



# Installation and Operations Manual



## UD02IC

### USB Data Mode Cable

This is an excellent piece of equipment that will give you outstanding performance.

This cable is compatible with the following **Icom** transceivers: **IC-7000, IC-703, IC-706, IC-706MKII, IC-706MKIIG, IC-718, IC-7200, IC-78**, etc.



IT'S STRONGLY RECOMMENDED TO READ THIS MANUAL ENTIRELY, AS IT CONTAINS IMPORTANT SAFETY AND HANDLING INFORMATION. DAMAGE RESULTING FROM MISUSE OR MODIFICATION OF THIS CABLE WILL VOID YOUR WARRANTY. IF YOU HAVE ANY PROBLEMS WITH THIS CABLE FIRST CHECK THE APPROPRIATE SECTION OF THIS MANUAL. IF YOUR PROBLEM IS NOT SOLVED BY READING THE MANUAL, YOU MAY CONTACT US BY EMAIL, FAX OR TELEPHONE. SEND A COMPLETE DESCRIPTION OF YOUR PROBLEM, AN EXPLANATION OF EXACTLY HOW YOU ARE USING THE CABLE.



## 1.0 Introduction

Communication technologies that are specifically designed to improve «live» HF keyboard operation can now be achieved that were previously only theory or too complex to be practical. Thanks to the generosity of radio hams with programming knowledge, and to the World Wide Web, new and powerful communications tools are available to all hams. The evolution and wide spread use of the Personal Computer with a digital sound card for DSP, is allowing us to use these tools to «push the envelope». The distinguishing features of live HF digital operation today are the use of lower power, compact or indoor antennas and courteous operating technique. This reverses the trend of several years ago...

Data modes are at the cutting edge of radio communications, making maximum use of the limited and precious band space. And with modes like PACTOR and PSK31, you will be amazed how it is possible to pull signals out of the noise and decode them 100% when normal voice communications is impossible. This cable enables you to connect your transceiver directly to your PC and operate a selection of data modes. No external power supply is required. Components are of the highest quality and the unit underwent the stringent quality control and inspection standards.

We recommend that the minimum requirement is a PC with 500 MHz processor or better, 512 MB of RAM, 1 GB hard drive, USB port, and Soundblaster or compatible soundcard. Simply download and install Prolific drivers, the software for the mode(s) that you want to try, plug in the supplied cable, and you are set. Presently available ham radio sound card software, this digital mode cable, a radio and a computer is the easy and modern way to operate: BPSK, QPSK, FSK, MFSK, MT63, Throb, Hellschreiber, SSTV, FAX, WeFAX, RTTY, AMTOR, ASCII, PACTOR, G-TOR, PACKET, APRS, CW, SSB Contest Voice Keying, WSJT, NAVTEX, Q15X25, Olivia, Domino, Chip, Echo-Link, and many others.

## 2.0 Precautions



Make sure that your computer and you ham station have a common AC ground that is bonded at a single point. This means that all station grounds and AC grounds must be at a single low impedance point. Any AC leakage or voltage between multiple grounds could damage your radio or computer when connecting the system together. This is true of all station interconnections and accessory installations.

Having the AC service ground on one side of your house and another ground for your antenna on the other side of your house creates dangerous ground loop if not bonded together at a single point. This huge ground loop (loop antenna) could pick up the electromagnetic pulse of a near-by lightning strike and induce a huge electrical spike directly through your equipment. If your equipment is effectively connecting two ground systems together instead of being connected to a single point ground you are asking for trouble. Disconnecting your antennas for thunder storms will not protect you if you have a station ground that is at a different location from your AC house ground.

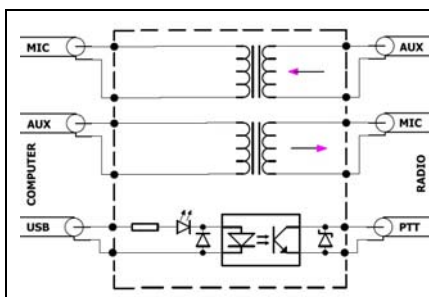
Be careful not to bump or stress the cable sticking out of your USB port or soundcard audio sockets as this could physically damage your computer's connectors, or the cable. Do not allow the cable to get wet or to use it in humid locations.

## 3.0 Features

You will find that when you purchase our data mode cable you will possibly never need to replace it. This cable is extensively tested at time of manufacture to be free of defects. Its features are listed below:

- Compatible with every soundcard equipped computer.
- Works with every present or future HAM radio soundcard program.
- Properly matched audio to your radio.
- Advanced circuit design and cable shielding for RFI product suppression.
- Bidirectional transformer isolation of input and output audio signals.
- Optical isolation of PTT signal through the optocoupler.
- Positive and fully automatic PTT control supported by almost all HAM programs.
- High quality and professionally designed fiberglass printed circuit board.
- High quality factory molded connectors.
- High quality and stylish inline screwed flat box for PCB.
- No external power supply needed, great for portable or QRP installations.
- Robust and light cable, excellent for both - portable and shack use.

## 4.0 Main Unit Circuit Diagram



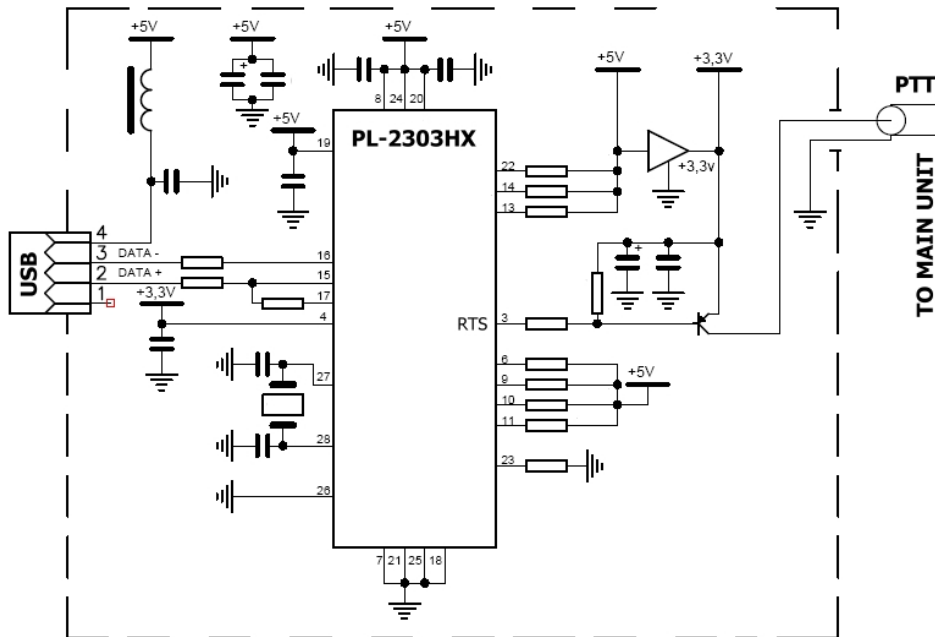
Input and output audio signals from the radio to the computer and vice versa are supplied through 1:1 bidirectional audio transformers for proper isolation of the circuit.

Positive and fully automatic PTT control is supplied from the computer to the radio from USB port through the circuit based on the Prolific PL-2303HX USB to Serial Bridge Controller and the optocoupler for proper optical isolation between your computer and the radio.

PTT control uses RTS line in the virtual COM port created after driver installation. PTT line provides +5 VDC by virtue of a corresponding voltage stabilizer implemented into the USB to Serial Bridge Controller circuit.




## 5.0 USB to Serial Bridge Controller Circuit Diagram



PL-2303HX provides a convenient solution for connecting the PTT line to the Universal Serial Bus (USB) port. PL-2303HX highly compatible drivers could simulate the traditional COM port on most operating systems allowing the existing data mode programs based on COM port to easily migrate and be made USB ready. By taking advantage of USB bulk transfer mode, large data buffers, and automatic flow control, PL-2303HX is capable of achieving higher throughput compared to traditional UART (Universal Asynchronous Receiver Transmitter) ports.

## 6.0 Connection Diagram

	<p><b>Computer End</b></p> <ul style="list-style-type: none"> <li>1 – Sound Card Microphone Input (3.5 mm Stereo Jack)</li> <li>2 – USB Port</li> <li>3 – Sound Card Speaker Output (3.5 mm Stereo Jack)</li> </ul> <p><b>Transceiver End</b></p> <ul style="list-style-type: none"> <li>4 – ACC Jack (13-pin DIN Connector)</li> </ul>
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It is not recommended to use long data mode cables, therefore this cable is 100 centimetres long only. Do not place this cable within 30 centimetres of power transformers, video monitors, or anything that emits strong varying magnetic fields. If you locate this cable near a monitor, the sweep circuits can introduce hum and noise into your signal. If there is a power line operated transformer within several centimetres and if it has flux leakage, 60-cycle hum can be introduced into your stations audio systems. Be sure your station ground is good, all the equipment is grounded together properly with a wide smooth conductor, and you have followed all station wiring suggestions found in reliable sources such as the ARRL Handbook. Check the sound card volume control settings, and the gain settings of the radio. Be sure they are close to normal operating settings, and not set too high.

## 7.0 Audio Signal Adjustment

One of the most common problems using digital modes is improper system level. Even at best, digital modes have limited dynamic range compared to modes that closely «fit» filter bandwidths in the transmitter and receiver. When the radio filter is wider than the mode being used, the system depends heavily on having absolutely no distortion at any place in the system. Adjustments and levels throughout the entire system affect bandwidth and quality of transmitted and received signals.

When transmitting, it is extremely important to use correct gain levels. If the input of a transceiver is overdriven, the signal will contain unwanted products. Problems might not show on spectrum or IMD displays and if they do, many people do not recognize them. Excessive level into the radio can aggravate harmonic distortion (this often does not register on IMD or displays), causing transmissions on multiple frequencies. For example a PSK transmitter using 1,000 Hz offset will have some signal level at 2,000 Hz and every other multiple of 1,000 Hz. These harmonics might make it back through a narrow filter, and while they cause others interference they will not show on a spectrum display! The same is true for poor carrier suppression. Since the carrier can be outside the pass band of a receiver, it will not always show on displays of people you are working.



Use a normal receiver volume setting, and adjust the sound card microphone level (make sure any extra gain options are off) to approximately half scale. Regardless of what you do, it is always a good idea to have someone listen to your signal when the band is empty, signals are strong, or noise is very low. They should look carefully for spurious signals, noise, and hum. When transmitting on modes like MFSK and PSK, always try to use a frequency setting of more than 1500 Hz and less than 2500 Hz. This will allow the transmitter's SSB filter to suppress unwanted harmonics from the audio system driving the transmitter. Remember it is sometimes necessary to select the narrowest filter possible in the receiver, rather than depending on the computer to filter out strong unwanted stations. If you depend only on the sound card, you will find that even very clean strong signals overload your system. The problem is often in your receiver system, not in the offending transmitter. Many transceivers allow a selection of narrow filters while operating SSB, or include pass band tuning controls. If you have trouble with a strong station nearby causing interference, try to use more selectivity or use the receiver's notch filter to reduce the signal level.

You must have a 16 bit sound card installed in your computer to use digital mode programs. Read the documentation with the sound card for full instructions on the use of this card in general. Find the mixer control panel, which may be a program that was supplied with the soundcard or it may be part of the Windows Control Panel. Learn how to adjust the soundcard playback output level and the record input level using the mixer panel: these controls will be used to set the levels for Digital Modes. The modem is feeding audio direct from the soundcard output to the AF input.

Do not use a speech processor with Digital Modes. When you have reached the correct setting, you will see that changing from the tuning tone to typing text, will make the transmitter power swing from 50% (no typing) to 100% (typing or tuning-tone). This change in power is correct. It's quite OK to let the transmitter ALC line operate on Digital Modes. The ALC line will control the drive level without clipping in the same way that it does on voice operation.

To check that the receiver output is not overdriving the soundcard, tune to a strong steady carrier to give 1,000 Hz audio tone, with the RF gain of the receiver at maximum so that the receiver AGC line is fully operating. Check that the waterfall shows a single vertical white line with no red. Reduce the soundcard input gain in the mixer control panel if you see red lines on strong signals (DigiPan example).

To complete the soundcard setup for use with Digital Modes, the soundcard sample rate needs to be set. A key defining characteristic of any digital audio signal is its sampling rate, usually just called the sample rate. This refers to how frequently the analogue signal is measured during the sampling process. If you think about it, the reason why this is important is obvious: imagine that you had a recording of someone speaking, and you sampled the recording once per second. You'd end up with a lot of choppy noise. The more frequently the signal is sampled, the better the approximation to the original sound. However, the higher the sample rate the more memory is required to store the samples, so you don't want to sample more than is necessary either!

## 8.0 Required Drivers

As mentioned above the PTT line of this cable communicates directly with a computer through the USB port. A physical Serial Port connection is not needed since the Prolific drivers emulate a virtual Serial (COM) Port which communicates with a radio at the required TTL voltage levels. The drivers for various operating systems are available at the Prolific website [[www.prolific.com.tw](http://www.prolific.com.tw)] or could be supplied on a CD along with the cable.

- Complete set of drivers is available at <http://www.prolific.com.tw/eng/downloads.asp?ID=31>
- Full driver installation instructions are available at <http://www.prolific.com.tw/eng/downloads.asp?ID=33>

## 9.0 Data Mode Programs

We do not write data mode programmes. We also cannot properly support software, only the author of that software can. There is a lot of data mode programmes can be found on the Internet! Most of these are «freeware» or «shareware» and in many cases provide a level of performance beyond your wildest dreams!

As a reference guide we would suggest you a few links listed below:

- EPC Data Mode Software Collection - [http://eu.srars.org/index.php?option=com\\_weblinks&catid=2&Itemid=79](http://eu.srars.org/index.php?option=com_weblinks&catid=2&Itemid=79)
- RV3APM Data Mode Software Collection - <http://www.qsl.net/rv3apm/>
- DL9QJ Data Mode Software Collection - <http://www.muenster.de/~welp/sb.htm>
- AC6V Data Mode Software Collection - <http://www.ac6v.com/opmodes.htm>

## 10.0 Disclaimer

The cable should not be used in any situation where its failure could cause human injury or severe damage to equipment. This device is not designed for or intended to be used in any life critical application.

This product and its documentation are provided as-is and no warranty is made or implied as to their suitability for any other purposes apart from those described above. This document provides information on our product and all efforts are made to ensure the accuracy of the information contained within. The specifications of the product are subject to change and continual improvement.