TIMEWAVE
TECHNOLOGY INC.

Navigator

Operating Manual

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Operating Manual – Timewave Navigator

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Table of Contents

1   Introduction

Thank you for purchasing the Navigator Sound Card Modem. The Navigator is a full featured, multi-mode digital interface between your PC and your amateur radio transceiver.

In this manual, you will find information about the features of Navigator, the design architecture, hardware and software installation and the technical specifications of the device.
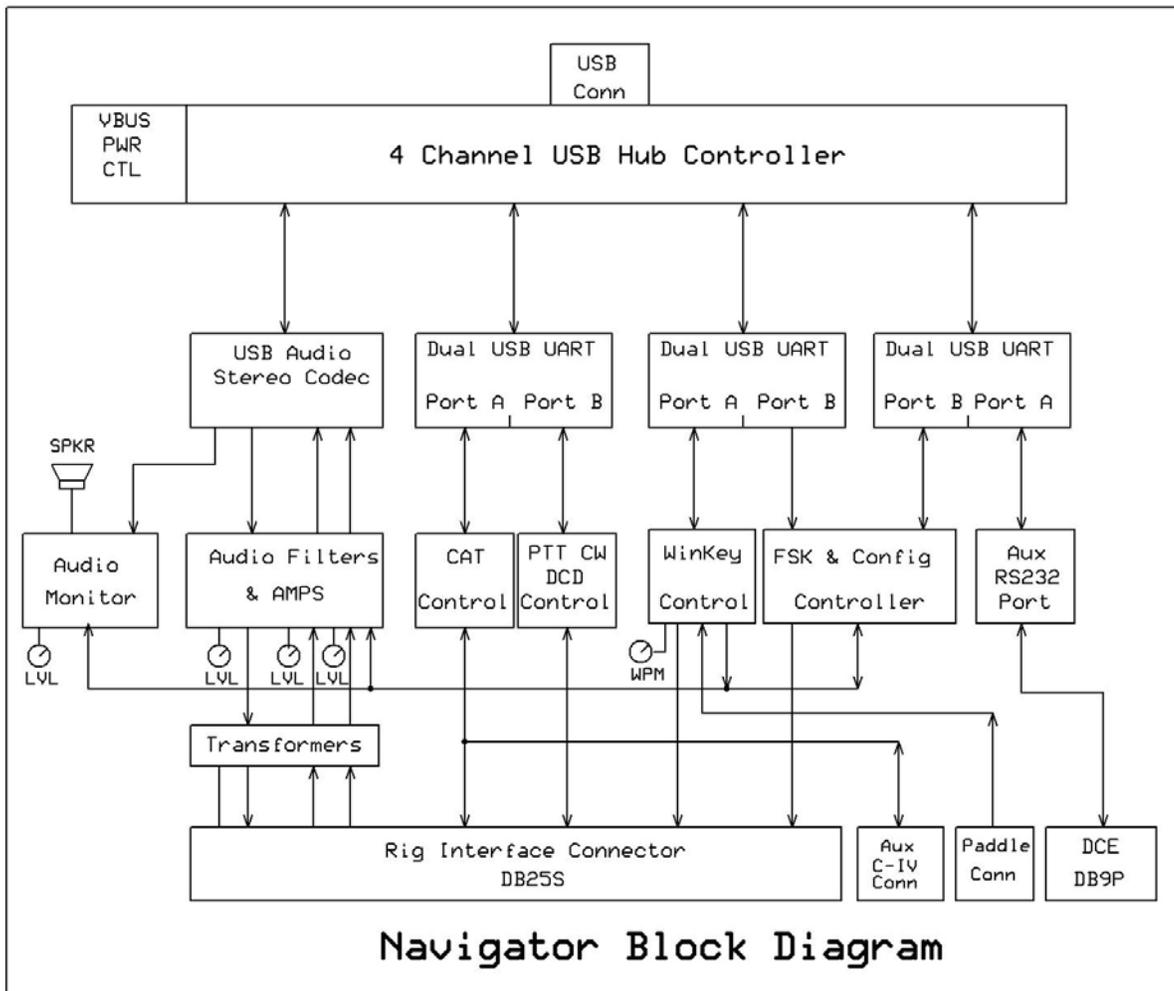
The appendix of this document contains technical specifications of I/O signals, Frequently Asked Questions (FAQ) about installation & operation, and the Navigator Software Distribution CD-ROM

The Navigator CD-ROM provided contains a section "Docs" which has detailed procedures for installing Navigator with your USB enabled PC.

2 Architecture

2.1 The Navigator is a general purpose, sound card modem & rig controller with precise CW and FSK operation that connects an Amateur Radio Transceiver to a Personal Computer. Connection to the PC is by a single USB cable. The Navigator provides all audio and control functions required for sound card modes with precise FSK, CW and rig control. A block diagram of the Navigator is shown below.

```
                              ┌─────────┐
                              │  USB    │
                              │  Conn   │
                              └─────────┘
┌──────┐  ┌──────────────────────────────────────────────────┐
│ VBUS │  │                                                  │
│ PWR  │  │         4 Channel USB Hub Controller             │
│ CTL  │  │                                                  │
└──────┘  └──────────────────────────────────────────────────┘

        ┌──────────┐ ┌──────────────┐ ┌──────────────┐ ┌──────────────┐
        │USB Audio │ │Dual USB UART │ │Dual USB UART │ │Dual USB UART │
        │Stereo    │ │              │ │              │ │              │
        │Codec     │ │Port A Port B │ │Port A Port B │ │Port B Port A │
        └──────────┘ └──────────────┘ └──────────────┘ └──────────────┘
 SPKR

 ┌──────┐ ┌──────────┐ ┌──────┬──────┐ ┌──────┬──────────┐ ┌──────┐
 │Audio │ │Audio     │ │ CAT  │PTT CW│ │WinKey│FSK &      │ │Aux   │
 │      │ │Filters   │ │      │ DCD  │ │      │Config     │ │RS232 │
 │Monitor│ │& AMPS   │ │Control│Control│ │Control│Controller│ │Port  │
 └──────┘ └──────────┘ └──────┴──────┘ └──────┴──────────┘ └──────┘
  LVL      LVL LVL LVL                   WPM

        ┌──────────────┐
        │ Transformers │
        └──────────────┘

 ┌──────────────────────────────────┐ ┌────┐ ┌──────┐ ┌────┐
 │  Rig Interface Connector         │ │Aux │ │Paddle│ │DCE │
 │         DB25S                    │ │C-IV│ │Conn  │ │DB9P│
 └──────────────────────────────────┘ │Conn│ └──────┘ └────┘
                                       └────┘
```

Navigator Block Diagram

All USB devices are controlled through an internal 4 channel USB Hub controller. Full two channel audio is provided by a USB audio codec. Three dual USB UART devices provide 6 USB COM ports. These COM ports are assigned to interface functions to provide compatibility with existing software applications. The assignments are detailed in the table on the following page.

Navigator Hub Assignments

Hub channel 1	USB Audio Codec
Hub channel 2	COM port A - Rig CAT Control
	COM port B - PTT/CW control & DCD input
Hub channel 3	COM port A - WinKeyer V22 CW Controller
	COM port B – RTTY/ FSK Controller
Hub channel 4	COM port A - Auxiliary RS232 DCE port
	COM port B - Navigator Options Controller

Interface Options are software selectable – no jumpers are used on the interface board.

An audio monitor is provided within the interface so that you can hear the side tone of all audio generated modes such as PSK. Side tone monitor of the WinKeyer CW controller and the FSK Controller are also provided.

Navigator is designed for use with Personal Computers using the Microsoft XP and Vista operating systems.

Navigator is an FCC class B certified USB computer peripheral device. It is also RoHS, European CE and Industry Canada compliant.

2.1.1 USB Device Serial Numbers

Each Navigator is assigned the same serial number set for the COM ports attached to the Hub. This allows easy installation of Navigators if replaced under warranty, or if several Navigators are purchased for a collection of different computer systems.

2.1.2 Multiple Interfaces on One Computer

If multiple Navigators are installed on a single computer, Windows uses the USB channel as part of the address to identify each Navigator uniquely. This allows multiple copies of the operating software to be running simultaneously, each talking to it's own Navigator. This requires that each software instance "belongs" to its own directory/folder within the computer.

Each instance can be operating the same type, or different types of transceivers. If you plan on multiple Navigators operating on one computer, ask us to change the USB serial numbers of the additional interfaces.

Note that if a dual receiver transceiver such as the Icom 7800 or the Yaesu 1000D is connected, only one instance of the operating software is required, since the interface has two input channels, one for each receiver.

2.2 USB Hub

- Bus Powered

- Total current for Hub and all Interface devices is less than 160 ma.

- Current draw during Hub enumeration less than 30 ma.

- Soft power control of VBUS for downstream devices

- Removes VBUS when in suspend

- Power LED activated after Hub is enumerated and VBUS is applied

- CW and PTT controls are disabled for 10 seconds during device startup.

  Power LED shows Orange during setup and Green after setup.

2.3 Audio Functions

2.3.1 USB Audio Codec

- Standard Microsoft Audio Device AC '97 compatible

- 2 channel Output DAC 16 bit

- 2 channel Input ADC 16 bit

- Codec operates at sampling rates up to 48,000 Hz

- Normal application operating rate 12,000 Hz

2.3.2 Interface - 2 Channel Analog Input Channels

- Two input channels

- Transformer Isolated, analog ground isolated from digital ground

- 10,000 ohm audio transformer each channel

- Level controlled by front panel potentiometer, each channel

- Software settable input attenuation 0 dB and 15 dB each channel

- Dual receiver transceivers are supported, each receiver with its own input channel

2.3.3 Interface - Analog interface – Output

- Left channel used internally for audio monitor

- Right channel used for audio drive to the transceiver.

- Transformer isolated, analog ground isolated from digital grounds

- 10,000 ohm audio transformer

- 1 uF Blocking capacitor on output

- Level of audio which drives the RF Output is controlled by front

   panel potentiometer "RF OUT"

- Software settable output attenuation: 0 dB and 20 dB.

2.3.4 Audio Monitor

- Monitor sound level controlled by front panel potentiometer

- Internal speaker 800 Hz to 2500 Hz

- Monitors: All modes generated via the Audio Codec such as PSK,

  MFSK, Olivia, MT63, Throb, AFSK RTTY, SSTV etc.

- CW side tone from WinKeyer controller. Software controlled

  enable / disable from WinKeyer WK2MGR Setup Manager

-FSK side tone generated by FSK controller gives audio

 representation of signal sent to digital FSK. Software controlled

 disable of FSK Side Tone

2.4 Digital Interface Functions

2.4.1 CAT and Rig Control

Serial COM channel dedicated to CAT functions. Data rate settable up to 115,200 baud.

2.4.2 CAT Interface combinations supported are:

Half duplex TTL level high true – two wire, open collector transistor drive. TTL receive.   Icom C-IV compatible.   A 3.5 mm (1/8 inch) connector is provided at the rear of the Navigator as an auxiliary output for C-IV applications. The C-IV signal provided for the transceiver under control of the Navigator is provided on the DB25S connector. The AUX CI-V connector is used for other ICOM devices which may be under control of the software operating the Navigator.

Full duplex TTL level high true – three wire, open collector transistor output drive, TTL receive.

Full duplex TTL level high true – three wire, TTL output drive, TTL receive.

Full duplex TTL level low true – three wire, inverted TTL output and input.

Full duplex RS232 level– three wire, RS232 bipolar levels for input and output.

2.4.3 Rig Interface Control Signals

All rig interface signals are available on a DB25S connector on the back of the interface.

Output control signals include PTT, CW, and FSK. These are all open collector transistor outputs.

Input signals include the SQUELCH input to the PTT/CW UART, which is connected to the DCD, DSR and CTS pins for use with applications such as that need to know when the rig Squelch has been activated. Different programs expect this signal on one of these input pins.

RFI Filtering – all input signals and bi-directional input/output signals to the interface are filtered with capacitors, mounted at the interface connector to reduce stray RF from entering the unit.

No power from the transceiver is needed to power the interface.

The pin assignments for the rig interface are shown in the drawing below. See Appendix A for full specs of the interface
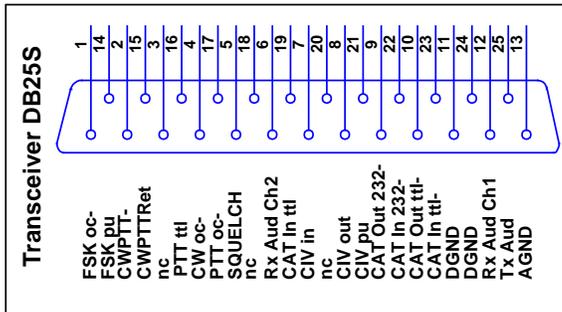
Note: CWPTT- and CWPTTRet are supplied with Navigators shipped after May 1, 2007. Prior versions were NC on these two pins. CWPPT- & CWPTTRet are Opto-Isolated from digital ground. These signals are intended for use with external RF amplifier control in CW mode.

2.5 Operating Modes

2.5.1 Audio codec generated modes:

Operating modes are dependent upon the software used with the interface. The unit is designed to accommodate sound card generated modes with audio frequencies within a 400 Hz to 5 kHz bandwidth, although typical amateur transceivers will limit the useful bandwidth to about 400 to 2700 Hz. Any modulation method that is contained within this bandwidth can be used with the interface.

Typical modes using this technique are BPSK31, BPSK63, QPSK31, FSK31, RTTY (AFSK), SSTV, Packet, AMTOR, MFSK16, THROB, MT63, Helleschreiber, Olivia, WSJT, CW (audio generated) and other new modes using the sound card architecture.

2.5.2 CW mode

CW using direct keying of the rig is provided in two ways.   Direct CW using the DTR line of a COM port; or by using the built in WinKeyer V22 keyer by K1EL.

Software which generates the key closures using a COM port DTR line is supported by the PTT/CW COM Port. This mode does not allow use of the paddle, CW output is only generated from the keyboard and an application program.

A more robust CW control, which supports both paddle and keyboard input, is provided by the control chip from the popular WinKeyer by K1EL. The Navigator Interface uses version 23 of the WinKeyer. This version eliminates the key bounce issue seen with some key paddles of earlier versions. Setup and test of the WinKeyer is done via WK2MGR software provided by K1EL. A COM port is dedicated to operation of the keyer. You can plug your paddle into the Navigator, and provide keyed output either from the keyboard or from the paddle. Side tone generated by the WinKeyer is played via the audio monitor feature of the Navigator. The output of the Navigator plugs into the rig Key connector, and mimics a "straight key" to the rig.

A special training mode is also featured with the when using WinKeyer. A small amount of the sidetone is fed back to the audio codec input, so that operating software that has CW copy functionality can decode the keying done by paddle. This is an excellent training tool to help improve readability of your "fist".

CW Options are set by the WK2MGR software. In addition, the Navigator Option software provides control over PTT (On or Off) during CW.

2.5.3 FSK

Direct FSK keying of transceivers is provided by the Navigator. One of the shortcomings of USB connected UART devices is that they do not support the baud rate, word length and stop bit configurations required by Amateur RTTY modes. For this reason, an on-board FSK Controller is provided which effectively acts as a UART for this mode.   The FSK Com Port of the Navigator is configured with a FIFO (first in first out) buffer and data is passed to the FSK Controller to generate the serial data stream required for Ham RTTY. Baud rate, stop bits, and FSK polarity are software configurable using the Navigator Option software provided.

Another feature of the FSK controller is that an audio FSK side tone is created and is routed to the Audio Monitor so that you can hear a representation of the FSK sent to the transceiver. If your transceiver has a side tone function for RTTY, you can disable the local monitor with the Navigator Option software to listen to RTTY from your rig.

The output from the audio codec is suppressed when FSK is generated by the FSK controller. This is done to improve the quality of the side tone monitor, since some software feeds the digital FSK signal into the audio channel.

FSK Options can be using Navigator Options to set:

Baud rate: 45.45, 75, 100

Stop bits: 1, 1.5, 2

Polarity: Normal or Inverted

PTT: On or Off

2.5.4 General Purpose RS232 Interface

A general purpose RS232 Interface is provided on one COM channel of the Navigator. This is implemented as a DCE device (just like the one on the back of a computer). Signal levels are bipolar RS232, generated by MAX232 integrated circuits. Signals supported are:

Output:	Input:
TxData	RxData
RTS	CTS
DTR	DSR
	DCD

Note: RI – Ring Indicator is not supported.

Connector – a DB9P (male pin) connector is provide at the rear of the Navigator. See Appendix A for wiring details.

All input signals are filtered at the connector to reduce any RF signals from entering the board.

3 Front Panel Controls and Displays

There are five potentiometer controls and five LED on the front panel.

3.1 Potentiometers:

CH1 IN & CH2 IN

Controls the signal level of audio input for each of two receive channels from the transceiver. These controls are used to set the level seen on the operating software waterfall. A two level attenuation control is also provided on the Navigator Option program for use with this control.

RF OUT

Controls the audio drive level of signals sent to the transceiver. It directly controls the RF output level of the transceiver when operating in LSB or USB modes. A two level attenuation control is also provided with the Navigator Option program for use with audio output.

MONITOR LEVEL

Controls the sound level of the Navigator audio monitor. Additional controls for the Monitor are provided with the Navigator Option program.

CW WPM

Controls the speed of the WinKeyer keyer. Display of the speed is provided by the application software.

3.2 LED Displays

PTT – Red LED *ON* whenever the rig PTT control is activated.

CAT – Yellow LED *ON* whenever control data is transferred to/from the transceiver. The LED can be set to either blink when polling is done, or remain steady when CAT is active. The control of this option is done via the Navigator Option software.

FSK – Yellow LED, *ON* whenever FSK data is being sent to the transceiver from the Navigator.

CW – Yellow LED, *ON* whenever CW is being sent to the transceiver from the Navigator.

PWR – Two Color LED to indicate the state of interface power. When power is first applied to the Navigator, the HUB is enumerated. The PWR LED will be off. Then, after Hub Enumeration is done, power is applied to the rest of the board. For the first 10 seconds, the PWR LED is set to Orange (Green plus Red). While the LED is Orange, power is applied to the rest of the board, but output from the PTT and CW lines are disabled, to allow the serial ports of the board time to be set up. When this time out is complete, the color changes to Green, and the PTT and CW lines are ready for use.

LED Brightness control – the brightness level of the LED can be controlled to adapt to the lighting environment of the ham shack. The control is done by the Navigator Option program.

4   Rear Panel Connector
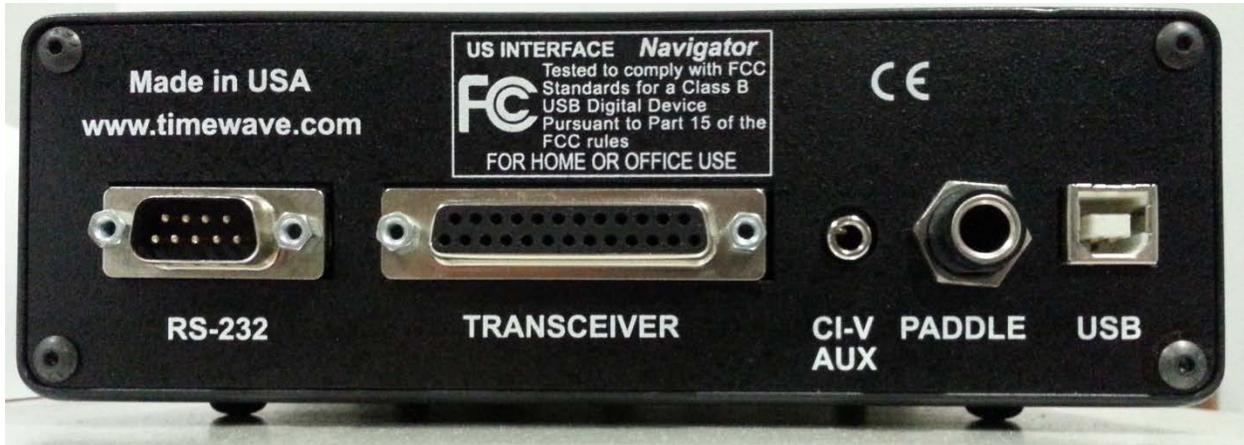
Navigator Rear Panel

The rear panel layout is shown above. See Appendix A for full description of the signals on these connectors.

General Purpose RS232

DB9P mates with DB9S on the cable.

Transceiver

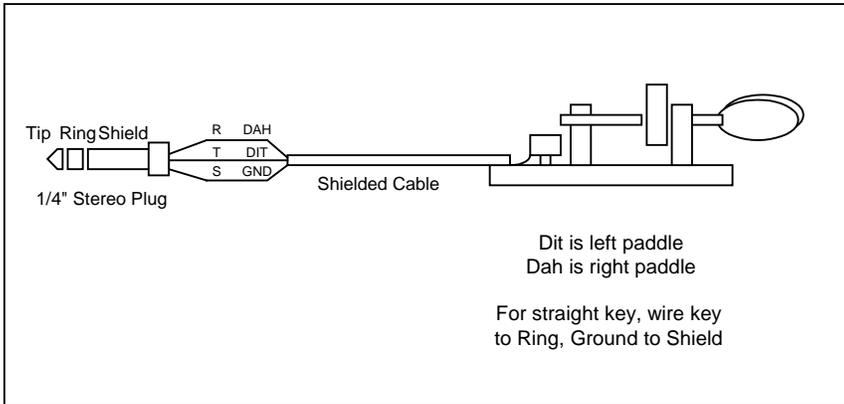DB25S, mates with DB25P on the cable. Signals on this connector connect to the transceiver.

CI-V Aux

3.5 mm (1/8") stereo jack. Signal connection is made to "Tip" and "Shield" only, so either mono or stereo cables can be used. The Transceiver connector contains the CAT signal for CI-V compatible transceivers. It is a two wire half-duplex control, which can be daisy chained to other compatible rigs. This connector is used to connect to other CI-V devices.

Paddle

6.3mm (1 / 4") stereo jack. Your CW paddle or straight key connects here.

Recommended wiring for your paddle for use with Navigator is shown below. If your paddle is already wired, and DIT and DAH are reversed, you can correct for polarity with the SWAP option in the WK2MGR program.

Tip Ring Shield

R DAH
T DIT
S GND

1/4" Stereo Plug

Shielded Cable

Dit is left paddle
Dah is right paddle

For straight key, wire key
to Ring, Ground to Shield

Note: The output of the Navigator connects to the key input of the transceiver. The Navigator mimics a "straight key", so the rig should be set to accept this type of input.

USB connector

Meets USB 1.1 and 2.0 specifications. This connects to the USB hub built into your computer.

5   Navigator Option Control

Interface options are software settable – there are **no jumpers** on the board. A control program, Navigator Options, is provided to manage the options.

5.1 NavOptions Software Installation

See *Docs/NavIns2 NavOptions* on the CD-ROM for detailed installation procedures. The installation program is found on *NavOptions/Setup* on the CD-ROM.

5.2 NavOptions Functions

A screen shot of the Navigator Option control program is shown below. Settings shown are the "as delivered" defaults.

The items shown can be selected and set by a mouse click on the item button. Each time the option set is changed, a new copy is sent to Navigator and the setting is immediately used. If you don't like the changes you have made, click the "Restore Default button" and it will be put back the way it was. If you like the settings, click "Save to Default" and the new copy will be saved in non-volatile memory in the NavOption Controller of Navigator.

When Navigator is powered on, the last option set saved to the non-volatile memory is reloaded ready for use.

Another feature of the Navigator Option software is the ability to scan connected ports to find a valid Configuration port. If there are two or more Navigators installed, port numbers of both interfaces are displayed so that you can select the one you want.

The Navigator Option software can be left running while the application software is operating, or it can be clicked off. Options are always saved within Navigator.

See the table *Navigator Options Settings* on the next page for descriptions of settings for each option.

Navigator Options Settings

CH1 Atten Attenuation on CH1 Input **Normal** No attenuation **15 dB** 15 dB attenuation	**FSK Polarity** **Normal** Low true FSK **Rev** High true FSK
CH2 Atten Attenuation on CH2 Input **Normal** No attenuation **15 dB** 15 dB attenuation	**FSK Side Tone** **On** Interface ST On **Off** Interface ST Off
RF Atten Attenuation of Audio Output **Normal** No attenuation **20 dB** 20 dB attenuation : This is the Audio Out to the rig. The level controls the RF output by the transceiver.	**FSK PTT** generated by FSK controller **On** On **Off** Off
WinKeyer PTT **On** PTT from WinKeyer On **Off** PTT from WinKeyer Off	**FSK Baud** **45.45** Normal baud for HAM use **75** **100**
LED **Normal** Full LED brightness **Dim** Reduced LED brightness	**FSK Stop** FSK Stop Bits **1** **1.5** **2**
CAT LED **Polling** LED Blinks with	**If you change an option, and want to keep it, click**

	polling	**"Save to Default"**
Steady	LED on Steady	
		This will now be your new default settings, which are stored in EEPROM in Navigator.

6 Installation

Detailed installation procedures are found on the Navigator Distribution CD, in the DOCS folder.   This section covers a summary of Installation Planning, Driver Installation, Application Software Installation and Setup, and Rig Hookup.

6.1 Installation Planning

The table below shows the parts of the installation procedure, and the recommended sequence of installation.

Installation instructions are illustrated with screen shots taken from a PC during installation. It is recommended that you follow the sequence of this procedure since some steps must be performed before others can be done. The procedures are in .pdf format under the names shown below. Follow this sequence when setting up your Navigator.

File Name	Procedure
NavInst1_Intro	**Introduction and Planning your config.**
	Do's and Don'ts of USB Connected Devices
	Software COM Port Restrictions
	Recommended Port Assignments
	Inventory of Configuration
NavInst2_Driver	**Driver Installation**
	Installing the drivers
	Checking COM Assignments
	Re-assigning COM Ports if required
	Uninstalling Drivers
NavInst3_NavOpts	**Navigator Options Installation**
	Installing NavOpts
	Using NavOpts

NavInst4_MixWInst	**MixW Installation**
	Installing MixW
	Loading Olivia DLL
	Installing WinKeyer Config file in MixW DIR
NavInst5_MixWSetup	**Setup of MixW**
	CAT port setup and test
	Sound Settings
	BPSK Test
	RTTY Setup and Test
NavInst6_WinKeyerTest	**WinKeyer Setup and Test**
	Using WKMGR to configure WinKeyer
	Using WinKeyer with MixW
NavInst7_MMTTYSetup	**MMTTY Setup for Navigator**
NavInst8_DM780 Setup	**Setup screens for DM780 and HRD**

While these procedures may look daunting, these steps are exactly what experienced users do as second nature. Detailed procedures are provided for hams who have not been through setup of an interface system on USB interfaced devices. Experienced hams will find the details they need to complete setup of not only MixW, and MMTTY, but other programs as well.

Most of these items require only a few minutes for configuration. These detailed procedures are provided in individual files so that you can keep them on your screen while performing the procedure. They can also be printed out on your printer if you need hard copy.

6.1.1   DO's and DON'T s of Operating with USB Connected

   Interfaces.

Computers of the 21st century provide few if any serial ports built in to the computer. At the same time, most ham radio software for rig control, sound card driven modes, RTTY and CW modes is dependent upon the use of serial ports to interface to radio transceivers. Use of "off the shelf" USB / Serial converter devices for use with transceiver interfaces has met with mixed success – some converters work fine, others don't – especially in the area of FSK interfacing for RTTY operations.

The need for a stable solution to these conflicts between hardware and software, has led to the architecture and design of the Navigator Interface. This device provides a built in 4 channel USB hub, a USB Audio Codec, Serial Port converters, and microCPU controllers for FSK and CW. These are integrated into a single design to maintain compatibility with both the modern PC and existing software, while providing a stable hardware/firmware platform.

The use of USB connected devices does require some management on the part of the user. USB connections and device assignments are handled by the operating system by assigning virtual COM port numbers to the serial devices, and drivers for the audio codecs. There are a few things to keep in mind when configuring your system that will make your life much easier! These apply to all interface devices using USB as well as Navigator. Here they are:

DO - Know the assignments of devices in your computer, before you start installation

DO - Know the COM port assignment limitations of the software that you want to use. Some have limitations built in regarding the maximum port number that can be used.

DO - Re-assign COM port addresses for Navigator if necessary to maintain compatibility with your software

DON'T – Assign more than one device to a COM port. DO - Check that the operating system has not tried to do this to you. The operating system will actually allow you to do this. In particular it will assign the same com port number to "real" COM ports and USB com ports. Knowing what your configuration is helps keep this from happening.

DON'T – Move the USB cable around to different physical ports on your computer, once you have configured the system. The operating system may try to move your port assignments when you do. The physical bus location is part of the internal COM port assignment maintained your computer's registry.

DON'T UNPLUG your USB cable while application software is running! Most software does not handle this very well, and the system will run <u>very</u> slowly until you stop the operating program. Often requires a reboot or turning off of power.   (Spoken from practical experience)

DON'T Assign USB ports to COM3 – for some reason, COM3 can be grabbed by other programs, and even though it looks like it is free, when you go to use it, it will show up as "in use by another program" or is otherwise unavailable. If the operating system assigns this port, move it to another channel.

6.1.2 COM Port Restrictions of Popular Ham Software

Many of the software programs used by hams for sound card, RTTY and CW modes have a built in limitation for the maximum COM port number which can be used. A partial list of control programs is found in the table below. In general, if you use COM port 8 and less, you can cover most if not all of the available programs. To do this, you must assign 4 of the 6 COM ports needed for Navigator to COM8 or less to cover all of these programs. The other two ports, the general purpose RS232 port, and the Configuration port can be above COM8, although Rotor controllers and TNC controllers connected to the RS232 port usually require COM numbers at 8 or below.

See the table on the next page for an analysis of popular ham transceiver control and operating mode software.

Com Port Restrictions of Popular Software

Program	COM max	Comments
Digipan	COM9	Set PTT to BOTH RTS and DTR
DX4WIN	COM8	
Ham Radio Deluxe	COM255	CAT control for use with DM780 and PSK Deluxe
DM780	COM255	Multi mode software companion to HRD
Log Windows	COM24	
MixW	COM19	CAT max COM255, other ports max COM19
MMTTY	COM8	MMTTY engine is used in many programs for RTTY
MMVARI	COM8	
MultiPSK	COM16	
N1MM Logger	COM8	
PSK Deluxe	COM8	Part of Ham Radio Deluxe
WinWarbler	COM8	
WinPSKse	COM8	COM4-8 available
WriteLog	COM8	4 ports required. Default is COM1-4, these can be reassigned using writelog.ini to change to other port numbers. Recommend moving these to COM5-8
NavOptions	COM255	Navigator Configuration Software
Navigator RS232	COM255	Navigator general purpose RS232 port
WK2MGR	COM12	WinKeyer2 Manager program, assign same COM port number as used by main program.

If your favorite software isn't listed above, check the PORT assignments in the SETUP section of your program to determine the COM ports required.

6.1.3 Recommended COM Port Assignments

While the COM ports of Navigator can be assigned a COM port up to 255, software restrictions often dictate that they should stay in the first 8 ports. Stay away from using COM1 through 3, since they may be taken up by "real" ports instead of USB assigned ones. The table below shows the assignments to cover as many ham control programs as possible.

Recommended COM Port Assignments

Navigator Function	COM	Comments
PTT, CW, Squelch	COM5	PTT control, CW if done by software, Squelch input
WinKeyer Controller	COM6	CW Using the WinKeyer Controller
FSK Controller	COM7	RTTY using native FSK instead of AFSK
CAT Control	COM8	Rig Control
Gen Purpose RS232 Port	COM4	Rotor control and TNC generally in first 8 COM ports
NavOptions	COM12	OK to move elsewhere that doesn't conflict with above assignments

See *NavInst1_Intro* on the CD-ROM for full procedures for setup, and change of COM port assignments.

6.2 Driver Installation

See *NavInst2 Driver* on the CD-ROM for USB driver installation procedures for your PC.

Also, see the Quick Start Guides on the CD-ROM for both XP and Vista.

6.3 Uninstalling Drivers

Go to the Windows Control Panel, and click on the Add or Remove Programs Icon. Scroll down to:

 "Windows Driver Package – US Interface CDM Driver Package".

You will find two entries. Highlight the first, and click Change/Remove.   You will see a message " All devices using this driver will be removed. Do you wish to continue?"   Click Yes. This removes ½ of the driver package. Highlight the second entry as above and repeat the process. The driver package is completely removed.
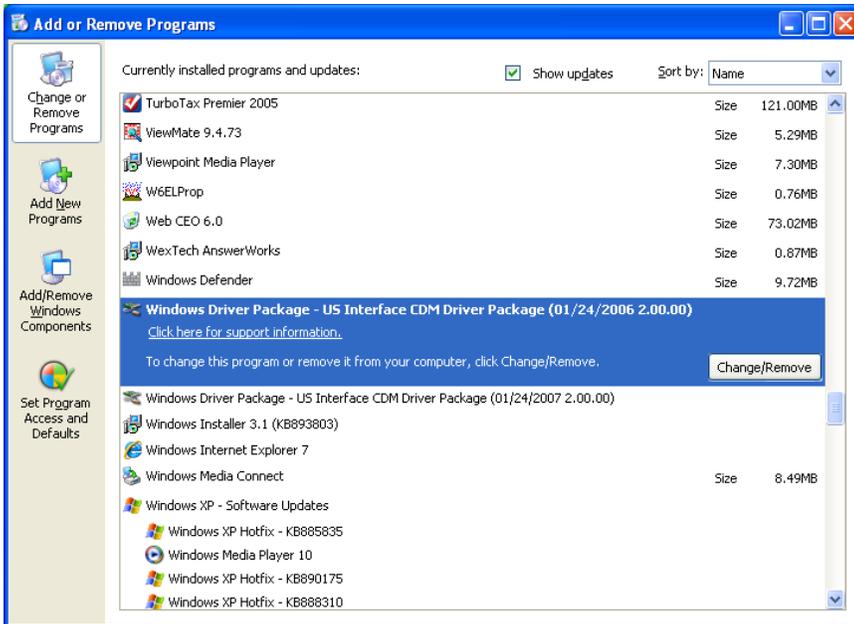
6.4 Application Software Installation

See *NavInst3 MixW* and *NavInst4 MixW Setup* for procedures to install and setup the MixW program with Navigator. These procedures serve as an example of application software setup for use with the Navigator.

These procedures deal with configuration issues involving the:

> CAT control COM port

> PTT / CW and Squelch COM port

> WinKeyer COM port

> FSK COM port

> USB Audio Codec setup

6.5 Rig Hookup

Connection to your rig involves installing a cable between the Navigator "Transceiver" connector and your rig.   See the www.USInterface.com website for a full list of cable drawings for use with the Navigator. An example below shows the connection of the Navigator to an Icom 756 transceiver.
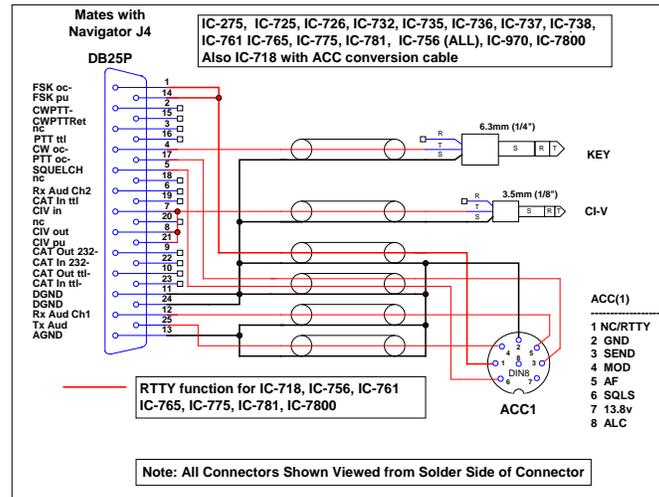
In this example, CAT is done by using CI-V half duplex protocol, so DB25 pins 7, 8, and 21 are tied together. Pin 28 provides pullup to +5V for the signal line. These connect to a mono or stereo 1/8" plug.

The CWoc- pin 4, is connected to a 6.35 mm 1 / 4" stereo jack to plug into the rig KEY jack**. Note: CW output mimics a straight key in this application**.

The ACC jack provides the remaining signals to be controlled. Shielded cables are used for all signals. Overall length is 3 feet. **Navigator to Icom IC756 (and others)**

Navigator	Pin	Icom	ACC Pin
FSK & FSKpu	1,14	RTTY	1
DGND	11,24	GND	2
PTToc-	17	SEND	3
TxAud	25	MOD	4
RxAudCH1	12	AF	5
Squelch	5	SQLS	6
AGND	13	GND	2

Appendix A Navigator I/O Specifications

The Navigator transceiver interface connector is a DB25S (female). The mating connector for the cable is a DB25P (male). A layout of the connector is shown below.   The pin arrangement is the same as shown in the diagram. This is the view looking at the connector on the back panel. The descriptions of these signals is shown in the table following, "Navigator Transceiver Connector – DB25S"
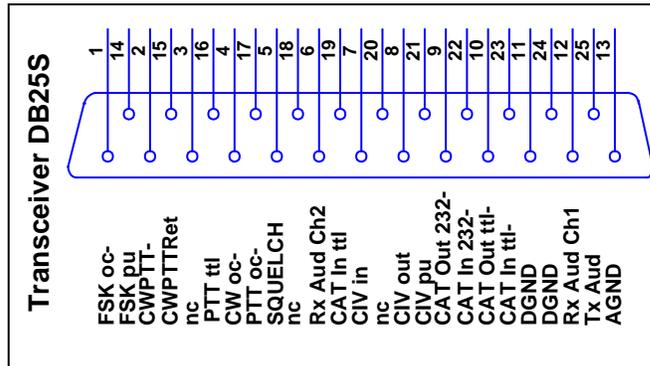
Navigator Transceiver Connector – DB25S					
Pin	Name	I/O	Description	Type	Polarity
1	FSK OC-	Out	FSK Out	Open collector	Low true
2	CWPTT-	Out	CW PTT	Opto Isolated	Low True
3	NC		No Connection		
4	CW OC-	Out	CW Out	Open collector	Low true
5	SQUELCH	In	SQUELCH, ties to DCD	TTL	
6	RXAUD CH2	In	Receive Audio Channel 2	Audio	
7	CI-V IN	In	CAT, CI-V In	TTL	
8	CI-V OUT	Out	CAT, CI-V Out	Open collector	
9	CATOUT 232-	Out	CAT Out RS232	RS232	Low true
10	CATOUT TTL-	Out	CAT Out TTL	TTL	Low true
11	DGND		Digital Ground		
12	RX AUD CH1	In	Receive Audio Channel 1	Audio	
13	AGND		Analog Ground	Audio	

14	FSK PU	Out	4.7k ohm resistor to +5v	Pull up	
15	CWPTTRet		CW PTT Return	Opto Isolated	Return for CWPTT
16	PTT TTL	Out	PTT TTL	TTL	
17	PTT OC-	Out	PTT Open Collector	Open collector	Low true
18	NC		No connection		
19	CATIN TTL	In	CAT In TTL	TTL	
20	NC		No connection		
21	CI-V PU	Out	4.7k ohm resistor to +5v	Pull Up	
22	CATIN 232-	In	CAT IN RS232	RS232	Low true
23	CATIN TTL-	In	CAT IN TTL	TTL	Low true
24	DGND		Digital ground	Digital Ground	
25	TX AUD	Out	TX Audio	Audio	

Navigator General Purpose RS232 Connector – DB9P				
Navigator RS232 Serial COM Port				
Pin	**Name**	**I/O**	**Description**	**Type**
1	DCD	In	Carrier Detect	RS232
2	RXD	In	Receive Data	RS232
3	TXD	Out	Transmit Data	RS232
4	DTR	Out	Data Terminal Ready	RS232
5	GND		Ground	
6	DSR	In	Data Set Ready	RS232
7	RTS	Out	Request To Send	RS232
8	CTS	In	Clear To Send	RS232
9			No connection	

I/O Signal Level Specifications	
TTL – specs per 74AC series Outputs High: 4.5 V min, source 24 ma. Low: 0.45 V max, sink 24 ma. Inputs High: 3.15 V Min Low: 1.35 V Max	**RS232** – specs per MAX232 device Outputs High: 5V min, 7 typ Low: -5V max, -7V typ Input switching point Pos going: Typ 1.7V, Max 2.4.V Neg going: Typ. 1.2V, Min 0.8V Input level: Max ± 30V
Open Collector Drivers MM3904 Outputs Low: Max 0.3V @ 20 ma. Sink: 20 ma.	**Audio**: Output into 4.7 kOhm load 410 mv rms (Norm atten) 24 mv rms (20 dB atten) Input: Signal level to produce full level signal into Audio Codec 60 mv rms (Norm atten) 500 mv rms (20 dB atten)

Appendix B – Frequently Asked Questions

FAQ about FSK operation with Navigator

Q. I followed the procedure for setup with MixW and FSK worked fine. Then I switched to MMTTY and now when I send a long FSK message, the screen says I am through, but some characters are still being sent at the end.   A. The problem is that the default MMTTY setup puts the stop bits at 1.5. MixW likes it set to 2. If you did not change the stop bit setting in NavOptions, then MMTTY sent it's data faster to Navigator than the output rate. There is a FIFO buffer in the FSK Controller, so that all of the data was received by Navigator, but it was still sending when MMTTY thought it was through. Fortunately, the FSK controller provides it's own PTT, which is synchronized with the output data, so all of the data got sent. You could also have changed the stop bit rate in MMTTY to 2 bits if you prefer. Also, see *NavInst7 MMTTY Setup* on you CD-ROM Docs for more information about setup with MMTTY.

Q. I have a Kenwood transceiver, so I set the FSK polarity in NavOptions to Reverse. I set the invert bit in MixW as well. The output data seems fine, but reading RTTY signals is garbage. A. The polarity of the FSK signal does require reverse with a Kenwood, but that has nothing to do with reading RTTY signals. RTTY is usually set to a Lower Side Band mode (LSB) so the "Normal" settings are set for that. If your transceiver operates in Upper Side Band (USB) then you should use the invert control in MixW. In your case, uncheck the invert control in MixW and you will be fine.

Q. When operating in FSK the RF OUT control on Navigator has no effect on rig output power. A. FSK RTTY is not a sound device mode (unless you are using AFSK). The power level is determined only by the rig RF output power control.

Q. I set my sound device settings to Full Duplex, so I could see what the audio input looks like while transmitting. In both CW and RTTY modes, I see very large signals, with appreciable harmonics. Is this going out over the air? A. No, these strong signals <u>are not</u> going out over the air.   What you are seeing is the square wave side tone signal from the Navigator Monitor being fed back to the audio input channel. In the case of both CW and RTTY, only the digital control signals for CW and FSK are being sent to the rig.

FAQ about WinKeyer operation with Navigator

Q. When I send data from the macros, or when I type on the keyboard, the characters echoed in the Rx window have ## between the characters, like C##Q### C##Q###. How do I fix this? A. You need to replace the standard WinKeyer config file in the MixW directory with the one on the Navigator Distribution disk. MixW was written to support WinKeyer1, the WinKeyer2 requires that the keyer be closed, then opened again. The new WinKeyer config file fixes this. See *NavInst4 MixW Install* on your CD-ROM for details.

Q. The upper and lower limits of the WinKeyer speed control seem to be fixed at 5 wpm to 35 wpm. How can I change this? A. The lower limit and range are set in the MixW WinKeyer config file. The section is at the end of the file. It looks like this:

[Setup Speed Pot]

MINWPM=5

WPMRANGE=30

POTRANGE=255

Change MINWPM and WPMRANGE to meet your needs. Leave POTRANGE at 255. You can use the Windows Notepad editor to change this. Save the file, quit MixW and restart it again and the new values will take effect.

Q. I want to change some of the weighting parameters for WinKeyer. Is this done in the WinKeyer config file? A. You could do it in the WinKeyer config file, but the easiest way is to use the WK2MGR utility program supplied on the CD ROM. See section *NavInst6* on the CD-ROM Docs for information about this utility program.

Q. I need to reverse the paddles on my iambic keyer. Do I need to change my cable to do this? Q. No need to re-wire your keyer.   Check the "Swap" box in WK2MGR and save the settings to reverse paddles.

Q. My WinKeyer was working, and I made some changes using WK2MGR. Now it doesn't key the rig, although I do get sidetone from Navigator. A. Check the WK2MGR setting of Output Config. It should be set to "Port1, ST On".   You probably set it to Port2. Navigator is wired to the Port1 output for CW control. Also check that the WinKeyer config file is loaded into MixW directory.

Q. My rig has a sidetone of 800 Hz, but MixW shows the offset to be 600 Hz on the waterfall. I set the sidetone in WKMGR to 800, but the waterfall doesn't change. A. In MixW, the setting for CW offset is in the Configure / TRCVR CAT/PTT menu. Set CW Pitch to match your rig. The waterfall will now show an offset matching the sidetone. Also, check that the CW is LSB is checked, if your rig has LSB CW.

FAQ About Power Levels

Q. I had my system all set up for TX Level, then ran some other programs. When I brought the system up again, the power levels were way down. What happened?   A. Most likely, the PC audio level sliders on the output volume control panel were changed by another application. Use a free program like QuickMix (http://www.ptpart.co.uk/quickmix/) to automatically set your power levels when you start your application program

Q. **I notice that when I move my cursor to 3000 Hz offset, the power level really drops off**. **A.** Your rig is an SSB rig, with an audio band pass corner frequency of around 2300 Hz. When you move the cursor on the waterfall above the corner frequency of the rig output filter, most of the audio drive has been cut off. Same thing happens on the lower end of the filter. A good rule of thumb is to keep the cursor from about 500 Hz to 2200 Hz offset. If the signal you want to contact is outside of that, move the base frequency on your rig.

Q. Even if I stay within the transmit passband, I see a difference in output power with different settings. A. The transmit audio band pass filter on many rigs is any thing but flat topped. Some rigs have a measured variation of 3dB across the pass band. The advantage of having a physical control on the Navigator is that the power level is easily adjusted as opposed to using software level controls.

Q. When I change bands, the power output changes for the same cursor offset. A.   This is typical of SSB transmitters. Normally, the ALC takes care of these differences, since for voice the levels are boosted to attain a full sound anyway. With digital modes, you are operating in the linear range, below the ALC level.   Use the RF OUT control on Navigator to bring the level to where you want it.

Q. What about other modes than PSK? A. Sound device generated modes such as MFSK16, Olivia, MT63 and AFSK are frequency shifting modes, running at about 100% duty cycle. The settings you use for PSK should be maintained for these modes as well, mainly to protect your rig from overheating as well as distortion.

Q. What about FSK RTTY and CW? How do I adjust the power level with those modes? A. These modes do not use the Audio Codec to generate the signal. The power levels are determined within your rig. Use the rig power level to control output power.

Q. I want to run my rig at higher than 50% level – how do I ensure that my signal is clean? A. If you do this, you should use an external monitoring device such as the PSK meter (www.ssiserver.com/info/pskmeter/) or an IMD meter (www.USInterface.com). Set your rig output level to whatever level you want as max, and then monitor your quality using one of these meters. Again, be careful of the heat level of your rig if you follow this method.

Appendix C CD-ROM Contents

Note: The Navigator_Install portion of the CD is copied to the Shared Document or Public Documents section of your hard drive. For XP and Vista:

XP: C:\Documents and Settings\All Users\Documents\Navigator_Install

Vista: C:\Users\Public\Public Documents\Navigator_Install

Nav_Contents\Navigator_Install\Docs

Navigator Manual	Users Manual
NavInst 1 Intro	Installation Manual Introduction
NavInst 2 Driver	Installation Manual Driver Install
NavInst 3 NavOpts	Installation Manual NavOpts Install
NavInst 4 MixW Install	Installation Manual MixW Install
NavInst 5 MixW Setup	Installation Manual MixW Setup
NavInst 6 WinKeyer Test	Installation Manual WinKeyer Setup
NavInst 7 MMTTY Setup	Installation Manual MMTTY Setup
NavInst 8 DM780 Setup	Installation Manual HRD / DM780 setup

Nav_Contents\Navigator_Install\Docs\HRD

HRD	Ham Radio Deluxe (HRD) and
DM780 Installation	

Nav_Contents\Navigator_Install\Docs\WinKeyer Docs

WinKeyer USB Manual	WinKeyerer2 Manual
WK2_SW_Guide	WinKeyerer2 Software Guide

Nav_Contents\Navigator_Install\Olivia\MixW

ModeOlivia.dll	Olivia mode .dll
Olivia_readme.txt	Olivia mode readme file

Nav_Contents\Navigator_Install\Utilities

FTClean

FTClean	FTDI Clean utility

FTDIUNIN   FTDI Uninstaller

USBView

USBView   Microsoft USB Viewer

Nav_Contents\Navigator_Install\WinKeyer\MixW

WinKeyer   Correction for WinKeyer V2.1

Appendix C: CD ROM Contents, continued

Nav_Contents\Navigator_Install\Docs\HRD

Ham Radio Deluxe (HRD) and

DM780 Installation

NavPrograms\Digipan   Digipan 20 application

NavPrograms\MixW   MixW installation programs

NavPrograms\MixW Modes   Config file for WinKeyer V2.1

NavPrograms\NavDrivers

WinXP2000\   32 bit drivers for 2000, XP & Vista

Vista   32 bit drivers for 2000, XP & Vista

Win 7   32 bit drivers for 2000, XP & Vista

Win 8   32 bit drivers for 2000, XP & Vista

NavPrograms\NavOptions   Installation files for Nav Options SW

NavPrograms\WinKeyer\WinKeyer Apps

Readme   Readme file for apps programs

WinKeyerer2_Setup   Setup program for WinKeyerer2 SW

WK2MGR_Setup   Setup program for WK2MGR

WKTest_Setup   Setup program for WKTest

WinKeyer Apps

WinXP2000   32 bit drivers for 2000, XP & Vista

For manual loading of drivers

Notes