Connector: 3.5mm (1/8") stereo
> TIP – Signal   RING – NC   SHELL – Shield

(8) – MIX: Adjusts the level of mixing of audio from one ear into the other.
> Mix is selected by the MODE button - when enabled the MIX light above the MODE button will light.

(9) – CW SPEED: Provides manual control of the WinKeyer2.
> Minimum and and Maximum speeds are defined by software.

(10) – CW/FSK:
> RED color indicates the CW output to RADIO1 is active
> GREEN color indicates the FSK output to RADIO1 is active

(11) – TX1: Adjusts drive level from the sound card to RADIO1

(12) – PTT1/PTT2:
      RED color indicates PTT1 (RADIO1 front panel microphone jack PTT) is active
      GREEN color indicates PTT2 (rear panel of RADIO1) is active
   YELLOW color indicates both PTT1 + PTT2 are active

(13) – CW/FSK:
      RED color indicates the CW output to RADIO2 is active
      GREEN color indicates the FSK output to RADIO2 is active

(14) – TX2: Adjusts drive level from the sound card to RADIO2

(15) – PTT1/PTT2:
      RED color indicates when PTT1 (RADIO2 front panel microphone jack PTT) is active
      GREEN color indicates when PTT2 (rear panel of RADIO2) is active
      YELLOW color indicates when both PTT1 + PTT2 are active

(16) – RECORDING/DIGITAL LEFT: Controls the left channel audio level to SC2 Line In (MK2R) or USB Audio CODEC (MK2R+) for audio recording or digital mode operation.

(17) – RECORDING/DIGITAL RIGHT: Controls the right channel audio level to SC2 Line In (MK2R) or USB Audio CODEC (MK2R+) for audio recording or digital mode operation.

Rear Panel
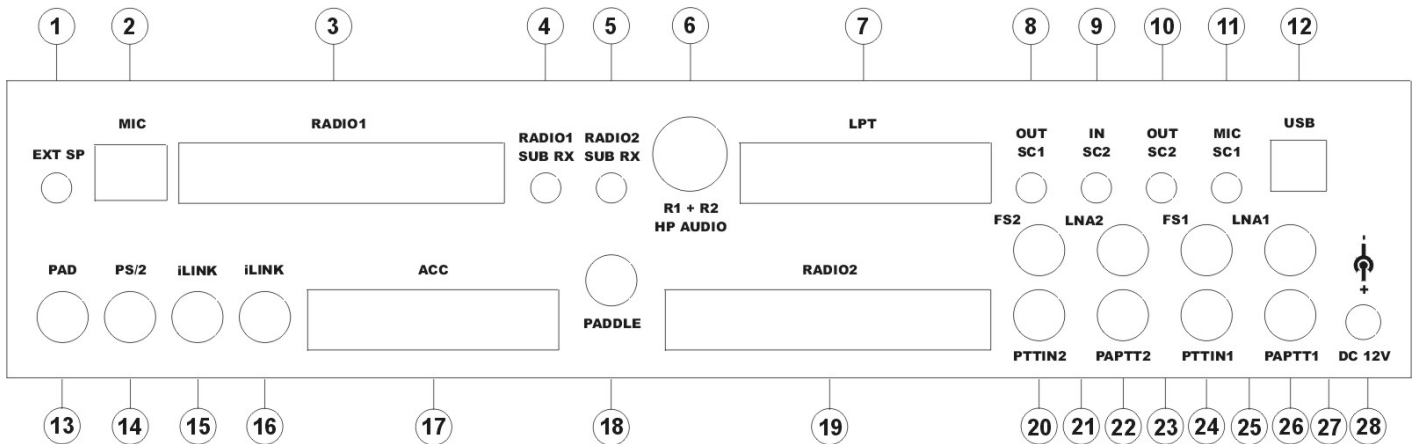
(1) – **EXT SP:** External speaker or second headphones (in parallel with front panel).
Connector: 3.5mm (1/8") stereo
TIP – Left channel   RING – Right channel   SHELL – Ground

(2) – MIC: Station microphone (original) for Radio #1.
Connector: RJ45 female. If the original radio microphone uses a connector other than an RJ45 the appropriate adapter is provided with the cable set. All microphone controls are connected to the RADIO1 DB37 connector (pins 12-15 and 30-33).

IMPORTANT WARNING: If dissimilar radios are attached to the MK2R or MK2R+. *NEVER* connect the microphone from Radio #2 to this jack.

(3) – RADIO1: Multi-pin jack for RADIO1 interconnection.
Connector: DB37 female
Detailed description is in Appendix A.

(4) – RADIO1 SUB RX: Input for constant level audio from the second (SUB) receiver RADIO1.
Connector: 3.5mm (1/8") stereo
TIP – Signal   RING – Signal (internally connected to TIP)   SHELL – Ground

(5) – RADIO2 SUB RX: Input for constant level audio from the second (SUB) receiver RADIO2.
Connector: 3.5mm (1/8") stereo
TIP – Signal   RING – Signal (internally connected to TIP)   SHELL – Ground

(6) – R1 + R2 HP AUDIO: Input for headphone audio outputs from both RADIO1 and RADIO2.
Connector: DIN6

Pin 1 – RADIO1 Left channel (TIP)
Pin 2 – RADIO1 Right channel (RING)
Pin 3 – RADIO1 Ground (SHELL)
Pin 4 – RADIO2 Left channel (TIP)
Pin 5 – RADIO2 Right channel (RING)
Pin 6 – RADIO2 Ground (SHELL)

(7) – LPT: Input from computer LPT (printer) port.
    Connector: DB25 female

(8) – OUT SC1 (MK2R only): Input from the Line Out of the computer **S**ound **C**ard **#1**
    Connector: 3.5mm (1/8") stereo
    TIP – Left channel   RING – Right channel   SHELL – Ground

(9) – IN SC2 (MK2R only): Output to Line In of the computer **S**ound **C**ard **#2**
    Connector: 3.5mm (1/8") stereo
    TIP – Left channel   RING – Right channel   SHELL – Ground

(10) – OUT SC2 (MK2R only): Input from Line Out of the computer **S**ound **C**ard **#2**
    Connector: 3.5mm (1/8") stereo
    TIP – Left channel   RING – Right channel   SHELL – Ground

(11) – MIC SC1 (MK2R only) : Output to Mic In of the computer **S**ound **C**ard #1
    Connector: 3.5mm (1/8") stereo
    TIP – Signal   RING – Signal (internally connected to TIP)   SHELL – Ground

    NOTE: These four jacks (8-11) are present only on MK2R. MK2R utilizes one or two external sound cards SC1 (for Voice modes) and SC2 (for Digital modes). MK2R+ includes internal SC1 (Voice Codec) and SC2 (Digital mode Codec).

(12) – USB: Port for connecting to the computer USB port.
    Connector: USB B

(13) – PAD: Port for connection of a future external controller.
    Connector: Mini DIN6

(14) – PS/2: Port for connection of external PS/2 keyboard or numeric keypad.
    Connector: Mini DIN6

(15, 16) – iLINK (interLINK): Ports for connecting other *micro*HAM devices (e.g., Station Master) to MK2R or MK2R+.
    Connectors: Mini DIN6

(17) – ACC: external multi-function I/O port (see ACC Port section of this manual)
    Connector: DB25 female
    Pin description is in Appendix B.

(18) – PADDLE: Paddle input.
    Connector: 6.3mm (1/4") stereo
    TIP – DIT Input   RING – DAH Input   SHELL – Ground

 NOTE: The paddle sense can be reversed using Router or application settings.

(19) – RADIO2 Multi-pin jack for RADIO2 interconnection.
    Connector: DB37 female
    Detailed description is in Appendix A.

(20) – PTT IN 2: Amplifier Key line from RADIO 2.
    Connector: RCA
    TIP – Signal   SHELL – Ground

  NOTE: This connection is required to support VOX operation and PTT by software (CAT).

(21) – FS2: Footswitch 2 input (configurable function, by default keys RADIO2).
    Connector: RCA, active when grounded.
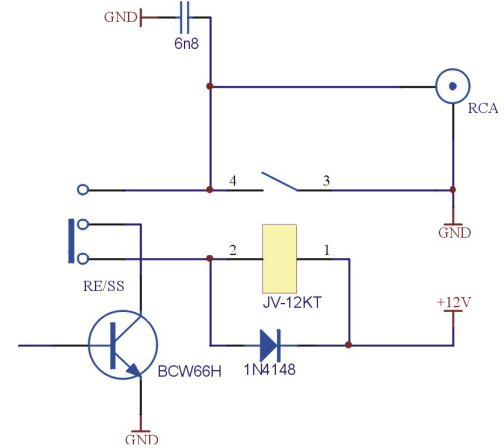   TIP – Signal   SHELL – Ground

(22) – PAPTT2: PTT output for Radio 2 Amplifier.
    Jumper selectable **S**olid **S**tate or **RE**lay output.
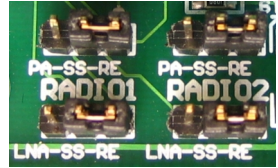   Connector: RCA, when active goes to ground.
    TIP – Signal   SHELL – Ground

If the jumper is in the SS position, the switching transistor (open collector) is connected to the PAPTT2 jack. The transistor can switch up to 45V/0.8A. This position is appropriate for modern amplifiers with electronic keying. Check the manual of your amplifier to be sure the PTT 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.

TIP: All of the RE/SS jumpers are located on the bottom circuit board just in front of the DC 12V input jack.

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

(23) – LNA2: Sequenced keying (LNA bypass or receive antenna control) for Radio 2
    Jumper selectable **S**olid **S**tate or **RE**lay output.
    Connector: RCA, when active goes to ground.
    TIP – Signal   SHELL – Ground
    The output circuit is the same as shown for PAPTT2.

(24) – PTTIN1: Amplifier Key line from RADIO 1.
    Connector: RCA
    TIP – Signal   SHELL – Ground

  NOTE: This connection is required to support VOX operation and PTT by software (CAT).

 (25) – FS1: Footswitch 1 input (configurable function, by default keys RADIO1).
    Connector: RCA, active when grounded.
    TIP – Signal   SHELL – Ground

(26) – PAPTT1: PTT output for Radio 1 Amplifier.
    Jumper selectable **S**olid **S**tate or **RE**lay output.
    Connector: RCA, when active goes to ground.
    TIP – Signal   SHELL – Ground
    Output ratings are the same as PAPTT2

13

(27) – LNA1:   Sequenced keying (LNA bypass or receive antenna control) for Radio 1
Jumper selectable **S**olid **S**tate or **RE**lay output.
Connector: RCA, when active goes to ground.
TIP – Signal   SHELL – Ground
Output ratings are the same as PAPTT2

(28) – DC 12V: Power input.
Connector: 2.1/5.5mm coaxial
CENTRAL – Positive pole   SHELL – Negative pole (Ground)

 NOTE: DO NOT connect MK2R/MK2R+ to any power supply used for either transceiver.

IMPORTANT WARNING: Be sure to observe the proper polarity!

4 - INSTALLATION

Installing MK2R consists of several steps:
1) prepare MK2R to work with your radios
2) install microHAM USB Device Router (the control and interface software)
3) configure the Windows USB Audio Devices (MK2R+ Only)
4) configure Router
5) set audio levels

Preparing MK2R for Use

1. **Turn off both radios** and make MK2R rear panel accessible.

2. Plug the DB37M of one radio cable set into the RADIO1 connector on the rear panel of the MK2R. Connect ALL connectors from the cable set to the matching jacks on the rear panel of RADIO1. Each connector on the radio interface cable is marked same as the jack on your transceiver.

3. Plug the DB37M of the other radio cable set into the RADIO2 connector on the rear panel of the MK2R. Connect ALL connectors from the cable set to the matching jacks on the rear panel of RADIO2. Each connector on the radio interface cable is marked same as the jack on your transceiver.

   RADIO1 should be your primary radio. Only the original station microphone for RADIO1 can be connected to the MK2R rear panel mic jack (RJ-45). Using the wrong microphone can damage the microphone, the radio or MK2R.

4. Connect cables from PTTIN1 to the PTT out of RADIO1 and from PTTIN2 to the PTT out of RADIO 2.

   Refer to the Operator's Manual for your transceiver for the proper signal connection. PTT output is on the REMOTE DIN for Kenwood, the Band Data jack for Yaesu (or TXGND), and ACC2 (DIN 7) or SEND for Icom. If your transceiver does not have an RCA connector for PTT output, it will be necessary to make the proper adapter.

IMPORTANT: This connection is required for proper VOX operation.

5. Connect the microphone for RADIO1 to the RJ45 **MIC** jack. If your microphone has a Foster (round) connector, use the adapter supplied with the RADIO1 cable set.

6. If your radios have two receivers (FT-1000D, FT-1000MP, FT-2000, FT-9000, Orion, IC-7800, K3, etc.) connect the fixed level audio output from the second receiver to the **SUB RX** jacks of MK2R

7. Connect the supplied headphone cable to the MK2R **R1+ R2 HP AUDIO** jack and plug the 6.3mm (1/4") plugs into the headphone jack of each radio.

8. Connect your paddles to the **PADDLE** jack.

9. If you use a foot switch, connect the foot switch for RADIO1 to FS1 and foot switch for RADIO2 to FS2. If you use only a single foot switch, connect it to FS1. You will configure MK2R for single or dual foot switch operation later with the MK2R control program.

10. MK2R only (not MK2R+) – connect two sound cards to their respective jacks
     OUT SC1: connect to the output of sound card 1 (line out or speaker)
     MIC SC1: connect to the microphone jack of sound card 1
     OUT SC2: connect to the output of sound card 2 (line out or speaker)
     IN SC2: connect to the Line In of sound card 2
   To use a using a single "three port" sound card,
     OUT SC1: connect to the output of sound (line out or speaker)
     OUT SC2: to **both** jacks using a stereo "Y" adapter
     MIC SC1: connect to the microphone jack of the sound card
     IN SC2: connect to the Line In of the sound card

11. Connect a 12V-16V DC supply to the **DC 12V** jack.
  Be sure to observe the proper polarity.

12. Locate the USB cable but **DO NOT connect it at this time.**

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/contents/en-us/d29.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 configuring Router for your station and software.

16

Configuring USB Audio CODEC and USB Voice CODEC (MK2R+ only)

Windows will automatically install the USB Audio Device driver to support the USB Audio CODEC and USB Voice CODEC in MK2R+.   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 MK2R+ and onto the air!
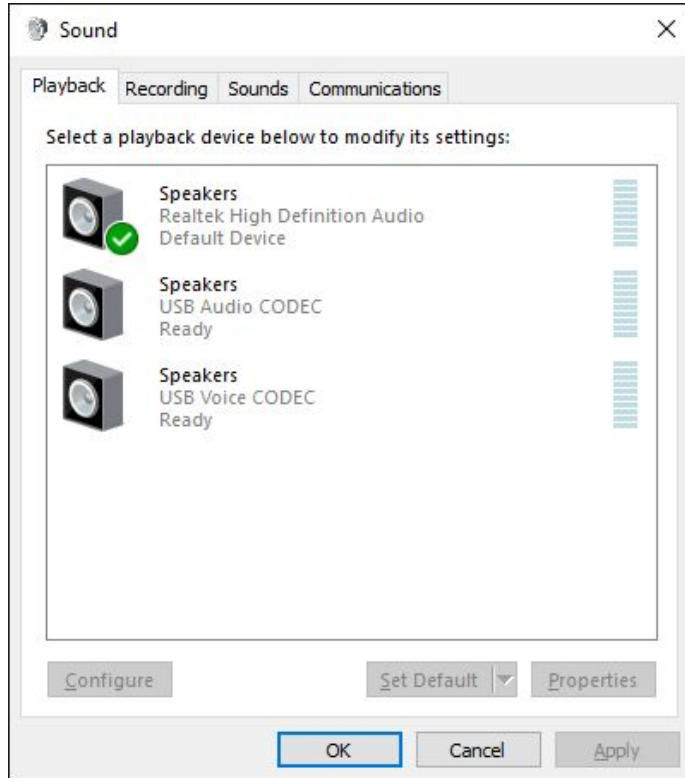
Right click on the Speaker Icon on the task bar and select "Playback Devices" or open "Sounds" in the Control Panel and reset the Default device for Playback to your computer's internal (primary) primary sound device.
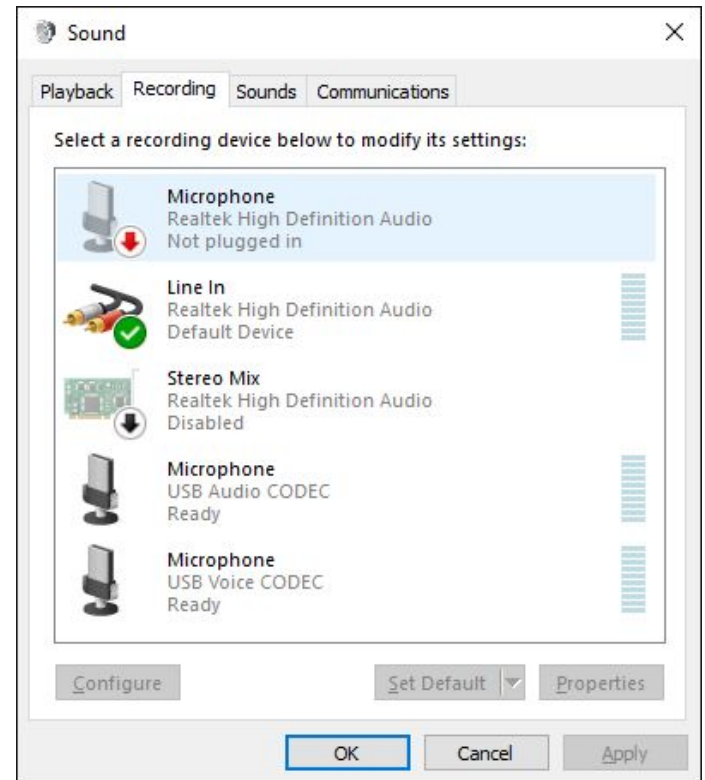
Select "Recording" reset the Default Device (and Default Communications Device if it is listed) to an input on your computer's primary internal (primary) sound card.

Double click on "Microphone" USB Audio CODEC, click on Advanced tab and set "Default Format" to 2 channel.

Configuring *microHAM USB Device Router*

The *microHAM USB Device Router (Router)* program provides a Windows compatible *configuration tool* for *microHAM USB Devices (MK2R or MK2R+ as well as DIGI KEYER, *microKEYER, CW Keyer and USB Interfaces) and *software interface* to other Windows applications (logging software, digital mode software, etc.). The software interface is provided as *Virtual Serial Ports*.

In order to configure and use MK2R with Windows compatible application programs, you must have installed the USB driver, started Router, applied power to MK2R and turned the device on. Router is then configured as required by the application (logging, control or digital mode) software.

MK2R includes an LPT (parallel) input. This connection is required for applications which do not support the microHAM SO2R Control Protocol or provide focus control information on a serial port.

MK2R Status
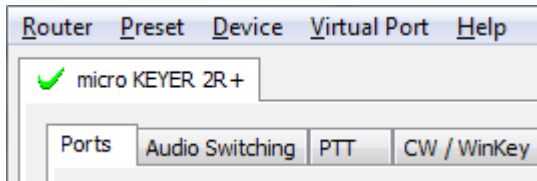
When the USB driver is installed correctly and MK2R is turned on Router will show a device tab with a **GREEN** check beside the device name (micro KEYER 2R).
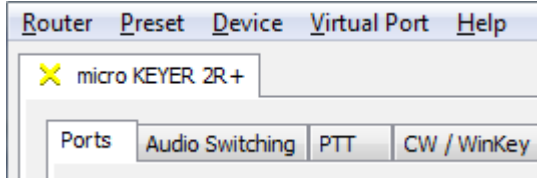
When Router shows a **YELLOW** "**X**" instead of a green ✓, it means the USB driver is correctly installed but MK2R is not turned on.
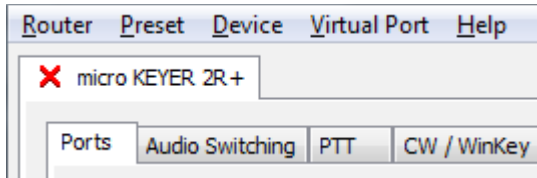
When Router shows a **RED** "**X**" instead of a green ✓, it means the device is disconnected and Router does not see the USB part of MK2R. This happens when the USB cable is unplugged or the USB driver is not correctly installed.

Initial Setup
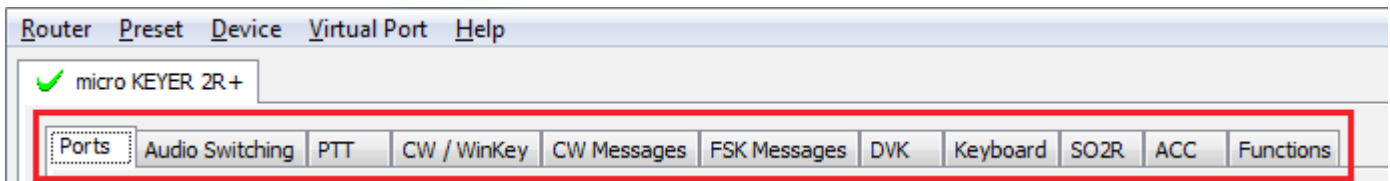
Router must be used to configure MK2R for proper operation. The device configuration tabs (in the red rectangle) are used to setup each part of the MK2R.

Creating and Using Virtual Serial Ports

*micro*HAM Router provides a set of virtual serial ports which allow Windows applications (logging and digital software) to work with MK2R 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 port to each function you wish to use (radio control, PTT, CW, FSK, etc.).

**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 that is used by another USB device. Even though Router will not allow creating a virtual port on 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, PDAs 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.

WARNING: Before you begin to create virtual ports, attach all external devices you are using with computer and allow them to connected to the system. Restart Router and then create virtual ports.

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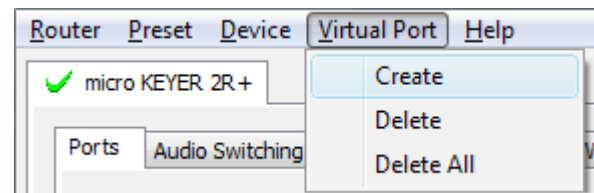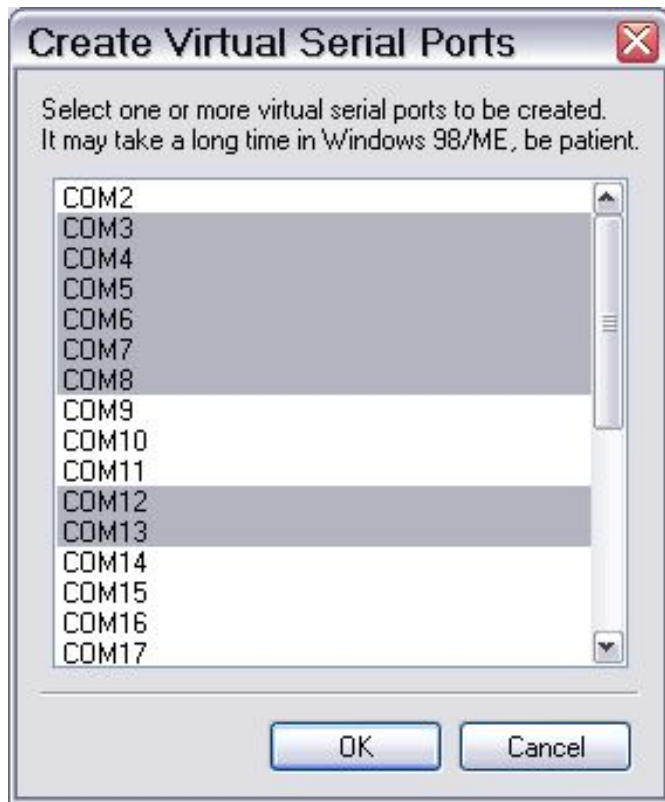
Create - Creates virtual COM ports. It is possible to select more than one port at a time by holding the *Ctrl* key on keyboard and clicking on COM port numbers. Creating virtual ports may take a long time (several tens of seconds), be patient.

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 the *Control* key on keyboard and clicking on the COM port numbers.

TIP: If you have removed 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 virtual ports in Router at once. Select "Virtual Port | Delete All" then create the ports again.   Any missing COM port numbers should appear.

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: The MK2R/MK2R+ can be completely reset by selecting **Default Router Settings** followed by **Device | Store as Power-up Settings** to save the defaults to the controller's EEPROM.

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 deletes 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: 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: Customizable band boundaries for the digital mode operation. This setting is used to automatically select VOICE or DIGITAL audio switching and the proper PTT output. 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 Ten-Tec 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.

WARNING: When selected, Router will not be able to control MK2R Audio Mixer and DVK, **use it carefully!**

Manually assign audio devices: when checked, Router will allow the user to select audio devices (sound card) in the appropriate fields of the Audio Mixer tab and will actively control the audio devices

Automatically assign microHAM audio devices: **(Not used with MK2R/MK2R+)**
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. This setting does not apply to MK2R or MK2R+, it applies only to DIGI Keyer.

Options | DVK:
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.

NOTE: Select the same sample rate and size as used by your software to avoid message distortion.

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 interface 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 Task Bar (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 in the Programs menu.

**Exit:** Clicking on this item will terminate Router.

NOTE: when Router is terminated the virtual ports will be closed and application software will be unable to communicate with MK2R and the radio.

PRESET MENU

The requirements of each application (logging, control and digital mode programs) are different. Each program handles radio control, CW, FSK, PTT, and the sound card its own way. In some cases, what works for one application may not work properly with another. To get maximum performance from *micro*KEYER II, the user should create customized settings for each application used.

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 II, a USB Interface II and Station Master, 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.
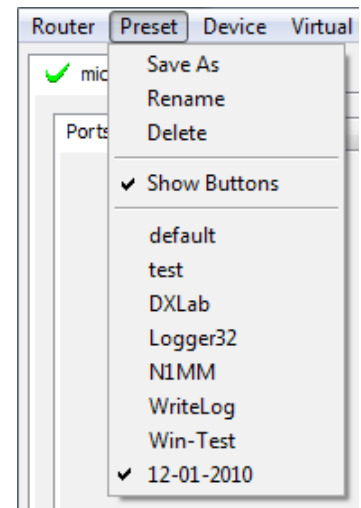
NOTE: Presets are not available until they have been created and saved by the user using **Preset | Save as**. For sample configurations for popular software, refer to the Setup Guide documents available in Router Help menu. Use **Help | Download Documents** if the Setup Guides are not available or incomplete.

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

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

2. Click on a preset button. For the buttons to be 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.
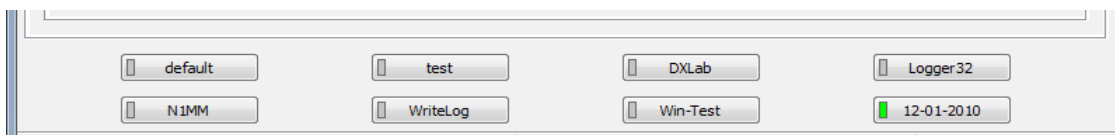
3. By right clicking on the system tray icon when the Router is minimized.

21
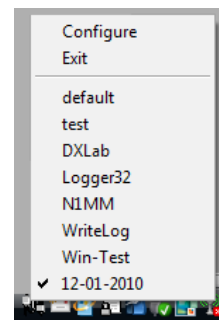
4. The presets and the current router configuration are stored to the registry when Router is closed and recalled when Router is loaded.

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 (interfaces) connected to the computer at the same time using the Presets.

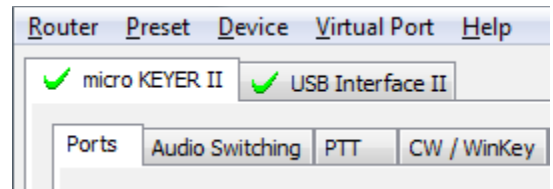Each device has its own tab (page) in the main Router notebook. The content of each device tab depends on the type of device. Adding a device is automatic when Router detects a new device. Once detected, a device remains in Router even though device is disconnected. Each device is identified by a unique serial string.

NOTE: Router supports all microHAM USB devices in a single instance by creating a separate root tab for each device. It is not necessary to run multiple instances of Router; a secondary instance can not be started.

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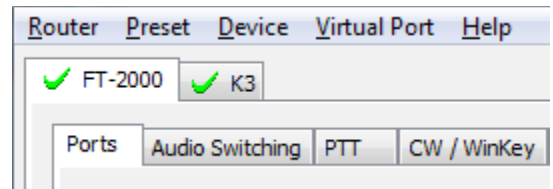
Delete - Removes a device from the Router. Only disconnected devices with a **RED** **"X"** on device tab can be removed. To disconnect a device from Router, unplug the USB cable from the computer or device.
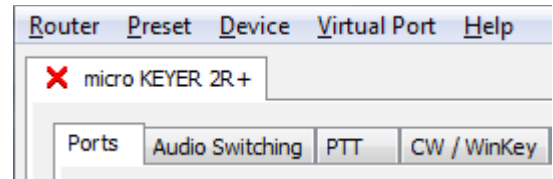
Save Template - will save the current Router settings to template file.

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 ideal for cloning setups in multi-computer stations or for sharing configurations between users.

Store as Power-Up Settings: - will store the current settings of the Audio Switching, PTT, CW/WinKey, SO2R and ACC tab to the MK2R EEPROM. If MK2R is operated without connection to the

computer it will use the settings stored in EEPROM. If MK2R is connected to a computer running Router, the Router settings will be used but the default settings are retained in EEPROM.

Upload Firmware: *micro*HAM will occasionally release updates to the firmware in MK2R. The update may support new features in Router or improve application compatibility. The most recent public version of the firmware is always available from www.microham.com/contents/en-us/d29.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.

NOTE: If you upgrade Router, each upgrade will include the latest firmware file. The new firmware will be automatically uploaded to the MK2R when the new version of Router connects for the first time, you have just to confirm the upgrade when prompted.

VIRTUAL PORT MENU
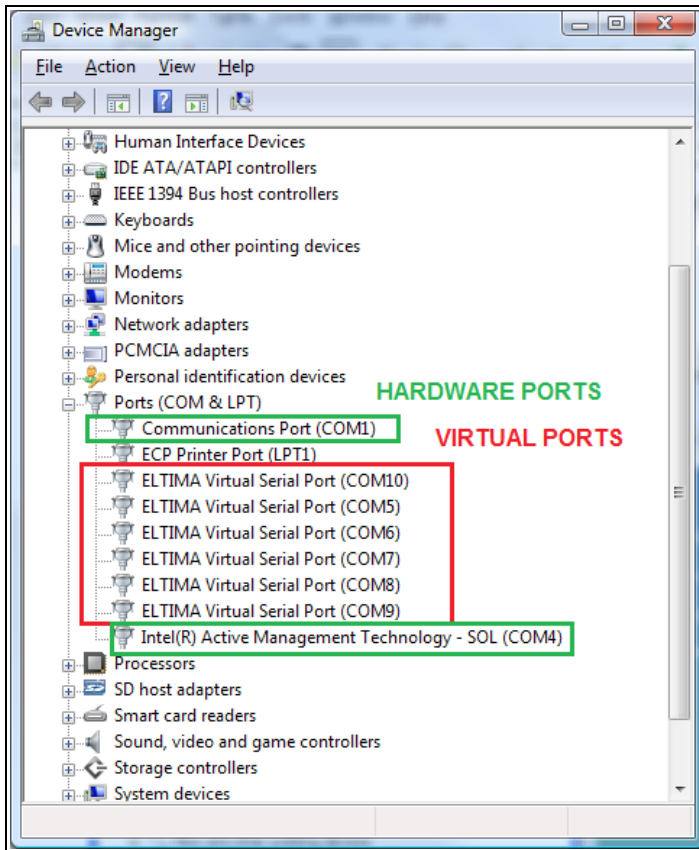
It is necessary to create a number of virtual serial ports (COM ports) in order for a Windows application (logging, control or digital mode program) to access *micro*HAM devices.
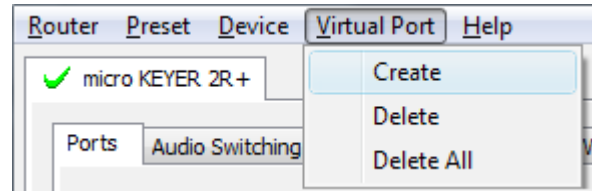
Create - Creates virtual COM ports. It is possible to select more ports at once by holding the *Control* key on the keyboard and clicking on COM port numbers. Creating a virtual port may take a while, be patient.

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.

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

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. This 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 twelve (12) tabs for configuring MK2R. Each tab controls part of MK2R's functions. Except for CW Messages, FSK Messages and Functions tabs, any change is applied immediately to MK2R.
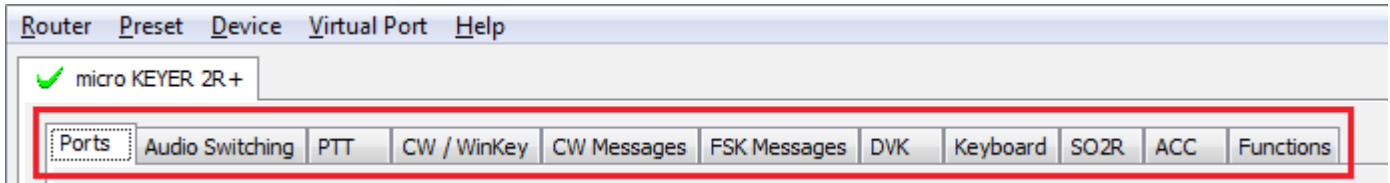
- **Ports:** assign virtual ports to the MK2R for use by applications

- **Audio Switching:** configures microphone and sound card audio routing based on operator preference, application sound card handling and operating mode

- **Audio Mixer:** sets sound card or CODEC levels.

  NOTE: The Audio Mixer is not available under Windows Vista or 7. Those operating systems do not permit an application like Router overall control of the sound device.

- **PTT:** configures T/R keying, keying sequencer and foot switch functions

- **CW/WinKey:** configures the internal CW keyer

- **CW Messages:** enter/store internal CW message memories

- **FSK Messages:** enter/store internal FSK message memories

- **DVK:** configure and control the level of Router's voice keyer

- **Keyboard:** configure operation of PS/2 keyboard or keypad

- **SO2R:** select source of focus control and other SO2R operating features.

- **ACC:** configure the accessory port

- **Functions:** configure headphone switching, audio routing for recording and digital operation.

PORTS TAB

Once the virtual ports have been created they must be associated with a specific function or 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.
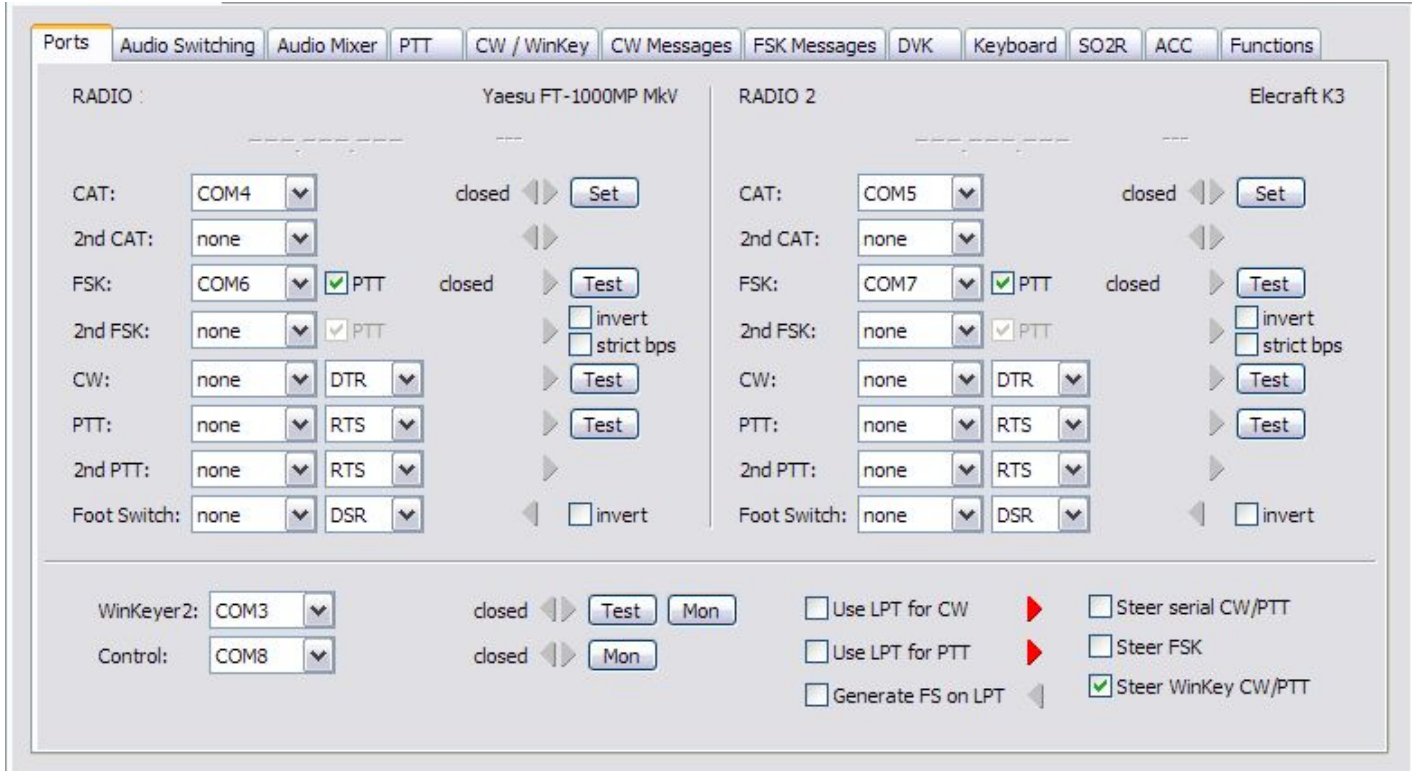
Proper port configuration is critical for operation with application software.

MK2R has ten channels – each channel provides an indication of the settings applied by the application and current state (e.g., or or off).

These eight channels (functions) are available for each radio:
- **CAT** (uses RxD and TxD)
- **2ⁿᵈ CAT** (virtual "fork" for the main CAT channel)
- **FSK** (uses TxD for FSK and RTS for PTT if checked)
- **2ⁿᵈ FSK** (uses TxD for FSK and RTS for PTT if checked)
- **CW** (uses DTR or RTS)
- **PTT** (uses DTR or RTS)
- **2ⁿᵈ PTT** (uses DTR or RTS)
- **Foot Switch** (uses CTS, DCD, DSR or RING)

These channels are common to both radios.
- **WinKeyer2** (uses RxD and TxD)
- **Control** (uses RxD and TxD)

   NOTE: Do not assign virtual ports for the channels/functions which are not used by your applications. It is unnecessary and only consumes resources.

CAT PORT & 2ⁿᵈ CAT PORT

The CAT channel is used by the host application to control transceiver frequency, mode, T/R switching and many other parameters. The application communicates with the radio using a serial protocol. Most modern radios implement some form of serial control but almost every radio implementation is different. The amount of radio control depends on the particular application and radio.

> **NOTE:** The COM 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 shows data flow from the host application to the radio and a red arrow shows data flow from the radio to the application.

> **TIP:** If the application provides PTT (T/R) 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 radios (CAT protocol) are being used. To select the radio, click the **Set** button, choose your radio in the **Radio** combo box, then select communication speed in the **Baud rate** box, and set the CI-V address for Icom and some TenTec radios.

When both radios are communicating with Router, click Device | Store as Power-up Setting. This will save the radio settings to EEPROM and allow frequency/mode decoding and iLink updates even if Router is not running (stand alone mode).

> **TIP:** Disable **AUTOBAUD** in Icom transceivers. Set the radio, Router, and application software to operate at 9600 or 19200 baud.

> **NOTE:** The baud rate must match your radio. All Icom and some Ten-Tec radios require the correct **CI-V address**. If everything is configured properly, your radio's current operating frequency and mode should be displayed.

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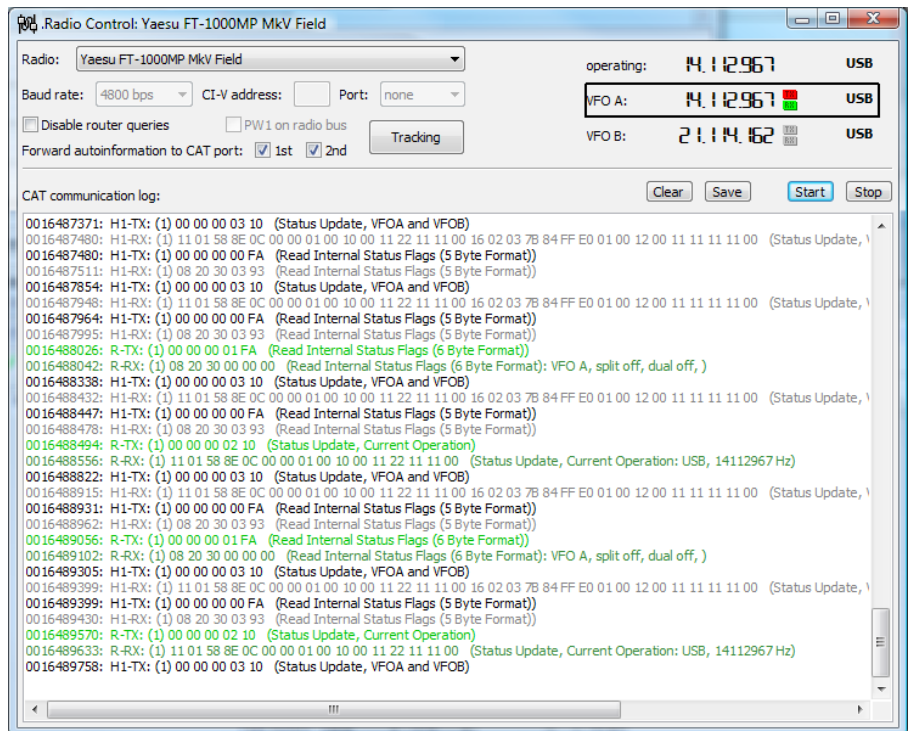
that information is not available from the communication between the application and radio.

> **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 and iLink update functions. 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 "Transceive" broadcast to keep the PW1 synchronized.

> **NOTE:** Check this box 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 PA port (described later).

Forward autoinformation to CAT port: When checked, all unsolicited packets (Icom "transceive" packets or "Auto-information" data from Kenwood, Elecraft and recent Yaesu transceivers), coming from the radio are transfered to the CAT port. Each CAT port has own check box.

Tracking: This function allows an external receiver to track the transceiver(s) attached to MK2R+.

> **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).

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.

IMPORTANT: If MK2R is to operate when Router is not running, the settings must be saved as power-up defaults using "Device | Store as Power-Up Settings."

2ⁿᵈ CAT PORT

Beginning with version 7.0, Router provides a 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 each application are processed alternately. In order to avoid collisions and avoid confusion due to unexpected data, responses from the radio are returned only to the application that generated the command. Unsolicited data from the radio such as automatic frequency/mode updates (Icom "transceive" packets or "Auto-information" data from Kenwood, Elecraft and recent Yaesu transceivers) can be forwarded to both CAT ports individually when appropriate "Forward autoinformation to CAT port" box is checked.

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

- Total data to/from from both applications must not exceed maximum throughput of the CAT port or the capacity of the 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 patiently while the other communicates with the radio.

- Due to protocol deficiencies in handling VFO split commands in 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: Although Router has been tested extensively using many different applications for the CAT and 2ⁿᵈ CAT ports, *micro*HAM cannot guarantee proper operation with every possible combination of software.

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 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 an analog (audio) signal used to modulate the transceiver for digital modes like 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, DATA, LSB-D or USB-D) 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

If your transceiver supports FSK, use FSK for RTTY whenever possible. It's the only sure way to get a clean RTTY signal no matter the microphone gain or compressor (processor) settings on your radio.

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 2ⁿᵈ 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.

The 2ⁿᵈ FSK port can also be used 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 Ten-Tec Omni V, Omni VI and Kenwood TS-940.

Strict bps: Some programs rely on the the UART "buffer full" signal for proper PTT timing and drop PTT (unkey)

when the UART buffer is empty. Because virtual ports generally have two buffers - one in the USB driver and one in the hardware - the first buffer may empty before all of the data has been transmitted allowing the PTT to before the message is complete. 'Strict bps' disables the USB buffering and sends one character at a time to the FSK output. With "Strict BPS" selected, the output will be about 20% slower due to the presence of extra stop bits between characters but proper PTT operation will be assured.

> **NOTE:** DO NOT select Strict bps for MMTTY, USB option C provides accurate timing.

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

> **NOTE:** Select RADIO1 or RADIO2 (as appropriate) with the buttons on MK2R when testing.

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 protocols, there are also latencies caused by computer CPU load, internal Windows message processing (inter-process communication) and data flow from another peripherals sharing same the USB hub. This 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 this principle, 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. 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.

> **NOTE:** Select RADIO1 or RADIO2 (as needed) with the buttons on MK2R when testing.

PTT & 2nd PTT PORTS

The PTT channels are used to control transmit/receive switching of the transceiver and power amplifier. An internal sequencer assures 100% protection against hot switching of the PA when the PTT channel is used. More information about T/R switching and the sequencer is provided under the PTT tab.

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.

> **NOTE:** Select RADIO1 or RADIO2 (as needed) with the buttons on MK2R when testing.

FOOT SWITCH

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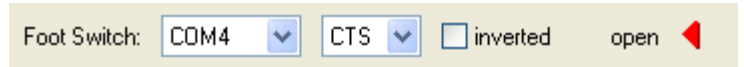
When the foot switch is pressed, this state is indicated by a red arrow.

32

WinKeyer2

WinKeyer2 is the next generation of the unique external CW processor developed by Steve Elliott, K1EL: WinKey with integrated dual radio support. This CW processor supports paddle input like any other electronic keyer, is highly configurable, and converts input received in ACSII (text) format to Morse characters. This unique property assures perfectly timed CW output regardless of operating system load. More detailed instructions for configuring WinKey are 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 channel as **closed**. When an application opens WinKey 2, (usually at start-up), Router reports port as **open** and displays settings used to configure COM port.
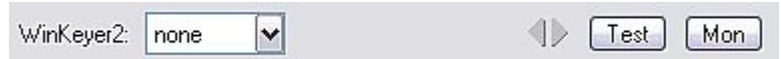
TIP: If you see settings other than 1200 8N2, the application is not configured correctly for WinKeyer. Even if the application sets an incorrect data rate, Router will send data to WinKey at 1200 baud but reliable operation is not guaranteed.

Data flowing through the channel are 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 Winkey2 when the channel unassigned or closed.

    NOTE: Select RADIO1 or RADIO2 (as appropriate) with the buttons on MK2R when testing.

**Mon:** "WinKey Monitor" allows capturing communications between Router or the application and WinKey2. 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.
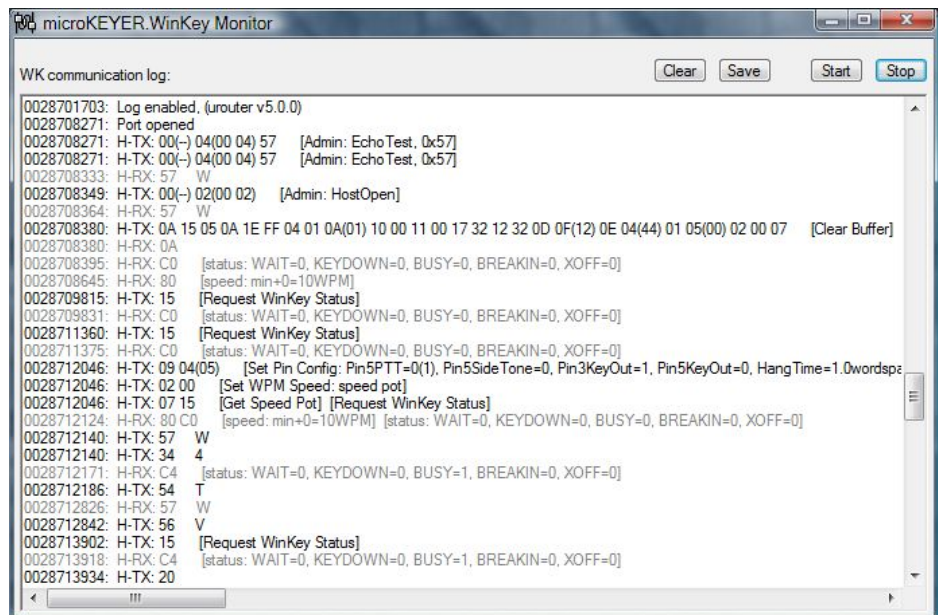
WK Monitor will display a description of each command from Router or the application and "decoded" response from WinKey. " If a line ends in three dots (...) it means that the command or response has been broken across two USB packets.

33

CONTROL PORT

The Control Port allows an application program (logger) that implements the microHAM Control (SO2R) Protocol to operate MK2R/MK2R+ completely with only a single USB connection.   The microHAM SO2R Control protocol allows a logger to specify Transmit Focus, Receive Focus, Stereo/Split headphone as well as control antenna switching and optionally use the CW, FSK and voice memory functions.

When an application opens the control port, WinKey 2, (usually at start-up), 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 to WinKey and the red arrow indicates data flow from WinKey to the host application.
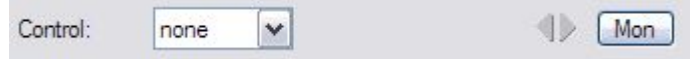
Mon: Opens a "Control Protocol Monitor" window to capture microHAM SO2R Protocol communications between a logger and Router. Controls for the monitor include **Start, Stop, Clear** and **Save**.

The Control Protocol Monitor should not be used under normal conditions. However, if there are problems between a logger and Router, 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.

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

CW and PTT from LPT (parallel port)

MK2R includes an LPT interface for "CT/NA compatible" CW and PTT inputs.

When the "Use LPT for CW" box is checked, MK2R will accept CW input on pin 16 of the LPT input. The red arrow indicates when LPT CW is active (key down).

When the "Use LPT for PTT" box is checked, MK2R will accept PTT input from pin 17 of the LPT. The red arrow indicates when LPT PTT input is active.
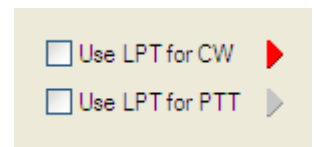
NOTE: Never enable more than one CW source at a time. You must select which source (WinKey, Serial or LPT CW) will be used by MK2R. Selecting multiple sources will result in distorted CW output.

TIP: If you plan to use MK2R with DOS based software, check both Use LPT for CW and Use LPT for PTT and select "Device | Store as Power-up Settings" from the Router menu.

Generate FS on LPT

When used with an LPT interface if the application supports it, MK2R can forward the state of FS1 on Pin 15 of the LPT.

CW/PTT steering

When manual control of transmit focus is selected in MK2R, CW (including WinKey) and PTT signals will be redirected to the active (selected) radio. This function was implemented to avoid confusion and assure the "expected" behavior. This means that CW and PTT signals for both radios will be directed to the selected (active) radio.

Some logging programs do not support two radios or are designed to generate only one set of keying signals which are connected to the selected radio using a steering (A/B) control. Select the "Steer serial CW/PTT" to allow Router and MK2R work properly with those applications.

When steering is enabled, the Serial CW, Serial PTT and 2nd PTT channels for RADIO1 are also used for RADIO2 and the active radio will be selected based on the "steering" control signal (**TX focus)** defined on the SO2R tab.

Steer FSK

Some applications, particularly day-to-day logging programs like DXLab Suite or DX4Win, do not support simultaneous operation of two radios but they do permit switching radios.

Steer FSK permits switching the FSK output from the MMTTY engine used by these loggers to the selected radio. When FSK steering is enabled the RADIO_1 FSK and 2nd FSK ports will also be used for RADIO_2. The active radio will be selected based on the "steering" control signal (**TX focus)** defined on the SO2R tab.

Steer WinKey CW/PTT

Some applications, most notably WriteLog, uses the original WinKey protocol with MK2R. This limits WinKey to a single CW output with no "two radio" support.

Steer WinKey CWPTT allows MK2R to steer the "RADIO 1" CW and PTT outputs of WinKey 2 to the active radio using the "steering" control signal (**TX focus)** defined on the SO2R tab.

35

AUDIO SWITCHING TAB

MK2R provides extensive and unique flexibility in routing audio among the computer sound card, transceiver, and the station microphone. To understand the way MK2R handles the sound cards, transceiver audio inputs and microphone you must understand how the sound card works. The following description is valid for both MK2R and MK2R+, the only difference is that the sound cards are integrated with MK2R+, where MK2R requires externally connected (in the computer) sound cards.

MK2R allows customizing the audio configuration to meet the needs of a specific logging program and operating style (VOX, foot switch, computer generated transmit/receive switching, etc.) for each mode. In addition, two sound cards (external for MK2R or internal for MK2R+) - one for CW and voice **(USB Voice CODEC or SC1)** and one for digital modes **(USB Audio CODEC or SC2)** are selected automatically based on radio mode and user preferences.

If the same mode (CW, voice, FSK, digital) is selected on both radios, the same sound card is used for both radios, One channel is used for each radio – typically left channel to RADIO1 and right channel to RADIO2. Output for the "unselected" radio is muted automatically when using Router DVK.

The output of the sound card or codec not being used for transmitting can be utilized for audio "feedback" - software events/warnings, external spot announcements, or audio review. The output of this sound card can be switched to the headphones under user control by selecting SC left or SC right to the left, right or both ears. When RADIO 1 and RADIO 2 are in different modes (digital <-> voice/cw), each radio uses a separate sound card or codec and the sound card output will not be connected to the headphones.

There are three distinct audio paths in MK2R and MK2R+. Each path is handled independently:

- from the transceiver fixed level audio outputs to the sound card input
- from the transceiver headphone output to the operator headphones
- from the sound card to the transceiver inputs including microphone switching
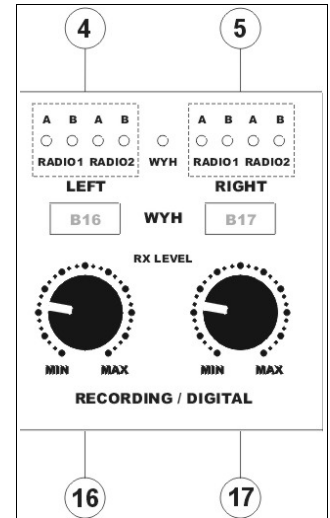
From transceiver fixed level audio outputs through MK2R to the sound card.

MK2R allows flexible audio selection of from both radios (and both receivers in dual receiver transceivers). Audio from the transceivers' "fixed level" outputs are connected to the **SC2 line in** (MK2R) or **USB Audio CODEC** (MK2R+). The signal for each sound card channel is selected using the **LEFT (B16)** and **RIGHT (B17)** buttons on the front panel. The level for each channel is adjusted individually by the pots **(16)** and **(17).**

The **+ (B5)** button can be used in conjunction with the **LEFT (B16) and RIGHT (B17)** button to allow selecting more than one source to each sound card channel. The selected sources are shown by the front panel lights (4) and (5).

Pressing the **LEFT and RIGHT** buttons at the same time connects the input of SC2 or the USB Audio Codec to the MK2R headphone output. This is called "What Your Hear" (WYH) and permits recording exactly the same audio as heard in the headphones. The WYH light will illuminate when WYH mode is selected.

> **NOTE:** Audio to SC2 (MK2R) or USB Audio CODEC (MK2R+) DOES NOT CHANGE with the transmit/receive state of the radios or the selected transmitter.

From transceiver headphone outputs to the operator headphones.

MK2R allows flexible audio selection of from both radios (and both receivers in dual receiver transceivers). Audio from the transceiver headphone jacks is connected to the MK2R headphone input, (optionally) mixed with other audio sources and routed to the headphone jack.

Pressing and holding the **+ (B5)** button in conjunction with **LEFT EAR (B4) or RIGHT EAR (B6)** buttons allows selecting/mixing multiple sources for each ear. The audio selection for each ear is indicated by lights (2) and (3) at front panel.

The **RADIO1 (B7), BOTH (B8) and RADIO2 (B9)** buttons allow fast, manual selection of Radio1, Both (Split/Mix), or Radio 2. When the **RADIO1** and **RADIO2** buttons are pressed simultaneously, the AUTO light will illuminate and MK2R will switch to the **AUTO** switching mode. The AUTO mode recognizes five (5) states:

- RADIO1=RX & RADIO2=RX & RX focus=R1
- RADIO1=RX & RADIO2=RX & RX focus=R2
- RADIO1=TX & RADIO2=RX
- RADIO1=RX & RADIO2=TX
- RADIO1=TX & RADIO2=TX
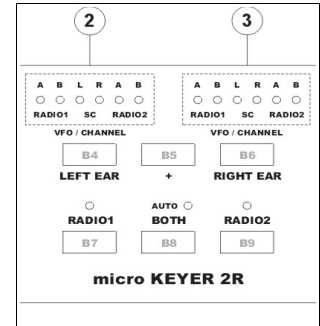
Receive audio (headphone) switching can be programmed separately for each of these states. MK2R stores up to eight sets of audio configuration Functions or "scenarios". Functions F1 through F4 are saved/recalled by pressing **F1 (B10)** through **F4 (B13)**. Functions F5 through F8 are accessed by holding **+ (B5)** and pressing F1 through F4.

To enter into programming mode, MK2R must be placed into AUTO mode by pressing the **RADIO1 (B7)** and **RADIO2 (B9)** buttons at the same time and then selecting **+ (B5)** and **BOTH (B8)** simultaneously. The AUTO light will flash while the MK2R is in programming mode. To exit Programming mode, press B5 and B8 simultaneously.

From the sound cards to the transceivers including microphone switching.

Audio from the sound cards or codecs can be used for two purposes - it can be used as a digital Voice Keyer (DVK) in voice modes (SSB, AM, FM) or for generating digital modes (AFSK/RTTY, PSK31, MFSK, etc.). If both outputs of either sound card/codec are unused, that sound card can be routed to the headphones by using the LEFT EAR and RIGHT EAR buttons described above.

MK2R recognizes four operating modes for each radio: CW, VOICE, DIGITAL and FSK. Each operating mode has a separate configuration for routing audio among the microphone, sound card or codec input, sound card or codec output and the transceiver inputs. The microphone can be switched to either the sound card mic input or the microphone input of either transceiver. Output from the sound card can be switched to the transceiver microphone jack (VOICE modes) or to the transceiver rear panel audio input (FSK and DIGITAL modes).

There are three audio configurations (settings):

- **setting A**: disconnects the computer generated audio and connects the microphone directly to the transceiver microphone input.

- **setting B**: routes the audio generated by computer to the transceiver rear panel audio input (PKT, AUX, or ACC depending on manufacturer). This audio routing is used for digital mode operation and sound card SC2 (MK2R) or USB Audio CODEC (MK2R+) output. Since the PKT or AUX input of most radios bypasses the radio internal microphone preamp and other audio processing stages which can distort digital modulation from the sound card, setting B is recommended for digital mode operation. In setting B, the microphone should be muted to avoid "hot mic" issues.

- **setting C**: routes the computer generated audio to the transceiver microphone input. This audio routing is used for VOICE modes and DVK operation from contest software. In setting C the microphone is normally connected to the microphone input of sound card SC1 (MK2R) microphone input or USB Voice CODEC (MK2R+).

For settings B and C, the microphone can be muted in the sound card if necessary. If the microphone is NOT muted, it is indicated by a lower case "m" in the setting string.

Router manages the Audio Switching based on three ways of generating PTT (VOX or software command, COM/LPT/WinKey PTT, and foot switch or hand mic PTT). Each PTT type can have a different audio configuration.

1. Transmit by VOX or software (CAT) command.

This setting is displayed in the TOP picture and indicated by the first letter of the settings (ABCm). The current operating state is indicated by a large black frame around the switching scheme picture.

A: Computer audio is disconnected from the radio and the station microphone is connected directly to the transceiver microphone jack. This setting is for those who prefer VOX operation in SSB.

B: Computer generated audio is routed to the transceiver accessory input and the station microphone is muted. This is the preferred setting for digital mode operation (AFSK, PSK, etc.) when the computer generates a PTT keying signal on a COM port.

C: The station microphone is connected to the sound card microphone input and audio output from the computer is connected to the radio's   microphone input. This setting is similar to "A" but microphone signal first goes to the sound card where it is looped to the output and then to the radio microphone jack.
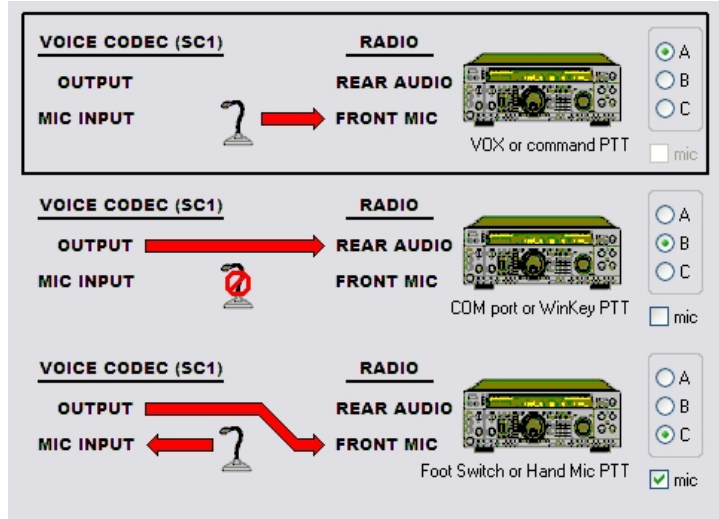
2. Transmit by computer generated PTT or WinKey PTT.

This setting is displayed in the MIDDLE picture and indicated by the second letter of the settings (A**Cm**A). The current operating state is indicated by a large black frame around the switching picture.

A: Computer audio is disconnected from the radio and the station microphone is connected directly to the transceiver microphone jack. This setting is for VOX operation.

B: Computer generated audio is routed to the transceiver accessory input and the station microphone is muted. This is the preferred setting for digital mode operation (AFSK, PSK, etc.) when the computer generates a PTT signal on a virtual port.

C: The station microphone is connected to the sound card microphone input and audio output from the computer is connected to the radio's   microphone input. This setting is similar to "A" but microphone signal goes through the sound card. This configuration is useful for voice keyer operation (DVK) and is the preferred setting with N1MM Logger, Win-Test, or WriteLog.

38
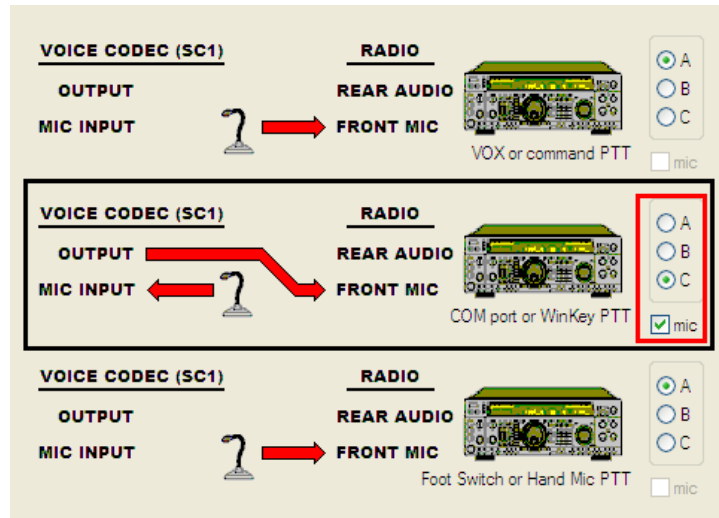
3. Transmit by foot switch or hand mic PTT.

This setting is displayed in the BOTTOM picture and indicated by the third letter of the settings (ACm**A**). The current operating state is indicated by a large black frame around the switching picture.

A: Computer audio is disconnected from the radio and the microphone is connected directly to the transceiver microphone jack. This setting allows the operator to interrupt a DVK message.

B: Computer generated audio is routed to the transceiver accessory input and the station microphone is muted. This is the preferred setting for digital mode operation (AFSK, PSK, etc.) when the computer generates a PTT signal on a virtual port.

C: The station microphone is connected to the sound card microphone input and audio output from the computer is connected to the radio's   microphone input. This setting is similar to "A" but microphone signal first goes trough the sound card.
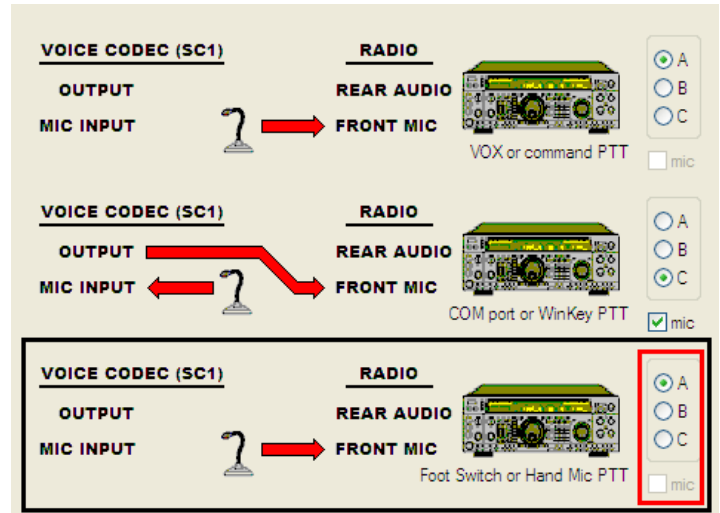
Even though all possible combinations can be accessed by clicking on the "Allow custom settings" box, not every combination is practical. Router preselects the most useful settings for each mode group.

Audio Switching

Router generally selects the proper audio configuration based on the mode, and optionally frequency, reported by the transceiver in response to polling by the application (logger) and/or Router. If Router is not able to read the operating mode from your radio (radio does not have computer control port or does not report usable mode information), you can select one of four fixed "no radio" modes or one "no radio" mode with manual (keyboard/keypad) mode selection.

Router generally selects the proper audio configuration based on the operating mode reported by the transceiver in response to polling by the application (logger) and/or Router. Some transceivers make the switching easy by providing a unique DIGITAL "mode." Among the rigs providing such support are nearly all Yaesu transceivers (PKT, PKT-L, PKT-U), most newer Icom transceivers (USB_D, LSB_D, DIGITAL-1, DIGITAL-2), and the Elecraft K3. Unfortunately, many radios fail to provide a separate digital mode or their serial control protocol does not report the digital mode. This is true for all Kenwood and TenTec transceivers, most older Icom transceivers. With those radios, digital operation (except for FSK) must be done using USB or LSB.

Even though the radio may not report a DIGITAL mode, Router can make an intelligent choice and apply the DIGITAL or VOICE configuration for Audio and PTT based on the operating frequency. The **VOICE/DIGITAL** combo box is used to select voice or digital mode when the transceiver it tuned to the "Digital Band" as defined in the Digital Band Map and the operating mode is USB, LSB or FM.

Select by frequency: Router will select DIGITAL settings when operating on a frequency inside the "Digita Mode" boundaries. These boundaries can be fully customized in the Band Map by clicking the Digital Band Map button.

NOTE: Use "Select by frequency" only if your radio does not have a dedicated mode (PKT, DIG, DATA or USB-D/LSB-D etc.) for audio based digital modes like PSK31, MFSK, OLIVIA, FSK-RTTY etc. and you must use USB/LSB/FM for digital operation.

Use VOICE settings: VOICE settings will be used when LSB, USB, AM or FM are selected regardless of operating frequency. This should be used with most Yaesu transceivers, Icom transceivers that support USB-D and LSB-D and the K3.

Use DIGITAL settings: DIGITAL settings will be used when LSB, USB, AM or FM are selected regardless of operating frequency.

Sound Card: is only visible with Vista and Windows 7.   It shows the Name, Mixer ID, Wave In ID and Wave Out ID for each input/output in the computer. The ID numbers are necessary to properly configure of some applications   (for example: WSJT, MMVARI etc.).

There are several audio switching configurations for each operating mode.

CW (AAA) – The audio configuration is not important for CW operation. This choice has been included to maintain consistency with T/R keying (configured on the PTT tab) where it is important. CW (AAA) assures quiet audio switching and minimizes relay clicking.

VOICE (ACmA) – The station microphone is connected to the radio mic jack. When the computer generates PTT on the virtual port PTT channel, the sound card output is switched to radio mic jack. This setting works with VOX or PTT (foot switch) mode, allows DVK playback, supports input switching for SSTV, and allows interrupting playback of a recorded message by pressing the microphone PTT or foot switch. When a DVK message or SSTV image is being transmitted, the station mic is muted and the computer audio is applied to the transceiver microphone input. With this setting, DVK messages must be recorded in the "on air" mode. This setting is recommended for general VOICE use.

VOICE (CmCmA) – The station microphone is connected to the sound card mic input except when the foot switch or microphone PTT is pressed. When the microphone PTT or foot switch is pressed, the microphone is connected to the radio. This setting allows use of VOX or manual PTT, off air recording of voice messages, and allows interrupting playback of a recorded message by pressing the microphone PTT or foot switch.

VOICE (CmCmCm) – The station microphone is always connected to the sound card mic input. This is the same as above but when the foot switch or hand mic PTT is pressed, the microphone remains connected to the sound card.

VOICE (CmBA) – Special setting for radios which use the rear panel audio input for DVK input during voice operation (N1MM Logger with Ten-Tec Orion or Orion II). Do not use with other loggers or radios.

VOICE (ABA) – Special setting for SSTV mode. The microphone is connected to the radio microphone jack and allows VOX or foot switch VOICE operation. When an image is being transmitted, the sound card audio is connected to the transceiver rear audio input (Kenwood, Ten-Tec, and Icom transceivers) and the mic is disconnected. This setting is not recommended for DVK operation with Icom transceivers.

FSK/DIGITAL (BBB) – The station microphone is disconnected and the computer generated audio is applied to the radio's rear panel audio input. This setting is recommended for all digital mode operation regardless of keying type (FSK or AFSK).

FSK/DIGITAL (CCC) – The computer generated audio is connected to connected to the radio front panel mic jack and the sound card microphone input is muted. This setting is recommended ONLY for older radios and the Elecraft K2 that do not have rear panel audio input for digital modes.

Router will show a black box around the selected mode/audio configuration.

40

MK2R must know which channel of the sound card to use for RADIO1 and which for RADIO2. This is done with the Left / Right selector labeled **Use line out channel.** When the **Left** channel is assigned to RADIO1, RADIO2 is automatically assigned the **Right** channel and vice versa. Because there is no standard, you can configure MK2R to match your software using this selector.

> **NOTE:** The Audio Switching is set independently for RADIO1 and RADIO2. Be sure to configure both!
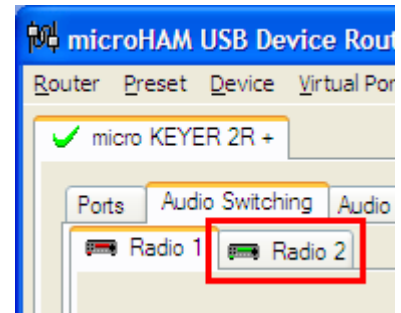
PTT TAB

The PTT tab provides independent PTT configurations for each radio.

PTT INPUTS

MK2R has ten PTT sources:

- PTT generated by the logging program on the virtual COM port RTS or DTR

- 2nd PTT generated by a second application on the virtual COM port RTS or DTR

- PTT generated on the DTR line of the FSK channel if the PTT box is checked.

- PTT generated on the DTR line of the 2nd FSK channel if the PTT box is checked.

  NOTE: The PTT and FSK channels generate the same **Serial PTT** input (they are logically paralleled),

- The foot switch attached to the MK2R rear panel RCA jacks.
  MK2R can be configured to recognize one or two foot switches on the SO2R tab. If MK2R is configured for one foot switch, both inputs will operate in parallel.

- The microphone PTT switch of the microphone connected to the RJ45 MIC jack.
  This input is hardwired to the FS1 input of the MK2R.

- PTT on the LPT port.
  LPT PTT will activate the radio with transmit focus

- WinKey generated PTT.
  Depending on the mode used by the logging program, WinKeyer2 can generate separate PTT signals for each radio or a single PTT that can be applied to the radio with transmit focus.

  NOTE: when WinKey2 is controlled by a logging program, the program configuration determines whether WinKey generates a single PTT output or separate PTT for each radio.

- Transceiver PTT status inputs (PTTIN) for sensing PTT status of the transceiver.
  To use VOX or software command for transmit/receive switching with power amplifiers connected to the MK2R PAPTT outputs, the PTT output from RADIO1 should be connected to PTTIN1 and the PTT output from RADIO2 should be connected to PTTIN2. Closing PTTIN will immediately cause PAPTT and LNA PTT to close if the are enabled.

WARNING: The use of VOX or software command for transmit/receive switching is not recommended and will likely destroy any low noise preamplifier inserted in the RF line.

- Virtual PTT generated by MK2R based on CW signal presence.

    MK2R generates "virtual" PTT from CW outputs when necessary for controlling transmit focus, PAPTT and LNA PTT if the software does not generate PTT. The leading edge of this "virtual PTT" is the same as the leading edge of the CW signal. The tail can be extended up to 2.5 seconds (using the WinKey PTT tail parameter).

PTT OUTPUTS

MK2R has four (4) PTT outputs for each radio: PTT1, PTT2, PAPTT and LNA PTT. PTT1 and PTT2 are brought out to the DB37 Radio connector. PAPTT and LNA PTT are RCA jacks for connecting to external devices.

PTT1 is wired to the radio microphone jack and is normally used to switch the radio into transmit in VOICE and CW mode.

PTT2 is wired to the radio Accessory jack and is used to switch the radio into transmit in DIGITAL and FSK modes.

> **NOTE:** PTT2 (rear panel PTT) is used by some radios to mute the microphone and disable microphone processing circuits (audio equalizers, compression, clipping, etc.) that can distort digital modulation.

PA PTT1 & PA PTT2 are available on the rear panel RCA jacks. They are designed for switching amplifiers for each radio. Each PA PTT is enabled by checking the appropriate **PA PTT** box. PA PTT will close before the radio PTT (PTT1 and PTT2) by the amount of **PTT lead** and open after the radio PTT by **PA PTT** tail setting.

> **NOTE:** PAPTT tail should be set to provide a few milliseconds of delay after the transceiver PTT releases. Some transceivers produce RF even after their "amplifier PTT" drops and the delay will prevent "hot switching on release".

LNA PTT1 & LNA PTT2 are available on the rear panel RCA jacks. They are designed for bypassing low noise preamplifiers (LNA) or disabling receive antennas during transmit. LNA PTT for each radio is enabled by checking the **LNA PTT** box. LNA PTT will close before the radio PTT (PTT1 and PTT2) by the amount of **PTT lead** and open after the radio PTT by **LNA PTT** tail setting.

MK2R can independently select the active PTT output for each radio based on the mode reported by the transceiver. If Router is not able to read the operating mode from your radio (radio does not have computer control port or does not report usable mode information), you can select one of four fixed "no radio" modes or one "no radio" mode with manual (keyboard/keypad) mode selection.

Router groups operating modes into three classes: CW, Voice (USB, LSB, AM and FM) and FSK/DIGITAL.   The available PTT options are:

CW:
PTT1 (microphone jack),
QSK (no transceiver PTT, PA PTT and LNA PTT include only PA/LNA PTT tail)
Semi Break-in (no transceiver PTT, PA PTT and LNA PTT include PTT tail and PA/LNA PTT tail)
PTT2 (rear panel jack).

VOICE:
PTT1 (microphone jack)
PTT2 (rear panel jack).

FSK/DIGITAL:
PTT1 (microphone jack),
PTT2 (rear panel jack),
PTT1 & PTT2 (both jacks).

PA PTT and **LNA PTT** can be enabled independently for each radio.

CW in VOICE: Enables CW output in Voice modes. Please note, this function must be supported by transceiver. CW in Voice always operates without transceiver PTT (Semi Break-in).

PTT lead: Specifies lead-in delay.

In CW with PTT1, PTT2 or Semi Break-in, PTT lead is the time between activation of PTT1, PTT2, PA PTT and LNA PTT and the first CW output. Transceiver PTT (PTT1/PTT2), PA PTT and LNA PTT all activate at the same time.

In CW with QSK, PTT lead has no effect. The leading edge of PA PTT and LNA PTT are coincident with the CW output.

In VOICE and FSK/DIGITAL, PA PTT and LNA PTT lead transceiver PTT (PTT1 or PTT2) by the amount of PTT lead.

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: Defines how long PTT 1 or PTT2 remains closed after the last CW character. PTT tail can be set to a constant value or can be proportional to the CW speed between seven (1.00 wordspace) and ten (2.00 wordspace) dot lengths.

PA PTT tail: Defines the time that PA PTT remains closed after transceiver PTT (PTT1 or PTT2) and/or PTT IN opens when switching from transmit to receive.

LNA PTT tail: Defines the time that LNA PTT remains closed after transceiver PTT (PTT1 or PTT2) and/or PTT IN opens when switching from transmit to receive.

NOTE: **LNA PTT** tail should always be greater than or equal to **PA PTT** tail.

ENABLE is an optional signal available on the ACC jack. Enable may be used with transceivers that provide an inhibit input from producing RF output until the amplifier and/or LNA switching is complete.
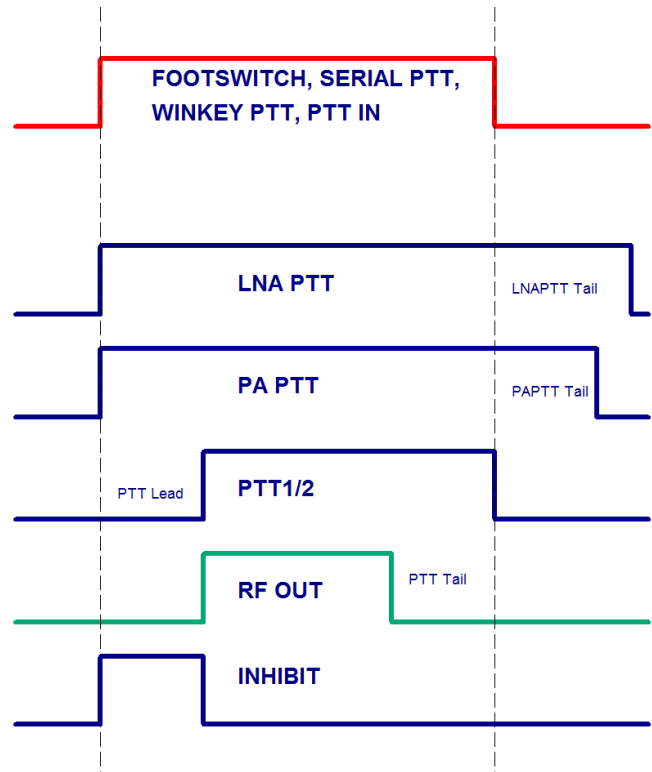
FOOT SWITCH SEQUENCER

Additional functions can be associated with the foot switch (or hand mic PTT). MK2R recognizes when the foot switch is closed (pressed) or open (released).

MK2R can mute or block serial port CW, FSK, PTT and audio when the foot switch is activated. Each of those inputs can be selectively restored when the foot switch (or hand mic PTT) is released or can remain muted until all PTT inputs are released.

Mute serial CW - if checked, virtual port CW (DTR or RTS) generated by 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 it has not already ended). If **Restore serial CW** is not checked, application generated CW will remain suppressed until the application releases PTT.

Mute serial FSK - if checked, FSK generated by an application will be suppressed while the foot switch is pressed. If **Restore serial FSK** is checked, FSK will resume when the foot switch is released (if it has not already completed). If **Restore serial FSK** is not checked, FSK will remain suppressed until the application releases PTT.

Restore serial PTT and audio - if checked, application generated serial PTT will be restored and audio routing will return to the "serial PTT" setting when the foot switch is released. If **Restore serial PTT and audio** is not checked, audio will only return after the application releases PTT.

CW/WinKey TAB

This tab provides the configuration for the internal, WinKey2 based, CW keyer. A complete WinKey2 manual can be downloaded from: http://k1el.tripod.com/files/WinkeyUSBman.pdf. Thanks to Steve Elliott, K1EL for this great product.

WinKey2 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 Winkey2. When an application opens WinKey2, Router plays no part in buffer handling and speed control. All other settings remain under Router control, application settings are discarded to avoid timing issues and to keep WinKey behavior consistent across applications.

> **NOTE:** WinKey parameters are stored separately for each Preset. This allows quick selection of parameters by choosing different preset. The Paddle swap parameter can be also controlled from attached PS/2 keypad.

WARNING: Do not change parameters while an application (logger) actively accessing WinKey.

When WinKey2 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)
- Ultimate (Single lever)
- Bug Keyer (Vibroplex emulation)

> **NOTE:** To connect a straight key to MKII, use "Bug Keyer" mode. The straight key should be connected between ring and sleeve of a three conductor plug. The tip must be open.

Priority – Ultimate 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%).

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

45

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 MK2R memory
Store All:	saves all messages to MK2R 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

46

FSK MESSAGES TAB

On this tab you can define nine FSK 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:

CR & LF:	Insert Carriage Return/Line Feed
Figure:	Insert special Figure character
Letter:	Insert special Letter character
Blank:	Insert special Blank character
Letter:	Insert special Bell character
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 MK2R memory
Store All:	saves all messages to MK2R 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 attached to the **PS/2** jack. See: External Keyboard.

> **NOTE:** Messages are not saved or loaded with Presets

DVK TAB

MK2R allows recording and playing nine voice messages per bank and an unlimited number of banks (limited only by the capacity of the computer hard disk). Banks can be managed with Rename, Add and Remove buttons. **Rename** to rename the current bank, **Add** to create a new bank, and **Remove** to delete the current bank. Bank selection is provided by **Bank** box.

Each memory may repeat with a programmable delay (loop) or can be chained with another memory using external keyboard or keypad.

While a DVK message is recorded or played MK2R uses the DVK mixer settings. When recording or playback is done, the settings in the Audio Mixer are restored. DVK mixer settings are not stored with presets but in the message banks. This means each bank can have its own levels (slider position). It also allows each bank to be configured for the voice of a different operator if MK2R is used in a multi-operator setup.

DVK memories can be played back using the LPT signals (DVK 1-4 or DVK 1-6) generated by many programs for controlling external DVK units.   The external control signals are defined on the SO2R tab.

Set: :

REC MIC: "Microphone (USB Voice CODEC)"

TX: "Speaker (USB Voice CODEC)"

REC MIC slider adjusts microphone level during message recording.

TX controls the DVK playback level.

48

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.

General:

QWERTZ layout – configures the keyboard for a QWERTZ layout.

FSK from keyboard:

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

UOS: shift back to LETTERS case whenever a space is encountered 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).

CW from keyboard:

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.

Auto numbering:

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** sub-tab permits configuring custom control commands on the PS2 keypad.

49

SO2R TAB

The SO2R Tab is used to configure the signals each program uses to convey transmit Focus, Receive Focus and Stereo (Split) headphone states to MK2R/MK2R+.

Computer AUTO Control:

If MK2R is in AUTO TX Focus and AUTO RX Focus, radio selection is under software control. MK2R provides three ways for the application to control focus: the traditional parallel (LPT) port – the "CT/NA standard," serial port handshake signals, or by software command (microHAM SO2R Protocol).

> **NOTE:** Software developers who would like to implement native control of the MK2R and MK2R+ should contact OM7ZZ at microham.com.

CLASSIC AUTO CONTROL is flexible tool for customizing MK2R for operation with current software. There are four (4) parameters which can be controlled via parallel port (CT/NA compatible LPT) or virtual serial port signals.

TX focus: Used for automatic selection of which transceiver will transmit.
    Available signals are:
- LPT pin 3
- LPT pin 14
- COM port RTS signal
- COM port DTR signal
- Two PTTs

Each signal can be inverted if necessary. The state of the signal is represented by a RED arrow.

RX Focus: Used for automatic headphone "priority" switching when both radios are in receive.
    Available signals are:
- LPT pin 4
- COM port RTS signal
- COM port DTR signal
- Follow TX Focus

Each signal can be inverted if necessary. The state of the signal is represented by a RED arrow.

"Follow TX focus" is a special setting for applications that provide only TX Focus control. Headphone audio is selected automatically based on the TX Focus.

Stereo Headphones: Forces stereo headphone (split) mode regardless of operating state.
    Available signals are:
- LPT pin 5
- LPT pin 9
- COM port RTS signal
- COM port DTR signal

LPT Control of DVK: Used for external control of MK2R DVK from the LPT port.
- 4 message support (pin 2= Abort, pin3 – pin6 = DVK 1 – 4)
- 6 message support (pin 2= Abort, pin3 – pin8 = DVK 1 – 6)
- 7 message support
    (pin 2= Abort, pin3 – pin6 = DVK 1- 4, 4+5 = DVK 5, 4+6 = DVK 7, 4+5+6 = DVK 7)

Live Status:
Shows the current TX Focus, RX Focus and STEREO status
RED 1 circle represents RADIO1 and GREEN 2 circle represents RADIO2

Semi-automatic focus control:
When checked, RX Focus will follow TX Focus if TX focus is manual and RX Focus is "Auto." Any focus command from the logging program will be ignored while TX Focus is in Manual (Radio 1 or Radio 2).

OPERATION

TX logic: MK2R supports two modes of operation - first one wins or last one wins. In **first one wins**, transmitting on one radio will lock out transmission on the second radio. In **last one wins**, beginning a transmission on one radio will abort a transmission in progress on the other radio.
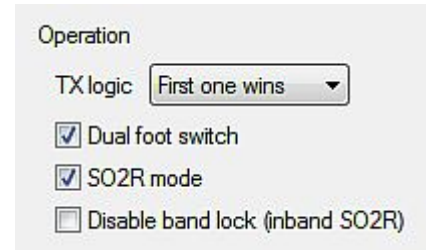
Dual foot switch: MK2R has two foot switch inputs.

If "Dual foot switch" is selected, the foot switch attached to FS1 controls RADIO1 and the foot switch attached to FS2 controls RADIO2. If Transmit Auto Focus is enabled, pressing a foot switch will override the currently selected transmit focus - for example, pressing FS2 with RADIO1 selected will move transmit focus to RADIO2 while the foot switch is closed. When the foot switch is released, MK2R returns to the auto focus state in effect before pressing the foot switch.

If "Dual foot switch" is not checked the foot switch inputs act in parallel.

SO2R mode: If checked, simultaneous transmission on both radios is not allowed. When not checked, the radios can transmit at the same time.

Warning: You are violating contest rules and etiquette if you enter a single operator or multi-operator single transmitter class with the SO2R mode disabled. ALWAYS observe contest rules !!!

Disable band lock (in band SO2R): In order to prevent accidentally transmitting with both radios on the same band, MK2R will normally inhibit transmission when both radios are on the same band or data from one radio is lost.

WARNING: Disabling band lock may result in damage to the transceiver front end.

MODE

MK2R includes "special" operating rules selected by the MK2R MODE button. There are three (3) slots, each of which can carry a different operating rule. So far there are seven predefined rules. Additional rules can be added by user request.

Use simple auto mode: does not use advanced headphone audio combinations. Headphone switching behaves the same way as classic SO2R controllers – headphones are switched to the non-transmitting radio and the "stereo" line puts the headphones in split mode regardless of any other inputs. Stored functions will be also simplified but the content of the stored scenario will be retained. This allows classic mode to be turned on/off without the need to modify the stored function.
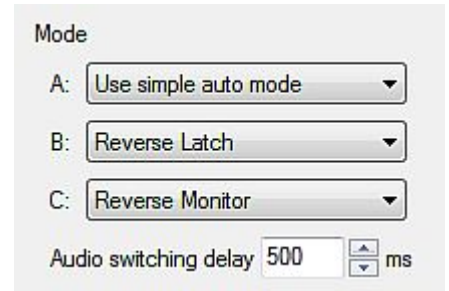
Reverse operating logic: when used, the current operating logic is reversed. For example, if was first one wins was selected, last one wins will be used and vice versa.

Reverse WinKey focus: if the logger is using serial CW, WinKey will key the opposite (unselected) radio. This means that the paddles will be connected to the radio not in use by the logging software.

Reverse DVK focus: if the logger is using its own DVK, the MK2R DVK will key the opposite (unselected) radio. You can use the MK2R DVK (with PS/2 keyboard or keypad) to call a station on the radio that does not have focus.

Delay audio switching: when enabled, headphone switching will be delayed by the defined period when going from receive to transmit. When using a system that forces the headphones to the non-transmit radio (e.g., Latch); so long as the radios' monitor functions are enabled, the switching delay allows the operator to hear the first portion of the message to confirm that the correct message is being sent!

Reverse Latch: if Latch ("aggressive SO2R") is enabled, it will be disabled. If Latch is disabled, it will be enabled. This allows turning Latch on or off without the need to modify the stored function.

Reverse Monitor: if Monitor ("paddle sidetone") is enabled, it will be disabled. If Monitor is disabled, it will be enabled. This allows turning Monitor on or off without the need to modify the stored function.

ACCESSORY (ACC) TAB

The Accessory connector supports 29 I/O functions which can be assigned to six "ports."
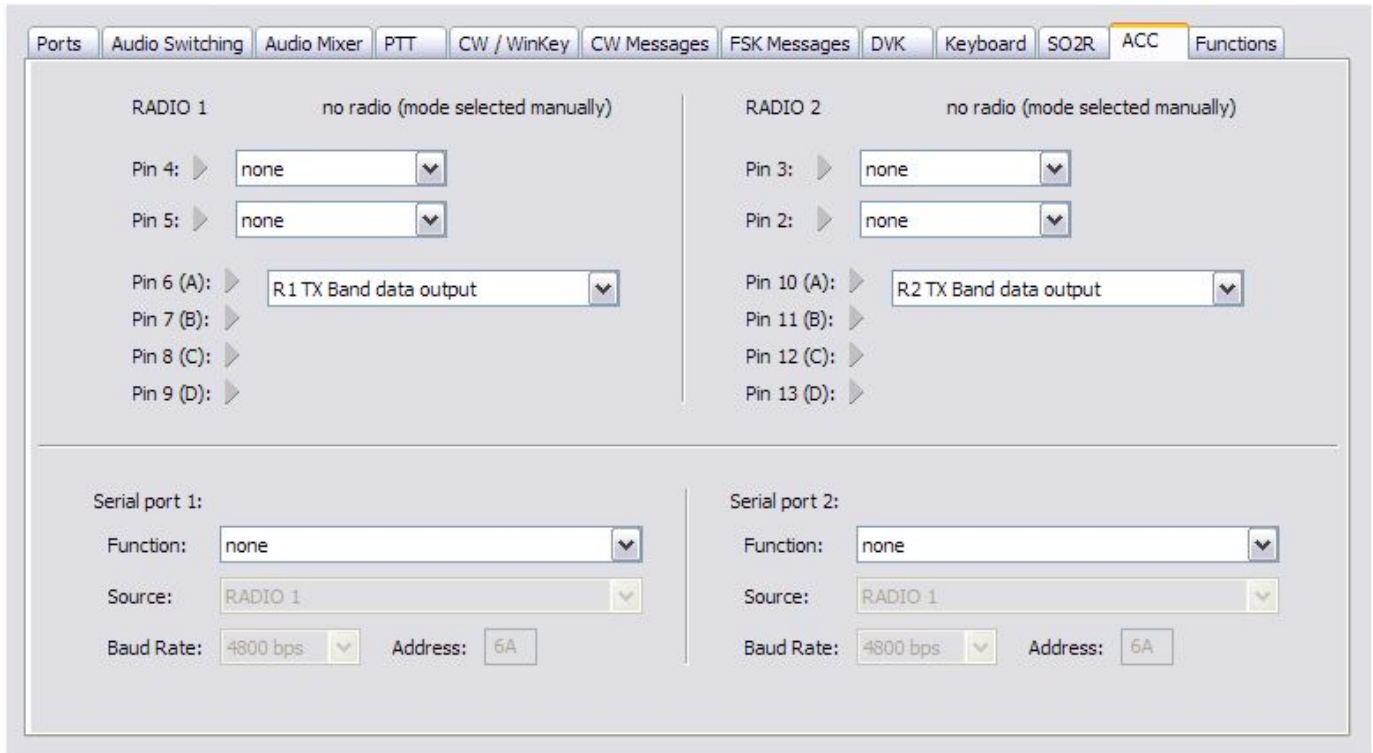
The left half of the Accessory tab is for RADIO1 (pins 4-9) - the right half for RADIO2 (pins 2,3 and 10-13). Pins 2, 3, 4, 5 are fully configurable and provide radio specific and global functions. Pins 6-9 and 10-13 are programmed as a group.

RADIO 1	**RADIO 2**
Available Functions – Pins 4, 5	***Available Functions – Pins 2, 3***
• RADIO 1 ENABLE	• RADIO 2 ENABLE
• RADIO 1 INHIBIT IN	• RADIO 2 INHIBIT IN
• RADIO 1 PTT1 OUT	• RADIO 2 PTT1 OUT
• RADIO 1 PTT2 OUT	• RADIO 2 PTT2 OUT
• RADIO 1 PA PTT	• RADIO 2 PA PTT
• RADIO 1 LNA PTT	• RADIO 2 LNA PTT
• RADIO 1 TX FOCUS	• RADIO 2 TX FOCUS
• RADIO 1 RX FOCUS	• RADIO 2 RX FOCUS
• STEREO FOCUS (SPLIT) OUT	• STEREO FOCUS (SPLIT) OUT
• CW INPUT (Straight key)	• CW INPUT (Straight key)
• SERIAL PORT 1 (both pins)	• SERIAL PORT 2 (both pins)
Available Functions – Pins 6-9	***Available Functions – Pins 10-13***
• RADIO 1 BAND DATA OUTPUT	• RADIO 2 BAND DATA OUTPUT
• RADIO 1 BAND DATA INPUT	• RADIO 2 BAND DATA INPUT
• LPT pins 2, 7, 8, 9 COPY OUT	• LPT pins 2, 7, 8, 9 COPY OUT
• BAND DATA OUT – Active Radio	• BAND DATA OUT – Active Radio
• PROTOCOL CONTROLLED	• PROTOCOL CONTROLLED

NOTE: all signals are **TTL:** be sure to use proper buffering and/or level conversion.

- RADIO 1/RADIO2 ENABLE
  Enable signal from MK2R to Radio1/Radio2 – delays generation of RF by radios equipped to use the signal and provides "hot switch" free operation even with VOX or CAT T/R switching

- RADIO 1/RADIO2 INHIBIT IN
  An external Inhibit input for devices such as Power Amplifiers that generate a "not ready" signal. MK2R to delay the PTT1/PTT2 and Enable outputs until the external device signals it is ready.

- RADIO 1/RADIO2 PTT1 OUT
  Copy of the microphone PTT – active only if PTT1 is enabled

- RADIO 1/RADIO2 PTT2 OUT
  Copy of the rear panel PTT – active only if PTT2 is enabled

- RADIO 1/RADIO2 PA PTT
  Copy of the PA PTT signal – active only if PA PTT is enabled

- RADIO 1/RADIO2 LNA PTT
  Copy of the LNA PTT signal – active only if LNA PTT is enabled

- RADIO 1/RADIO2 TX FOCUS
  High if the respective radio is selected for transmit.

- RADIO 1 /RADIO2 RX FOCUS
  High if the respective radio is selected for receive

- STEREO FOCUS (SPLIT) OUT
  High if stereo (split) headphone mode is selected

- CW INPUT (Straight key)
  Input for a second keyer – currently connected in parallel with LPT/Serial CW

- RADIO 1/RADIO2 BAND DATA OUTPUT
  Band Data – 4 bit binary (defined in "Band Map") – indicating the band of the respective radio

- RADIO 1/RADIO2 BAND DATA INPUT
  Band Data Input – 4 bit binary (Yaesu format) – from the respective radio

- LPT pins 2, 7, 8, 9 COPY OUT
  Copy of the data on pins 2-9 of the LPT input

- BAND DATA – Active Radio
  Band Data – 4 bit binary (defined in "Band Map") – indicating the band of the radio with transmit focus

- PROTOCOL CONTROLLED
  Output controlled by logger using microHAM Control Protocol (e.g., logger controlled antenna selection, "Band relay," or other logger specific data)

- Serial Port 1 (Radio 1)/Serial Port 2 (Radio 2)
  frequency related data generated within MK2R/MK2R+ – either Icom CI-V Transceive or SteppIR protocol format – for controlling frequency dependent accessories like amplifiers, automatic antenna tuners or SteppIR antennas.

Serial Port 1/Serial Port 2:

When configured for serial device support, each serial port can operate in one of two modes (each mode requires the proper external hardware interface):

CI-V: When the serial device function is set to CI-V, MK2R simulates Icom's *CI-V transceive* function and broadcasts the chosen frequency in Icom format even when the radio is not an Icom transceiver. The CI-V address and baud rate of simulated radio is set in appropriate field.

One of six frequency sources can be selected: RX frequency, SUB 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 settings may not work with some radios.

Antenna Control: MK2R can control SteppIR and Ultra Beam antennas using the antenna's native protocol. For connection information see your antenna's manual.

NOTE: Connecting MK2R or MK2R+ to an antenna controller requires a TTL to RS-232 converter like the ***micro*HAM ACC-DualSteppIR.** The *micro*HAM ACC-DualSteppIR is a dual TTL to RS-232 converter designed to connect the "serial port" lines to the DATA OUT ports of two antenna controllers. Pin-out documentation for the ACC port can be found in Appendix A.

Native mode control has two advantages over control based on transceiver frequency only.

- MK2R protects the antenna while elements are moving (retuning). Transmission can not be initiated using PTT while the antenna is retuning. When using VOX, MK2R will not activate PAPTT to prevent a power amplifier from operating the SteppIR is tuning.

- When operating in split frequency mode, the transmit frequency is sent to the SteppIR to prevent retuning between transmit and receive when operating with wide splits.

NOTE: This function does not replace the OEM controller, the original controller is still used.

A PS/2 keypad attached to MK2R permits suspending/resuming Antenna control, selecting 180 degree mode and/or selecting bidirectional mode. Using the keypad allows manual control while keeping MK2R and Antenna controller in sync.

IMPORTANT: The original SteppIR controller MUST be switched into the GENERAL mode. Manual band changes on controller front panel are disabled. Autotrack must be turned on with the SDA-100. Use 9,600 bps or less for reliability. Connect the serial port to the SteppIR DATA OUT port using a TTL to RS-232 converter and cross-wired ("null modem") cable which uses **only three wires** (pin 2 to pin 3, pin 3 to pin 2 and pin 5 to pin 5. The *micro*HAM **ACC-DualSteppIR** is a dual TTL to RS-232 converter designed to connect MK2R and the DATA OUT ports of two SteppIR controllers. Contact your *micro*HAM distributor.

IMPORTANT: Baud rate must be set to 19200 bps for Ultra Beam. A special DB9M-DB9M adapter must be used between the ***micro*HAM ACC-Dual SteppIR** adapter. Connect pins 2-3, 3-2, 5-5 from end to end and a jumper between pins 4 (DTR) and 8 (CTS) on the Ultra Beam end.

FUNCTIONS TAB

The Functions Tab provides a tool for managing the operating modes and defining the audio configuration in each of the eight states. Configuration data can be uploaded to MK2R and saved as a function or it can be saved to an file on the computer. Any single function or all eight functions can be retrieved from MK2R, saved on the computer and modified. New or modified configurations can be saved, uploaded to MK2R and/or shared with other users.

The Function (select) box is used to select the function to be retrieved, loaded or edited.

Description provides a short title to remembering the purpose of the configuration when storing the configuration to a file. The description is not saved in MK2R.

Each **check box** indicates that the associated LED/control is on.

MK2R supports the following **HEADPHONE** states:

RX focus on R1:	Both radios receiving, RADIO1 has RX Focus
RX focus on R2:	Both radios receiving, RADIO2 has RX Focus
Computer TX on R1:	RADIO1 in transmit by computer (serial PTT, WinKey, or Protocol).
Computer TX on R2:	RADIO2 in transmit by computer (serial PTT, WinKey, or Protocol).
Manual TX on R1:	RADIO1 in transmit manually (Footswitch, mic PTT, paddles, or VOX).
Manual TX on R2:	RADIO2 in transmit manually (Footswitch, mic PTT, paddles, or VOX).
STEREO:	Priority "stereo" state. Special "Stereo" settings are applied when the logging program selects "stereo" or split operation.
FIXED:	Automatic headphone switching is disabled

Unused states are grayed out.

FIXED is disabled when **Auto** headphone switching is selected.
Computer TX is disabled if **Latch** is not selected
Manual TX is disabled if **Monitor** is not selected.

56

These **RECORDING/DIGITAL** states are available:

RX focus on R1:   RADIO1 is selected (has RX Focus)
RX focus on R2:   RADIO2 is selected (has RX Focus)

  NOTE: Split/Stereo is ignored for Recording/Digital

Functions stored in MK2R can be saved to and restored from a file.   Users can share configurations by exchanging files.

The control buttons are:

Get:	retrieve the selected Function from MK2R.
Get All:	retrieve all stored Functions from MK2R.
Store:	store the currently selected Function to MK2R.
Store All:	store all Functions defined in Router to MK2R.
Load From File:	loads a single Function into Router from a file
	Single function files have a u1s extension
Load All From File:	loads definitions for F1 through F8 into Router from a file
	"All function" files have a usc extension
Save to File:	store the current Function to a u1s file.
Save All to File:	store all Function definitions to a usc file.

The default location for u1s and usc files is:
      C:\Documents and Settings\All Users\Application Data\microHAM\cfg

TIP: The Function Tab is an **EDITOR**, not an on-line configuration tool. All changes must be written to MK2R with **STORE** or **STORE ALL** before they can be used.

Once the configuration has been written to MK2R, it can be selected by pressing the appropriate F-key on the MK2R front panel or by selecting the desired function and pressing APPLY on the Function tab.

6 - MK2R OPERATION
Setting Audio Levels

For optimum operation of MK2R and MK2R+, the audio levels must be set properly. The function of each control was described in the AUDIO MIXER and DVK sections of the manual.

About microphones and MK2R: In order to configure MK2R correctly, it is absolutely necessary to understand the difference between electret and dynamic microphones.

A dynamic microphone consists of a small moving coil and a magnet. As sound moves the diaphragm, the magnetic field in the coil changes producing a very small AC current which results in about 15 millivolts peak-to-peak at the of the typical transceiver.   If a small voltage is applied to a dynamic microphone, it requires more sound pressure to move the diaphragm and the output of the mic is reduced. If the current through the coil is not limited, a dynamic mic can be damaged.

An electret mic consists of a capacitor with an electrostatically charged dielectric attached to the diaphragm and a small amplifier. The voltage variation caused by sound on the electret capacitor is so small that the amplifier is required before the output can be used. The amplifier requires a small DC voltage ("bias") to operate and provides an audio signal of about about 500 millivolts peak to peak.

While dynamic and electret microphones each have their strong points, they are not directly interchangeable. Where an electret mic will not work without a DC supply, a dynamic mic can be damaged by that voltage. In addition, signal levels are very different with the typical electret mic producing signal levels 20-60 times greater than that from a dynamic mic. Because of the differences, one can not interchange dynamic and electret microphones without special consideration.

Most amateur transceivers are designed for use with dynamic microphones - this includes those made by Elecraft, Kenwood, TenTec and Yaesu. On the other hand, Icom transceivers are designed for use with electret microphones. When compared to other transceivers, Icom radios typically required a larger audio input and have a DC voltage on their microphone line. Note: the Elecraft K3 can be configured for either electret or dynamic microphones.

Configuring MK2R for your radios:

1. Open the top cover of MK2R and check position of the jumpers for the three internal microphone preamps. The first preamplifier (RECORDING – LIVE MIC) is used ONLY when the microphone is switched to the sound card ("C" audio settings). The other two, (RADIO1 and one for RADIO2) are used ONLY when the microphone is connected directly to the radio ("A" audio settings).

2. **RECORDING – LIVE MIC:** This preamplifier is designed for use with dynamic microphones including the Heil HC-4 or HC-5 elements. It makes the relatively low output of the dynamic microphones compatible with the mic input of most sound cards (including the USB Voice CODEC in MK2R+). Jumpers for the Recording preamplifier are located on the upper circuit board behind and slightly to the right of the Mix control. This preamp is enabled at the factory.

3. **RADIO1, RADIO2:** These preamps allow using dynamic microphones (including the Heil HC4 and HC5 elements) with older Icom radios. The RADIO1 and RADIO2 preamplifier jumpers are located on the right side of the upper circuit board behind the Recording/Digital controls. These preamplifiers are bypassed at the factory.
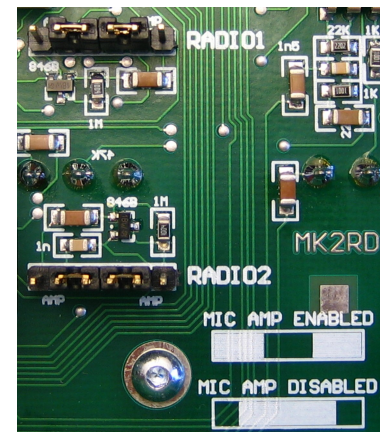
   WARNING: Never mix microphone types with MK2R. Use the same type of mic (electret or dynamic) at both the front panel mic connection and the RJ-45 MIC jack.

4. If you are not using Icom radios, turn the RADIO1 and RADIO2 preamplifiers OFF and turn the

RECORDING-LIVE MIC preamplifier ON. Use a dynamic microphone, there is no bias for an electret mic.

5. If you mix one Icom and one non Icom radio, you must use a dynamic microphone and take care to prevent the Icom DC bias from reaching the microphone. Add a 1 uF capacitor in series with the microphone element (either inside the body of the mic or in the cable between MK2R and the mic). Turn the RECORDING-LIVE MIC preamplifier ON and, if necessary, turn on the RADIO preamplifier for Icom radio only.

6. If you are using two Icom radios, you can use either dynamic or electret microphones.

   ● With a dynamic microphone you must add a blocking capacitor as described for the "mixed" radio configuration. Turn the RECORDING-LIVE MIC preamplifier ON and if needed enable the RADIO 1 and/or RADIO2 preamplifiers.

   ● With electret microphones, turn OFF all three preamplifiers

NOTE: Microphones with switchable dynamic and electret elements should never be used with MK2R unless the microphone includes a blocking capacitor for the dynamic element. Even then there will be significant problems with dual element microphones due to the substantial difference in level between the electret and dynamic elements.

7. Set the **R1** (Radio 1) and **R2** (Radio 2) microphone trimmers (located just to the front of the RADIO1 DB37) in middle of their range (towards each other).
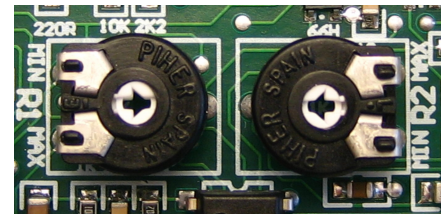
8. Set the front panel TX1 and TX2 knobs to 3 o'clock.

9. Connect your microphone to MK2R and select Radio 1 for transmit.

10. Open Router's Audio Switching tab and set the VOICE switching to ACmA, Voice codec, SC1 on the Radio 1 tab. Make sure the VOICE switching has a black (not gray) frame around it.

11. On the PTT tab, set the Radio 1 PTT selector for VOICE to: "PTT1 (microphone jack)."

12. Set your radio to USB or LSB, connect it to a dummy load and switch RADIO1 to transmit. With the MIC GAIN control on RADIO1 set proper drive level while speaking to microphone (this should be your normal operating level). When finished, do not touch the MIC GAIN control again.

13. Select Radio 2.

14. Open Router's Audio Switching tab and set the VOICE switching to ACmA, Voice codec, SC1 on the Radio 2 tab. Make sure the VOICE switching has a black (not gray) frame around it.

15. On the PTT tab, set the Radio 2 PTT selector for VOICE to: "PTT1 (microphone jack)."

16. Press the Radio 2 button on MK2R.

17. Set your radio to USB or LSB, connect it to a dummy load and switch RADIO2 to transmit. With the MIC GAIN control on RADIO2 set proper drive level while speaking to microphone (this should be your normal operating level). When finished, do not touch the MIC GAIN control again.

Setting audio levels:

1. Open Router's Audio Switching tab and set the VOICE switching to CmCmA, Voice codec, SC1 on the Radio 1 tab AND Radio 2 tab.

2. Click the "Sound Card" button.

3. On the "Audio Devices" window:
   • For MK2R+ choose "Speakers (USB Voice CODEC)" in the Mixer and WaveOut boxes.
   • For MK2R select the sound card connected to the SC1 jacks in the Mixer and WaveOut.

   NOTE: MK2R can use the same sound card for both SC1 (Voice) and SC2 (Digital) if is has separate microphone and line inputs (e.g., a "three port" sound card).

4. Click the TX Mixer button. Select "Speakers (USB Voice CODEC)" or the sound card connected to SC1 in the Volume mixer if not already selected. 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 "Speakers (USB Voice CODEC)" or the SC1 sound card in the Sound Control Panel reaches maximum. If not, turn off the Test Signal, restart Router and return to step 2. Turn off the Test Signal.

6. On the "Audio Devices" window:
   • For MK2R+ choose "Speakers (USB Audio CODEC)" in the Mixer and WaveOut boxes.
   • For MK2R select the sound card connected to the SC2 jacks in the Mixer and WaveOut.

7. Select "Speakers (USB Voice CODEC)" or the sound card connected to SC1 in the Volume mixer if not already selected.

8. Click on the "Test Signal" button and verify that the VU Meter for "Speakers (USB Audio CODEC)" or the SC2 sound card reaches maximum. Turn off the Test Signal. If the VU Meter does not reach maximum, turn off the Test Signal, restart Router and return to step 2.

9. Close the Audio Devices window but leave the Sound Control Panel open.

10. Select the "Playback" tab in the Sound Control Panel.
    ◦ double click "Speakers (USB Voice CODEC)" or the sound card attached to OUT SC1
    ◦ click Levels tab and unmute both Speakers and Microphone
    ◦ click Balance and set LEFT and RIGHT to 70%, then click OK
    ◦ Preset the Microphone level to 70%

11. Select the "Recording" tab in the Sound Control Panel
    ◦ double click "Microphone (USB Voice CODEC)" or the sound card attached to MIC SC1
    ◦ click Levels tab and unmute the Microphone
    ◦ Preset the Microphone level to 70%

12. While speaking into the microphone, adjust the Microphone level until you see the top green bar light on the VU meter for "Microphone (USB Voice CODEC) on the Recording tab, then click OK.

13. Return to the Playback tab, double click "Speakers (USB Voice CODEC)," select the Levels tab and adjust the microphone to the same level you set in the previous step.

14. Turn on VOX and speak into the microphone. Using the **R1** trimmer, set the same drive level as you set in step 12 on page 66 - do not adjust the MIC GAIN on the radio.

    NOTE: To make fine adjustments, you can compare levels for the direct ("A") connection and through the sound card ("Cm") by pressing the footswitch or hand mic PTT. When the radio is keyed by VOX or MOX, the microphone audio is passing through the sound card. When the radio is keyed by the footswitch or hand mic PTT, the microphone is connected directly to the radio.

15. If you cannot balance the direct and sound card levels with the trimmer, return it to the midpoint, click on "Balance" in the "Speakers (USB Voice CODEC)" Levels tab and adjust the **Left** level. Then use the trimmer for fine adjustment.

16. Select Radio 2 (press the Radio 2 Transmit Focus button).

17. Turn on VOX and speak into the microphone. Using the **R2** trimmer, set the same drive level as you set in step 17 on page 66 - do not adjust the MIC GAIN on the radio.

18. If you cannot balance the direct and sound card levels with the trimmer, return it to the midpoint and click on "Balance" in the "Speakers (USB Voice CODEC)" Levels tab and adjust the **Right** level. Then use the trimmer for fine adjustment.

19. On the DVK tab in Router, select default bank and set REC MIC and TX to 70%.Press the "Record" button and adjust the REC MIC so that signal does not peak into to the red area.

20. Press the "Play" button and check that the drive level is same as you set in step 15. If not, adjust the TX level.

> **NOTE:** DVK levels are stored with the message banks which permits each operator to customize the DVK for his own voice.

21. The voice settings are now complete.

22. Select an AFSK mode on RADIO1 and RADIO2. (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 old Icom transceivers). Do not select RTTY or FSK; those modes do not use the audio input.

23. Go to Router's Audio Switching tab and set FSK/DIGITAL to "BBB, audio codec SC2" for each radio. Make sure the FSK/DIGITAL switching has a black (not gray) frame around it on each radio tab.

24. Select the PTT tab, set FSK/DIGITAL to "PTT2 (rear panel jack)" for each radio.

25. Select the "Playback" tab in the Sound Control Panel
   ◦ double click "Speakers (USB Audio CODEC)" or the sound card attached to MIC SC2
   ◦ click Levels tab and unmute the Speakers
   ◦ click Balance and set LEFT and RIGHT to 70%

26. Select Radio 1 on MK2R Transmit Focus.

27. Confirm that all transceiver signal processing circuits (speech processor, TX DSP, etc.) are off.

28. Click the "Sound Card" button on the Audio Switching tab. Select "Speakers (USB Audio CODEC)" or the sound card attached to OUT SC2 in the WaveOut box and press the "Test Signal" button. Adjust the **Left** control on the Speakers Balance window for normal drive level - rated power output with the lowest possible ALC reading.   **Do Not** adjust the radio Mic Gain, the TX1 control or the Radio 1 trimmer. When finished turn off the Test Signal.

> **NOTE:** For transceivers that have separate mic gain and data gain controls (the data gain control may be in a menu), do not adjust the Balance control. Adjust the data gain for the appropriate input level for your transceiver.

29. Select Radio 2 on MK2R Transmit Focus.

30. Press the "Test Signal" button. Adjust the **Right** control on the Speakers Balance window for normal drive level - rated power output with the lowest possible ALC reading. **Do Not** adjust the radio Mic Gain, the TX2 control or the Radio 2 trimmer. When finished turn off the Test Signal.

31. Click OK on the Balance window and close Speakers Properties, Sound Control Panel and Audio Devices windows.

Understanding Transmit (TX) Focus

MK2R allows changing transmit focus several ways. The **READY** lights indicate which radio will transmit in response to a PTT signal.

Manual TX focus mode

In manual mode, focus (selecting which radio will transmit) is fully under operator control - the computer <u>CAN NOT</u> change focus. The operator can select the active radio (change focus) by pressing the RADIO1 (B14) or RADIO2 (B15) buttons. If MK2R is in AUTO mode, pressing the   RADIO1 or RADIO2 button will cancel AUTO mode and same time move TX focus to the selected radio.

Another way to change focus in manual mode is with the foot switches. If **Dual foot switch** is selected on the **SO2R** tab, pressing either foot switch will change TX focus and key the radio. TX focus will remain on the last selected radio when the foot switch is released. FS1 jack is used for RADIO1 and FS2 for RADIO2. If **Dual foot switch** is not selected, either foot switch will key the radio with TX focus.
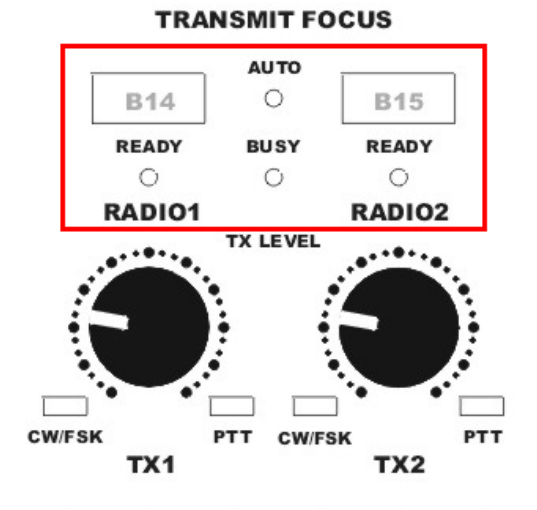
In manual mode, MK2R will redirect all CW, FSK, PTT, WinKey and DVK signals to the "active" radio (the radio with transmit focus) even when the signal was assigned to the other radio.

AUTO TX focus mode

In AUTO mode, focus (transmitter selection) is controlled by the logging program. **AUTO** mode is selected by pressing the RADIO1 (B14) and RADIO2 (B15) buttons at the same time. AUTO mode is indicated by AUTO light. The software can control TX focus in several ways (Parallel port [LPT] signals, a virtual COM port signal, or by using the microHAM SO2R Control Protocol) depending on the **TX focus** configuration on the **SO2R** tab.

Two PTTs is designed for software that provides a separate PTT signal for each radio including N1MM Logger, Win-Test and DXLab Suite. With "Two PTTs," MK2R will change focus in response to the serial port signals (PTT, 2^(nd) PTT, and FSK) or WinKey2 PTT (if the application uses WinKey's SO2R mode). In "Two PTT" mode, transmitter priority can be "first one wins" or "last one wins". If "first one wins" is selected, the second radio will be prevented from transmitting until transmission is complete on the first radio. If "last one wins" is selected, a transmission on the second radio will interrupt the first radio.

If **dual foot switch** operation is selected, pressing a foot switch will not change TX focus. When the foot switch of the unselected radio is pressed, MK2R moves TX focus to this radio temporarily. When the foot switch is released, MK2R returns to focus to the selected radio and resumes AUTO focus.

Understanding Headphone Switching

Like transmit focus, headphone switching (receive focus) can operate in **MANUAL** or **AUTO** modes.

Manual headphone switching

In manual mode the operator has several ways to control what he hears in the headphones. There are "small preset" buttons RADIO1 (B7), BOTH (B8) and RADIO2 (B9) as well as the "full access" LEFT EAR (B4), RIGHT EAR (B6) and "shift" + (B5) buttons.

RADIO1, BOTH and RADIO2 buttons are designed for quickly switching the headphones to a particular radio. RADIO1, BOTH and RADIO2 buttons are called "small preset" because MK2R allows the operator to customize which VFO will be switched to each ear when selected.

The factory defaults are:

	LEFT EAR	RIGHT EAR
RADIO 1	RADIO 1 - VFO A	RADIO 1 - VFO B
BOTH	RADIO 1 - VFO A	RADIO 2 – VFO A
RADIO 2	RADIO 2 - VFO A	RADIO 2 - VFO B
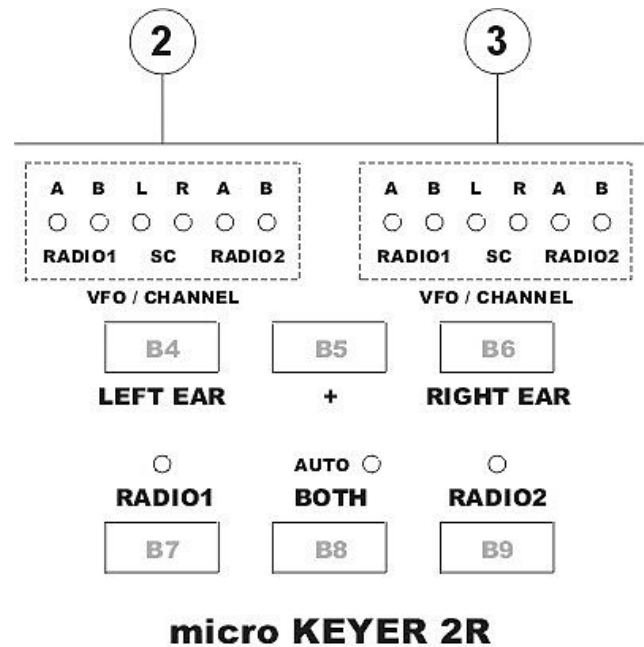
The operator can customize settings for each button by holding that button and cycling through the available choices with the LEFT EAR and RIGHT EAR buttons. Any changes to the "small preset" buttons are automatically stored in EEPROM and do not need to be customized after each power up.

The LEFT EAR, + and RIGHT EAR buttons are used for "full access" to headphone audio switching. MK2R includes an internal 6 x 2 crosspoint switch that allows switching any of six audio sources to each earphone. These sources are VFO A/B of RADIO1 and RADIO2 and left/right channel of the unused sound card. Selecting the desired source for each ear is accomplished by stepping through the available options with the LEFT EAR or RIGHT EAR button. Additional sources can be selected by holding the '+' button and stepping through the available sources again. The selected sources are indicated by lights above buttons (2) for left ear and (3) for right ear.

When SC L (left) or SC R (right) channel of sound card is selected, MK2R will switch the UNUSED sound card to the headphones. The "unused sound card" depends on mode of both radios.

> If both radios are in CW, LSB or USB modes and audio switching is set for "(Voice codec, SC1)" on the Audio Switching tab, the output of SC2 (MK2R) or USB Audio Codec (MK2R+) is switched to the headphones.

> If both radios are in Digital mode and audio switching is set for "(Audio codec SC2)" on the Audio Switching tab, the output of SC1 (MK2R) or the USB Voice Codec (NK2R+) is switched to the headphones.

> If one radio is in CW, LSB or USB using "Voice codec SC1" and one radio is in digital mode using "Audio Codec SC2" **NO** sound card will be connected to the headphones (both are in use) even if SC is selected for the headphones.

TIP: To confirm that your logging program, digital program, or DVK is sending audio to the radio, you can temporary monitor the output of the transmit sound card in the headphones by holding the "+" button and pressing the appropriate RADIO button. While you hold this combination, you will hear the transmit audio in both headphones.

AUTO headphone switching

Automatic headphone switching is a unique and powerful feature of the MK2R. By using programmable **Functions,** MK2R provides the maximum level of flexibility to customize headphone switching to match actual operating conditions, including a wide variety of band conditions, contest type, operator skill and technique.   The available functions are fully configurable from very simple switching scenarios to very complex audio switching systems.

Switching MK2R to AUTO headphone switching mode is accomplished by pressing the RADIO1 and RADIO2 buttons at the same time. AUTO mode is indicated by the AUTO light (above the BOTH button). Pressing RADIO1, RADIO2 or BOTH at any time will exit the AUTO mode (return to manual control).

The MK2R AUTO mode operates based on seven "operating" states and one "priority" state. For each state a different, operator defined, headphone switching configuration can be applied. In addition to the, transmit/receive state of each radio and the transmit focus, two additional signals, "Receive Focus" and "STEREO" (or SPLIT) are used to control headphone switching. The interface by which the logging program communicates these additional signals can be configured on the SO2R tab in Router.

The status of the RX FOCUS and STEREO signals are indicated by the RADIO1 and RADIO2 lights. When receive focus is on RADIO1, the light above the RADIO1 button will be illuminated. When receive focus is on RADIO2, the light above the RADIO2 button will be on. When the STEREO (Split) signal is present, both lights will be illuminated.

MK2R recognizes these states:

State 1:	Both radios receiving, RADIO1 has RX Focus
State 2:	Both radios receiving, RADIO2 has RX Focus
State 3:	RADIO1 is switched to transmit by computer (serial PTT, WinKey, or Protocol).
State 4:	RADIO2 is switched to transmit by computer (serial PTT, WinKey, or Protocol).
State 5:	RADIO1 is switched to transmit manually (Footswitch, mic PTT, paddles, or VOX).
State 6:	RADIO2 is switched to transmit manually (Footswitch, mic PTT, paddles, or VOX).
State 7:	Both radios transmitting (non SO2R mode) Uses State 1 or State 2 depending on RX focus.
Stereo:	Priority "stereo" state. Special "Stereo" settings are applied when logging program indicates "stereo" or split operation.
Fixed:	Automatic headphone switching is disabled

For proper automatic operation, the desired configuration must be defined for each applicable state. This can be accomplished by using the logging program to place MK2R in each state and manually selecting the headphone inputs for that state or the Functions Tab can be used as a visual editor to create, upload and apply the configuration.

NOTE: AUTO headphone switching (receive focus) and AUTO transmit switching (transmit focus) can be enabled independently.

Using Functions

Functions are memories in which the current configuration of MK2R, including all headphone selections, can be stored. Using these functions (memories), the operator can easily program and recall the MK2R configuration for specific operating situations – for example: a small pile-up with multiplier hunting on the second radio, a large pile-up, S&P on both radios, 40 meter split operation, etc.

MK2R has eight memories: F1 - F4 are accessed by pressing a single button and F5 – F8 are accessed by holding + and pressing F1 – F4. These memories are retained in EEPROM when MK2R is turned off. The contests of the memories can be saved to a file on the computer either individually or as a group. The configuration files can be uploaded from the computer to MK2R and configuration files can be freely exchanged between systems.

The current configuration can be stored to a memory by pressing any F-key for longer than one second and the configuration saved in a function can be recalled with a short press of the F-key. Contents of the memories can be protected by enabling "Function Lock" (a short press of the Power button).

These settings are stored with the function:
- headphone selections for each state
- AUTO RX focus (headphone) mode
- AUTO TX focus mode
- headphone MIX
- MODE selections and status
- RECORDING/DIGITAL channels selections

These setting are NOT saved:
- TX focus
- RX focus
- STEREO signal
- FRONT/REAR microphone selector

TIP: When creating functions, begin by recalling a configuration that is similar to the desired   function to minimize the required changes.

Understanding Interlocks

MK2R provides several forms of interlock and timing protection. When a radio is locked, MK2R immediately disables any input to the "locked" radio which could cause it to generate RF (microphone, sound card output, CW, PTT1, PTT2, and PAPTT). The inputs remain disabled as long as the condition that generated the lock continues.

There are five locks:
- Transmit interlock (or "SO2R mode")
- Same Band lockout
- Transmit Inhibit
- External Inhibit (Inhibit In)
- Transceiver Enable (Inhibit Out)

Except for the "same band" and "SO2R" locks, the interlocks operate independently for each radio.

Transmit interlock: is enabled by selecting the **SO2R mode** check box on the SO2R tab. Transmit interlock can be "first one wins" or "last one wins." If selected, simultaneous transmission on both radios is not allowed. When not checked, the radios can transmit at the same time. This lock works independently of any logging software.

Same Band Lockout: disables both radios (or one radio and any other radio present on the iLink bus) if MK2R detects two radios on the same band. When the same band lockout is activated transmission on all radios on the effected band are immediately disabled and the BUSY LED will start flashing. Transmission will be enabled when only one radio remains on the effected band.

There are three methods of band decoding:

- the frequency of each radio is obtained from Router based on the frequencies obtained by decoding the transceiver control communication.

- band is obtained from the transceiver BAND DATA (BCD) output. This is the preferred method because it is the fastest and most secure way to obtain the band data. Unfortunately this data is available only from certain Yaesu transceivers and the Elecraft K3. However, if you are interfacing MK2R with FT-450, FT-840, FT-900, FT-920, FT-950, FT-990, FT-1000D, FT-1000MP, Mark V, FT-2000 or FT-9000, you should connect the Band Data output to the ACC port and select pins 6-13 as band data inputs.

   If band data is provided by the transceiver, SAME BAND protection works even if the computer is turned off or you are using an MS-DOS based logging program.

NOTE: If the ACC port is configured for band data input, that input has priority and is assumed to be valid even when communications (CAT) is lost or an error causes Router to decode a different frequency.

Do not configure the ACC pins as band data inputs unless they are connected to a radio. If they are left unconnected, a "same band" lockout will occur.

- In stand alone mode (MK2R is not connected to the Router) frequency is obtained directly from the transceiver connected to MK2R and distributed via the iLINK bus.

NOTE: If one radio is turned off, cycle the power on MK2R to disable "same band" lockout.

BUSY: is a lockout designed for Serial Devices defined on the ACC tab. When the serial device responds to the MK2R with a "busy" response, MK2R locks out the specified radio. While the serial device is BUSY the BUSY light on MK2R front panel will be lit.

ENABLE: When a pin is configured as enable (inhibit output), it can be connected to the transceiver inhibit or enable ("LINEAR") input with the proper driver to assure completely safe, hot switch free operation even if the transceiver is operated in VOX or is switched to transmit by CAT command. MK2R automatically generates an ENABLE signal after the PTT lead defined on the the PTT tab. The radio will not generate power until the enable line becomes active which provides time for any slow power amplifier or LNA/RX antenna switcher to activate.

The radio PTT output must be connected to the MK2R PTT IN jack for proper ENABLE generation.

INHIBIT IN: When a pin is configured as an inhibit input, an external device can lock out the radio as long as the input is active. This interface can be used with external devices like antenna controllers, power amplifiers or any other device that provides a control output when the device requires "no power" from the radio.

System Considerations

MK2R and MK2R+ can be used with a wide variety of software applications. The capabilities of those packages will have a large impact on the level of computing power needed to utilize MK2R.

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.   A parallel port is desirable for "classic" interface applications.

EXTERNAL KEYBOARD/KEYPAD

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

MK2R includes the ability to generate FSK or CW, record and play CW, FSK or VOICE messages using a PS/2 keyboard or numeric keypad connected to the PS/2 jack. A numeric key pad is sufficient to record and play CW and DVK messages, control CW speed (WPM) or play a serial number message. "Live" CW or FSK (RTTY) requires a full keyboard.

Switching modes:

The keyboard or keypad mode will follow the mode of the transceiver with Transmit Focus. 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 operating 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
x	ON	ON		VOICE

Playing messages:

A message is started by pressing F1-F9 on the keypad 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 and 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, MK2R stores characters as they are echoed from the internal WinKey2: 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*			CW mode	FSK mode	Voice 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		✓	

69

7 - HARDWARE SPECIFICATIONS

USB: USB 2.0 Full speed, USB 1.1 compatible

Power consumption:
USB – less than 300mA
Power supply – less than 300mA at 13.8V (max. 16V)

Radio Ports: 2 x RxD, TxD – max. 57,600 Baud, RTS/CTS handshake supported
Levels: TTL, inverted TTL, open collector bus, RS232

CW: 2 x open collector, max 30V/400mA
FSK: 2 x open collector, max 30V/400mA
PTT1: 2 x open collector, max 30V/400mA
PTT2: 2 x open collector, max 30V/400mA
PA PTT: selectable by internal jumpers
2 x Open collector, max. 45V/0.8A
2 x Relay contact, max. 125VAC/2A 60VDC/2A
LNA PTT: selectable by internal jumpers
2 x Open collector, max. 45V/0.8A
2 x Relay contact, max. 125VAC/2A 60VDC/2A
ACC port pins 2-13: TTL levels, max 4mA load
ACC port pin15: 5V, max. 100mA
LPT port: TTL levels, max 4mA load
Foot Switch: 2 x active when closed to ground, max load: 1 mA at 5V
PTT IN: 2 x active when closed to ground, max load: 1 mA at 5V
EXT SPEAKER: stereo, 32 ohm load

Audio Out: 600 Ohm, 3V p-p max.
3dB bandwidth: 0.2 - 6KHz typical
MK2R+ only
Second harmonic: -84 dB typical
Third harmonic: -72 dB typical
D/A Sampling rates: 32000, 44100, 48000 Hz.

Audio In: 50K Ohm, max 4Vpp
3dB bandwidth: 0.2 - 6KHz typical
MK2R+ only
Absolute noise floor: -82 dBm @600 Ohms typical
Dynamic Range: 82 dB typical
A/D sampling rates: 8000, 11025, 16000, 22050, 32000, 44100, 48000 Hz.

Dimensions: W 305mm (12") x **H** 67mm (2.63") x **D** 106mm (4.17")

Weight: 1.5 kg (3.3 lbs.)

8 - PACKAGE CONTENTS

The product includes MK2R or MK2R+, USB cable, LPT cable, Foster (8) to RJ-45 adapter, six (6) - MK2R or two (2) - MK2R+ stereo audio cables, headphone cable ending with two (2) 6.3mm (1/4") plugs, two (2) 3.5mm (1/8") plugs, one (1) coaxial 2.1mm/5.5mm power plug, two (2) RCA to RCA cables, 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

9 - 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.

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

microHAM, s.r.o. declares that the products:

Product Name: MK2R

Conforms to the following Product Specifications:

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

European Union Declaration of Conformity

microHAM, s.r.o. declares that the products:

Product Name: MK2R+

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 1, RADIO 2 - DB37

Pin #	Label	Description
1	N/C	No contact
20	RS232 RTS	RS232 radio port RTS output
2	RS232 CTS	RS232 radio port CTS input
21	IF-FIF	iface matrix - used for configuring desired levels for radio control interface
3	IF IN	iface matrix - used for configuring desired levels for radio control interface
22	FIF IN	iface matrix - used for configuring desired levels for radio control interface
4	RS-TTL OUT	iface matrix - used for configuring desired levels for radio control interface
23	FILTER OUT	iface matrix - used for configuring desired levels for radio control interface
5	CI-V IN	iface matrix - used for configuring desired levels for radio control interface
24	RS232 IN	iface matrix - used for configuring desired levels for radio control interface
6	CI-V OUT	CI-V bus output "open collector"
25	RS232 OUT	RS232 TXD output
7	FIF OUT	FIF-232 TXD output "TTL"
26	IF OUT	IF-232 TXD output "TTL"
8	FILTER IN	RXD input for all interfaces
27	PTT1	PTT1 output "open collector" generally used as all mode front panel MIC PTT
9	PTT2	PTT2 output "open collector" generally used as rear panel digital modes PTT
28	CW OUT	CW output "open collector"
10	PULL UP	+5V through a 10K resistor
29	FSK OUT	FSK output "open collector"
11	FSW IN	Hand Mic PTT input, N/A at RADIO2
30	MIC #1	RJ45 Microphone jack pin #1, N/A at RADIO2
12	MIC #2	RJ45 Microphone jack pin #2, N/A at RADIO2
31	MIC #3	RJ45 Microphone jack pin #3, N/A at RADIO2
13	MIC #4	RJ45 Microphone jack pin #4, N/A at RADIO2
32	MIC #5	RJ45 Microphone jack pin #5, N/A at RADIO2
14	MIC #6	RJ45 Microphone jack pin #6, N/A at RADIO2
33	MIC #7	RJ45 Microphone jack pin #7, N/A at RADIO2
15	MIC #8	RJ45 Microphone jack pin #8, N/A at RADIO2
34	MIC GND	Microphone ground, N/A at RADIO2
16	MIC	Microphone signal, N/A at RADIO2
35	RADIO MIC IN GND	Radio MIC ground
17	RADIO MIC IN	Radio MIC signal
36	RADIO AF IN GND	Radio AUDIO input ground
18	RADIO AF IN	Radio AUDIO input signal
37	RADIO AF OUT GND	Radio AUDIO output ground
19	RADIO AF OUT	Radio AUDIO output signal
SHELL	GND	Radio and power GND

ACCESSORY - DB25

Pin #	Label	Description
1	NC	N/A
14	NC	N/A
2	PIN2	Configurable I/O, TTL levels, max 4mA load, RX DATA Serial 2
15	+5	5V output, max. 100mA load
3	PIN3	Configurable I/O, TTL levels, max 4mA load, TX DATA Serial 2
16	NC	N/A
4	PIN4	Configurable I/O, TTL levels, max 4mA load, TX DATA Serial 1
17	NC	N/A
5	PIN5	Configurable I/O, TTL levels, max 4mA load, RX DATA Serial 1
18	GND	GND
6	PIN6	Configurable I/O, TTL levels, max 4mA load
19	GND	GND
7	PIN7	Configurable I/O, TTL levels, max 4mA load
20	GND	GND
8	PIN8	Configurable I/O, TTL levels, max 4mA load
21	GND	GND
9	PIN9	Configurable I/O, TTL levels, max 4mA load
22	GND	GND
10	PIN10	Configurable I/O, TTL levels, max 4mA load
23	GND	GND
11	PIN11	Configurable I/O, TTL levels, max 4mA load
24	GND	GND
12	PIN12	Configurable I/O, TTL levels, max 4mA load
25	GND	GND
13	PIN13	Configurable I/O, TTL levels, max 4mA load
SHELL	GND	GND

iLINK – miniDIN 6

Pin #	Label	Description
1	DATA	I2C Data channel for expansion (TTL)
2	n/c	Not connected
3	GND	Connected to system ground and case
4	+5 V	+5V output, max.100mA.
5	CLOCK	I2C Data Clock (TTL)
6	n/c	Reserved – do not use
SHELL	GND	Connected to system ground and case

PAD – miniDIN 6

Pin #	Label	Description
1	PS/2 DATA	TTL PS/2 DATA line
2	n/c	WinKey 2 Command
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	n/c	PAD Interrupt
SHELL	GND	Connected to system ground and case

PS/2 – miniDIN 6

Pin #	Label	Description
1	PS/2 DATA	TTL PS/2 DATA line
2	n/c	Not connected
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	n/c	Not connected
SHELL	GND	Connected to system ground and case

APPENDIX B – microHAM Control Protocol

Introduction

This appendix describes the commands in the microHAM Control Protocol that are likely to be useful to users in creating custom macros in loggers that support user defined "scenarios." These user level commands can be used to select antenna outputs (e.g., the 4 bit value on pins 6-9 (Radio 1) and 10-13 (Radio 2) of the Accessory port), to select transmitter or receiver focus, to control the Digital Voice Keyer, CW Memory Keyer or FSK Message memories, to perform custom/dynamic headphone switching, or recall saved configurations ("functions").

*micro*HAM Control Protocol, as a whole or in any subset, is the intellectual property of *micro*HAM, s.r.o. and may not be used by any person in conjunction with any hardware interface or control product ("controller") not manufactured by *micro*HAM. Individuals who have purchased a controller from microHAM, s.r.o or its dealers and distributors are licensed to utilize the following subset of commands only with that controller. Complete documentation is available on request and execution of a non-disclosure agreement to qualified software developers who wish to support *micro*HAM interfaces and controllers.

Disclosure of this sub-set of the *micro*HAM Control Protocol shall not grant license to any party to use these controls for any purpose not specifically authorized herein, nor shall this disclosure grant license to use these controls, or any subset of these controls, with any controller not produced by *mico*HAM.

Commands

All commands are ASCII and are case sensitive. Each command is uppercase and ends with <CR>. In this document parameters (arguments) for the command are shown in lower case. Router responds to any invalid command with an error message where the first character is an E is followed by copy of the received command – e.g., **Ecommand<CR>**.

- ### Focus control:
  These commands control transmit focus and headphone switching.

  SetTxFocus(): active only when TX Auto Focus has been selected

  FT1<CR> SetTxFocus(R1)

  FT2<CR> SetTxFocus(R2)

  SetRxFocus(): active only when RX Auto Focus has been selected

  These commands set RX Focus to the states defined in the current "Function" for Radio_1, Radio_2, and Stereo. The current "Function" can be selected from the front panel or selected using the **SA#<CR>** command.

  FR1<CR> SetRxFocus(R1)

  FR2<CR> SetRxFocus(R2)

  FRS<CR> SetRxFocus(STEREO)

  This command selects headphone audio sources directly. Parameters represent binary values that correspond to the 12 headphone source LEDs on the front panel.

  FRDxxxxxxxxxxxx<CR> SetRxFocus(DIRECT)

  For example: FRD100000000010<CR> switches Radio1-A (main) to left ear and Radio2-A (main) to right ear.

- **ACC output control:**
  These commands control 16 bits represented by the 4-bit outputs of the ACC port. The 4-bit outputs must be configured for "Protocol Control" on the ACC tab. Current firmware treats the 4 four bits as a HEX representation (0-F) of a 1:16 decoder connected to the port. Only one output may be active.

  This command sets the output using a binary mask.

  AM1xxxxxxxxxxxxxxxx<CR> SetAccOutputs(R1, outputs)

  AM2xxxxxxxxxxxxxxxx<CR> SetAccOutputs(R2, outputs)

  This command sets the output by decimal value.

  AS1dd<CR> SetAccOutputSelection(R1, selection)

  AS2dd<CR> SetAccOutputSelection(R2, selection)

- **Function control:**
  This command selects Function 1 – 8

  SAs<CR> ApplyScenario(scenarioIndex)

- **DVK, CW and FSK messages:** These commands control playing and recording of messages. The current operating mode (determined from the radio or Router if the radio is not CAT capable) will be used to determine if Voice, CW or FSK messages will be played/recorded.

  Abort:
  This command aborts the current message and clears message queue.

  MA<CR> AbortMessage()

  Playback:
  This command starts message playback – index is 1 to 9

  MPm<CR> PlayMessage(msgIndex)

  This command starts message playback in a loop – index is 1 to 9, interval is 0 to 9 seconds.

  MPImi<CR> PlayMessagePeriodically(msgIndex, interval)

  Record:
  This command starts message recording – index is 1 to 9 MRm<CR> StartMessageRecording(msgIndex)

  This command stops message recording.

  MRS<CR> StopMessageRecording()

  DVK Message Bank Select:
  This command selects voice message bank – applies only to DVK.

  MBname<CR> SetMessageBank(msgName)

APPENDIX C – 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 D – 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.

APPENDIX E – 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, SO2R or ACC tabs.

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, SO2R or ACC tabs.

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.