Converting the Kenwood TKR-820 to use with D-STAR

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Converting the Kenwood TKR-820 for use with D-STAR is almost trivial. Here is what you need to do this project.

First you need a TKR-820 (or 720 for VHF) complete with duplexer, antenna, etc., tuned to your repeater pair. These are currently available on E-Bay (repeater and optionally a duplexer) for around $250-500 as pulled from commercial service. This is a nice little repeater which can run 5W for 100% duty cycle up to around 25W at a decreasing duty cycle.

NQMHS w/DE-9 Plugged-In

Next you need to purchase a node adapter. I use the "Not Quite Mini Hot Spot" (NQMHS) board from ENIcommunications. It comes either as a kit for $80 or pre-built for $110. I chose the prebuilt version and this post is based on using this version of node adapter. There are others in the marketplace, but I cannot say if additional work will be required to use them with the TKR-820.

The next order of business is building the cable to go from the NQMHS to the TKR-820. The NQMHS uses a DE-9 plug and the TKR-820 has a great accessory jack which is a Molex 1625-15. I had a DE-9 socket in the junk box, and purchased the 1625-15PRT, socket and plug, from the local Fry's Electronics.
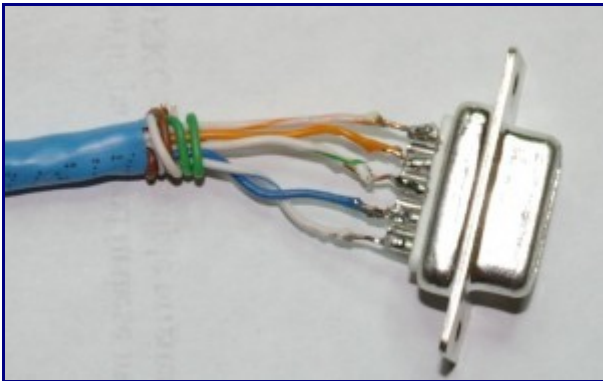
DE-9 Example

The pinout for the DE-9 is as follows:

1 – Audio to Repeater (Modulator)
2 – Carrier Operated Squelch from Radio (Not actually used with the PA4YBR firmware, but I wire it anyway)
3 – Audio from Repeater (Discriminator Audio)
4 – Key Repeater Transmitter (PTT)
5 – Ground
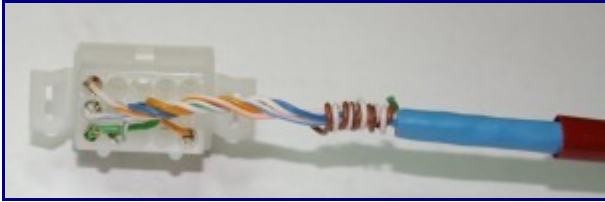
Molex 1625-15P Example

The Molex 1625-15P (plug) pinout:

Jumper pin 1 to pin 11. This tells the Repeater it is being controlled by an external controller via the accessory plug (green wire in photo). Note: if your repeater happens to have an ID-8 module, you will get a CW-ID periodically. You want to remove or disable it.

Pin 2 is used for ground to the NQMHS board.
Pin 3 is the modulator input (audio from the NQMHS)
Pin 4 is the discriminator output (audio to the NQMHS)
Pin 8 is the external PTT line
Pin 13 is the carrier operated squelch (COS) also documented as RUS by Kenwood.

Check all of your wiring.

Signal	NQMHS DE-9 Pin	Molex 1625-15P Pin	My Wire Color
Modulator In	1	3	White/Orange
COS/RUS	2	13	Orange
Discriminator Out	3	4	White/Green
PTT	4	8	Blue
Ground	5	2	White/Blue
Jumper	-	1 to 11	Green

Please verify these pinouts against documentation for each device. These work for my configuration, but your repeater may be different. No warranty is expressed or implied. Perform at your own risk.

You will note that no conditioning of lines, such as bypass capacitors, resistors, etc. are included in these instructions. My repeater and board just play together nicely.

This should complete your cable. If you haven't guessed I used a piece of CAT-5 cable between the connectors.

Plug the DE-9 into the NQMHS (as above), and the Molex 1625-15P into the repeater.

Molex 1625-15P Plugged into TKR-820

Attach the antenna (or service monitor) and power, adjust the NQMHS and the modulator for approximately 1.8 Khz deviation. Adjust power for your use.

Using the firmware tools, insure that transmission is of the proper format (inverted/not inverted) and adjust the NQMHS for proper detection of data coming from the repeater.
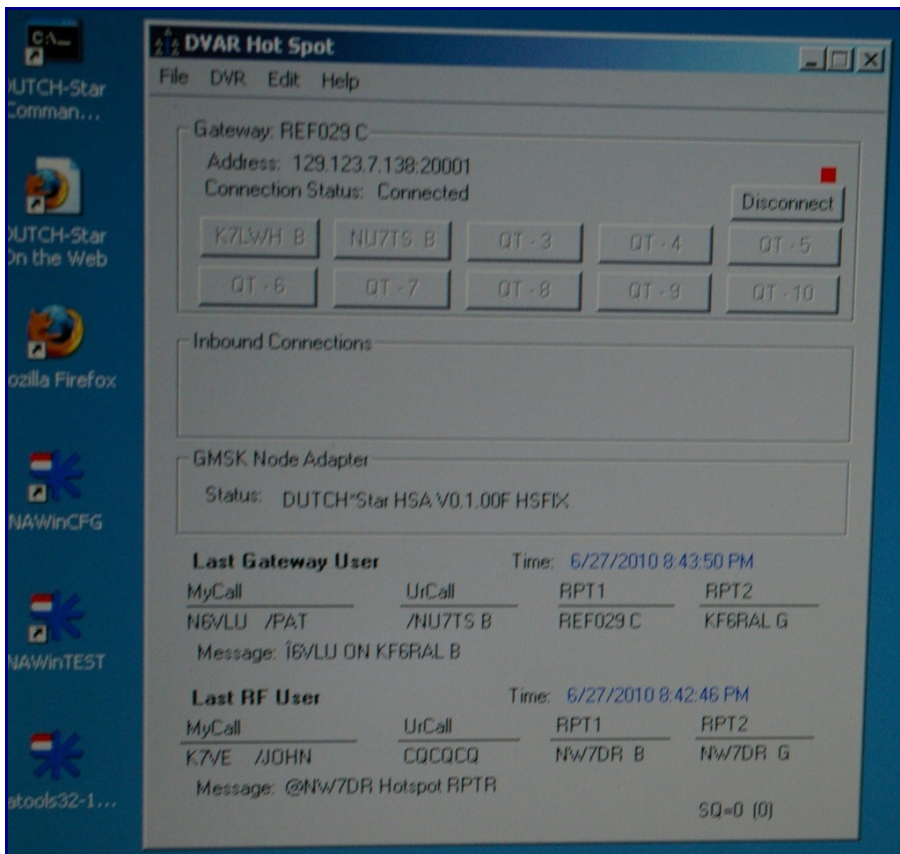
Screen of DVAR Hotspot in operation

You can now fire up DVAR Hot Spot, with proper configuration. With a properly registered callsign and configuration you should now be able to link to repeaters, reflectors, and other HotSpots. Note: I tried a netbook to run DVAR with this NQMHS and it would not key PTT, I think it was a USB drive level. switching to a full size computer solved the problem.

Here is the final product for the NW7DR repeater:

This is the NW7DR Repeater in operation

My repeater is literally a classic "garage repeater." The TKR-820 should perform in traditional repeater settings, though for such high RF installations better cabling and packaging of the NQMHS (shielded) is probably warranted. The NQMHS could be mounted internally to the case, pushing the Molex socket inside and running the USB cable out the opening to the controlling computer.

My plan is to move this repeater over to G4ULF's G2 compatible gateway software after release. I have a lovely 1U Linux server just waiting to replace the surplus Windows/XP tower currently attached to the NQMHS.

Good luck with your conversion!