Radio Shack Remote Operation for an **FTDX101D + RF2K-S** with **Zerotier**, Chrome Remote Desktop, Mumble, WIN4Yaesu, and WinKeyer/RemoteCW or Morconi Keyer

KA2C

Remote Operations Over Internet

Ham Operating Point - NJ or portable

Radio Shack

Dell Optiplex 5060 or Dell Laptop

USB mic
USB footpedal PTT
USB knob
USB 12-key keyboard
Headphones/speaker
Paddles

Dell Optiplex 5060

FTDX101D

USB

WIN4Yaesu VNC

LAN

RF2K-S
1.5 kW

WINkeyer USB & RemoteCW By DF3CB

Mumble Client

Chrome Remote Desktop

Zerotier client

Internet

Zerotier servers

Chrome Remote Desktop extension

Mumble Server & Client

Zerotier client

WKmini & Remote CW by DF3CB

Remote Operations Over LAN

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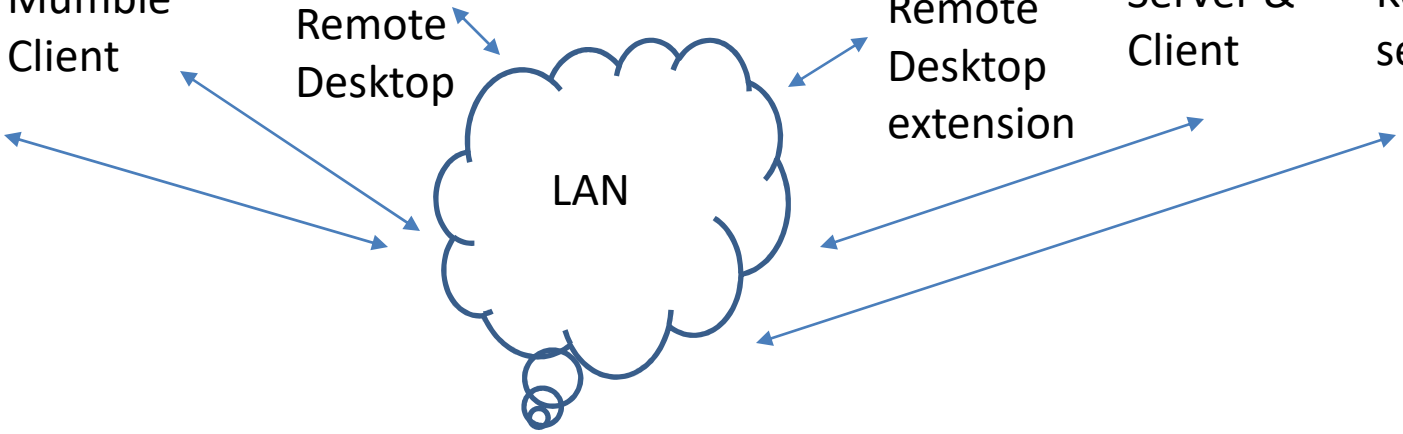
LAN

Morconi Keyer client

Mumble Client

Chrome Remote Desktop



Chrome Remote Desktop extension

Mumble Server & Client

Morconi Keyer server

Operating Point - NJ

Left Screen is the Remote PC Screen

Right Screen is for Local Control and Logging

USB foot pedal for PTT – USB mic on a boom – paddles with Winkeyer

Two 27” QHD (2560x1440) monitors

Main Keyboard & Mouse, and Freq Knob, 12-key Keyboard

A DROK USB knob controls frequency - a 12-key keyboard selects 1000, 100, 10, 1 Hz tuning steps, 4 CW messages, & 4 important screen entry points (logging input,…)

Remote Shack

WIN4Yaesu Rig Control is on the Screen

FTDX101D on the table with RF2K-S Amplifier

Radio Shack

- T-Mobile Home Internet Service – CGNAT for Internet or LAN for local
- Internet power strip (controlled on cellphone) & UPS
- Dell Optiplex 5060 Desktop with Windows 11 Pro, WIN4Yaesu, N1MM rotor app, Hamation Control Center for SAL-20 control, Winkeyer and Morconi Allrigs server (soon), Winlink+VARA, FLdigi
- Yaesu FTDX101D rig - SDRplay RSPdx spectrumscope controlled by WIN4Yaesu
- RF- POWER RF2K-S amp with VNC control from the local PC and a CAT interface through WIN4Yaesu for auto-band switching
- Antennas – A3S 20/15/10 Yagi, Hy Tower + 160, SAL-20 160/80/40 RX, 160/80/40 inverted vee, 6/2/70-cm Yagi, 6-band vertical 30/20/17/15/12/10 (future)
- Set antenna switch for auto mode, set rig coax switch for rig 1 and set a camera to view the rig and aux equipment

Ham Operating Point

- Verizon cable in NJ, T-Mobile cellular or LAN in PA
- Dell Optiplex 5060 or Latitude 5411 Laptop – Windows 11 Pro with Zerotier and Chrome Remote Desktop
- USB mic with audio over Mumble
- Headphones or speaker
- Winkeyer + paddles with RemoteCW app or keyboard input & messages OR Morconi Allrigs Keyer on LAN
- PTT with a USB foot pedal
- QRZ and N1MM logging

Shack PC Setup for Boot to Desktop at Power ON

- Set BIOS - set AC Recovery to Power On, set Deep Sleep Control to Disabled
- Registry changes to bypass Windows Welcome Screen: https://answers.microsoft.com/en-us/windows/forum/all/how-do-i-bypass-or-turn-off-windows-welcome-screen/97795273-7ae1-446e-96b0-689c654da4a0
- Registry changes to bypass User Login: https://www.youtube.com/watch?v=JsnViEchX5Q

Zerotier & Chrome Remote Desktop

- Setup Zerotier account and network
- Install Zerotier client on Radio Shack PC and on Operating Point PC or laptop and connect and authorize on network
- Install Chrome Remote Desktop Extension on Radio Shack PC and use Chrome Remote Desktop Connection on Operating Point PC or laptop for access - Use the User PIN for remote login to the Radio Shack User account since the password is set for bypass - Windows Remote Desktop insists on rerouting Mumble audio on the remote shack PC and seems unusable - Set Chrome remote access to “full screen” on PC or laptop
- https://www.youtube.com/watch?v=ZghEKQ0iQLM
- https://www.youtube.com/watch?v=_1dxoBAt4cg
- https://groups.io/g/RigPi/topic/89394537

Mumble for 2-way VOIP Audio

- Install Mumble server and Mumble client on the Radio Shack desktop, start both & connect the client to the server
- Install Mumble client on the Operating Point laptop and start the Mumble client and connect to the Radio Shack server (over Zerotier)
- Set input/output audio devices, audio levels and other Mumble configuration parameters – set audio to continuous at high quality, 10 msec frames, no echo cancelling, no compression,… and 100 kbps
- Use headphones ¼" jack output of rig to an external USB audio device to include the rig's CW sidetone – remove the headphone jack plug for local operation (turn rig sidetone OFF when operating with operating point sidetone – but enable it if operating with messages and keyboard input to WIN4Yaesu)
- Use FTDX101D USB connection for a mic/audio input to the rig and select rear panel mic input for remote operation and front panel mic input for local operation

RF2K-S Power Amp Control

- Provide an Internet LAN interface over Ethernet
- Install VNC on the shack PC and configure to control the amp from the PC – reserve an IP address in the LAN router
- Connect a serial port from the RF2K-S to a PC's serial port (dB9) using a USB FTDI to serial port dB9 adapter and null modem cable
- Configure the RF2K-S for a CAT interface at 38,400 baud
- Configure a CAT connection to a 3rd party device using a serial port at 38,400 baud in WIN4Yaesu - https://yaesu.va2fsq.com/third-party-hardware-and-software-integration/ - no need for COMOCOM, just configure WIN4Yaesu 3rd Party HW/SW to connect directly to the hardware COM port on the PC connecting to the RF2K-S
- Connect a 1kW dummy load to antenna 4 port for test and tuneup
- Connect PTT to the rig
- Connect the rig's +12 VDC power supply to the remote power ON jack

CW Operation Alternatives

- CW Terminal in WIN4Yaesu on remote PC
  - Remote sidetone (needs headphone output connection at the rig for RX audio)
  - Messages or keyboard input
  - WKmini at rig
  - Internet connection using PC based Chrome Remote Desktop
- WKUSB at Control Point – Character transmission
  - Local sidetone
  - Messages from WKUSB with 4 pushbuttons or paddle input
  - 1 char delay + Internet delay in transmissions
  - WKmini at rig
  - Internet connection using PC based Zerotier
- Morconi client with Ethernet LAN interface at Control Point – ON/OFF keying transmission
  - Local sidetone
  - Messages?? Pair with an external keyer or OK with Morconi only??
  - Internet delay in transmissions
  - Morconi server at rig
  - Internet connection using Mikrotik Hex E50UG router with Zerotier

WinKeyer CW Remote Operation

- Install a WKmini at Shack and a WKUSB at the Operating Point (which includes local sidetone)
- Install RemoteCW by DF3CB at Shack and Operating Point
- Add paddles at the Operating Point
- Configure Radio Shack RemoteCW app
- Configure Operating Point RemoteCW app
- Get this to work over the LAN using the PC's LAN IP address
- Get this to work over the Internet using Zerotier and use the IP address from Zerotier user account assigned to the shack PC as the IP address in the operating point RemoteCW app

WINkeyer + RemoteCW over Zerotier

- CW speed knob on WKUSB does not work when RemoteCW is active – use the RemoteCW slider and/or alt-F9/F10 for down/up
- The remote connection does not initially work after starting server and client and they show green for connections – open settings at the operating point and set local WINkeyer to OFF and apply and then set it to ON and apply to bring up the link
- If the spacing between letters is a bit too tight, the char recognition software may reject the sequence and nothing is sent – adjustments to WINkeyer settings are possible.

Morconi CW Keyer Operation

- Provides less delay than WINkeyer since it operates with ON/OFF from the keyer instead of decoding chars and then sending char info
- Use over LAN for remote operation from shack to house but Internet operation has some challenges
- WINkeyer has a USB interface to the host PC's and operates over the PC's Zerotier for Internet operation, but Morconi has its own Ethernet interface and bypasses the PC, so PC based Zerotier is not available to operate over CGNAT for possible remote Morconi operation of the Internet as well as the LAN,….
- Unable to get Internet Connection Sharing on the PC to work with Windows 11 Pro to use Zerotier,……
- Low-end routers do not support Zerotier but a Mikrotik HEX E50UG supports Zerotier ($60 each) – install 1 at the shack in PA and 1 in NJ to operate a Morconi keyer

Mikrotik E50UG Setup – Key Steps

- Install WINBox on your PC to manage the router: https://help.mikrotik.com/docs/spaces/RKB/pages/6488069/How+to+install+WinBox
- Install the Zerotier app to the router: https://www.youtube.com/watch?v=_gTvAYBQHuc
- Configure Zerotier on the router: https://help.mikrotik.com/docs/spaces/ROS/pages/83755083/ZeroTier
- Login to your Zerotier account and Activate the router Zerotier app on your Zerotier network

Remote PTT with a USB Foot Pedal using AutoHotKey and WIN4Yaesu Macros

- Running WIN4Yaesu on the shack PC controlling the FTDX101D – set Macro 1 to a label MOX ON and to send “MX1:” and Macro 2 to a label MOX OFF and to send MX0: - these will be sent over the CAT interface to the rig – open the Macro window in the lower right corner of the shack control screen to show icons for the Macros - WIN4Yaesu will return this to the same exact position when started, provided the Macros window is not closed nor moved.
- Connect a USB Foot pedal at the control PC and program it for double click operation with a press sending “F5” and a release sending “F6”
- Setup 2 AutoHotKey v2 scripts on the control PC: the first is triggered by F5 and has a single line of code with ControlClick sending a click to the X,Y coordinates of Macro 1 to “Google Chrome” and the second with a single line of code with ControlClick sending a click to the X,Y coordinates of Macro 2 to “Google Chrome” - set these scripts to run on boot or signin -
- Running Chrome Remote Desktop on the control PC – set to full screen mode
- Deselect VOX on the FTDX101D
- For CW, operate in semi-BK-in mode with 200 msec hang time (PTT not needed)

Remote Frequency Control

- Use a USB knob – DROK $30: https://www.amazon.com/dp/B01MV411BR?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1
- Program Clockwise to generate a Mouse Wheel+ and Counter Clockwise to generate a Mouse Wheel - note that the mouse wheel also functions to tune the frequency in the same way
- Use Editpad Lite 8 to edit the USB Knob keys – open the editor, hold down the USB knob and plug it into a USB port – edit and save the key changes
- The 12-key pad will be programmed to use 4 keys to select 1000 Hz, 100Hz, 10 Hz and 1 Hz tuning steps
- Usually 1 KHz steps work quickly and accurately for SSB since most stations operate on 1 KHz frequency bins and 100 Hz steps work well on CW, but lower resolution bins can be selected rapidly when needed

Remote Freq Tuning Resolution Selection, CW Messages & Pointer Control with a 12-key keyboard

- Use a 12-key gaming keyboard $25: https://www.amazon.com/dp/B09NRQQFHW?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1
- Program the lower row for F1 to F4 and F21 – F22
  - program AHK macros for F1 to F4 to trigger CW messages on the open WIN4Yaesu CW terminal window using the ControlClick command.
  - Program an AHK macro for F21 move the mouse pointer to N1MM logging on the local screen and at the start of input for a contact and click
  - Program an AHK macro for F22 to move the mouse pointer to QRZ on the local screen to look up a call and click

- Program the upper row for F13 to F18
  - program AHK macros for F13 to F16 to select the Google Chrome window and move the mouse pointer to the 1000, 100, 10, 1 Hz frequency digits – Use the four keys on the upper row to select the frequency tuning resolution digit prior to using the frequency tuning knob
  - Program an AHK macro for F17 to move the pointer to the middle of the spectrum display (no click)
  - Program an AHK macro for F18 to mover the pointer to the SAL-20 control window (no click)

AutoHotKey Example Scripts

- MOX ON
  - F5::
  - {
  - ControlClick "X1270 Y773", "Google Chrome"
  - }
- MOX OFF
  - F6::
  - {
  - ControlClick "X1325 Y773", "Google Chrome"
  - }
- 1000Hz tuning steps
  - F13::
  - {
  - WinActivate "Google Chrome"
  - Click 582, 488
  - }
- X, Y coordinates will be screen and setup dependent – these need to be determined with AHK spy and entered for each script

Fixed Control PC Setup – NJ to Shack over Zerotier and Internet

- Dell Optiplex 5060 SFF Tower – Windows 11 Pro
- 2x 27” QHD gaming monitors
- USB
  - Mic
  - Keyboard
  - Mouse + DROK knob for freq control + 12 button keyboard for CW messages and Macros with AutoHotKey
  - WINKeyer USB with paddles
  - Morconi keyer with Mikrotik routers
  - Foot Pedal
- Speakers and Headphones
- QRZ logging and local N1MM logging

Fixed Control PC Setup – PA house to Shack over LAN

- Dell Optiplex 5060 SFF Tower – Windows 11 Pro
- 2x 27” monitors
- USB
  - Mic
  - Keyboard + DROK knob for freq control and 12 button keypad for remote control of CW messages and AutoHotKey macros
  - Mouse
  - Morconi Allrigs keyer with paddles
  - Foot Pedal
- Speakers and Headphones
- QRZ logging and local N1MM logging

Portable Control PC Setup

- Dell Latitude 5411 – Windows 11 Pro
  - Optional 2x 14 inch or 2x 27 inch monitors
  - USB-C to 2x HDMI splitter
  - 2x HDMI to VGA adapters for 14 inch monitors
- USB portable mic
- USB portable mouse
- USB foot pedal for PTT
- Portable speaker (USB) or headphones
- Use keyboard function keys to select freq tuning digits with AHK scripts – use mouse wheel for tuning
- Operate CW with keyboard & function keys and AHK scripts for CW messages

IP Connections

- PA Shack
  - T-Mobile Home Internet Box to LAN router in Morton Shed
  - 5 GHz WiFi (from LAN router in Morton Shed) to shack router then ethernet to PC
- NJ Operating Point
  - Verizon Internet (from fiber) in cellar to Ethernet over power to attic to PC
- Ping round trips from NJ to PA PC's over Zerotier measures 30 to 55 msec (15 to 27.5 msec 1-way)

Remote Internet Equipment Reset

- T-Mobile Home Internet Device does not have a separate reset (consider a no-Internet detector and reset) but the T-Mobile device does have a highly reliable reset
- Routers and WiFi devices/links are prone to error from power line disturbance and need reset functions
- Power plug remote ON/OFF for shack router and WiFi devices (connected to T-Mobile device 2.4 GHz WiFi)
- Power plug remote ON/OFF for shack smart power strip (connected to T-Mobile device 2.4 GHz WiFi)
- Power plug remote ON/OFF for Main router with DHCP (connected to T-Mobile device 2.4 GHz WiFi)

Common Issues

- Only one of WINkeyer server or WIN4Yaesu at the remote shack can connect to the WINkeyer mini – enable one at a time depending on CW mode
- Mumble audio connections in Windows devices – ck the connections and reassign if necessary
- Mumble audio has large delay due to an unusual packet delay with spectrum-scope and audio not in close synch - restart mumble clients
- RemoteCW client needs to be disabled and re-enabled to work properly
- Google remote desktop not in full-screen mode
- Windows have been moved causing AutoHotKey coordinated to be misplaced

References/Sources

- Hamvention 2025 – Sat AM Forum 2 – Best Practices in Remote HF Operating - https://www.youtube.com/watch?v=aQuC0uAH-vw
- Thanks to AA0Z – Kyle Krieg – for information on Zerotier and the Morconi keyer
- WINYaesu - https://yaesu.va2fsq.com/
- Zerotier - https://www.zerotier.com/
- Mumble audio - https://www.mumble.info/
- WINkeyer - https://www.hamcrafters2.com/
- RemoteCW - https://df3cb.com/remotecw/
- Morconi keyer - https://www.morconi.com/