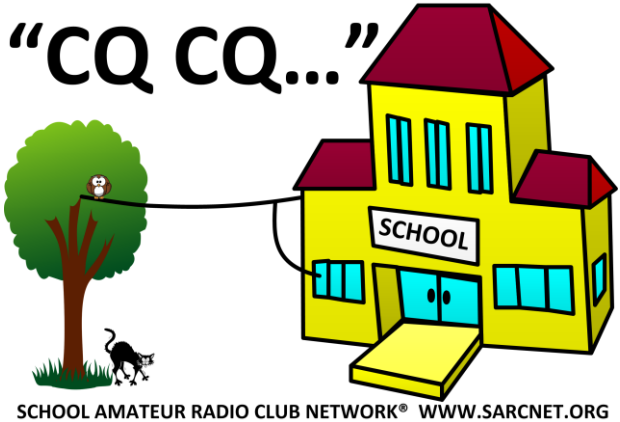
School Radio Club



SCHOOL AMATEUR RADIO CLUB NETWORK® WWW.SARCNET.ORG

Your school radio club is all about having fun with radios. You can learn **secret radio codes and alphabets**, **official radio operating procedures** and **how to make and answer a radio distress call** in an emergency situation. You can imagine you are the radio operator on board a battleship: Your job will be to **target enemy ships and send launch codes** to the fleet. Later, you might get stranded on a desert island, it will be up to you and your team to **set up and operate your own emergency radio station** to call for help. Then, suppose an aircraft went down in rugged terrain, you can track its emergency radio beacon and lead a rescue team to the site. Just for fun you can hike up to a mountain peak, set up your own portable radio station and win an award for the **Summits On The Air** contest. You can take radios with you anywhere touring, camping, bushwalking or cycling. Through your school radio club you can learn all about how to get involved in the fascinating world of **amateur radio**. You can even use the club's low-power, shortwave radio station to **talk on-the-air to other radio operators and school children** from regional areas in Victoria and maybe even overseas.

Modern amateur radio is a community-aware, technology-based and rewarding hobby. It has become an outdoor sport for many enthusiasts engaged in portable radio operation from mountain summits, national parks, museums, lighthouses and many more. Amateur radio clubs actively support local community activities and provide free communications for public events. Through club meetings and organised events they provide an enriching environment for experimentation, construction, technical advancement and social activities. Recently, there has been a resurgence in amateur radio participation due to simplified licencing conditions, availability of low-cost equipment and no minimum age requirement. This has provided a new opportunity for primary school students, as young as nine, who have successfully obtained their own amateur radio foundation licence. Unlike "Citizens Band", all amateur radio operators are licenced and must identify themselves using their individual call signs. Amateur radio communications is regulated by the Australian Media and Communications Authority providing an open, safe and friendly environment for adults and children.

Amateur Radio Codes

Amateur Radio operators all over the world use special codes when they get on the air. Amateur Radio codes are used to replace common words or phrases, which may otherwise get misunderstood when spoken in noisy conditions or take too long to send using Morse code. Operators use a combination of the **International Radio Alphabet**, **CW abbreviations, Q-codes**, and other **Amateur Radio code words** all the time. There is also a code used to report on a station's **Readability, Signal strength and Tone quality (RST)**. Coded messages can be a little cryptic because many unnecessary words are also removed. Here are some examples of Amateur Radio coded messages and their translations. The words or phrases that get translated are shown in **bold**. They may sound funny at first, but you soon get used to them. You can use the Amateur Radio code charts on the next few pages to look up any codes that you hear or want to use on the air.

Code:

__Roger__ Joe. __QSL__. Thanks for the __QSO OM__. You are __59__ here with some __QSB__ and __QRN__. My __QTH__ is Melbourne. Transmitting __QRP__. I'm __QSY 15__ for __DX Hi Hi__. __73 OM__ from Julie. __QRT__. __Over__.

Message:

All __OK__ on your last transmission Joe. I __received everything__ you said without any problems. Thanks very much for having this __contact__ with me __old man__. By the way you are __perfectly readable here and a very strong signal__, although there is now some __fading__ on your signal and some __interference__ from a nearby station. I am actually __located__ in Melbourne and I am only transmitting __low power__ at the moment. I will be __changing frequency__ to the __15 metre amateur band__ to hopefully work some __long distance__ stations – that should be a __lot of fun__! __Best regards__ to you __old man__ from Julie. I will have to go __off and clear__ of this frequency now, but first I will put it __back to you__ for your final transmission.

Code:

__CQ 40__ this is __VK3YSP__, __VICTOR KILO THREE YANKEE SIERRA PAPA over__...
__QRZ__?...
__Roger__ VK3FOWL. You are __34__, __34__, __QRN__, __QRN__, __over__…
__QRX__, Julie, __QRX__…
VK3FOWL this is VK3YSP __QSY 7140__, __QSY 7140__. __QSL? Over__...
__Negative copy__, Julie, __Negative copy__. __73__ this is VK3YSP __QRT__.

Message:

Calling any stations who can hear me on **40 Metres** this is VK3YSP **back to you**... **Who is calling me?**…**OK** acknowledging a transmission from VK3FOWL. You are **just readable here, but with considerable difficulty** and you only have a **fair signal strength**, but there is a lot of **noise** on your signal too. **Standby** Julie, **standby**… VK3FOWL this is VK3YSP please **change your frequency** to **7140kHz**. **Do you read me? Back to you**…. I **can't hear your signal** any more Julie. **Best regards** from VK3YSP. I am going to go **off and clear** of this frequency now.

Imagine that you are the radio operator on board a motor vessel at sea in treacherous weather conditions. There is an engine failure and the ship is taking on water. The only hope is to get a message to a Coast Guard patrol boat. But the shortwave band is very noisy, your generator is down and your transmitter is running on backup batteries. It is your job to make sure your distress message gets through. But will it be received and understood? Let's hope you know your radio codes and operating procedures: Your survival may depend on it...

International Radio Alphabet

Radio operators use the International Radio Alphabet to make sure that spoken letters and numbers don't get lost in the noise. Instead of saying "A, B, C", they use the code words "Alpha, Bravo, Charlie", and deliberately pronounce them "AL FAH, BRAH VOH, CHAR LEE" on the air.

	CODE	SOUND		CODE	SOUND		CODE	SOUND
A	ALPHA	AL FAH	**N**	NOVEMBER	NOH VEM BER	**0**	ZERO	ZEE-RO
B	BRAVO	BRAH VOH	**O**	OSCAR	OSS CAR	**1**	ONE	WUN
C	CHARLIE	CHAR LEE	**P**	PAPA	PAH PAH	**2**	TWO	TOO
D	DELTA	DEL TAH	**Q**	QUEBEC	KEH BECK	**3**	THREE	TREE
E	ECHO	EKK OH	**R**	ROMEO	ROW ME OH	**4**	FOUR	FOW- ER
F	FOXTROT	FOKS TROT	**S**	SIERRA	SEE AIR AH	**5**	FIVE	FIFE
G	GOLF	GOLF	**T**	TANGO	TANG GO	**6**	SIX	SIX
H	HOTEL	HO TELL	**U**	UNIFORM	YOU NEE FORM	**7**	SEVEN	SEV-EN
I	INDIA	IN DEE AH	**V**	VICTOR	VIK TER	**8**	EIGHT	AIT
J	JULIET	JEW LEE ETT	**W**	WHISKEY	WISS KEY	**9**	NINE	NIN-ER
K	KILO	KEY LOH	**X**	X-RAY	EKS RAY			
L	LIMA	LEE MAH	**Y**	YANKEE	YANG KEE			
M	MIKE	MIKE	**Z**	ZULU	ZOO LOO			

CW Abbreviations and other Amateur Radio Codes

CW is an abbreviation for Continuous Wave, meaning Morse code. It takes a long time to send a message in CW, so common words and phrases are abbreviated. Sometimes these codes are used by the same operators during "phone" or voice contacts. Other Amateur Radio code words have evolved to become part of the Amateur Radio "lingo" and are used quite frequently.

CODE	MEANING	USAGE
CQ	Seek You – Calling all stations	CQ, CQ ,CQ
Hi	Laughter	Very funny, Hi Hi
73	Best Regards	73, Joe
88	Love and kisses	88 from Julie
YL	Young Lady	Nice to hear a YL on the band
OM	Old Man	See you later OM
DX	Long distance	I'm looking for a DX contact
CW	Continuous Wave (Morse code) mode	I'm going to send you CW now
WX	Weather	The WX is getting bad here
Phone	Voice communication mode	Switching to phone mode now
80,40,20 etc	Wavelength of the amateur band	I will be operating on 40
7100	7.100 kilohertz	Change frequency to 7100
Roger	Yes, OK	Roger Joe
Negative	No	Negative copy Julie
Over	Back to you	I'm finished talking, over
Copy	Heard and understood	I did not copy that
Rig	Radio Transceiver	I just switched on my rig
Eyeball	Face to face meeting	Let's have an eyeball
Doubled	Two stations transmitting at the same time	Julie, you just doubled with Joe. Go again please.
Ragchew	A long rambling contact	You have been ragchewing for hours
Zulu	The time in UTC	It is 2359 zulu here
PAN	Urgency call – Emergency situation	PAN PAN PAN … engine failure, taking on water…
MAYDAY	Distress call – Life and death situation	MAYDAY MAYDAY MAYDAY … ship sinking…

Q-Codes

The Q-codes are all three letter codes starting with a Q to make them more distinctive. Operators use Q-codes during QSOs (on-air contacts) to report on the band conditions and their operating situation.

Q-CODE	MEANING	USAGE
QRM	Interference	There is QRM on your signal
QRN	Noise	There is QRN on this band
QRP	Low power	I am transmitting QRP now
QRT	Off and Clear	I am going QRT now
QRV	Ready to operate	I am QRV
QRX	Stand by or wait	Please QRX
QRZ	Who is calling	QRZ?
QSY	Change frequency	I will QSY to 20 Metres
QSB	Fading	There is QSB on your signal
QSL	All received	QSL on your last transmission
QSO	Contact	Thank you for the QSO
QTH	Location	My QTH is Melbourne

Note: Interference is generally caused by other stations or electrical equipment. Noise is natural and is caused by the sun or lightning storms. Fading is environmental and is caused by daily changes in the ionosphere.

RST codes

Readability, Signal strength and Tone (RST) reports are an important part of Amateur Radio. They are two or three-digit codes read over the air which indicate how clear, strong and pure your signal is. The tone report digit is only required for a **CW** (Morse code) contact. A good report like **59** means that others can hear you perfectly. A bad report like **31** might mean it is time to give up and try again another day when conditions are better. **RST reports are recorded for each QSO in the operator's log book.**

No.	Readability	Signal Strength	Tone (Morse Code)
1	Unreadable	Faint	Harsh tone with hum
2	Barely readable	Very weak	Harsh tone with modulation
3	Readable with difficulty	Weak	Rough tone with hum
4	Almost perfectly Readable	Fair	Rough tone with modulation
5	Perfectly Readable	Fairly good	Wavering tone, strong hum
6	-	Good	Wavering tone, strong modulation
7	-	Moderately strong	Good tone, slight hum
8	-	Strong	Good tone, slight modulation
9	-	Very strong	Perfect tone, no hum or modulation

Note: "Hum" includes household AC and modulation includes key clicks and chirps

OK. The water is coming in fast now so you pick up the mic: "**PAN PAN PAN this is MV176, this is MV176, this is MV176, Motor Vessel - 15 miles West of Flinders Island**. **We urgently require assistance. Over**".

Nothing heard, Maybe there are no ships for miles…

Now the ship is really sinking: "**MAYDAY MAYDAY MAYDAY, this is MEXICO VICTOR 176, this is MEXICO VICTOR 176, this is MEXICO VICTOR 176. Latitude 39 57 41 South, Longitude 147 25 38 East. Seven souls on board. Abandon Ship. Abandon Ship. Abandon Ship."**

Then, just in time you hear: **"MV176 this is Australian Coast Guard vessel. We are 5 nautical miles West of your position. Send up one red flare and activate your Emergency Position Indicating Radio Beacon. Over."**

Whew! It was just as well you remembered you radio codes and procedures.

Amateur Radio Code Practice

Translate the **bold** words and phrases in the following QSO to Amateur Radio codes.

Is this frequency in use? Nothing heard.
VK3YSP this is **VK3FOWL**. Can you **hear and understand** me Joe?

VK3FOWL this is VK3YSP. **OK** Julie. **All received**.

You are **almost perfectly readable and a strong signal** here.

There is some **fading** on your signal though. Shall we **change frequency** to **the 80 metre band**?

All received Joe, **No** don't **change frequency**. I am only running **low power – very funny**!

Calling all stations, Calling all stations, Calling all stations, this is VK3FQSO.

Stand by Joe. **Who is calling me?** Was that VK3FUXO? This is VK3FOWL, **back to you**?

VK3FOWL this is VK3FQSO, **VK3FQSO** over.

Roger VK3FQSO this is VK3FOWL. Hi Amanda.
Thanks for the **contact.** Nice to hear another **young lady** on **the 40 metre band**.

Hi Julie. I am **ready to operate** Summits On The Air. My **current location** is VK3/VC-025, **back to you**.

OK Amanda, **love & kisses**. You can have this frequency. Good luck. This is VK3FOWL **off and clear**.

VK3YSP **change frequency** to **7.100kHz.** Did you **hear and understand** Joe? **Back to you.**

OK Julie. **All received**. **Change frequency**.

Translate the following contact into plain English.

CQ 40 *this is* ***VICTOR KILO THREE YANKEE SIERRA PAPA over****…* ***QRZ****?…*

VK3FOWL this is VK3YSP. Roger Julie you are ***31*** *with* ***QRN over****…*

QRX*, Julie,* ***QRX****…*

VK3FOWL this is VK3YSP. ***QSY 7140****.* ***QSL****?* ***Over****…*

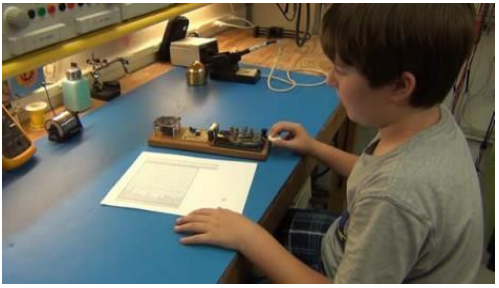
Negative copy *Julie.* ***73*** *this is VK3YSP* ***QRT****.*

International Morse Code

Radio operators use the International Morse Code to send text messages in noisy conditions using a sequence of short and long tones sometimes called **dots** and **dashes**.

Instead of "A, B, C" they send:	●—	—●●●	—●—●
Which sound just like:	**di-dah**	**dah-di-di-dit**	**dah-di-dah-dit**

You might think Morse code is really old fashioned, but it is still extremely popular with Amateur Radio operators. Once you learn it you will be hooked too. Imagine hiking up to a **ten-point mountain top** for the **Summits On The Air** contest, pulling out a **matchbox size Morse code radio** from your coat pocket attaching a simple wire antenna and working a "pile up" of thirty Amateur Radio operators all wanting to contact **YOU**.



International Morse Code chart

LETTERS				NUMBERS	
A ●—	H ●●●●	O ———	V ●●●—	1 ●————	6 —●●●●
B —●●●	I ●●	P ●——●	W ●——	2 ●●———	7 ——●●●
C —●—●	J ●———	Q ——●—	X —●●—	3 ●●●——	8 ———●●
D —●●	K —●—	R ●—●	Y —●——	4 ●●●●—	9 ————●
E ●	L ●—●●	S ●●●	Z ——●●	5 ●●●●●	0 —————
F ●●—●	M ——	T —	, ——●●——		
G ——●	N —●	U ●●—	. ●—●—●—		

Morse Code Send Practice

Listen to what each of the letters and numbers above sound like in Morse code. Learn the timing and spacing of letters and words. Sound each letter and number to yourself using **dits** and **dahs.** Fill in the missing text in the message below. Take it in turns to send it using a **real telegraph key**:

Send this text:

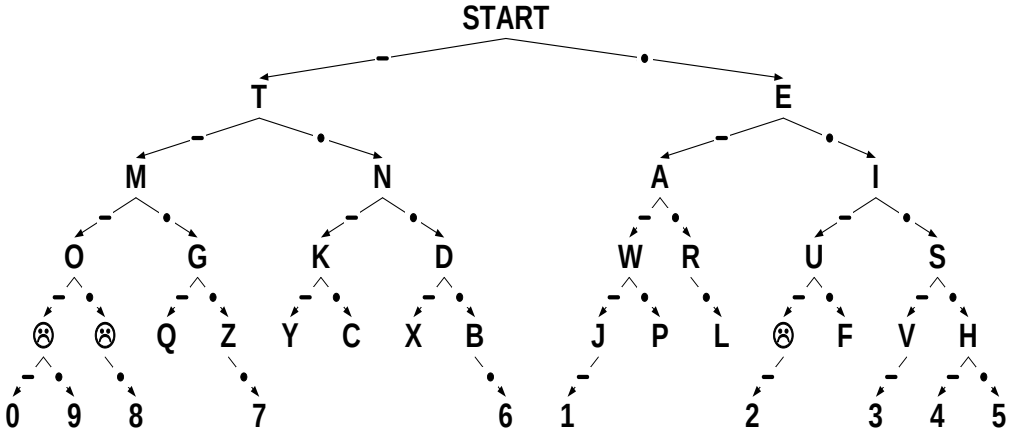
"The quick brown fox jumps over the lazy dog."
"My name is _____."
"I live in _____."
"See you later."

Congratulations. You have just sent 20 words in Morse code!

← But it looks like this guy beat you to that 10-point mountain top! Don't worry. There's plenty more out there.

1 - 2 - 3 Altogether sing: **Dah Dah Di Di Dit, Di Di Dit Dah Dah!** Which means "73" or best regards.

The Morse Code Decoder Chart



Morse Code Receive Practice

Listen to some Morse code being sent. Use the Morse code decoder chart above. Take it in turns to call out the letter or number when you hear it. Write down the message. Keep going until you have received 20 words.

Morse Code Battleships Game

Imagine you're in the communications centre (COMCEN) of a real battleship: It is a US DDG class Guided Missile Destroyer. It is your job to send **missile launch commands** to the fleet using Morse code. You better get this right or else those missiles won't hit their targets. Watch out for reports of **incoming missiles** too**.**

1. Each team secretly places 5 battleships (marked with an **X**) randomly on their grid (A-Z, 0-9) below. Toss a coin to see who goes first.
2. Take it in turns to:
    a. **Send** a grid square to attack. E.g. "C3".
    b. Any <u>enemy</u> battleships in that square and in the 8 adjacent squares will be destroyed
    c. Draw a horizontal line "—" through all the 9 squares you have attacked
    d. Wait for a report to see what happened…
    e. **Receive** each grid square of any battle ships sunk: E.g. "B2", "D4" or "." ●—●—●— for a total miss.
    f. Draw a circle "**O**" in the grid square of any battleship sunk
    g. **Receive** the grid square of incoming missiles. Any of your ships in that square and in the 8 adjacent squares will be sunk.
    h. **Send** the damage report: The grid squares of each sunk vessel or "." ●—●—●— for a total miss.

All hands. Battle Stations. Battle Stations. We're under attack.

	1 ● — — — —	2 ● ● — — —	3 ● ● ● — —	4 ● ● ● ● —	5 ● ● ● ● ●	6 — ● ● ● ●	7 — — ● ● ●	8 — — — ● ●	9 — — — — ●	0 — — — — —
A ●—										
B —●●●										
C —●—●										
D —●●										
E ●										
F ●●—●										
G ——●										
H ●●●●										
I ●●										
J ●———										
K —●—										
L ●—●●										
M ——										
N —●										
O ———										
P ●——●										
Q ——●—										
R ●—●										
S ●●●										
T —										
U ●●—										
V ●●●—										
W ●——										
X —●●—										
Y —●——										
Z ——●●										

Amateur Radio Operating Procedures

Amateur Radio operators must use **call signs** and special **operating procedures** whenever they get on the air. Imagine that after a weekend training session at your local radio club, you pass the multi-choice test and you now have an **Amateur Radio Operator's Certificate of Proficiency, an Amateur Radio Licence** and **your own call sign**. You can't wait to get **on-the-air** with your **new rig** and a **home-made shortwave antenna.** You tune around the band; hear some stations on and give them each a call. Everyone is pleased to log a contact with a new operator. They ask about your rig, your antenna and kangaroos and they all say they can't believe how young you are. You record all the details of your first contact in your **log book**. Then next week you get a **QSL card** in the mail from someone you talked to in Russia! There is a picture of a farm house with some antennas. You wonder what other countries you can get with your rig, which transmits less power than the light globe in your fridge!

Call signs

Call signs identify the station. They are like car number plates and it is a legal requirement to use them at the **start** and **end** of each contact and **at least every 10 minutes** during a contact. Call signs generally have a prefix to identify the station's location and a suffix to identify the individual licencee and the licence type. Here's how it works for a call sign, say **VK3FOWL**:

VK	**3**	**FOWL**
COUNTRY	STATE	(TYPE) LICENCEE
AUSTRALIA	**VICTORIA**	**(FOUNDATION) JULIE**

Is this frequency in use?

Before calling on a new frequency an operator always **listens carefully** and **asks**:

Is this frequency In use?

If another station replies "Yes, this frequency is in use. This is VK3YSP". The operator will try a different frequency.

Calling CQ

To call any stations listening on the frequency. Call **CQ** – it is short for **Seek You** - and identify yourself.

CQ CQ CQ this is VK3FOWL

Calling a Station and Replying to a Call

Simply use their call sign first followed by your own. Remember: <u>They</u> always go first – It's only polite.

VK3YSP this is VK3FOWL

What to talk about

- Always be polite: Say good morning or good afternoon.
- D**on't mention any private details or touchy subjects**.
- Remember there are **always** short-wave listeners and other operators listening to you.
- The first thing you should do is to give your **first name** and **location**.
- You can provide a signal report, a weather report, the band conditions, the type of radios and antennas you are using, what you are doing today, who you have contacted recently etc.
- If you can't think of anything to say, just ask questions about the same things.
- **Always mention the other operator's name** as it makes it more personal.
- **Always try to finish with a question** as it keeps the conversation going.

Net operation

When three or more stations are sharing the same frequency it is called operating in a "net". When operating in a net, each station takes it in turn to speak to the others. You have to remember **your place in the net** and when you have finished pass it on to the next station in line. You need to keep the net going even if you have nothing to say:

> **VK3YSP in the group, this is VK3FOWL. All received Joe. Nothing more to say here for the moment. You're next Amanda. VK3FQSO in the group, this is VK3FOWL, Over.**

Signing off

When you have finished your contact don't forget to say thanks.

> **VK3YSP this is VK3FOWL. 73 Joe and thanks for the QSO.**

Keeping a log book

For each contact you make you should write down the **date, time, band, frequency, mode, call sign, name and signal reports** both sent and received. The date and time used by international convention is called **Coordinated Universal Time (UTC).** The time is written in **24 hour format (HHMM)** and it is **11 hours earlier** than Daylight Savings Time here in Melbourne (so the date could actually be yesterday). Here are some example log book entries:

DATE	TIME	BAND	FREQ	MODE	CALL	NAME	SENT	RCVD
20140910	1322	40M	7170	LSB	VK3FOWL	JULIE	57	59
20140910	1445	20M	14136	USB	VK3YSP	JOE	43	47

On-Air Practice

Under the supervision of a licence Amateur Radio operator, take turns to practice your operating procedures on-the-air between members of your group using **hand-held radios**. You will need to **write down all the information in your log book** including the date, time, band, frequency, mode, call sign, name and signal strength reports. You will need to know how to give signal strength reports by reading the S-meter on your radio. Note: You will have to log your own call sign because you may be using different call signs during the day.

My Log Book

MY CALL	DATE	TIME	BAND	FREQ	MODE	CALL	NAME	SENT	RCVD

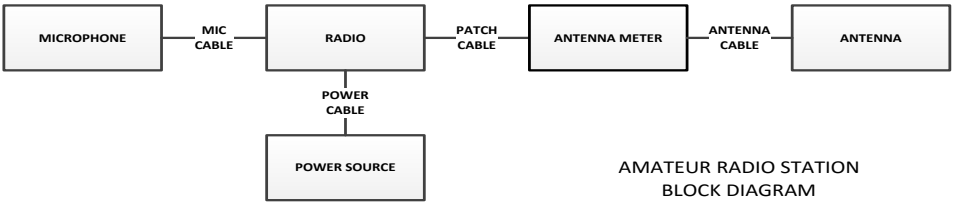
How to set up and use an Amateur Radio Station

Imagine you have been marooned on a desert island. You need to call for help, but there is no mobile phone coverage. You have salvaged some of the ships radio equipment, but there is no antenna and everything is in a total mess. You will have to test everything first to see if it still works. It is up to you to get things connected up and save the day. Quickly get your team together and work on a plan. Your survival may depend on it!

Getting Started

Every radio station is different. Be sure to check out all the equipment and cables you will be using today. Put all the equipment on a table and ask a licenced Amateur Radio operator what everything is called, what it is for and how to connect it up. Then, as a group, create a **parts list** and draw up a **block diagram** showing how everything should be connected. Then you can then copy the information into your booklet on the following pages and start setting up your station. Here is an example of a parts list and block diagram for a typical Amateur Radio station:

Amateur Radio Station Parts List			
Type	**Make**	**Model**	**Description**
Microphone	Yaesu	MH-48	PTT mic with mic cable attached
Radio	Yaesu	FT-7900R	VHF/UHF FM Transceiver 50W
Power Source	Sunstonepower	MLG12-120	12 Volt 120AH Battery
Power Cable	Homebrew	50A	50A with Anderson Connectors
Patch Cable	Homebrew	RG-58C/U	50 ohm coaxial cable with PL-259 connectors
Antenna Meter	Daiwa	CN-801HP	SWR/Power Meter 1.8-200MHz
Antenna	Diamond	X50	2m/70cm Collinear Antenna on a 8.5m mast
Antenna Cable	Homebrew	RG-58C/U	50 ohm coaxial cable with N-Type connectors



AMATEUR RADIO STATION
BLOCK DIAGRAM

Safety Briefing:

Before going any further, a licenced Amateur Radio operator will explain to you any potential safety hazards and what precautions you should take to protect yourself including:

1. Electrocution:
2. Lightning:
3. Electro Magnetic Energy:
4. Short Circuits:
5. Lead Acid Batteries:
6. Structural Collapse:
7. Tool Slippage:
8. Wood Splinters/Rope Burns:
9. Tripping:

Write down the precautions you should take in the space provided above.

Remember: It is always better to be safe than sorry

Test Questions

1. Who can you talk to with this station?
2. What band and frequency does the radio work on?
3. What voltage does the radio work on?
4. How powerful is the transmitter?
5. What type of signal does the radio receive and transmit?
6. What does “Look up and live“ mean?
7. Where is the best place to stand when erecting a mast?
8. What can happen when a screwdriver slips?
9. What happens if you short out the power leads?
10. What type of feed line is used for the antenna?
11. What sort of connector is used?
12. What type of antenna is it?
13. Is it a vertical or horizontal antenna?
14. How high is the antenna?

Setup Procedure

Once you have everything you need, have drawn up your plans and when it is safe to do so: Set up and test your Amateur Radio station, under the supervision of a licenced Amateur Radio operator, as follows:

1. First build and erect the antenna
2. Arrange the radio and other equipment on a table
3. Connect the microphone to the radio
4. Test the power source with a multimeter
5. Connect the power source to the radio
6. Connect the antenna meter to the radio
7. Test the antenna with a multimeter
8. Connect the antenna to the antenna meter
9. Turn on the radio and adjust the volume and squelch
10. Select an unused channel
11. Test the antenna by briefly holding down the Press To Talk button. Observe the antenna meter.
12. The antenna meter will show you if the radio and the antenna is working
13. If everything is working correctly, test your Amateur Radio base station with some hand-held radios
14. Test your Amateur Radio base station with some hand-held radios again, this time via a repeater

Parts List

Amateur Radio Station Parts List			
Type	**Make**	**Model**	**Description**

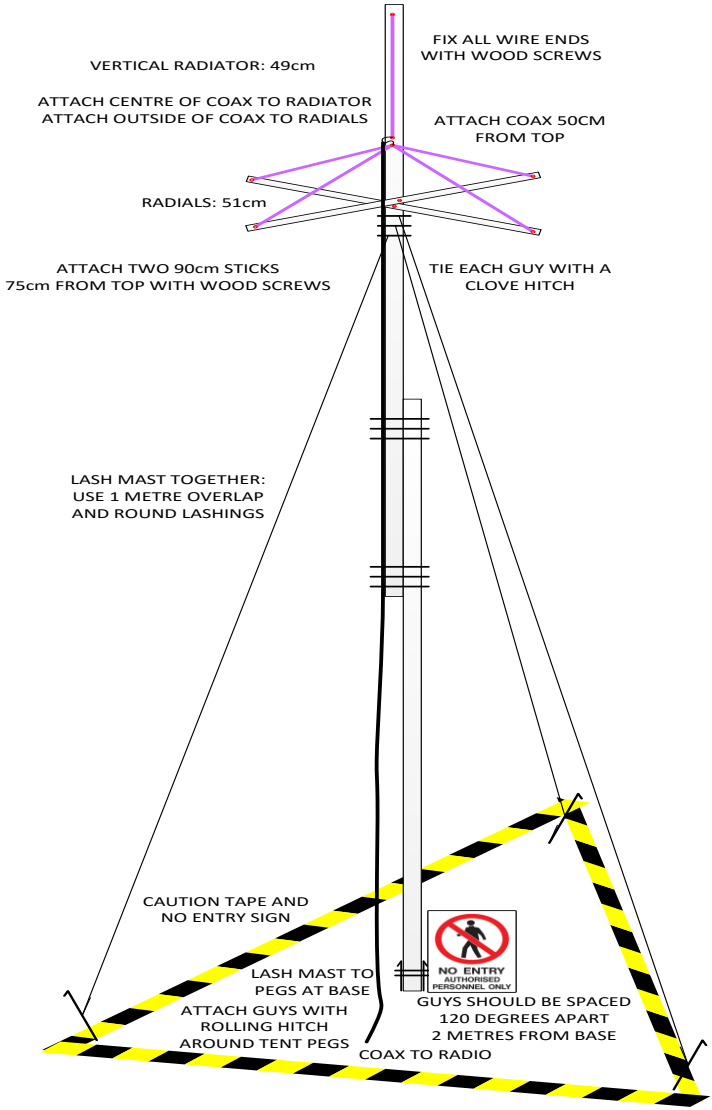
Notes:

Write down any information that you may need here:

Block Diagram

Making a VHF Ground Plane Antenna

1. Lash together two, 3 metre mast sections with a 1 metre overlap using round lashings
2. Attach two 90cm metre sticks 75cm from the to the top of the mast using brass wood screws
3. Cut the radiator and radial wires to length and bare the ends. Bare the coax wire end too.
4. Insert the bare wire ends into the screw holes and fix them with brass wood screws
5. Test all the connections with a multimeter
6. Attach the guys to the mast using a clove hitch
7. Raise and guy the mast using tent pegs spaced 2 metres from the base at 120 degrees apart
8. Lash the mast to two tent pegs at the base
9. Place Caution Tape and a No Entry sign at the base



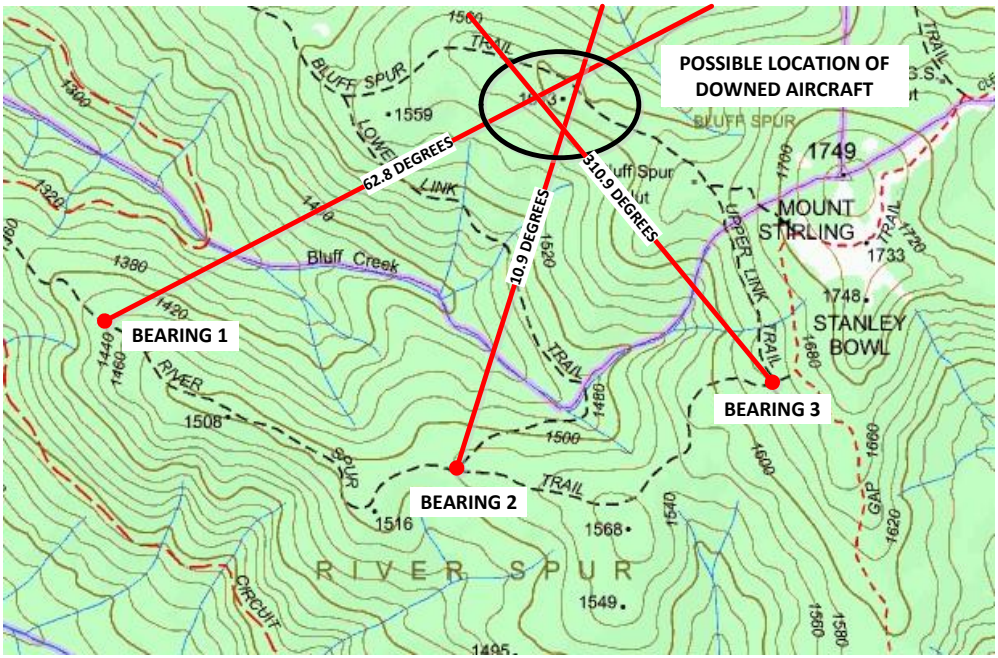
Amateur Radio Direction Finding

These days Amateur Radio is more like a sport than a hobby. There are so many out-door events and contests to get involved in like **Summits On The Air**, the **National Parks Award** and **Amateur Radio Field Day Contests** etc. But what could be more fun than **combining Amateur Radio with orienteering**? It is called **Amateur Radio Direction Finding (ARDF)**. The concept is simple: Someone hides a small transmitter and you try to find it by tracking down its "beep, beep, beep" signal using a tracker. Are you getting warmer now? Well how about a real life scenario to really whet your appetite for Amateur Radio adventure:

Locating an Emergency Beacon

Direction Finding can also be used for **triangulating** the location of an **emergency homing beacon**. You simply take several **compass bearings** using your tracker at three different positions and then plot them on a map. The intersection of the three bearing lines forms a triangle indicating the possible location of the beacon.

Imagine that a downed aircraft has activated an emergency homing beacon after crashing in rough terrain. You are the radio operator with the search and rescue squad travelling along the River Spur Trail. You regularly radio in your position to the rescue communications centre. Using your tracker, you have taken three compass bearings and plotted them on the map below. By observing where the lines intersect you figure the location of the beacon: An unnamed peak at 1613 metres, not far from Bluff Spur hut. You radio in the position of the crash site: A rescue helicopter is on its way by the time you arrive.



Search and Rescue Mission

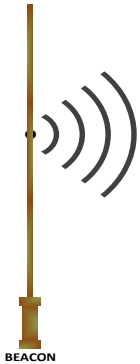
Imagine you have to find a downed aircraft and rescue the survivors. The trouble is that you are not sure where the aircraft has crashed. Luckily the crew has activated an emergency homing beacon. Now it is your job to track it down. You use your Amateur Radio Direction Finding (ARDF) tracker to home in on the signal. It tells you the direction of the beacon and as you get closer the signal gets stronger.

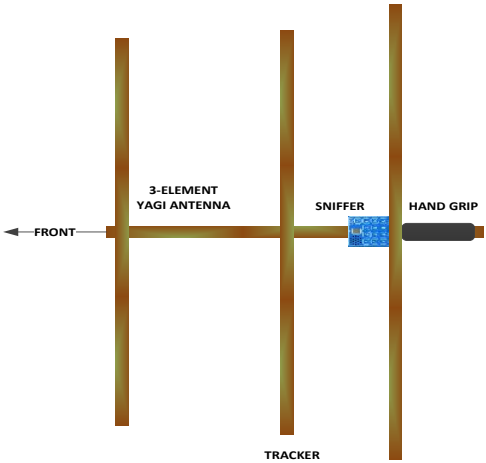
The tracker looks like a small TV antenna with a little box called a "sniffer". The sniffer lets you hear the beacon's signal.

To find the beacon:

1. Hold the rear end of the tracker by the hand grip with the elements pointing up and down.
2. Observe the number displayed on the sniffer (0 – 9) and listen to the pitch of the tone from the speaker as you move the tracker around.
3. Turn in a complete circle: The highest number displayed together with the highest tone pitch indicates that the tracker is pointing towards the beacon. The number increases as you get closer to the beacon and the tone is reset to a lower pitch each time the number increases.
4. Move the tracker slowly from left to right and back again in the general direction of the beacon.
5. Note where the tracker is pointing for the highest number and pitch. Use landmarks or take a compass bearing and draw a line from your position in that direction on a map.
6. Move along the designated trail to a different position and let someone else get a bearing for the map.
7. At the end of the trail your map will show where the plane is and you can complete your mission.

Tips: Have Fun! **But don't run and don't poke anyone in the eye with the antenna elements.** Be aware of false readings caused by reflections from nearby metal structures.



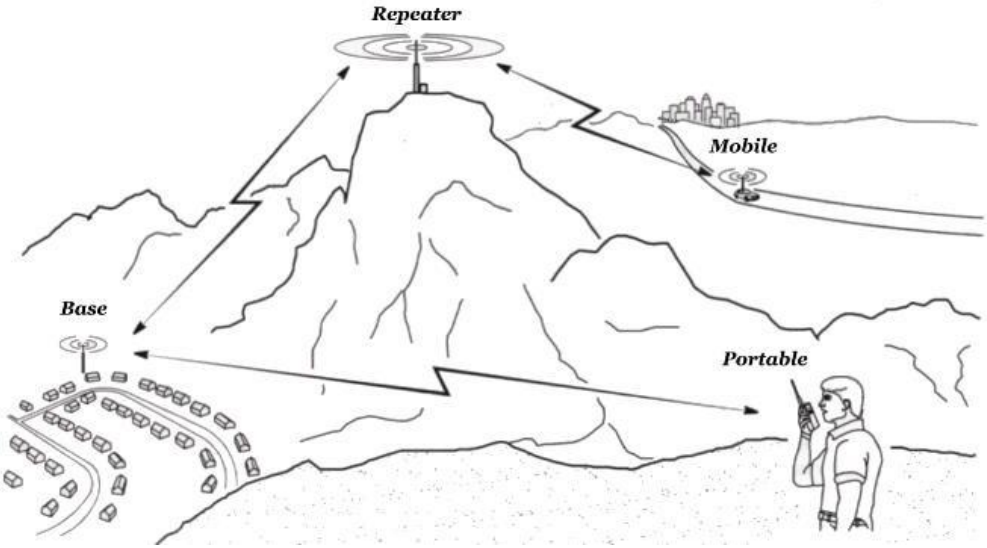


VHF/UHF Bands

The Very High Frequency (VHF) and Ultra high Frequency (UHF) bands allow you to communicate with other stations provided that they are not obscured by mountains or tall buildings. At ground level, you might only be able to talk to a station in the neighbouring suburbs. But using a very high antenna or operating from a mountain peak you might be able to work stations in the next town or beyond.

VHF/UHF Repeaters

VHF and UHF stations can communicate even further afield if they can both use the same repeater. A repeater re-transmits each station's signal from a very high location, like a tall building or mountain top. The range of the repeater may be 150kms or more. In the following diagram the base station can communicate with the portable station because there are no obstructions between them. The base station cannot communicate with the mobile station directly because there is a large mountain in the way. However, the base station can communicate with the mobile station via a repeater on the mountain peak. Have you ever wondered why there are all those tall towers on a mountain peak? Well now you know.



Congratulations, you have passed all the training exercises and you are about to go **On The Air**. A licenced Amateur Radio operator must be present, but you can hold the radio, press the talk button, talk to other stations and log your own contacts. Remember your procedures and codes. You should also be familiar with all the details of your station so you can enter them into your log book or mention them on the air. Before having a QSO on VHF/UHF and using repeaters, first write down the following information:

Your Call Sign:

Your Radio Alphabet Call Sign:

Your Name:

Your Radio Alphabet Name:

Your Location:

Your Maidenhead Locator:

Your Radio Type:

Your Band:

Your Frequency:

Your Mode:

Your Transmit power:

Repeater Call Sign:

Repeater Frequency:

Repeater Location:

Your VHF/UHF QSO

1. To start a QSO first turn on the radio and select a local repeater channel. Adjust the volume and squelch levels. Listen for a while to make sure that the channel is not in use. A CQ call is too long to use on busy repeaters. Instead just say:

   This is _____ listening. Over.

2. Or just call a known station on the channel:

   _____ this is _____. Over.

3. Then each member of your group can take it in turns to answer any station that calls you back:

   _____ this is _____.
   Good morning/afternoon _____. Thanks for calling back.
   My name is _____ . (What's yours?).

4. You can then ask a different question like:

   My QTH is _____. What is your QTH? Over.
   I am receiving you readability _____ strength _____. What is my signal report? Over.
   I am using a _____ transceiver. What are you using? Over.
   I am running _____ watts into a _____ antenna. What are you running? Over.
   Do you know the Radio Alphabet? My name is _____. What's yours? Over.
   Do you know Q-codes and abbreviations? QSL? 73 OM (or 88 YL). Over.
   Do you know Morse code? How about this: Dah Dah Di Di Dit, Di Di Dit Dah Dah? Over.
   We played Morse code Battleships. Our group won/lost. What have you been doing? Over.
   We did Amateur Radio Direction Finding. What have you been doing ? Over.
   We built a portable antenna on a mast. What have you built? Over.

5. After the response say:

   _____ this is _____.
   Roger _____. QSL.
   <Answer any questions asked>
   Thanks for the QSO _____. 73. I will now pass the microphone over to _____.
   _____ this is _____. Over.

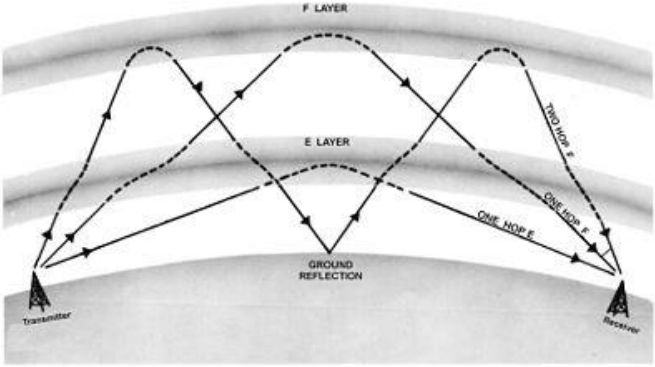
6. Hand the microphone to the next member of the group.
7. Repeat steps 3 – 6. If there is time you can have another go round around with your own questions.
8. Don't forget to fill out your log book.

HF Bands

The High Frequency (HF) or shortwave bands allow you to communicate with other stations all over the world, but only if the conditions are favourable and at certain times during the day or night.

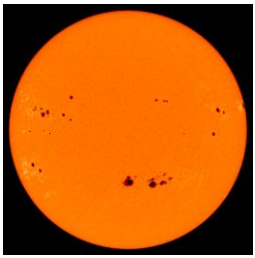
HF Propagation

HF radio signals travel high into the sky where they are bent back to earth by invisible layers of particles charged by the sun. Signals can even bounce back and forth, between the ground and sky, travelling all around the world.

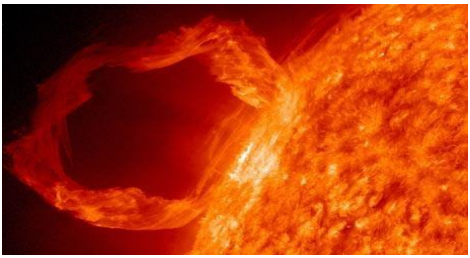


HF bands can be noisy and unpredictable at times. Noise and interference can come from nearby electrical equipment, overseas stations or thunderstorms.

The earth's ionosphere changes during the day and night. Sometimes you can hear only local stations and other times only distant stations. Signals can fade in and out over just a few minutes. The band conditions are even affected by sun spots and solar flares. The appearance of an aurora at night is visible evidence of the sun's effect on the earth's ionosphere. Experienced radio operators learn how to read the signs and make the most of the prevailing band conditions.



Sunspots



Solar flares

Aurora

HF radios have lots more controls to adjust for all the different band conditions. You can control the radio's sensitivity, bandwidth, pre-amplification, attenuation, pass band and noise blanker to name just a few. There are no fixed channels on HF and the frequency is continuously variable. Tuning around for stations takes a little practice: So just make small moves on the dial and tune in the signal for the most natural sound.

Congratulations, you have passed all the training exercises and you are about to go **On The Air**. A licenced Amateur Radio operator must be present, but you can hold the microphone, press the talk button, talk to another station and log your own contacts. Remember your procedures and codes. You should also be familiar with all the details of your station so you can enter them into your log book or mention them on the air. Before having a QSO on HF, first write down the following information:

Your Call Sign:

Your Radio Alphabet Call Sign:

Your Name:

Your Radio Alphabet Name:

Your Location:

Your Maidenhead Locator:

Your Radio Type:

Your Antenna Type:

Your Antenna Height:

Your Power Source:

Your Band:

Your Frequency:

Your Mode:

Your Transmit power:

Your HF QSO

1. To start a QSO call CQ if there is no one else on the frequency;

   Is the frequency in use this is _____. Over.
   CQ, CQ, CQ, this is _____.
   CQ, CQ, CQ, this is _____. Over.

2. Or just call a known station on the frequency:

   _____ this is _____. Over.

3. Then each member of your group can take it in turns to answer any station that calls you back:

   _____ this is _____.
   Good morning/afternoon _____. Thanks for calling back.
   My name is _____ . (What's yours?).

4. You can then ask a different question like:

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   I am using a _____ transceiver. What are you using? Over.
   I am running _____ watts into a _____ antenna. What are you running? Over.
   Do you know the Radio Alphabet? My name is _____. What's yours? Over.
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   Do you know Morse code? How about this: Dah Dah Di Di Dit, Di Di Dit Dah Dah? Over.
   We played Morse code Battleships. Our group won/lost. What have you been doing? Over.
   We did Amateur Radio Direction Finding. What have you been doing ? Over.
   We built a portable antenna on a mast. What have you built? Over.

5. After the response say:

   _____ this is _____.
   Roger _____. QSL.
   <Answer any questions asked>
   Thanks for the QSO _____. 73. I will now pass the microphone over to _____.
   _____ this is _____. Over.

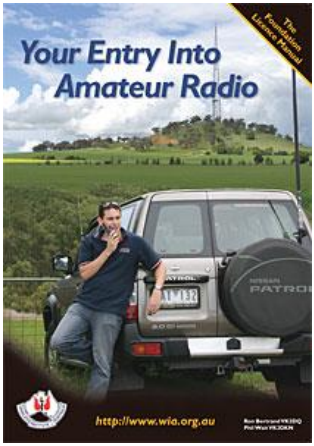
6. Hand the microphone to the next member of the group.
7. Repeat steps 3 – 6. If there is time you can have another go round around with your own questions.
8. Don't forget to fill out your log book.

Further Information

How to get you own Amateur Radio Operator's Licence

You can get your Amateur Radio Foundation Licence by private study (either by book or DVD) and by sitting a multi-choice test. There is no minimum age. You could be the youngest ever! A very convenient way to go is to attend an all-inclusive weekend foundation licence course offered by a local club.

Here is all the information you need to get started:



1. Purchase a copy of the "**Your entry into Amateur Radio**" book at http://www.wia.org.au/licenses/foundation/foundationmanual/
2. Contact the **Radio and Electronics School** at http://res.net.au/ for free on-line tutorials or to purchase complete course DVDs.
3. Contact **Amateur Radio Victoria**:

   2015 Foundation Licence Weekend Courses
   Dates: February, April, June, August, October
   Address: 40G Victory Blvd, Ashburton.
   Contact: Barry Robinson VK3PV, 0428 516 001
   foundation@amateurradio.com.au
   Ref By: Julie VK3FOWL

Notes