IP and COM ports for amateur radio

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Preamble

- This is a introductory talk to IP (Internet Protocol) and COM (Communication) ports for use in Amateur Radio.
- This is not a in depth discussion on the OSI model or RS232 standards.

What is a COM port?

- A COM (Communications) port is also called a serial port.
- They look like this:



They are not to be confused with a VGA port:



What if my PC has no COM port?

- You need a serial to USB adapter. Also known as a USB to COM cable.
- Be aware! You want to acquire a genuine FTDI chip adapter or you may end up struggling with dodgy drivers on Windows OS (Operating System).
- Linux can be more forgiving with these.
- Recommended cable:

Windows setup

- In Windows OS (Operating System) you will be using the "Device Manager" to configure the COM port.
- The device manager shows the allocated port ID/Identifier. For example COM1.
- It will also show the status of the drivers.

Windows setup continued

- COM1 is the most common ID.
- COM IDs can progress in a non sequential order so if COM1 doesn't work check the device manager.
- The reason there are multiple IDs is in case you have multiple COM devices attached. For example an Arduino and a radio.
- You can open the device manager in windows 8 or newer by right clicking the start menu and choosing device manager.

Device manager

📇 Device Manager	
File Action View Help	
CA Batteries Computer Disk drives DVD/CD-ROM drives DVD/CD-ROM drives UDE Computer face Devices Computer pointing devices Model Model Portable Devices Ports (COM & LPT) Communications Port (COM1) COMPuter Port (LPT1) COMPuter Port (LPT1) Processors Sound, video and game controllers System devices Universal Serial Bus controllers	

Device manager continued

Missing driver
 may show up as
 unknown device.

B Device Manager	- • X
File Action View Help	
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👂 🚛 Computer	
👂 👝 Disk drives	
🔈 📲 Display adapters	
DVD/CD-ROM drives	
Floppy disk drives	
Floppy drive controllers	
Human Interface Devices	
IDE ATA/ATAPI controllers	
👂 – 🟺 IEEE 1394 Bus host controllers	
▷ - Come Keyboards	
Mice and other pointing devices	
Monitors	
Network adapters	
Other devices	
🔤 🦣 Unknown device	
Ports (COM & LPT)	
Processors	
Sound, video and game controllers	
Storage controllers	
⊳ ₁₽ System devices	
👂 🟺 Universal Serial Bus controllers	

Linux setup

- To find the USB COM port number on linux systems you need to run: Is /dev/ grep ttyUSB
- This will output the names of active USB serial ports.
- Another option is to run: dmesg | grep tty
- This will output:
- 0.000000] console [tty0] enabled
- [1.288070] 0000:00:16.3: ttyS4 at I/O 0x20b0 (irq = 19, base_baud = 115200) is a 16550A

CAT control

- CAT or Computer Aided Transceiver is essentially serial communication over a COM port.
- CAT just aids in electrical isolation between the radio and the PC.
- CAT also has logic level converters.
- Essentially CAT is just serial COM.

Tools

- Putty (available on Linux and Windows).
- WSPR-X (available on Linux and Windows).
- HRD (Ham Radio Deluxe) (available on Windows).
- Hamlib (available on Linux and Windows).



- This tool is probably the most user friendly way to communicate with serial.
- IP, COM with all the stops... stopbits.
- SSH
- COM cable for CISCO:



IP for amateur radio

- More and more ham radio equipment is going digital.
- Many SDRs and radios can be connected to your local home network and controlled from across the house over the local network.
- You can even control the radio from across the world over the web. However be careful of remote operating licence terms.
- It allows us to communicate with our radio. It is more advanced than COM.
- Mesh networking (https://2e0pgs.github.io/ham-radio/hsmm-mesh.html)
 - BBHN (BroadBand HamNet)
 - HSMM-MESH (Former name for BBHN)
 - AREDN (Amateur Radio Emergency Data Network)

IP

- IP just stands for Internet Protocol.
- RJ-45 is the most common connector we use for IP based equipment.
- Ethernet is the name given to a network made up of IP devices.



IP continued

- You can connect two devices directly together thanks to something called Auto Negotiation (switch) or by using a Cross Over Cable.
- However you will need to assign static IP addresses for each device for this to work.
- Instead I recommend plugging them into a central network which has a router. This is because the router will assign them an IP automatically using DHCP.

IP address

- An IP address is simply the ID of the device.
- An address is where you address the information to be sent. Think of it as a postal address you send a letter to. The postman knows how to deliver the information because of its address.
- Most home networks will have a subnet of:
 - 192.168.0.1<mark>/24</mark>
 - 192.168.1.1<mark>/24</mark>

IP address continued

- We are only going to cover the class C address range.
- 192.168.0.1/24

192.168 network

0 network

1 – 254 available for devices (255 is reserved for broadcast).

/24 is just a notation so we know it's a class C with 254 hosts max. Aka 255.255.255.0

- e.g. 192.168.0.1 is normally the router
- 192.168.0.2, 192.168.0.3 are devices

192.168.1.3 would be a totally different network.

Subnet mask: https://www.aelius.com/njh/subnet_sheet.html

Windows static IP

👰 Network Connections —		×	Internet Protocol Version 4 (TCP/IPv4) Properties
← → ✓ ↑ 🔮 « All C > Network Connect ∨ ♂	nections	Q	General
Organize Disable this network device Diagnose this connection	-	?	You can get IP settings assigned automatically if your network supports
Ethernet Network Intel(R) Ethernet Connections No clients connected Bridge Connections Create Shortcut Delete Rename			 You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings. Obtain an IP address automatically Obtain an IP address automatically Use the following IP address: IP address: Static IP: 192.168.2.10 Subnet mask: 255.255.255.0 Router Address: Default gateway: 192.168.2.1
4 items 1 item selected			Obtain DNS server address automatically Use the following DNS server addresses: Router Address: Preferred DNS server: 192.168.2.1 Alternate DNS server: Validate settings upon exit Advanced OK Cancel

Linux static IP

Run: nano /etc/network/interfaces

```
1 #.interfaces(5).file.used.by.ifup(8).and.ifdown(8)-
2 auto.lo-
3 iface.lo.inet.loopback-
4 -
5 auto.eth0-
6 iface.eth0.inet.static-
7 address.192.168.1.44-
8 netmask.255.255.255.0-
9 gateway.192.168.1.1-
10 dns-nameservers.192.168.1.1-
-
```

Finding the IP

- A great tool for finding the IP of a device on a local network is Fing.
- You can download this from the Google Play Store or IOS App Store.
- https://www.fing.com/products/fing-app

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•	Fing London Excell Group PLC (GB)	93/143 now
Ņ	DOMOTZ-PC 192.168.11.73	Intel Windows
۵	Marcuss-iPhone 192.168.11.169	Apple iPhone 6S
٥	Pietro iPhone 192.168.11.121	Apple iPhone 7
	Pietros-MacBook-Pro 192.168.11.137	Apple MacBook PRO
	Tablet 192.168.11. 128	Samsung Galaxy Tab4 10.1
0	iPhone-2 192.168.11.107	Apple iPhone 6
Q	DESKTOP-TC8704F 192.168.11.140	Elitegroup Computer S Windows
۵	Mobile 192.168.11. 124	Vodafone Vodafone Smart ultra 6
0		

Radios with IP connectivity

- Many modern SDRs (Software Defined Radios) have Ethernet connectivity.
- Flex SDR with the flex desktop app or mobile app for IOS.
- Yaesu radios with remote control apps.

Flex



FT2000RC: CAT & Remote Control Software



Adding IP connectivity

- Raspberry PI (RTL SDR, USB, COM).
- Desktop or Laptop PC (RTL SDR, USB, COM).
- Beaglebone board (Kiwi SDR).
- WebSDR software (local SDR to a web enabled one).
- Hamlib is a great piece of software for controlling radios over COM/USB. It has a feature that allows your PC connected to the radio to become a server for other machines over network to connect to and control the radio that's local to the server. I use it myself: https://2e0pgs.github.io/blog/programming/2018/12/17/ic7100-hamlib/

Questions?

