

**Noble Radio NRV7B Remote VFO / Station Accessory
with Integrated Panadapter for the Drake TR-7**



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NRV7 Remote VFO Overview



The NRV7B Remote VFO is designed to operate with the Drake TR-7 HF Transceiver. It is a highly stable DDS based VFO that replaces the function of the internal PTO of the TR-7. The remote VFO function can be turned on or off from a front panel pushbutton switch. This will still allow the use of the internal PTO of the TR-7 if desired. The NRV7B VFO function features either a fixed 10 Hz step tuning rate or a variable speed tuning rate (VST mode) determined by how fast the tuning knob is turned. This mode is accessed by a pushbutton switch on the front panel. There is also an RIT and SPLIT mode available plus 20 tunable memories which are accessed by front panel switches. Two VFO frequencies are displayed. One for the transmit frequency and one for the received frequency. They can be tuned independently or tuned together.

In addition to the VFO function the NRV7B contains an electronic keyer and a PC PS/2 Keyboard interface which also will allow CW sending from any PS/2 compatible keyboard. There is also a USB Winkey interface to allow keying the TR7 from stored messages in programs such as N1MM or DS780. When using the internal PS/2 keyboard interface the bottom line of the display will show up to 16 characters that have been typed and are being sent. The keyer speed is adjustable by front panel switch selection and then turning the main tuning knob to the desired speed. The internal NRV7B keyer is independent of the Winkeyer interface for both speed and paddle operation however they do run in parallel so the operator can switch from Winkey PC operation to the internal keyer by just pressing the paddles. An external keyer (or straight key) may also be used by plugging its output into the Key jack on the NRV7B rear panel and setting the internal keyer to MANUSL mode.

Also contained in the NRV7B is a sound card and transformer isolated interface to allow digital mode operation (i.e. FT8, MSK144, PSK31, RTTY, etc) using a single USB cable interface to a PC. Receiver audio is sent to the sound card from the AUDIO jack on the back of the TR7 and transmit audio is fed into the TR7 Mic jack via the isolated interface. The RX and TX sound levels can be adjusted from the front panel controls on the NRV7B so it is not necessary to access the PC sound mixers to reset levels if it becomes necessary.

The real power of the NRV7B is a second USB port that can connect to a PC and allow frequency control of the VFO from a logging program. The VFO can be controlled by any logging or rig control program that can connect to an FT-857 transceiver.

The rig control program will display the frequency of the VFO and follow it when the main tuning knob is used. The frequency of the VFO can also be controlled by the frequency buttons in the Rig Control Window and also by the memory buttons in the program. This gives the VFO an additional memories limited only by the capability of the application program in the PC. In addition to frequency data the mode information is also pulled from the VFO into the logging program. The VFO gets information about what band the TR-7 is set for by a special interface cable that must be connected to the top board in the radio, the DR7 Digital Readout board. It is a simple connection that requires no boards to be removed from the radio and can be done in less than one half hour. To round out the features of the VFO a VOGAD (Voice Operated Gain Adjusting Device) speech compressor is also included for SSB operation. This is an AGC controlled speech amplifier that keeps the audio level from the microphone relatively constant over a wide input level range and greatly increases the average talk power with little distortion. There are separate controls for Compressor Gain, Compression Level and AGC Delay Time Constant. In addition to the Speech Compressor function there is a Noise Gate that can be activated to remove background noise that can go out over the air when the transmitter is keyed but no one is speaking. The Noise Gate Threshold is adjustable by a front panel control.

The NRV7B also differs from its NRV7 predecessor with the inclusion of a panadapter internal to the VFO. This is the PAN7 unit that was available as a separate item which could be used with the original NRV7 to provide “point and click” frequency selection capability. This is all integrated into one enclosure with the NRV7B. The panadapter and VFO functions are designed to be used with Ham Radio Deluxe Logging/Rig Control Program and HDSDR for a spectral display and rig control. These two programs connect together via a software DDE interface to pass freq and mode, etc data between them with only one physical USB connection to the PC. There is also a beta version of a com port “Bridge” program available from Noble Radio which allows HDSDR to be used with any other logging program. It requires the use of a program such as VSPE to create virtual com ports to connect the 3 programs together. Contact Noble Radio for more information on this application.

TABLE OF CONTENTS

Introduction to the NRV7B	6
Front Panel Display and Controls	7
Rear Panel Connections	8
NRV7B Setup	9
NRV7B Band Data Cable Installation	11
Display Description	17
Front Panel Switch Functions	18
A) VST	18
B) RIT	18
C) SPLIT	19
D) REMOTE ON/OFF	19
E) KEYS PD	20
F) DIGITAL ON/OFF	20
Using the Memories	20
Using the Internal Sound Card	22
Using the Speech Compressor	23
Using the NRV7B with a PS/2 Keyboard	24
Operation with Logging Programs	25
Additions with REV B Software Upgrade	27
Using the CW Memories	28
Accessing Memories in the Message Editor	28
Sending Messages in Memory	28
Connecting and Using the WinKey Interface	29
Specifications	30

Noble Radio NR-PAN7 Installation and Setup	31
Installation of the PA7 into the TR7	32
Connections to the NRV7B	37
Required Software and Installation	37
HSDR Calibration	41
Using the SDR Receiver Capability of HSDR	41
PC/Laptop Hardware Considerations	42

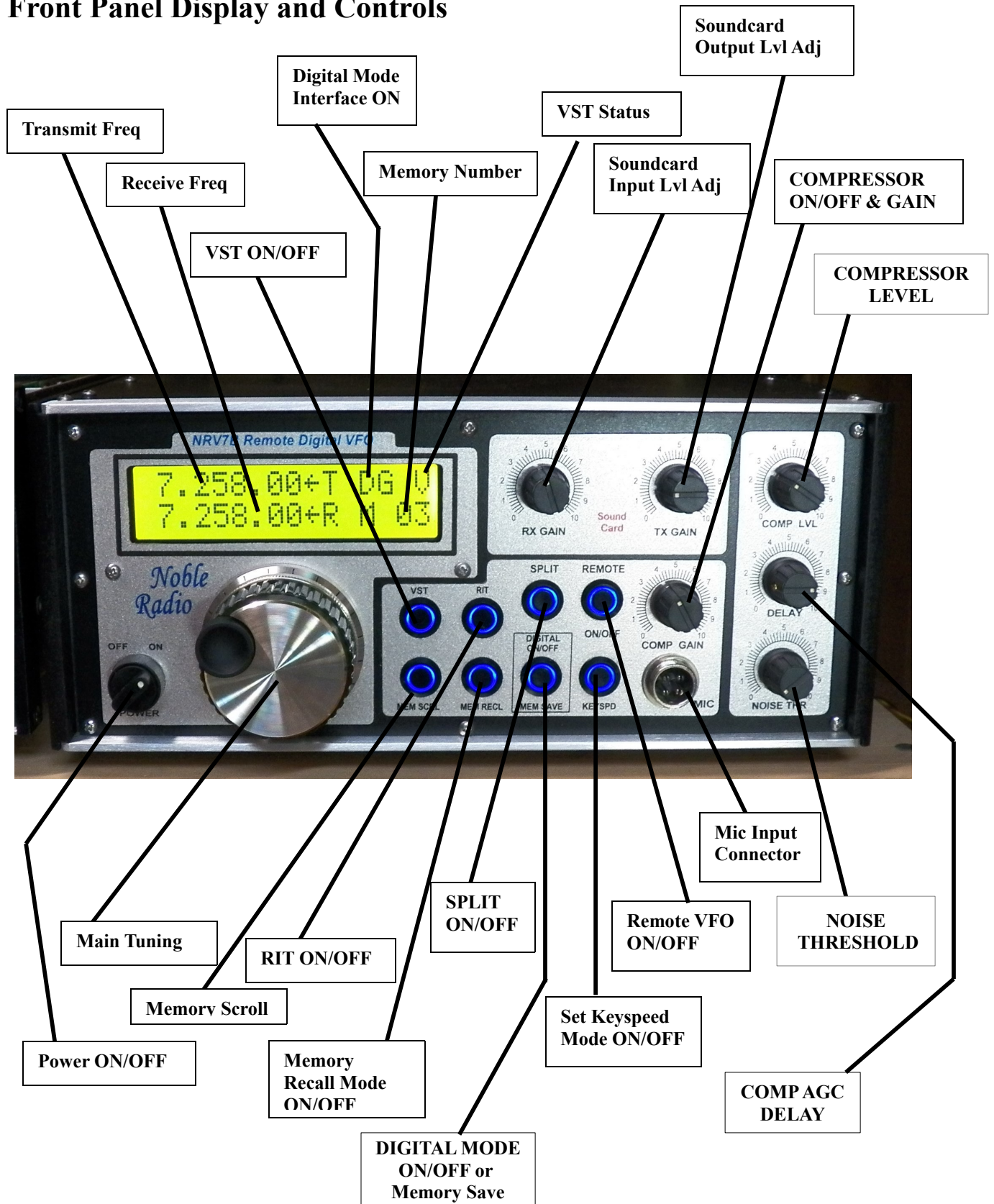
Introduction To the NRV7B

The NRV7B is a powerful DDS based Remote VFO and Station Accessory Module with an Integrated Panadapter for the Drake TR-7 HF Transceiver. The DDS is driven at a high reference clock frequency of 107.374182 MHz and generates an output between 5.020 MHz and 5.580 MHz. This gives a 500 kHz band segment with an extra 30 kHz on each end. The high reference clock to output frequency ratio provides a low spurious signal for driving the TR-7 electronics. The display on the VFO will not only show the offset frequency from the bandswitch selected 500 kHz boundary but the entire actual operating frequency to match the number shown on the display of the TR-7. To do this the VFO requires the band data information from the TR-7. A special interface cable that is supplied with the NRV7B must be installed in the TR-7. It is a simple operation to do this with the 8 conductor cable being routed through the bottom cover and up to the top corner of the DR7 Digital Readout board. Only the top and bottom covers need to be removed to do the installation. The 8 wires from the cable are soldered to 8 pins on a connector located at the back left corner of the board. The other end of the cable terminates in an RJ45 connector and simply plugs into the back of the NRV7B. The NRV7B shows both the transmit and receive frequency on the display. They are normally tuned together but can be independently controlled for special circumstances such as SPLIT mode operation.

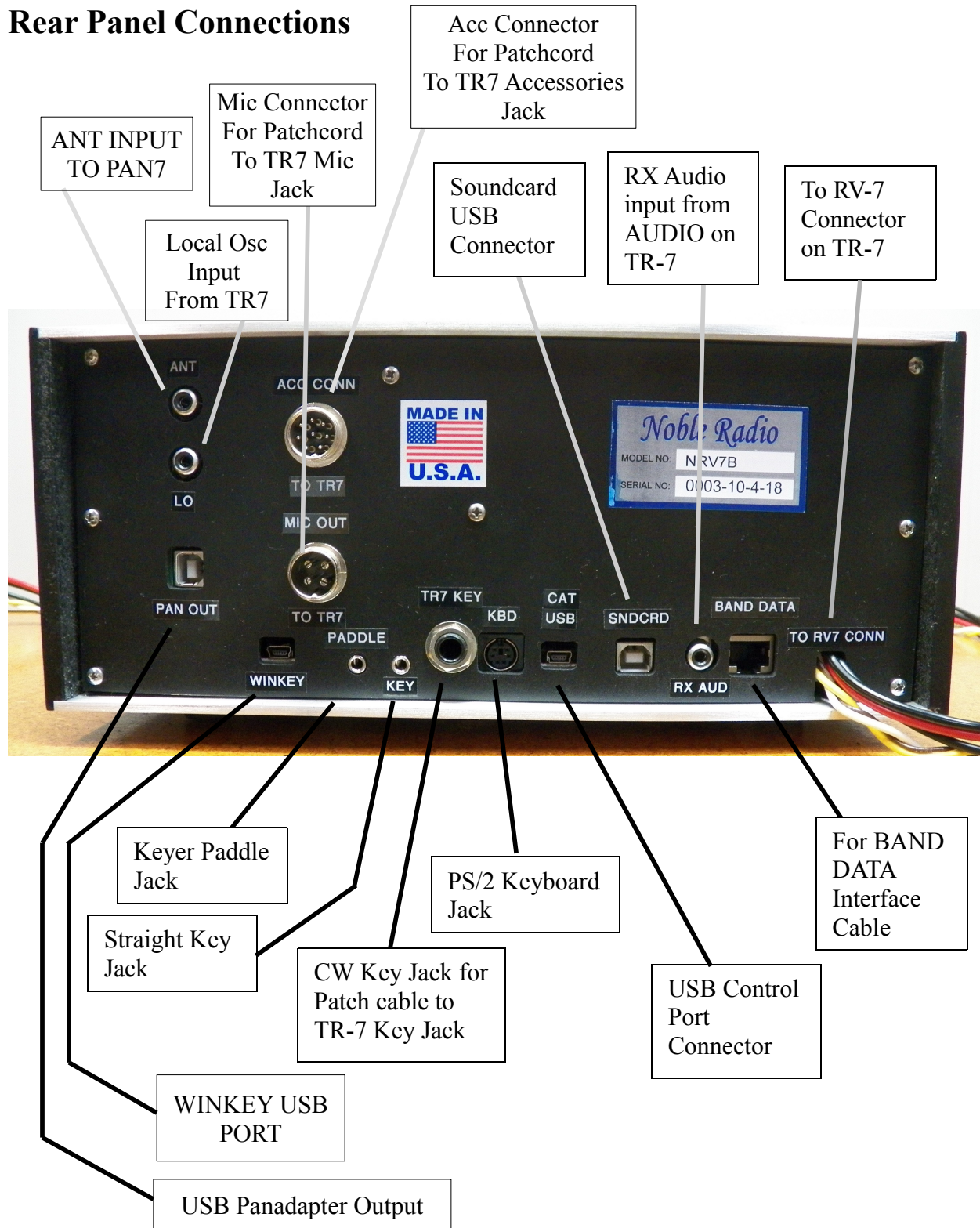
An interface cable to match the RV-7 connector on the back of the TR-7 is permanently attached to the NRV7B and exits out of the rear of the enclosure. The other end of the cable simply plugs into the RV-7 connector on the TR-7 to complete the connections required for running the VFO. The remaining cables are used for connecting the sound card and CAT USB control port as well as the PS/2 keyboard, RX audio output to the sound card from the fixed level output connector on the rear of the TR-7, Winkey USB port, keyer paddles and/or straight key, ANT and Local Osc signals to the PAN7 module as well as the USB connector for the Panadapter output and the patch cable from the TR-7 Mic jack to the Mic output jack on the rear of the NRV7B.

The actual connections for these cables will be described in further detail in the following sections.

Front Panel Display and Controls



Rear Panel Connections



Keyer Paddle Jack – TIP = Dot connection, RING = Dash connection, SLEEVE = Common

MIC OUT follows standard TR7 Microphone wiring as on the TR7 MIC Connector

NRV7B Setup

The NRV7 is supplied with 6 interconnect cables to make it easy to get the VFO up and running. The cables are shown in the photo below. Each is identified in the photo.



The **USB Soundcard Cable** is a Type A Female to Type B Male and plugs from the Soundcard connector (Male Type B) in the back of the NRV7B to a USB port on the PC

The **USB PAN OUT (Panadapter Output) Cable** is a Type A Female to Type B Male and plugs from the PAN OUT USB connector (Male Type B) on the back of the NRV7B to a USB port on the PC

The **USB Rig Control Cable** is a Type A male to Type B Mini that plugs from the CAT USB port on the back of the NRV7B (Mini B side) to a USB port on the PC

The **Band Data Cable** is a custom cable that must be installed (one end) in the TR7 and the installation procedure will be covered later in this section. It is an 8 conductor cable with one end of stripped wires and covered with a piece of heat shrink tubing while the other end is an RJ-45 connector which will plug into the BAND DATA connector on the back of the NRV7B. The heat shrink tubing is on the cable to allow easy threading through the areas of the TR7 chassis and will be removed once the cable is in place in the radio.

The **Mic Patch Cable** has a 4 pin female Mic connector on each end. One end goes to the MIC OUTPUT connector on the back of the NRV7B and the other end is plugged into the MIC connector on the front of the TR-7. This cable will carry the Microphone audio (either straight through or through the speech processor) or the sound card audio if using digital modes and the PTT signal from the NRV7B to the TR7.

The **RX Audio Cable** has RCA type plugs on both ends and connects from the RCA AUDIO jack on the back of the TR7 to the RX AUD jack on the back of the NRV7B. This carries the fixed level audio signal from the TR7 receiver output to the sound card for Digital mode operation. The NRV7B has a transformer isolated interface from the Soundcard to the TR7 on both the received and transmit audio signals.

The **CW KEY Cable** has 1/4" phone plugs on each end and connects from the TR7 KEY jack on the back of the NRV7B to the KEY jack on the back of the TR7. This cable is used to key the TR7 TX in CW mode.

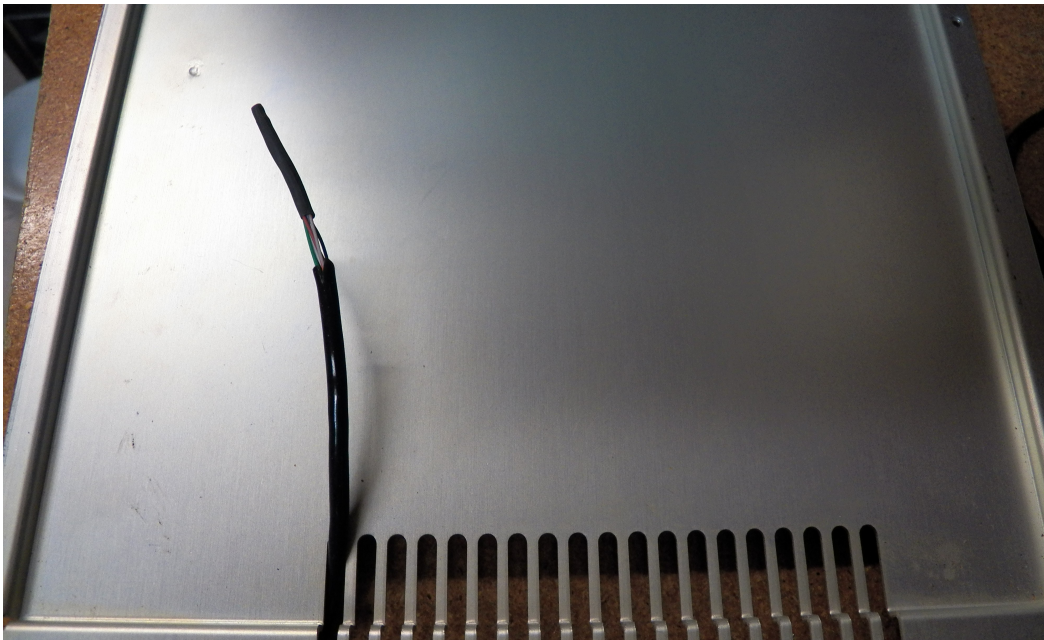
The **WinKey USB Cable** is a Type A male to Type B Mini that plugs from the WINKEY USB connector (Mini B) on the back of the NRV7B to a USB port on the PC

The **LO Cable and Buffer Board** need to be installed in the TR7 To bring a buffered Local Oscillator signal out from the TR7 Synthesizer to the Panadapter. The installation procedure will be covered later in this section. The board is installed on the bottom of the TR7 Parent Board with double sided tape and then three connections are soldered to the Parent Board. The Cable is routed through a slot in the bottom cover and the end without a connector is soldered to the two output holes on the Buffer Board.

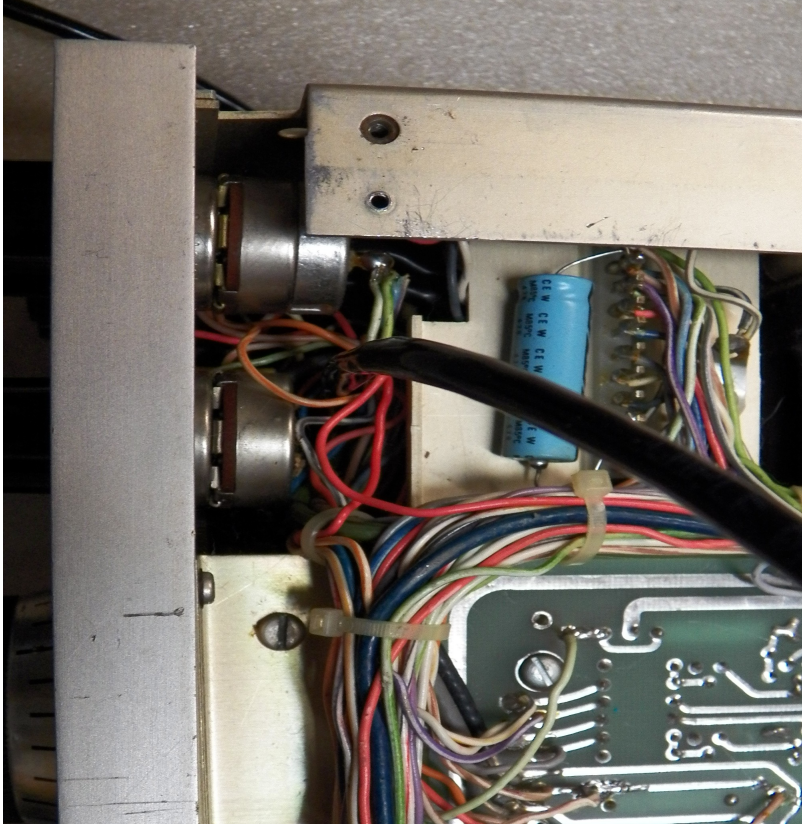
Before installing the BAND DATA cable to interface to the VFO section of the NRV7B the Local Oscillator Buffer Board should be installed on the bottom of the radio. See Section II (NR-PAN7 Installation and Setup) first and then return to this section to complete the NRV7B installation. While it is not mandatory to install in this order it will make the job mechanically easier to install the Buffer Board first.

NRV7B BAND DATA CABLE INSTALLTION

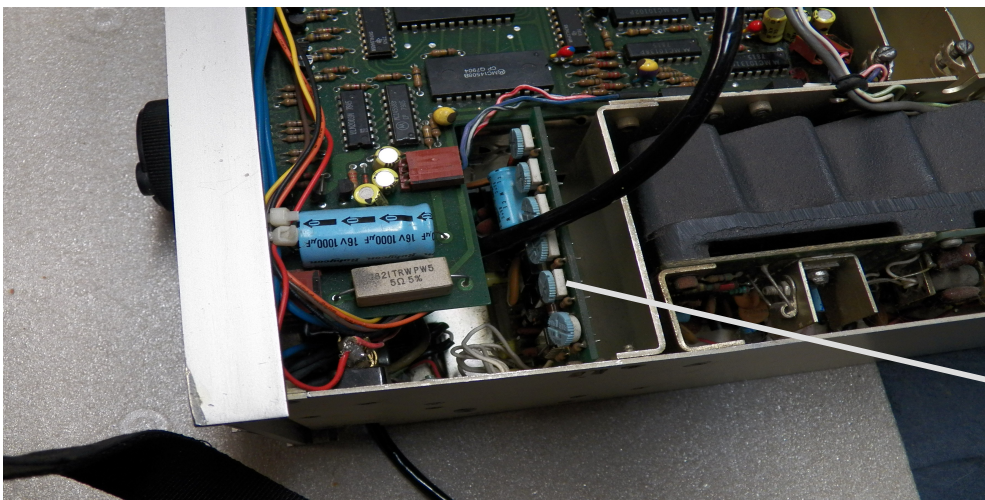
The first step in setting up the NRV7B for operation with a TR7 is to install the BAND DATA cable into the radio. In order to do this the TOP and BOTTOM covers must be removed. You should also have access to a good quality soldering iron and solder for attaching the wires in the cable to the connector inside the TR7. Be sure that the power supply cable is removed from the radio when performing the installation. Once the covers are removed the cable can be threaded through the first slot (closest to the front of the radio) in the PA vent holes in the bottom cover by pushing the end with the heat shrink tubing through from the outside of the cover (see photo below). Pull about 15 inches of cable through the slot.



Next, thread the cable into the area between the front panel and the compartment where the power supply board is located through the slot on the bottom of the power supply compartment (see photo below).



The cable should come up in front of the power supply board as shown below. **Be very careful not to turn any of the adjustment pots on the power supply board while bringing the cable through this area.** Turning any of these would require resetting the pots for the BFO settings for the individual mode that was moved or an entire re-alignment of the radio if the 10 Volt supply pot were changed. Once the cable is brought up through this area check to be sure there is enough cable to reach to the extreme left back corner of the DR7 Display Readout board (the large board lying flat across the top of the radio with the displays in the front).

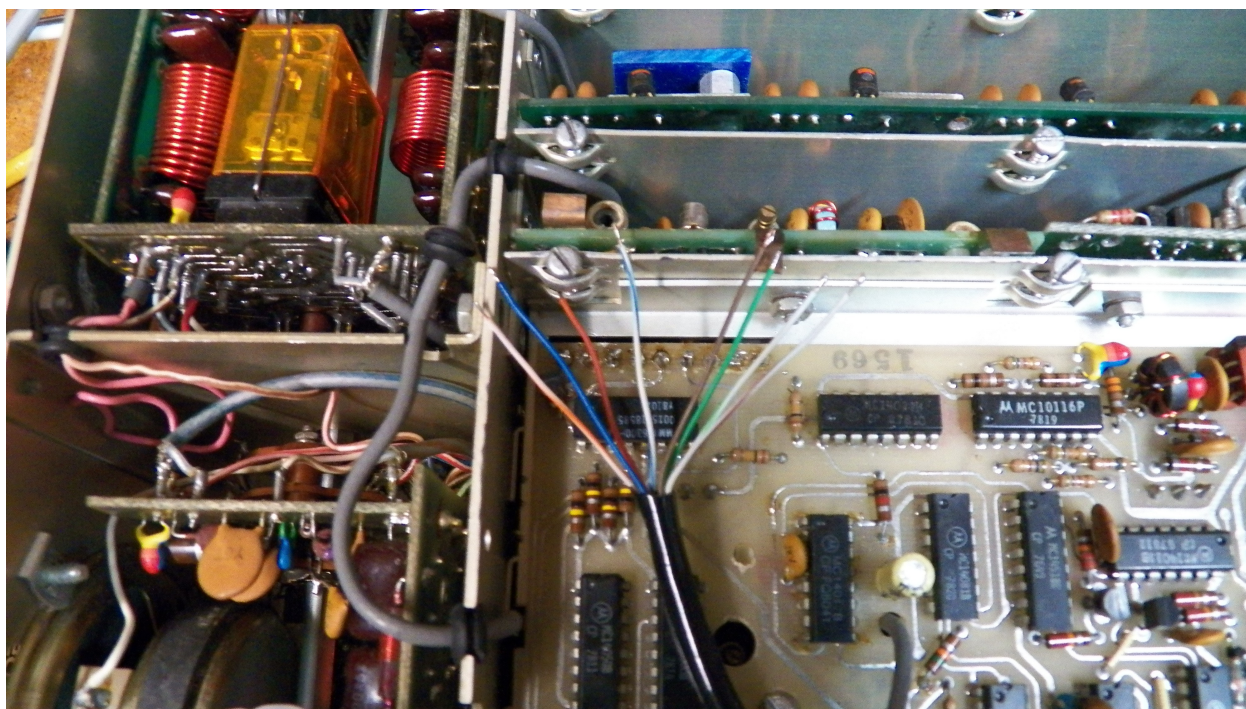


**DO NOT TURN
ANY OF THESE
6 POTS**

Cable coming up in front of Power Supply Board

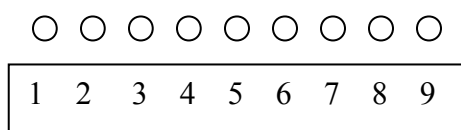
With the cable in position and the length checked, the bottom cover can be put back in place (DO NOT INSTALL THE BOTTOM COVER YET IF THE LO BUFFER BOARD HAS NOT BEEN INSTALLED YET. Just put it in place with one screw to allow the completion of the Band Data cable installation) making sure the Band Data cable is not interfering with any of the other wiring / components under the cover. Once the cover is set a couple of screws can be put into the cover to hold it in place. Return to the top of the radio to complete the cable installation.

Pull the heat shrink tubing off the end of the wires to expose the tinned wire ends. Spread out the wires as shown in the photo below. Then following the Chart below the photo solder each of the wires to the connector pins. To make it a bit easier, a small amount of solder can first be added to each pin before the wires are actually attached to the pins.



Wires spread out and ready to be soldered to the connector below them.

CONNECTOR WIRING CHART

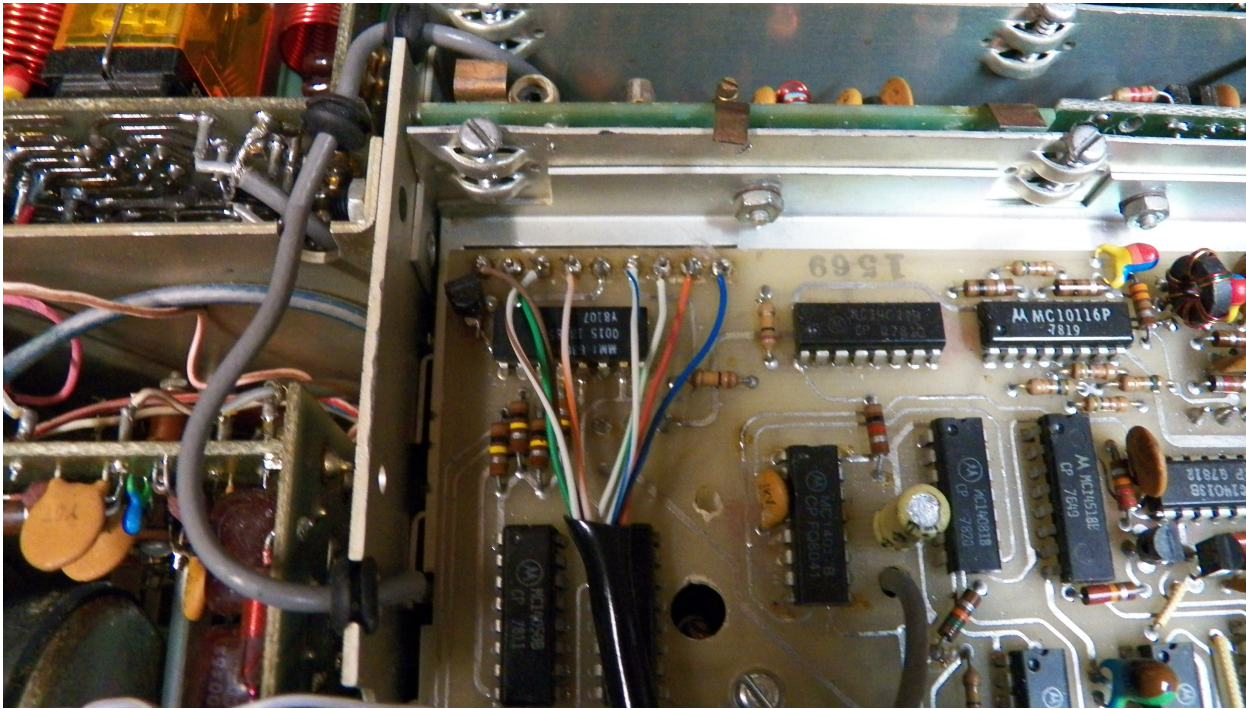


Pin Layout for connector on the DR7 board in the TR7

CONN PIN # WIRE COLOR

1	Brown
2	Green
3	White/Brown
4	White/Orange
5	DO NOT CONNECT
6	White/Blue
7	White/Green
8	Orange
9	Blue

Double check the wiring of the connector. The final result should look like the picture below.



If everything looks like the picture the installation is just about finished. Leave the top cover off of the radio until the rest of the cables have been connected to the NRV7B so that a final operational check can be made. If everything is working at that point the top cover can be put back on and all the remaining screws replaced in the top and bottom covers.

The next step in setting up the NRV7B is to plug in the main cable into the RV7 connector in the back of the TR7. After that the Power connector can be plugged back into the TR7. Then plug in the RX AUDIO cable between the RX AUD on the NRV7B and the AUDIO jack at the back of the TR-7. Plug in the CW KEY cable from the KEY jack on the back of the TR7 to the TR7 KEY jack on the NRV7B. Plug in the sound card cable from the SNDCRD connector on the back of the NRV7B to an unused USB port on the PC. Plug the CAT USB cable into the CAT USB port

on the back of the NRV7B but **DO NOT** plug the other end into a PC USB port at this time. The driver for the USB device must be loaded first. This will be done in a later step. Plug the Band Data cable that was installed in the TR7 into the BAND DATA connector at the back of the NRV7B. Note that the clip securing this connector is covered with a small boot. If you need to remove the connector a small screwdriver can be inserted under the clip to lift up when the connector is pulled out.

If a keyboard is to be used with the VFO then plug a PS/2 compatible keyboard into the KBD connector on the back of the NRV7B.

Attach the MIC Patch Cable from the TR7 front panel MIC connector to the MIC OUT connector on the back of the NRV7B. The cable is long enough to be routed around the left side of the TR7 across the back and into the NRV7B if the NRV7B is placed on the right side of the TR7. If CW operation is anticipated then a paddle can be plugged into the PADDLE jack at the back of the NRV7. A second jack is provided to plug in a straight key but to use the key as a straight key the keyer must be set to MANUAL mode in the KEYER SPEED function. This is explained in more detail in the description of the front panel switches functions. If the Winkey keyer is going to be used then plug the USB cable (with the Mini B end) into the WINKEY USB port on the back of the NRV7B. The other end will be plugged into an unused PC USB port but leave it disconnected for now.

To setup the Panadapter the USB cable with the Type B connector (same as the sound card) should be plugged into the PAN OUT port on the back of the NRV7B. Assuming that the Buffer board has been installed in the TR7 then the cable from the bottom of the TR7 with the RCA jack and Red heatshrink behind the jack should be plugged into the LO connector at the back of the NRV7B. The last cable with the 2 RCA jacks (one at each end) should be plugged into the ANT jack at the back of the NRV7B and the other end plugged into the EXT RCVR jack on the back of the TR7.

Once the cables are all connected the TR7 can be powered on. Once the TR7 is running set the bandswitch to 14 MHz then turn the NRV7 on with the front panel POWER switch. The display should light and the startup message should appear on the display for a few seconds. The current REV of software will be displayed.



Once the message has timed out the standard display format should appear as below

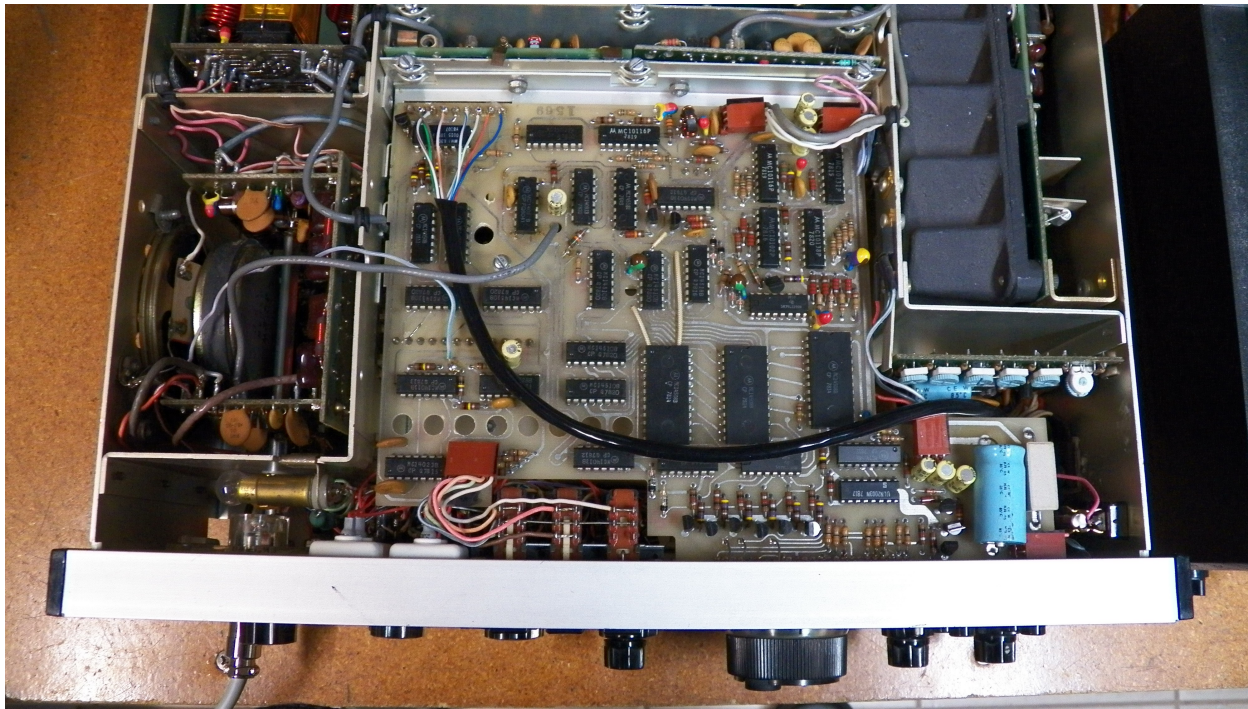


The actual frequency that will be displayed will depend on what is contained in the last memory that was used in the VFO. In the example above the memory is 02 and contained 14.070 MHz. If all is well at this point the next step is to check that the band data cable is working and wired properly. To do this run the TR7 bandswitch through each position. If the NRV7B is reading the band data properly the frequency display on the VFO should track the bandswitch position. For the example in the photos of 14.070 MHz, the offset from the bottom of the band is 70 kHz. So each band position should indicate a freq 70 kHz up from the band bottom. For this frequency moving the bandswitch through all its positions should give the following result with an initial freq of 14.070 MHz:

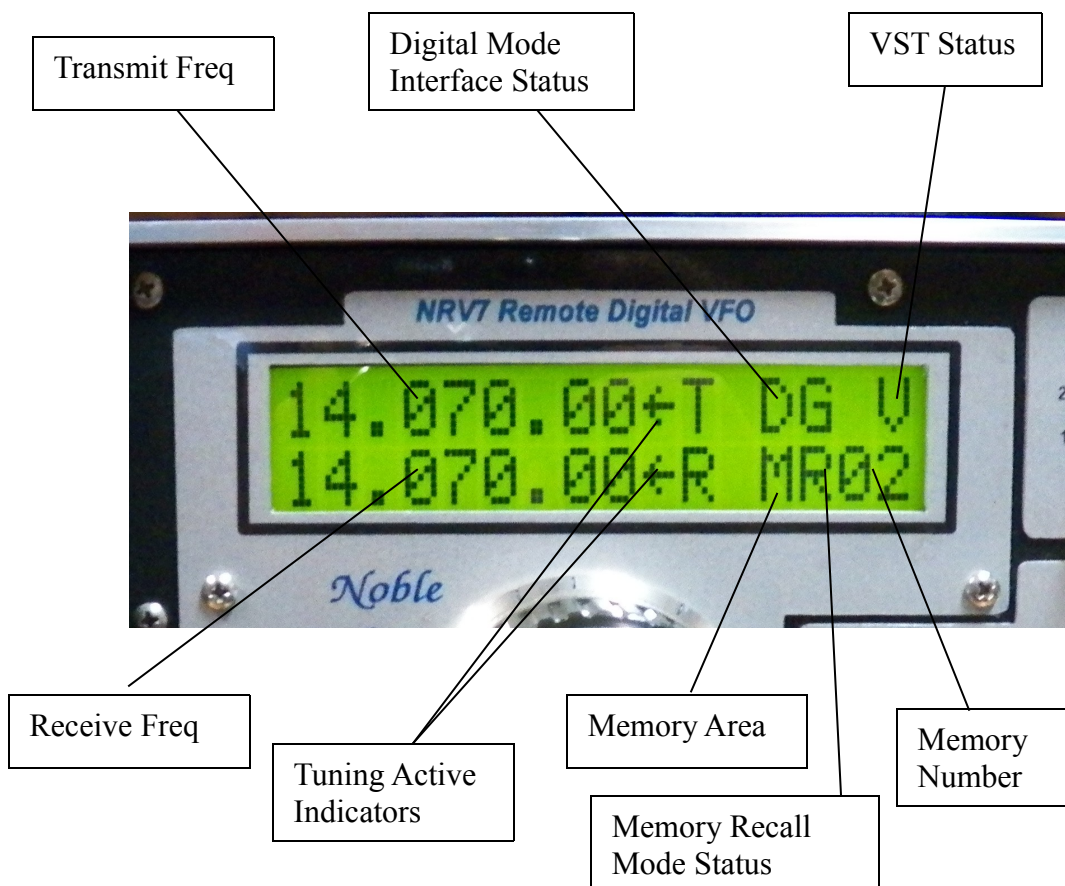
BAND FREQ ON DISPLAY

1.5	1.570.00
2.5	2.570.00
3.5	3.570.00
5	5.070.00
7	7.070.00
14	14.070.00
21	21.070.00
28.5	28.570.00

Using the UP and DOWN buttons on the TR7 the display should still follow with the 500 kHz step changes from the UP and DOWN buttons. If an AUX board is installed in the TR7 the VFO should also follow the changes using the AUX PROGRAM switch. In all cases the display on the TR7 should show the same frequency as the display on the NRV7B. As a last check for the VFO operation turn the main tuning knob up and down the band and be sure that the VFO display responds and that the TR7 display tracks. Note that when you reach the end of a band segment the VFO will stop tuning once it hits 30 kHz below or 30 kHz above the end of the 500 kHz segment. You will not be able to tune any higher or lower than those limits. To go past them you will have to switch to the next segment by either using the bandswitch or the UP DOWN buttons on the TR7. If all of these checks pass then the TR7 can be powered off and the cover and screws can be replaced in the radio. The following picture shows the band data cable routing across the top of the TR7's DR7 board.



Display Description



Transmit & Receive Frequencies – Shows the frequency currently being received and the frequency that will be used for transmit mode.

Tuning Active Indicators – If an arrow is on that means that VFO (TX or RX) will be tuned by the Main Tuning knob. If the arrow is off then that VFO will not be affected.

Digital Mode Interface Status – If a DG is shown in the display the sound card interface is ON for transmission. The receive interface is always connected. If the DG is OFF then the sound card is disabled for transmission and the Mic circuit is connected to the TR7 Mic input instead

Memory Area & Memory Number – The M indicates the memory area of the display. The number shows which memory was selected. If the R is present between the M and the memory number then the **Memory Recall** mode is on and the Memory Scroll and Memory Save buttons will be operational.

Front Panel Switch Functions

A) VST (Variable Speed Tuning)

The VST switch will allow you to tune with progressively larger step sizes based on the speed that the tuning knob is turned. The steps are 10 Hz, 100 Hz, 1 KHz and 10 KHz. This allows quick excursions across the larger bands while still providing fine tuning of a signal once at the desired frequency. When the VST function is active a “V” will appear at the end of the top line of the display (see photo).



Pressing the VST button repeatedly will turn the function on then off. When the function is off then the VFO tunes in fixed 10 Hz steps.

B) RIT (Receiver Incremental Tuning)

The RIT function can be used if a received station is off of your transmit freq but you do not want to move the transmit frequency to match. Pressing the RIT will cause the arrow (tuning active indicator) in front of the T frequency to go off. That leaves the receive frequency as the only active VFO. Turning the Main Tuning knob will only change the receive frequency. When the TR7 goes into transmit the T freq will be used and this will be reflected in the frequency display on the TR7. To turn the RIT mode OFF just press the RIT button a second time and the

arrow will appear in front of the T frequency and the T frequency will move to match the R frequency. Now both VFO's are tunable and will track when the Main Tuning knob is turned.

C) SPLIT

The SPLIT mode allows independent control of the Transmit and the receive frequencies. To engage the mode press the SPIT button on the front panel. The transmit arrow will go off indicating that any changes made with the tuning knob will only affect the receiver frequency. Press the SPLIT button again and the arrow moves from the receive to the transmit frequency indicating that the tuning knob will only affect the transmit frequency. Whichever frequency the arrow points to is the frequency to which the receiver will be tuned. So if you are monitoring a pileup on a DX station and want to find the frequency of the last station that he was working and call from that point you can use the SPLIT button to move the arrow to the T frequency and then zero beat the station that is working the DX. Then press the SPLIT button again to move back to the RX frequency (to copy the DX station) and when you transmit you will be on the same frequency of the last station worked. One thing to note is that you will not be able to transmit (TX is locked out) if the arrow is pointing to the TX frequency. You must return the arrow to the RX frequency in order to use the transmitter. To exit the SPLIT Mode press the RIT button. Both arrows will appear and the TX frequency will move to the same as the RX frequency. Note also that when the RX and TX frequencies are split, making a transmission will cause the frequency display on the TR7 will change to the TX frequency set on the NRV7B.

D) REMOTE ON/OFF

This switch will allow the use of either the VFO in the NRV7B or the internal PTO of the TR7 to control the transceiver. When the NRV7B is first powered up it defaults to the remote ON state where the VFO in the NRV7B is enabled and controlling the TR7. You get the standard display that was previously shown with the 2 frequencies displayed. When the REMOTE button is pressed the display will change to the following:



Notice that the frequency on the TR7 no longer matches the NRV7B VFO frequency. The TR7 will now be controlled by the PTO in the TR7. To return to remote operation (NRV7B controlling the frequency) just press the REMOTE button again. The REMOTE OFF line will

change back to the transmit frequency and the TR7 will show the same frequency as the NRV7B VFO.

E) KEYSPD (Keyer Speed Adjust)

This button will put the NRV7B into the keyer speed adjustment mode. When pressed the display will change to what is shown in the photo below.



The main tuning knob can now be used to set the speed to the desired speed from 5 to 35 WPM. If you want to use a straight key then set the keyer speed to MANUAL by turning to the low end of the range (next step below 5 WPM). Once the speed is set press the KEYSPD button once again and the display returns to the normal dual frequency readout. To work with a straight key the key should be plugged into the KEY jack at the back of the NRV7B (next to the paddle jack) and not directly into the CW KEY jack at the back of the TR7. If it is plugged into the TR7 then SPLIT mode will not work when you key the transmitter.

The NRV7B defaults to a 25 WPM speed when it is powered up.

F) DIGITAL ON/OFF

The DIGITAL ON/OFF button will connect the Mic audio input connection to the TR7 to either the sound card interface or to the Mic interface (either direct Mic connection or through the Speech Compressor). When DG appears in the top line of the display the sound card is connected. When it is off the Mic circuit is connected.

This switch button has a dual function. It controls the digital mode interface and also serves as a memory save switch when in the memory mode. That will be described in detail along with the MEM RECL and MEM SCRL switches in the section on using the memories.

USING THE MEMORIES

There are 20 tunable memories available in the NRV7B. They are initially set to 14.000 MHz and can be change to any other frequency by use of the 3 memory buttons on the front panel.

When the NRV7 is first powered on it will display the frequency of the last memory that was in use. The Memory number is shown on the far right side of the bottom line of the display (see photo in DISPLAY DESCRIPTION section). This frequency is now tunable over any part of the band and will maintain its offset from the lower edge of the 500 kHz band segment if the bandswitch is changed and continue to be tunable in the new band segment. To enter the memory mode the MEM RECL switch button must be pressed. An “R” will appear next to the M in the

memory area of the lower display line (see the photo in DISPLAY DESCRIPTION section). The MEM SCRL button can now be used to sequence through the 20 memories by successive pressing of the button. The frequency and the memory number will change on the display as each one is selected. If the new memory falls within the same band to which the bandswitch is currently set, the frequency of the TR7 will be changed to that frequency. If the memory is for a different band then the new frequency will be displayed on the top line and a CHANGE BAND message will appear on the bottom line of the display. See photo below.



In the photo we can see that the TR7 was set to the 20M (14 MHz) band and then a memory (#3) was selected that was in the 40M (7 MHz) band. So the NRV7B (and therefore the TR7) remained at the last frequency in the 20M band that was being used. The NRV7B sees that the bandswitch is set to 14 MHz and a 7 MHz frequency is being requested so it tells the operator to change the bandswitch to the 7 MHz position. Once that is done the display changes to display the following information:



The TR7 will now be tuned to 7.258MHz. At this point the frequency can be tuned with the Main Tuning knob to any other point in the band. If it is anticipated that the memory may want to be overwritten with a new frequency then the VFO should be left in the MEM RCL mode ("R" on in the bottom line of the display). When the new frequency to be saved is on the display, press the MEM SAVE button and the new value will be written into the currently displayed memory number and then the "R" will be removed from the display. If you just want to recall the data that

was already in the memory and do not want to change it then as soon as it is on the display just press MEM SAVE and the “R” will be removed and the memory data will be setup in the system. There is one other useful feature to the memory system. If you want to quickly switch between two frequencies in the same band you can set a memory to one of them then tune to the second frequency. Press the MEM RECL key and you will be tuned to the memorized frequency. If you press it a second time the “R” will go off in the display and you will be back at the last frequency you were tuned to before pressing MEM RECL. You can continually “bounce” back and forth between the two using this technique.

USING THE INTERNAL SOUND CARD

The NRV7B contains its own sound card that is interfaced to a PC using the supplied USB cable. There are no drivers that need to be loaded into the PC. The sound card will work with programs such as WSJT-X, Digipan and Fldigi. If Winlog32 is to be used as the logging / control program then Fldigi is recommended for the digital modes since it can integrate with Winlog32 and pass logging data directly to the program. To setup for use in Fldigi, open the program and select “Configure” from the top menu and then Sound card in the drop down menu. Select PortAudio and then in the drop down lists under Capture and Playback select Microphone (USB Audio Device) for capture and Speakers (USB Audio Device) for playback. Click SAVE and then close the windows and you should see the RX output from the TR7 receiver on the waterfall display. If any signals are present using the mode that is selected in Fldigi (i.e. PSK31, RTTY, CW, etc) they should start to decode in the signal browser window on the left side of the screen. Use the RX Gain control in the sound card area on the front panel of the NRV7B to set the receive level so as not to overload the sound card input. Adjust so there is just a slight amount of background noise in the waterfall with no signals present. This should provide good sensitivity without any overdriving of the sound card. To setup for making a transmission using the sound card, set the TX Gain control on the front panel of the NRV7B to minimum. Connect the TR7 to a dummy load. Set the Mic Gain on the TR7 to the 11 o’clock position. Set the MODE on the TR7 to USB. Set Fldigi to PSK31 mode. Press the DIGITAL ON/OFF button on the NRV7 (the DG should appear in the top line of the display). Click the TX-F10 button in Fldigi and the TR7 should go into transmit mode with almost no output power. Slowly advance the TX Gain control clockwise and the output power should start to increase. To get maximum output power advance the TX Gain control on the NRV7 until the point where the ALC light just comes on then back off until it is out. That is the maximum power point for the TX without excessive distortion. Never operate PSK or other digital modes with the ALC light on. Once the setting has been reached click the RX-F11 button in Fldigi to turn the TX off and return to the receive mode. At these settings the TR7 should show about 45 Watts on an average reading meter which is a full carrier power of 100W for PSK31 operation. This is a high power level for PSK operation and can also create a lot of heat in the TR7 power amp, especially if it is setup without the optional cooling fan. It is recommended that a lower power level be used for the digital modes down around 40 – 50 W. Use the Mic Gain control on the TR7 to reduce the power level to the lower level. The NRV7B / TR7 is now ready to be used on a digital mode. While this example was described for Fldigi other programs such as WSJT-X and DS780 can be setup in a similar manner. Select the audio or Sound card menu for whatever program you will use and select the USB sound card in the NRV7B as the input and output device. To make sure that the VOX circuit in the NRV7B has enough signal to key the PTT line to the TR7 the volume control slider for the USB card in the

Windows Audio Mixer should be set to maximum (100%). Use the TX Gain pot on the NRV7B to reduce the level to the TR7 Mic. Follow the operation guide for the program you will be using for any other details about the mode you will be using.

USING THE VOGAD SPEECH COMPRESSOR

The NRV7B has a built in VOGAD (Voice Operated Gain Adjusting Device) speech compressor. It is basically a mic amplifier with an AGC system to increase the gain on lower input levels and reduce the gain for higher mic input levels. This tends to keep the average microphone input level to the transmitter at a relatively constant level and provides a higher average output power level with very low distortion. The compressor also contains a downward compressing Noise Gate which can be used to suppress background noise during quiet periods between normal speech when the transmitter is keyed.

There are several controls to configure the compressor. The COMP GAIN control sets the gain of a front end preamplifier to boost the signal level of the mic output to a range where the AGC controlled stages can keep things relatively constant. This control also has a switch on it which will turn the compressor off altogether. When the compressor is off the Mic signal is fed directly to a buffer amplifier in the NRV7B and then to an isolation transformer where it then goes to the Mic connector on the back panel of the NRV7B and finally to the TR7 Mic connector via the Mic patchcord cable. The COMP LVL control is used to set the amount of compression that is applied to the signal that comes out of the preamp. The compression level essentially sets the gain slope of the mic signal from the lowest input level which is above the Noise Gate threshold to the maximum output that the AGC'd amp section will allow. The more compression the flatter this slope will be meaning that there will be very little difference between the output of the compressor when the input signal is very low or at its max into the mic. This results in a higher average output power from the transmitter but can also tend to make the audio sound a bit harsh and lacking the normal dynamic range you would get from unprocessed audio. This may be a good setting for trying to break a DX pileup but may not be suitable for a casual rag chew. So it is best to experiment with the settings of the compressor gain and level to get a good compromise between high average output power and pleasant sounding audio on the receiving end and record the values you want to use for different situations.

There is another control called DELAY which basically sets the time constant for the AGC action of the mic amplifier. A longer time constant (higher number on the control scale) will tend to average the audio level and keep it more constant. A shorter time constant will tend to make the audio a bit more choppy and let the mic gain recover to a higher value in between syllables. It is very similar to a fast and slow AGC on a receiver.

The NOISE THR control is used to set the level of where the compressor will downward compress the input signal to try to eliminate it from the output that goes to the transmitter. Any signal levels that fall at this point or lower will be negatively amplified to reduce their gain. Once a signal exceeds that threshold it will be handled in a manner consistent with the way the compressor gain, level and delay are set.

A recommended starting point would be to set the TR7 Mic gain control to between 9 and 11 o'clock. The COMP GAIN control to a 4, the COMP LVL control to a 3 and the DELAY to an 8. Start with the NOISE THR at zero. This control should only be brought up if there is a high level of background noise that goes over the air during speech pauses. Key the transmitter and then advance the NOISE THR control until the audio does not modulate the transmitter.

These settings should work with most microphones but some on the air tests will also give a better indication of the optimal settings to use for your particular microphone. The Speech Compressor can be left on all the time, even when running digital modes since engaging the sound card interface for transmit will disconnect the processor automatically. With proper setting of the compressor you should see a noticeable difference in average output power with the compressor on and off.

USING THE NRV7B WITH A PS/2 KEYBOARD

The NRV7B has a PS/2 connector on the rear panel to allow the operator to control the unit with the keyboard in addition to the front panel pushbutton switches. It also will allow CW sending via the keyboard with a 16 character display and buffer of the typed characters. A PS/2 compatible keyboard must be plugged into the NRV7B to do this. The function keys on the keyboard are setup to duplicate the functions of the front panel switches as well as add the CW keyboard send function not available from the front panel. The following list defines which function keys are used:

KEY	FUNCTION
F1	RIT ON/OFF
F2	REMOTE ON/OFF
F3	VST ON/OFF
F4	DIGITAL MODE INTERFACE ON/OFF
F5	SET KEYSPEED (ON/OFF)
F6	SPLIT MODE
F7	MEM RECL ON/OFF
F8	MEM SCRL
F9	CW KEYBOARD SEND MODE ON/OFF
F10	CW MESSAGE EDITOR (REV B SOFTWARE)

The ON/OFF functions are just toggled by successive pressing of the function key. To enter the CW keyboard send mode press the F9 key and the bottom line of the display will blank and show a blinking cursor at the first character position awaiting a character to send. Any valid CW character that is typed will immediately be sent out in CW at the preset key speed. It is not necessary to use caps lock or SHIFT to enter the characters for sending. All characters are displayed as upper case on the display. There are some special characters and control characters that can be used in addition to the normal A-Z and 0 – 9 alphanumeric characters. The following is a list of those characters:

CHAR	FUNCTION/CW CHAR SENT
ESC Key	Halts transmission of any characters left in the buffer
ENTER Key	Resumes transmission of characters remaining in the buffer
@ (SHIFT 2)	AR
+ (SHIFT =)	SK
* (SHIFT 8 or Numeric *)	AS
! (SHIFT 1)	Error (8 dots)
-	BT

Pressing the Esc Key twice will cause anything remaining in the buffer to be erased. The BACKSPACE key may be used to erase characters from the buffer even while it is sending. If the Esc key is pressed once while the buffer is empty characters (up to 16) may be entered and erased with the backspace key for editing and then the contents of the buffer can be sent by pressing the ENTER key. The photo below shows sample text that was entered while the buffer was halted with the Esc key.



The normal paddle keyer is always available to use even while in the keyboard send mode. So you can switch back and forth at any time between keyboard and paddle. To exit the keyboard send mode simply press F9. Note that the keyboard send mode cannot be used while in the SPLIT mode.

OPERATION WITH LOGGING PROGRAMS

The NRV7B contains a USB port that will allow limited rig control and auto logging capability with a PC logging program or any rig control program. The program must be configured to operate with an FT-857. The NRV7B uses that rig's command set for frequency and mode information exchange. The interface was written and debugged using the very capable freeware program, Winlog32 written by Colin, G0CUZ. The program will allow for frequency control of the NRV7B VFO from the RCW (Rig Control Window) in the program and will also follow and display the NRV7B VFO frequency when the VFO is tuned from the main tuning knob. Winlog32 has 240 memories available which can also be used to change the frequency of the NRV7B VFO. The VFO can also be changed in discrete step sizes by the use of the UP/DOWN buttons in the RCW. This allows for a very powerful frequency control environment for the TR7 allowing it to be used like many modern day transceivers.

Frequency data from the VFO is automatically entered into the log when a QSO is entered. While the NRV7B does not directly read the MODE information from the TR7 MODE switch, it uses the operators actions to determine which mode is being used and automatically sends that to the logging program for entry into the log. If the Mic PTT switch was activated then it is assumed that the mode is SSB. If the digital mode interface is on it will assume PSK31, if the keyer paddle was the last thing to be used or if the keyboard send mode is on then it assumes it is in the CW mode.

Another very nice feature of the Winlog32 program is that it can be linked to a DXCluster. A DXCluster window can be opened along with the RCW and when a spot comes up that you want to look at simply click the mouse on the frequency of that spot and the program will send that data to the NRV7B VFO and put the TR7 on that frequency. Of course if the TR7 is on a different band than the spot frequency the operator will have to manually turn the bandswitch to complete the QSY. Very easy to catch DX with the TR7 now.

While the NRV7B firmware was designed around Winlog32 it also will operate with other programs such as HRD, N1MM and DX Labs Suite of programs.

In order to use the CAT USB interface on the NRV7B, driver routines must be loaded into the PC. In most cases Windows will do an automatic install once it detects the device is connected. If this does not happen then the driver can be downloaded and installed manually. The NRV7B interface uses an FTDI chip and the drivers are available from the Parallax website at www.parallax.com/usbdriers

The current version of the driver for Windows XP/Vista/7/8/8.1 is Ver 2.12.16(r2)

Use this site to download and install the current version driver for your system **before plugging the USB cable from the NRV7B into the PC**. Once the driver has been loaded and run through the installer the USB cable from the NRV7B can be plugged into the PC. You will get a new hardware found message and the hardware install wizard should pop up on the screen. Let it do the automatic installation where it will search for the drivers and complete the install. On the older OS systems like Windows XP you will get messages that the software is not Microsoft Certified as the drivers are being loaded. This is because Microsoft has ended their certification programs for those systems that they do not support any longer. Answer YES to the questions as to whether you want to continue the installation. Once the total install is complete you will find that another COM port has been added to your system. This is the COM port for the USB port in the NRV7B. When you setup your logging program you will have to select that port for the communications port to the connected rig. Now that the COM port has been established the next step is to download the latest version of Winlog32 or whatever other logging and rig control program you choose and install that.

Note that if you will be using the integrated panadapter along with a logging and control program that you will need to use Ham Radio Deluxe as your logging program since that program has a software link to HDSDR (the program that will be used for the spectral display) and is the only way to allow both programs to control the one USB CAT port on the NRV7B. There is a beta version of a Com Port Bridge program available from Noble Radio which will allow HDSDR to interface to other logging programs besides HRD. It does require the installation and use of a virtual com port program such as VSPE to complete the links. Contact Noble Radio for more information about this program.

Regardless of the program that is used for rig control it must be setup to connect to a FT-857 radio and you will have to tell it the COM port that was allocated to the NRV7B CAT USB port

when the driver was installed. You can find that by looking at the ports in Windows Device Manager. If you are unsure then just pull up Device Manager and look at the list there. Then unplug the USB cable that is connected to the CAT USB port from the PC. The device manager will remove the port from its list. When you plug the USB cable back into the PC the Device manager will update again and show the port that was just connected in its list. You will also have to specify the baud rate as 9600 with 8 data bits and 1 stop and no parity. The FT-857 uses a polling technique to constantly get data on the freq and mode, etc from the radio. The polling rate should be set to 100 mS for best performance. If the program being used has an ENABLE RT or CTS they should be turned off.

At this point with the NRV7B up and running and connected to the USB port on the PC you should be able to run the Rig Control program and see the freq of the NRV7B/TR7 appear in the window on the PC screen. You should now be able to use whatever methods are available for frequency control in the program being used to change the frequency of the VFO/TR7.

If that is all working then congratulations, you now have PC rig control of your vintage TR7. Read the notes from Winlog32 or the other available programs for setting up the DXcluster and then you should be able to open that window by clicking the DXCluster selection on the top menu bar of the main part of the logging program and then DXCluster Start. It will take a few seconds for the cluster spots to start appearing in the window. Once it has filled up you can click on the frequency of one of the spots and it should immediately send the NRV7B VFO to that frequency. If it is in a different band than what you are currently set for, the NRV7B will issue a CHANGE BAND message on the display and you will have to manually change the bandswitch to complete the change.

If digital mode operation is planned using Fldigi and you are using Winlog32 then you will want to click on “Options” in the top menu bar and then go down to “Logging Interface” and then to FLDIGI and then finally click “Enable Interface”. Now whenever you click on the Save QSO button in Fldigi while Winlog32 is running all of the QSO data from Fldigi (including things like RST and name and QTH if it was filled in for the Fldigi log fields) program will automatically get passed to Winlog32 and an automatic log entry made. You can go into Winlog32 and make any changes you would like after the entry is there but it saves 95% of the work.

Another option that is available with most logging programs is to link to one of the callsign databases like QRZ.com. When you enter a callsign in the logbook and hit enter, the program will automatically perform a lookup (assuming you have an internet connection) and the data for the station (name, QTH, etc) will be displayed in a popup window. You can copy and paste the info from that right into the log.

If all of this is working at this point you have brought your TR7 into the 21st Century.

ADDITIONS WITH REV B SOFTWARE UPGRADE

The REV B software has made some improvements in operation as well as incorporating new features into the NRV7B. The changes are:

1> Improved the com link over the USB control port to allow operation with Ham Radio Deluxe and N1MM contesting software using the FT-857 as the emulation rig. HRD was usable in the A version but the frequency updates to the PC screen were slow. N1MM did not link at all with REV A software.

2> For operating frequencies of 10 MHz and higher the mode will be sent as USB when in SSB and as LSB if below 10 MHz.

3> The intercharacter spacing when in the Keyboard Send mode for CW has been increased to provide better timed CW

4> Six 15 character CW memories have been added to the CW keyer. They must be accessed / controlled with the external PS/2 keyboard.

USING THE CW MEMORIES

The memories must be used with the external PS/2 keyboard. Make sure that is plugged into the connector on the rear panel. There are three sections for using the memories.

- 1> Pulling up a memory in the editor and changing or deleting it
- 2> Accessing / sending the memory in the background (no display of the message)
- 3> Sending a memory while in the keyboard send mode

ACCESSING MEMORIES IN THE MESSAGE EDITOR

The F10 key will put the NRV7 into the editor mode. It will automatically display the current message on the bottom line of the display and it will indicate the message number on the top line After the frequency with CX, where X is the message number 1 – 6.

Once the message is displayed it can be edited by using the backspace key or just typing more characters at the end of the message. When the cursor hits the end of the display it will stop accepting characters. When you are done with the changes you can save the message by either switching to a different memory or by pressing the F10 key to leave the editor mode. **Memories are accessed by using the 1 thru 6 keys on the numeric keypad.** When in the editor mode, pressing a key for a new memory will place the memory contents on the second line of the display and also change the number on the top line. It will save the previous memory to its buffer.

SENDING MESSAGES IN MEMORY

A saved message may be sent in one of two ways. If you are in the Keyboard Send mode (F9 Key) the message will be put up on the display and immediately start to send. You can use the backspace key to edit as it is sending and retype into the send buffer. You can also immediately type in more characters as the message is sending and they will be appended to the end of the memory message. Be careful to type at a rate that will not cause the cursor to hit the end of the buffer since it will stop accepting characters at that point until something is sent out making more room in the buffer.

The second way to send a memory message is to just hit one of the numeric keys (1 – 6) while you are not in the keyboard send mode. The message will immediately start to send when the key is pressed. You cannot edit it on the fly in this mode

Longer messages may be made up by sending one buffer after another. There is no automatic synchronization of the messages. You must wait for the first message to be completely sent before pressing the key to send the next message. If the second message is pressed before the first one is finished it will erase whatever was left of the first message and start the second as soon as the current character is completed.

Certain modes will be blocked when using the message editor. You will not be able to enter the keyboard send mode (F9) while in the editor. All other function keys will not work with the exception of F3 (VST ON/OFF) and F2 (REMOTE ON/OFF).

You can be in the KEYSPEED mode (to adjust the keyer sending speed) and press one of the memory keys. The message will send and you can adjust the speed while it is sending. You can also start sending the message first and then move into the keyspeed mode to change the speed while the message is going out.

Connecting and Using the WinKey Interface

The NRV7B includes K1EL's Winkey interface. This has become a standard in most logging and data programs. It is connected to the PC application via a USB port and can be used to send saved messages in the logging program to key the transmitter in CW mode. It is very useful for contesting with a program like N1MM. It can also be used for automatically sending CQ's and with the proper software for general keyboard sending of CW. The interface in the NRV7B is only accessible via the USB port (there are no paddle connections or hardware speed controls to the interface). The interface must be setup in the same way as the USB port was done for the CAT USB port (see the Operation With Logging Programs section). Once the port drivers are installed and the COM port is assigned in the Device Manager list that port can be specified to the Application program as the WinKey port. The default baud rate for the WinKey interface is 1200 baud. Speed control by the hardware speed pot should be turned off. It may also say follow speed pot changes, turn these options off. The speed of the keyer is set only by the speed adjustments available in the application program. Once these parameters are entered the application program should be able to control the interface and key the transmitter. If you want to use the interface for general keyboard CW operation a good program to try is WinWarbler from DX Labs. It will display a window that you can type into and have the message sent out in CW. If you activate the SEND function and leave it on it will immediately send out whatever characters you type. This program also has message buffers that you can save things like CQ's in and recall and send them by pressing a single function key.

The WinKey interface is in parallel with the internal NRV7B keyer. So at any time you can switch to the paddles to start sending instead of using the WinKey interface. Of course you should stop any outgoing text that is being sent by the PC before trying to send with the paddles.

One thing to note when using the WinKey interface. As was mentioned earlier, the NRV7B detects what mode the TR7 is in by whether or not the PTT was activated (SSB modes) or the

Digital Interface was on or if the paddle/key was pressed for CW. The WinKeyer does not go through the NRV7B's microprocessor so it does not know that the keyer was activated and therefore cannot pickup the fact that we are in CW mode. So before starting to operate in the CW mode with the WinKeyer you should just tap one of the paddles to let the logging program know that you are in CW mode until another mode is selected. From that point on you can use any method to key the transmitter and the log entries will show as CW.

SPECIFICATIONS

VFO

Output Frequency: 5.020 – 5.580 MHz
Output Level: 3 Vp-p
DDS Generated with 107.374182 MHz Reference

INTERFACE

RV7 Compatible Cable

Transformer Isolated Internal Sound Card with USB Interface to PC using a Type B connector

USB Rig Control Port with Mini Type B connector

PS/2 Keyboard Interface

VOGAD Speech Compressor for SSB operation with Adjustable Noise Gate and Variable Compression Level, Gain and AGC Delay

5 – 35 WPM Internal Iambic Keyer. Also accepts external keyer or straight key in KEY connector

WinKey USB Interface runs in parallel with internal keyer or external keyer plugged into KEY connector

DIMENSIONS & WEIGHT

11.00 in W x 8.5 in D x 4.5 in H (27.94 cm x 21.6 cm x 11.43 cm) – Does not include Knobs and feet

5.0 lbs (2.27 Kg)

Noble Radio NR-PAN7 Panoramic Adapter Installation and Setup

Description

The NR-PAN7 is a Panadapter designed specifically to operate in conjunction with the Noble Radio NRV7 DDS VFO to create a spectral display and rig control environment for the Drake TR7 using Ham Radio Deluxe and HDSDR programs running on a Windows based PC. The combination of the NR-PAN7, NRV7 and the aforementioned software will allow “point and click” freq control of the TR7 using a mouse on the HDSDR spectral display. The frequency may also be controlled by the HRD rig control interface as well as the main tuning knob of the NRV7. This combination creates a powerful control and logging environment for the TR7.

The NRV7B incorporates the PAN7 into the same enclosure and picks up the control signals for the PAN7 from the NRV7B PCB. This not only removes one box from the operating desk but also eliminates the need for a control cable to plug into the Accessory connector on the back of the TR7 which is required for the stand alone version of the PAN7.

The novel approach to the way the NR-PAN7 has been designed allows for a very easy solution to adding a Panadapter to the TR7. The conventional approach is to add a tap off of the 48.05 MHz IF signal path in the TR7's Up Converter board. This is a complicated procedure and requires major disassembly of the radio. Installation of the NR-PAN7 does not require any boards to be removed from the radio. The entire modification to the TR7 is done on the bottom of the Parent Board and only requires removal of the bottom cover. The simple installation is achieved by duplicating the Up Converter board function in the NR-PAN7. It creates its own 48.05 MHz IF signal that tracks the signals in the TR7's IF because it uses the local oscillator from the TR7 to generate its own IF signal. The signal from the antenna is bandpass filtered to remove signals below 1.7 MHz and above 35 MHz and then converted to 48.05 MHz and then bandpass filtered again before going to its own IF amplifier stage where it is amplified and applied to an SDR receiver that connects to the PC environment with a USB connection.

HDSDR is used for the spectral display because it is a freeware program with many features and also connects to Ham Radio Deluxe via a DDE link so that no virtual com ports are required to use a rig control / logging program as well as a spectral display program to control the same radio. This makes for a very easy software installation and control / logging environment for the vintage Drake TR7.

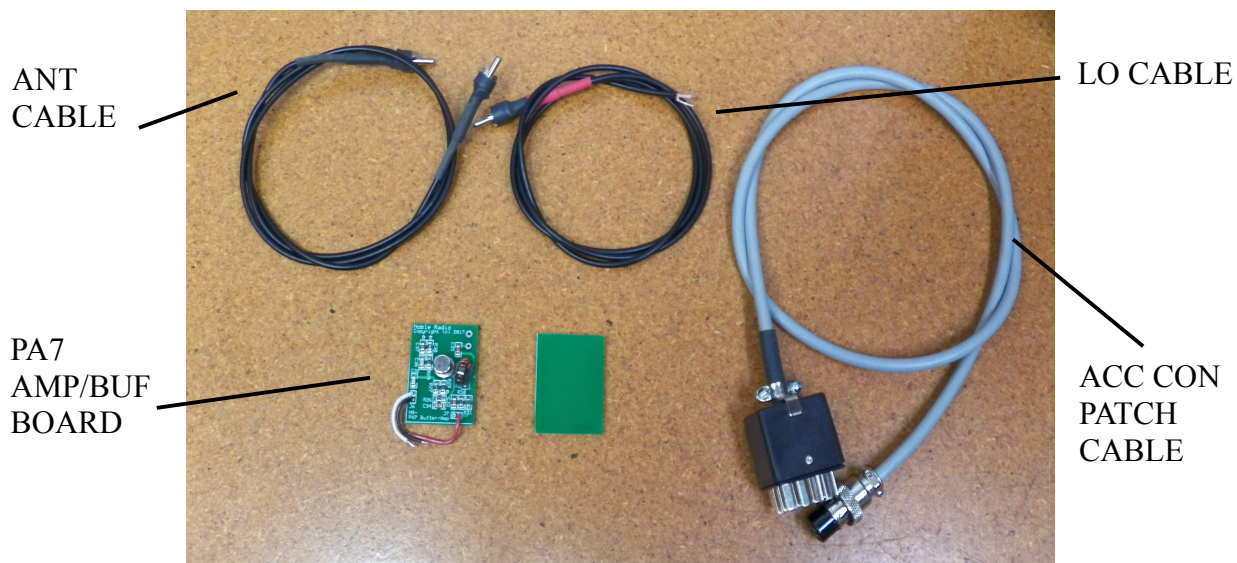
The installation of the PAN7 requires a small amplifier/buffer board to be mounted on the bottom of the Parent Board where it picks up the operating voltage and Local Osc signal from the Parent Board with 3 connections. A supplied coax cable (to carry the LO signal to the NR-PAN7) is routed through the slots in the bottom cover and attached to the Amp / Buffer board to complete the modification. The Antenna signal is picked up from the EXT ANT jack on the rear panel of

the TR7. The SDR is connected to the PC via the USB connector on the NR-PAN7. There are connections to the NRV7B Main board which provides power for the NR-PAN7 as well as the required signals to mute the Panadapter during transmit thus preventing severe overload of the spectral display.

Installation of the PA7 into the TR7

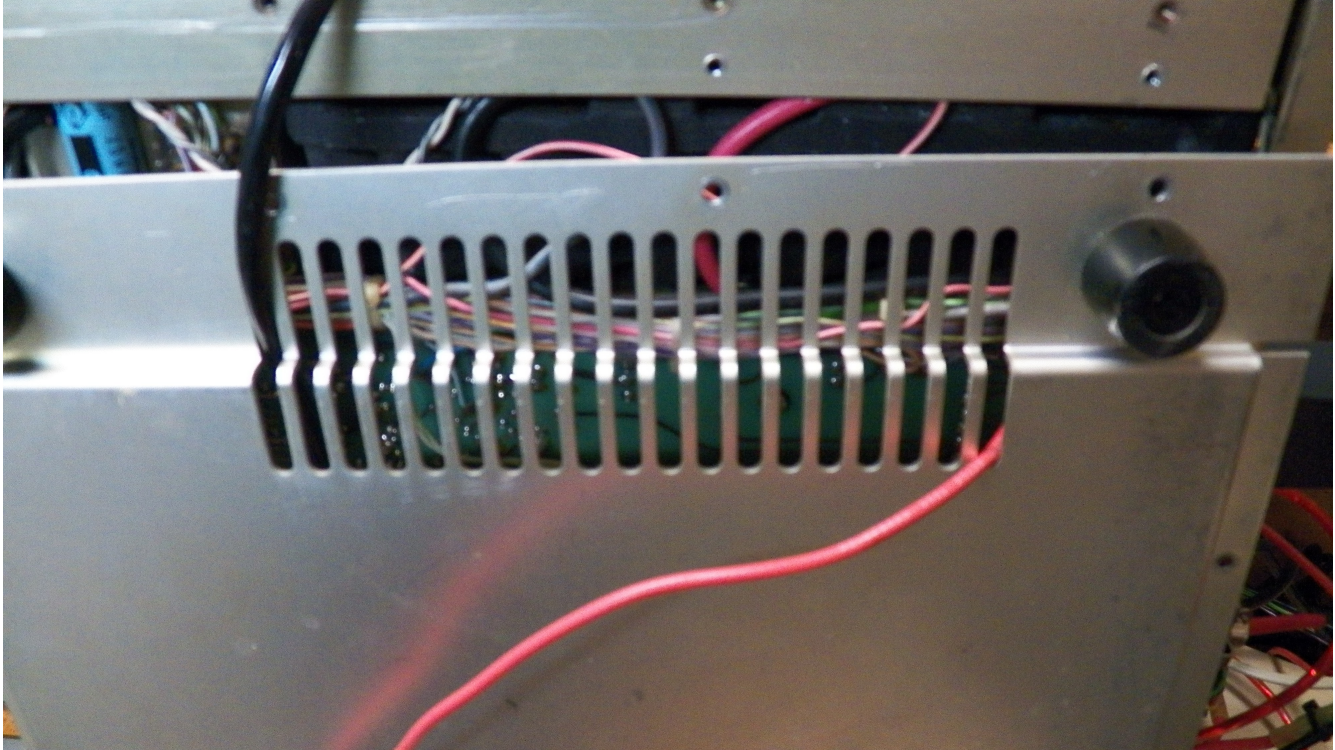
The following items are supplied with the NRV7B.

- 1> Antenna Input cable
- 2> Local Oscillator cable
- 3> USB Cable
- 4> PA7 Amplifier Buffer board
- 5> Insulating Fiber board
- 6> Cable ties for securing the LO coax inside the TR7
- 7> Accessories jack patch cable with 8 pin round connector and 12 pin Cinch Connector

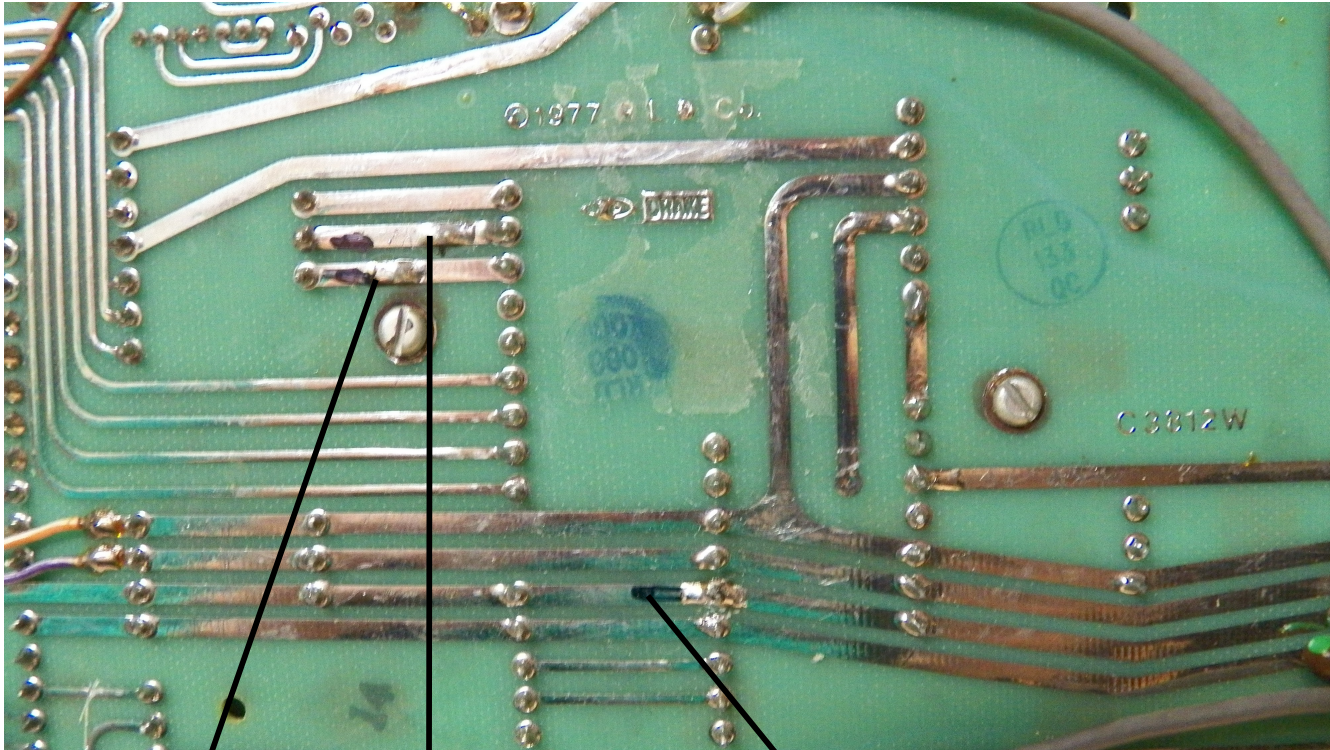


INSTALLING PA7 AMP/BUFFER BOARD , LO AND ANTENNA CABLES

Before the NR-PAN7 can be used a small Amplifier/Buffer board (PA7) must be installed in the bottom of the Parent Board of the TR7. The bottom cover of the TR7 must be removed. Use care if a band data cable has already been installed for the NRV7B so as not to put excessive force on that cable. Once the cover is removed take the end of the LO cable without the connector and thread it through the last slot in the bottom cover from the outside of the cover (see picture below).



Once that is done flip the cover to the side so the PA7 may now be installed.
The first step is to take a marking pen and mark the traces that will have wires from the PA7 board connected to them.



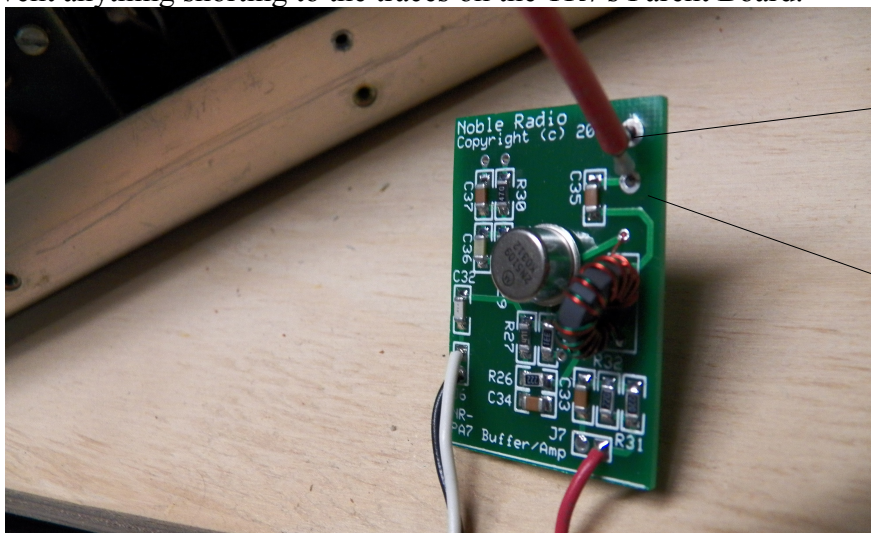
Ground –
Black wire

LO Input –
White Wire

+10 Volts – Red
Wire

PARENT BOARD SHOWING PA7 CONNECTION POINTS

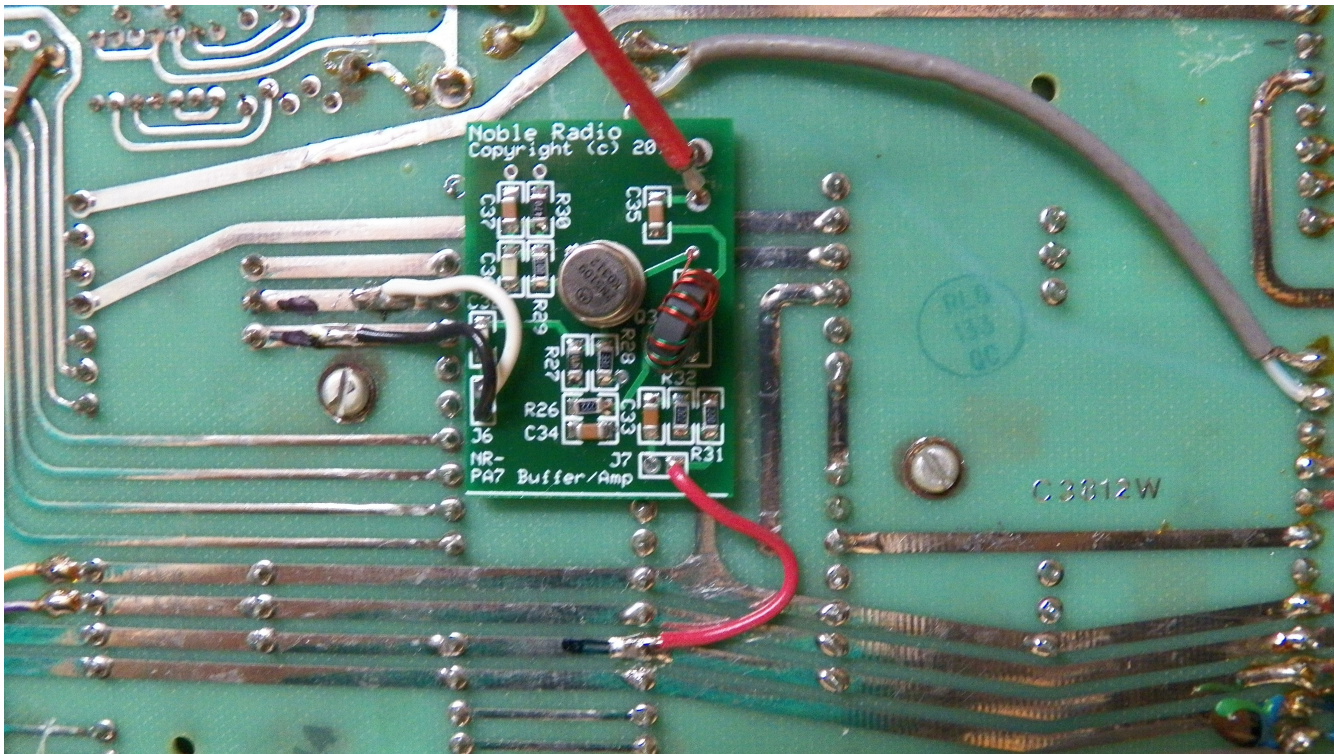
The next step is to connect the end of the coax that was routed through the slot in the bottom plate. It must be soldered to the holes in the PA7 board as shown in the picture below. Once the connections are made any wires protruding out of the back of the board should be cut flush to the board to prevent anything shorting to the traces on the TR7's Parent Board.



Shield Here

Center wire
Here

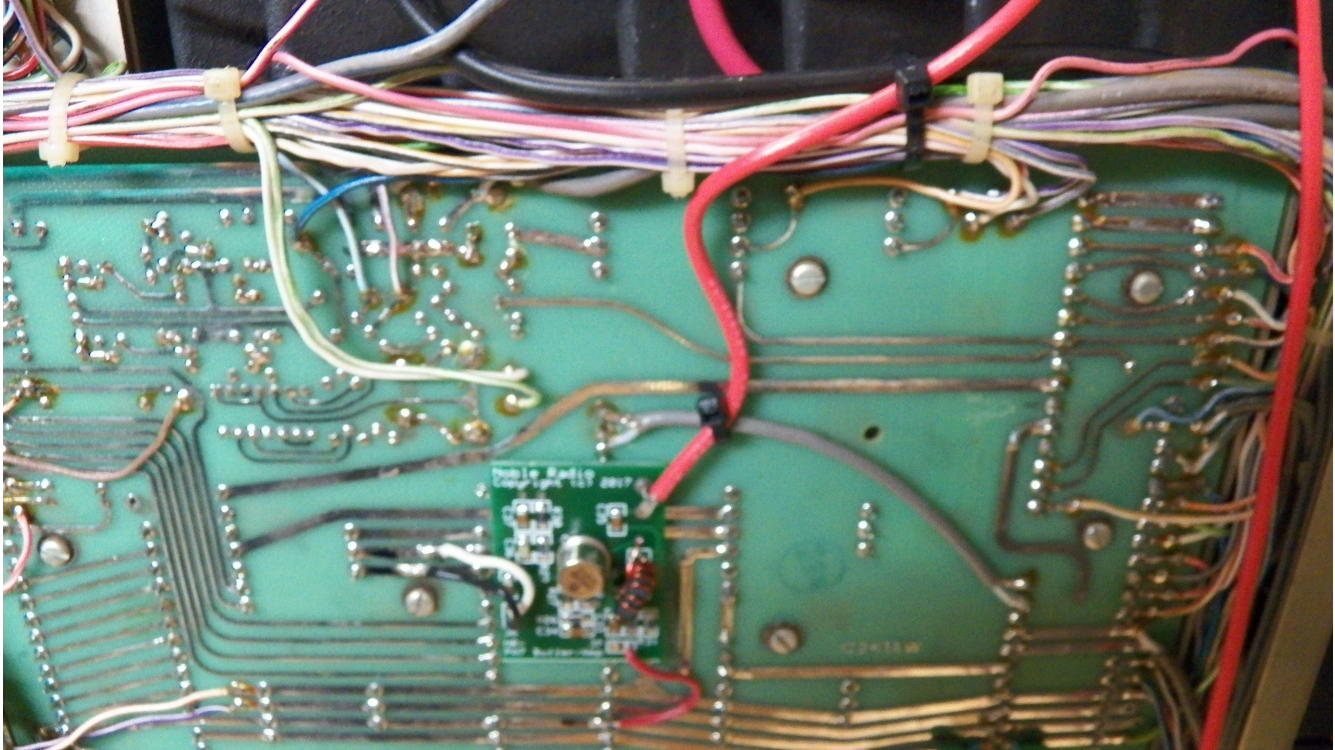
Once the connection points are marked and the coax is connected take the PA7 board and look at how it will fit between the connection pins on the Parent Board. The PA7 will attach to the board with double sided tape that is already attached to the PA7 board. The protective backing paper just needs to be removed and the PA7 can be pressed to the Parent board for a secure connection. Try the board first before removing the backing paper because once the tape is pressed to the Parent Board it will be very difficult to removed and cannot be reused. New tape will have to be put on the PA7 after the old is removed. So find the position first before sticking the board in place. The following picture shows the correct placement and orientation of the PA7 board.



PA7 Board Correctly placed on the TR7 Parent Board

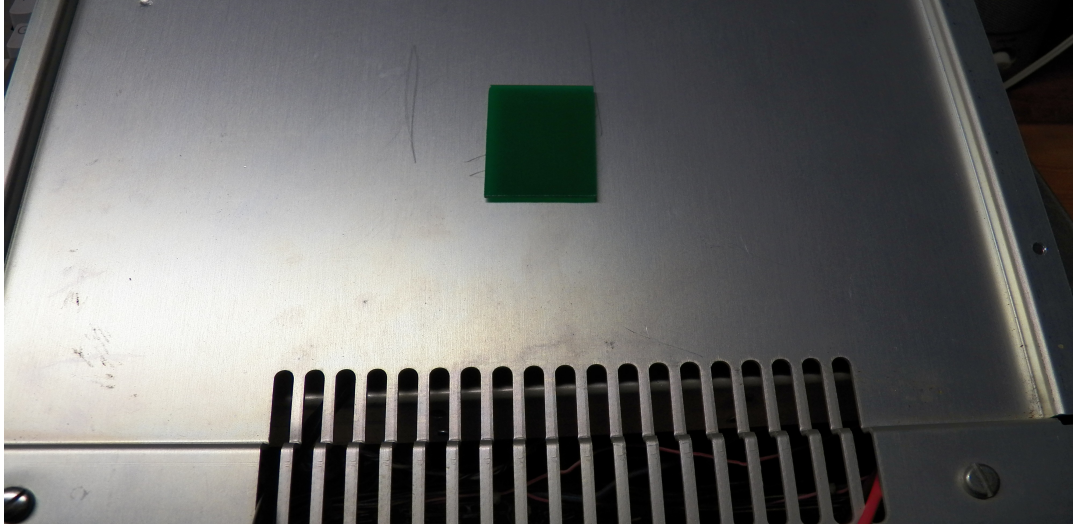
When you are sure of how it will be placed remove the backing tape and press the board firmly against the Parent board to secure it. The next step will be to solder the three wires to the connection points on the Parent board as shown in the photo. Use a minimum amount of solder to get a secure connection and be sure the solder flows from the wire onto the board traces.

The next thing to do is to secure the coax cable to the wire harnesses in the TR7. This will keep the wire in place and provide some strain relief for the PA7 board. See the photo below for the points to use for this. Use the cable ties provided with the PAN7.



Cable tie points

Before replacing the bottom cover the small rectangle of fiberglass board material should be placed in a position that is directly over the PA7 board. This will prevent any pressure on the bottom plate from allowing the plate to come in contact with the transistor on the PA7 board since this would ground the +10 volt supply in the TR7 and could cause some damage to the TR7's power supply circuits. The correct position for the material is 6 inches in from the front of the plate and 5.25 inches from the right side. This will give the center point for the board. It has a piece of double sided tape on it with backing paper that should be removed an the board pressed in place just as was done with the PA7 board.



At this point the PA7 is installed and the bottom cover can be replaced. Feed the coax and the band data cable from the NRV7 carefully through the slots until the cover is in place and then screw it down.

Connections to the NRV7B

Now that the PA7 has been installed in the TR7 the PAN7 module in the NRV7B can be connected to complete the installation. Plug the coax from the PA7 board (Red Heat Shrink at the RCA Plug) into the Jack marked LO on the NRV7B rear panel. Plug the antenna cable (RCA plugs on both ends with black heat shrink) into the jack marked ANT on the NRV7B rear panel and the other end in to the jack marked EXT RCVR on the TR7 rear panel. Plug the USB cable provided into the PAN OUT connector on the rear panel of the NRV7B and the other end into an unused USB jack on your PC or laptop. Attach the 8 pin round connector on the Acc Patch Cable to the ACC Connector on the back of the NRV7B. Plug the 12 pin Cinch Connector on the other end of the patch cable into the Accessories Jack on the back of the TR7. This cable supplies power to the PAN7 module as well as the control signals necessary to mute the panadapter during transmit. This completes the physical installation of the unit. Next the software will have to be installed and setup to use the panadapter.

Required Software and Installation

In order to use the functions of the Panadapter there must be some sort of control software setup in a PC or laptop computer. The Panadapter was designed to operate with two freeware programs to provide a spectral display plus rig control and logging functions. Ham Radio Deluxe (HRD) and HSDR are the two applications that work well with the NR-PAN7 in the NRV7B to control the TR7.

Ham Radio Deluxe 5.24 is the final free version and can be found with an internet search for download from several sites on the internet. That program should be downloaded and installed

on the control computer. HRD will give you rig control and logging plus many other functions. To get the most features from this program you may want to consider upgrading to the paid version. The next program that will need to be installed is HSDR. It is also a freeware program that can be found at www.hdsdr.de . That will provide the spectral display for the panadapater. Once both of these programs are installed the drivers for the hardware will have to be installed. The drivers for the NRV7B CAT USB control port are FTDI USB types and more information about installing those can be found in the section for setting up the NRV7B for use with a logging program. Once the driver is installed it will be assigned a COM port number in Windows. You can use that number or go to the Device Manager in Windows to change it to another port number. Just be careful not to use something that is already assigned to an active device connected to the computer. HRD will need to know to which COM port the NRV7B is connected. The CONNECT menu on HRD will allow the setup of a COM port to interface to the NRV7B. Make sure that the TR7 and NRV7B are powered on. In HRD set the Baud Rate to 9600 and be sure that the rig is set to the FT-857. This should now allow HRD to connect to the NRV7B and display the operating freq of the VFO. HRD should be able to change the freq of the NRV7B by clicking on the band bars or the numbers in the frequency readout. Once that is working it will be time to focus on the HSDR program and the spectral display. To use HSDR with the PAN7 the driver for the SDR receiver must be installed. The driver to use is installed with zadig. The zadig utility can be downloaded from <http://zadig.akeo.ie> . Download the latest version that is compatible with the operating system you are using. Make sure that the USB cable is plugged into the SDR OUT connector on the NR-PAN7 with the other end into an unused USB port on the PC or Laptop. Run the zadig utility by clicking on the file and opening the dialog box. The app may need to be opened and run as an administrator. Do this by right clicking it and choosing Run As Administrator. Go to OPTIONS ---> List All devices and make sure that is checked. In the drop down box chose Bulk In, Interface (Interface 0). This can also sometimes show up as an item prefixed with **RTL28328U** . Make sure that WinUSB is selected as the target driver and click on Replace Driver. The following site will also show step by step instructions for loading the SDR driver <http://www.rtl-sdr.com/tag/zadig/> .

Once the driver is installed HSDR can be started. If the driver is working properly the spectral display screen should appear. To verify that the driver is installed correctly click on the ExtIO box next to the frequency display and it should show a box with the heading **ExtIO – RTL2832.DLL**. If that is present then close the box and press F7 to bring up the **OPTIONS** Menu. Point to the **Select Input** item and then make sure that **Generic RTL2832U OEM** is selected. You may also see it listed as **RealTek**.

Next go to the **RF Front End Calibration** item in the F7 menu. Click on (select) **SDR on IF output, which is controlled by** and then select **HRD (DDE)**. Under Sync mode select **Full Sync in Both Directions**. Under **IF Frequency** enter **48050000**. Leave the Offset at 0 for the moment. Click **Mirror RF Spectrum in General**. Click **APPLY** and close the window. In the F7 menu select **DDE to HSDR**. Select **HRD** in the box that pops up. Next click “Manual Connect” and you should see green text at the bottom that says “Status Connection OK :)” Click OK to close the window.

With the TR7 and NRV7B powered on and HRD running and connected to HSDR via the DDE link (this should show in the pop up box that was used to select HRD as the DDE link in the previous step. If it is not connected then select Manual Connect in that box) clicking the **START** button on HSDR should bring the spectral display alive and any signals in the passband of the TR7's IF should appear on the display. The amplitude of the display may be way off from

optimal when first started and the frequency of a tuned signal on the TR7 may not be exactly lined up with the spectral display. These factors will have to be adjusted to suit your individual taste and to calibrate frequency to the TR7. But a good starting point is to have the spectral display set for a 100 kHz width (this gives the best overall display bandwidth while still allowing for easy frequency selection of a signal with the mouse) and the SDR RF Gain set to around 30. This can be set by either using the slider from the box labeled RF+N (N being the value selected) at the right side of the buttons at the bottom left corner of the screen, or by clicking the ExtIO box. The window that appears will show a slider which will also control the gain plus a few other options. The Sample Rate should be set to 2.4 Msps as a starting point. The Buffer size should be set to 64 kB. Make sure both of the AGC selections are OFF (not checked). Offset Tuning should be checked. In some PC systems the sample rate may have to be lowered to avoid excess spurs near the center of the screen. If this is what you see then start with the lowest rate (.94 Msps) and gradually increase until the problem appears then back off one step. The actual scale height and spectral width and speed of the update, etc are controlled by the sliders under the spectral display window. You will need to play with these to get the best display to suit your preferences. A typical display will look like the picture below.



Typical Spectral Display from the NR-PAN7

You can use the position of the sliders in the picture as a starting point for setting up your display. You can see that the frequency displayed on the Tune value is set to the actual operating freq of the TR7/NRV7 and not the frequency of the IF. Use the mouse to place the red vertical cursor on one of the signals on the spectrum display and left click the mouse. The display should instantly put the selected signal at the center of the screen and the Tune frequency on HSDR, the NRV7B, TR7 and HRD frequency displays should all change to the new frequency and the

selected signal should be heard on the TR7. The proper way to select a signal depends on what sideband is in use. For USB the cursor should be placed to the left side (edge) of the signal passband. For LSB it should go to the right side. For CW it will also be to the left since on the TR7 that is an USB mode. The mode of the display will be changed with the NRV7B. It is best to use the NR-PAN7 with the REV B NRV7B software. That software has improved updating capability for use with HRD plus will send LSB as the mode for operating frequencies below 10 MHz and USB for operating frequencies at 10MHz and above. The mode can be set by simply pressing the PTT on the mic for a second. The mode on the HDSDR and HRD displays will set to the correct value for SSB and that frequency. Tapping the DASH paddle on the keyer will set the mode to CW. To calibrate the amplitude of the screen use the Calibration Settings menu in the F7 menu. Note this is for Ver 2.76, last release in Feb 2017. Earlier versions will use a different menu setup. The antenna should be disconnected from the TR7 and the “S-meter Calibration” tab should be selected. The noise floor should be about -112 to -114 dBm in the “Current Level” box. If it is much different than that enter a value of -112 in the “Correct Level” box and then hit “Calculate”

This should all be done with the RF Gain set to a value of 30 dB. Next go to the sliders under the spectrum display window. Using the slider closest to the word “Spectrum” set the minimum level on the spectrum scale to -135 dBm. Using the slider to the left of that one set the max scale value to -84 dBm. That should give a good starting point for weak signals (barely moving the S-meter on the TR7) to just start to pop out of the noise floor while still keeping very strong ones from moving past the top of the display. These numbers are just a starting point and can be played with to get a display that suits your individual preference. One thing that should be noted is that the minimum of RF gain necessary should be used to prevent overload of the SDR receivers front end. Excessive gain will only result in many spurs and possible images from strong broadcast stations appearing in the spectrum. Values should be limited to between 25 and 30 dB for best results.

HDSDR Calibration

In most instances the SDR receiver will not be exactly calibrated to the NRV7B VFO and will require a correction factor to be entered. The quickest way to check this is to tune in a broadcast station or a station like WWV or CHU on the TR7 using the NRV7B VFO. Zero beat the station with the NRV7B tuning knob (should be within 10 Hz or so of the actual broadcast station frequency). Look at the spectral display on HDSDR and see where the carrier for the station appears. It should be exactly on the red line at the center of the display. If this is not the case, estimate what the error is from the freq display bar at the top of the spectral display and then pull up the RF Front End and Calibration box through the F7 menu. Go to the **Global Offset** box and enter the error value (in Hz) of the signal. Close the box and go back and recheck the signal. Do this until you match the TR7 frequency with the Spectral Display. At this point you should be able to accurately click on SSB signals and they should appear tuned properly on the TR7/NRV7. Once the software is calibrated properly the audio spectral display (bottom right corner of the screen) can be used for very accurate frequency spotting on CW. Although the NR-PAN7 does provide muting of the SDR receiver output there is a small leakage of signal that comes through and appears on the spectral display. Keying the TR7 in CW mode will show this on the audio spectrum as well as the audio waterfall above it. Note the frequency where this occurs. To

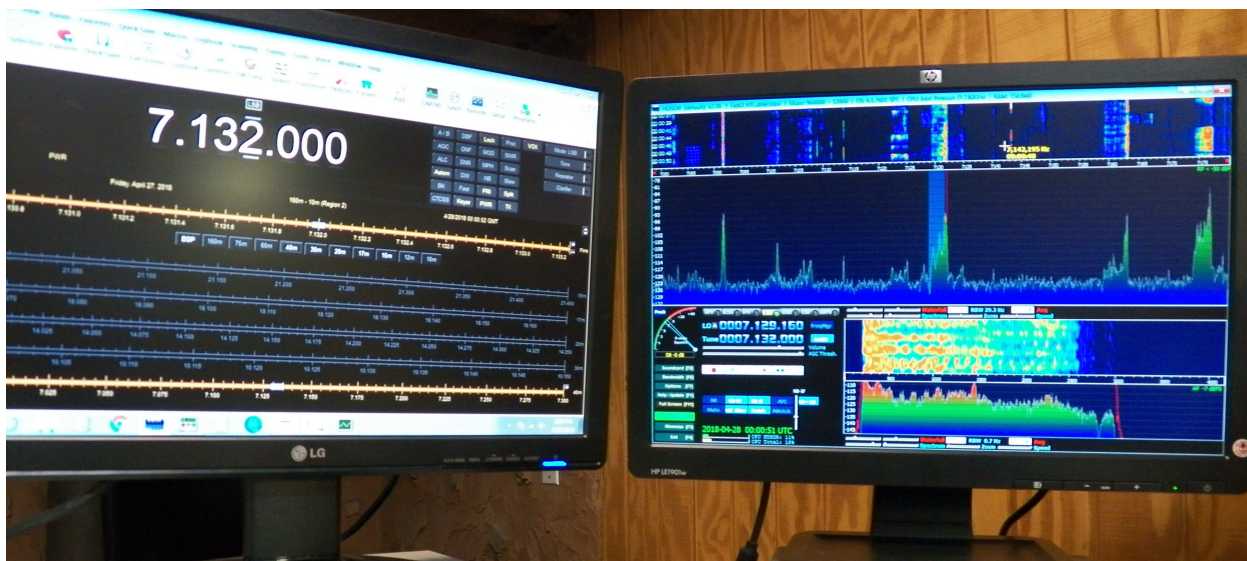
directly zerobeat a CW station simply tune the receiver until that received station falls at the same frequency on the waterfall.

Using the SDR Receiver Capability of HDSDR

Since the signals from the TR7 receiver are also being received by the SDR receiver in the PAN7 they can be processed by the DSP software in the HDSDR program as well. The DSP filtering and other features can be used on received signals. This mode can also be used to more accurately set the freq offset in the previous section by listening to an AM station and matching the audio from the SDR receiver to that of the TR7. The only drawback to using it this way is that there will be a noticeable latency or delay between the real time audio from the TR7 until it actually appears at the output of the HDSDR audio from the PC speakers. So it is not very easy to operate in this way but could be suitable for just receiving. Operating CW with the SDR receiver would be almost impossible. To use this mode reliably the TX enable option should be turned off. You may occasionally get data from the NRV7 that causes the HDSDR program to think that the TR7 is in the transmit mode and it will mute the RX audio from the PC speakers. To avoid this issue pull up the TX menu from the F7 menu. Make sure all options are unchecked. Especially the “Mute RX audio on TX” and the “Enable TX button for HRD(DDE)” selections. Audio from the PC RX can still be muted by the MUTE button near the bottom left corner of the display.

PC / Laptop Hardware Considerations

There is obviously a lot of processing going on between the HRD and HDSDR programs so to get the best results from the system it would be advisable to use a reasonably fast computer, preferably one with at least a dual core processor and it would also need at least 2 or 3 free USB ports to support the NRV7 control port plus the SDR receiver data and also the sound card on the NRV7B if digital modes are to be used. With both HRD and HDSDR running the computer should be setup with dual monitors so that each program could have its own screen making it a lot easier to see what is going on and access all the features of both programs without having to move and shrink windows around, etc. Plus the logging windows will also need to be popped up in HRD if you use that feature so it gets crowded quickly. The photo below shows a typical setup for the TR7/NRV7B running HRD and HDSDR.



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