# JOTA 2021
# ACTIVITIES
# for the
# BOREE REGATTA

Jamboree On The Air, JOTA, is a combined, worldwide activity between Guides, Scouts and Amateur Radio groups that takes place during October each year. The Amateur Radio network is used so that Guides and Scouts can communicate to each other and exchange information and ideas — a Jamboree on the air.

For over two decades an amateur radio station has operated as an activity during the Endeavour Boree Regatta. Unfortunately, due to COVID-19 restrictions, it is not possible to operate a JOTA radio station in 2021.

As an alternative, youth members can participate in a range of communication related activities, based some of the earliest methods of communication including some amateur radio techniques.

Many of the activities were original designed for youth members to participate as a face to face group. Youth members can still participate together using an audio video conference facility, to comply with COVID-19 restrictions.

All activities must be supervised by leaders and / or parents / guardians. The activities vary in level of difficulty so be selected to match the ability of the youth members. Some activities may require equipment that may not be readily available.

Some activities are based on communicating using Citizen Band (CB) radios. Unlike amateur radio, CB radio users are not licenced or regulated, and the content that might be heard on CB radios may not be suitable for youth members.

As an alternative consider using a smart device with an audio / video conferencing facility such as “Zoom” or “Google Meet” or “FaceTime”, which would also allow individual youth members to participate in activities as a group, from home.

Leaders and parents should assess each activity to ensure the safety of youth members and others, in accordance with the respective organisations safety policy and procedures. Some activities may require the use of personal protective equipment (PPE).

Each activity has been given a rating based on difficulty, level of expertise and equipment required. The higher the rating, the greater the level of difficulty, expertise and equipment.

Assistance is available by contacting Paul Howarth (JOTA Coordinator) by email: jota_coordinator@sgars.org or Facebook JOTA at Boree Regatta

# Table of Communications Activities




Acknowledgements:

- Scouts NSW JOTA-JOTI web site
- Garth & Bev
- Australian Communications and Media Association (ACMA)
- www.adsbexchange.com
- www.nsw.scouts.com.au

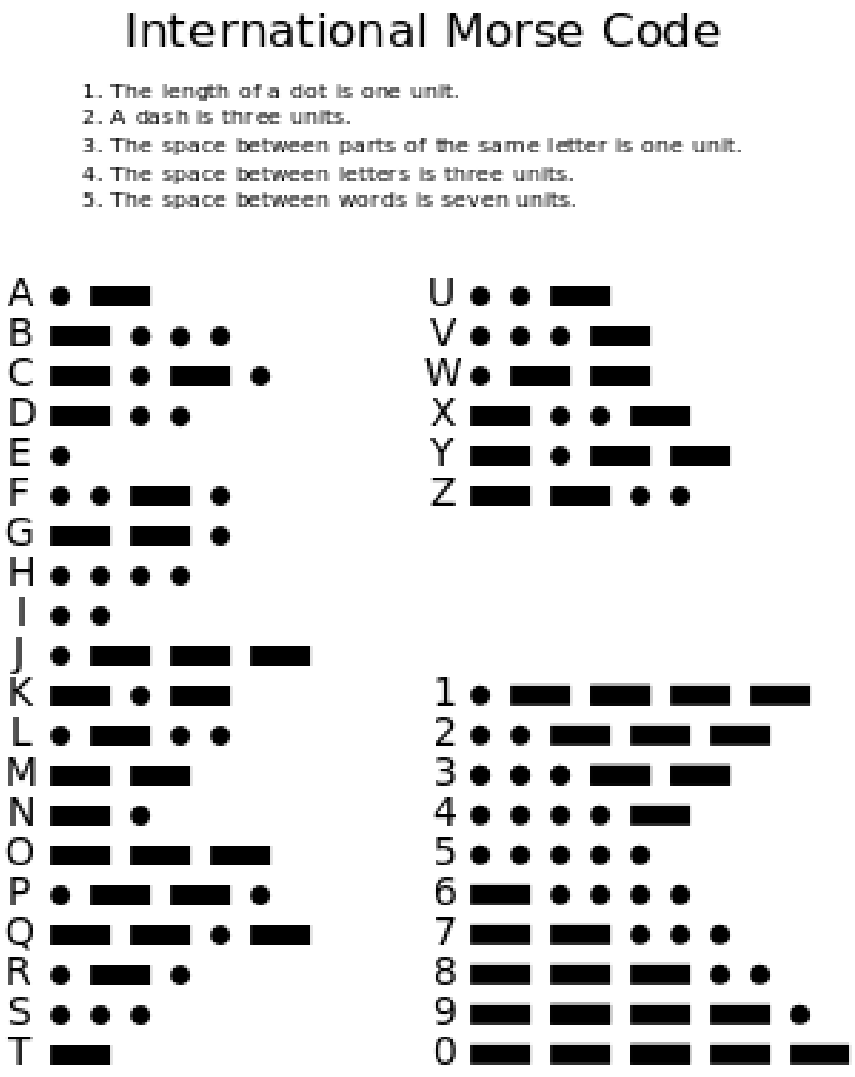
## International Morse Code (Information)

**Morse code** is a method used in telecommunication to encode text characters as standardized sequences of two different signal durations, called *dots* and *dashes*, or *dits* and *dahs*. Morse code is named after Samuel Morse, one of the inventors of the telegraph.

**International Morse Code** encodes the 26 Latin letters **A** through **Z**, one non-Latin letter, the Arabic numerals, and a small set of punctuation and procedural signals. There is no distinction between upper and lower case letters.

Each Morse code symbol is formed by a sequence of *dits* and *dahs*. The *dit* duration is the basic unit of time measurement in Morse code transmission. The duration of a *dah* is three times the duration of a *dit*. Each *dit* or *dah* within an encoded character is followed by a period of signal absence, called a *space*, equal to the *dit* duration.

The letters of a word are separated by a space of duration equal to three *dits*, and words are separated by a space equal to seven *dits*.



## NATO Phonetic Alphabet (Information)

The International Radiotelephony Spelling Alphabet, commonly known as the NATO phonetic alphabet, is the most widely used for radio communication as a spelling alphabet.

The phonetic alphabet was created by international agencies by assigned 26 code words to the letters of the English alphabet, so that the names for letters and numbers would be distinct enough to be easily understood by those who exchanged voice messages by radio or telephone, regardless of language differences or the quality of the connection.

The words were chosen by NATO to be accessible to speakers of French and Spanish in addition to English.

| *CHARACTER* | *MORSE CODE* | *TELEPHONY* | *PHONIC (PRONUNCIATION)* |
|---|---|---|---|
| A | • — | Alfa | (AL-FAH) |
| B | — • • • | Bravo | (BRAH-VOH) |
| C | — • — • | Charlie | (CHAR-LEE) or (SHAR-LEE) |
| D | — • • | Delta | (DELL-TAH) |
| E | • | Echo | (ECK-OH) |
| F | • • — • | Foxtrot | (FOKS-TROT) |
| G | — — • | Golf | (GOLF) |
| H | • • • • | Hotel | (HOH-TEL) |
| I | • • | India | (IN-DEE-AH) |
| J | • — — — | Juliett | (JEW-LEE-ETT) |
| K | — • — | Kilo | (KEY-LOH) |
| L | • — • • | Lima | (LEE-MAH) |
| M | — — | Mike | (MIKE) |
| N | — • | November | (NO-VEM-BER) |
| O | — — — | Oscar | (OSS-CAH) |
| P | • — — • | Papa | (PAH-PAH) |
| Q | — — • — | Quebec | (KEH-BECK) |
| R | • — • | Romeo | (ROW-ME-OH) |
| S | • • • | Sierra | (SEE-AIR-RAH) |
| T | — | Tango | (TANG-GO) |
| U | • • — | Uniform | (YOU-NEE-FORM) or (OO-NEE-FORM) |
| V | • • • — | Victor | (VIK-TAH) |
| W | • — — | Whiskey | (WISS-KEY) |
| X | — • • — | Xray | (ECKS-RAY) |
| Y | — • — — | Yankee | (YANG-KEY) |
| Z | — — • • | Zulu | (ZOO-LOO) |
| 1 | • — — — — | One | (WUN) |
| 2 | • • — — — | Two | (TOO) |
| 3 | • • • — — | Three | (TREE) |
| 4 | • • • • — | Four | (FOW-ER) |
| 5 | • • • • • | Five | (FIFE) |
| 6 | — • • • • | Six | (SIX) |
| 7 | — — • • • | Seven | (SEV-EN) |
| 8 | — — — • • | Eight | (AIT) |
| 9 | — — — — • | Nine | (NIN-ER) |
| 0 | — — — — — | Zero | (ZEE-RO) |

## Q Code (Information)

The **Q-code** is a standardised collection of three-letter codes that each start with the letter "Q". It is an operating signal initially developed for commercial radiotelegraph communication and later adopted by other radio services, especially amateur radio.

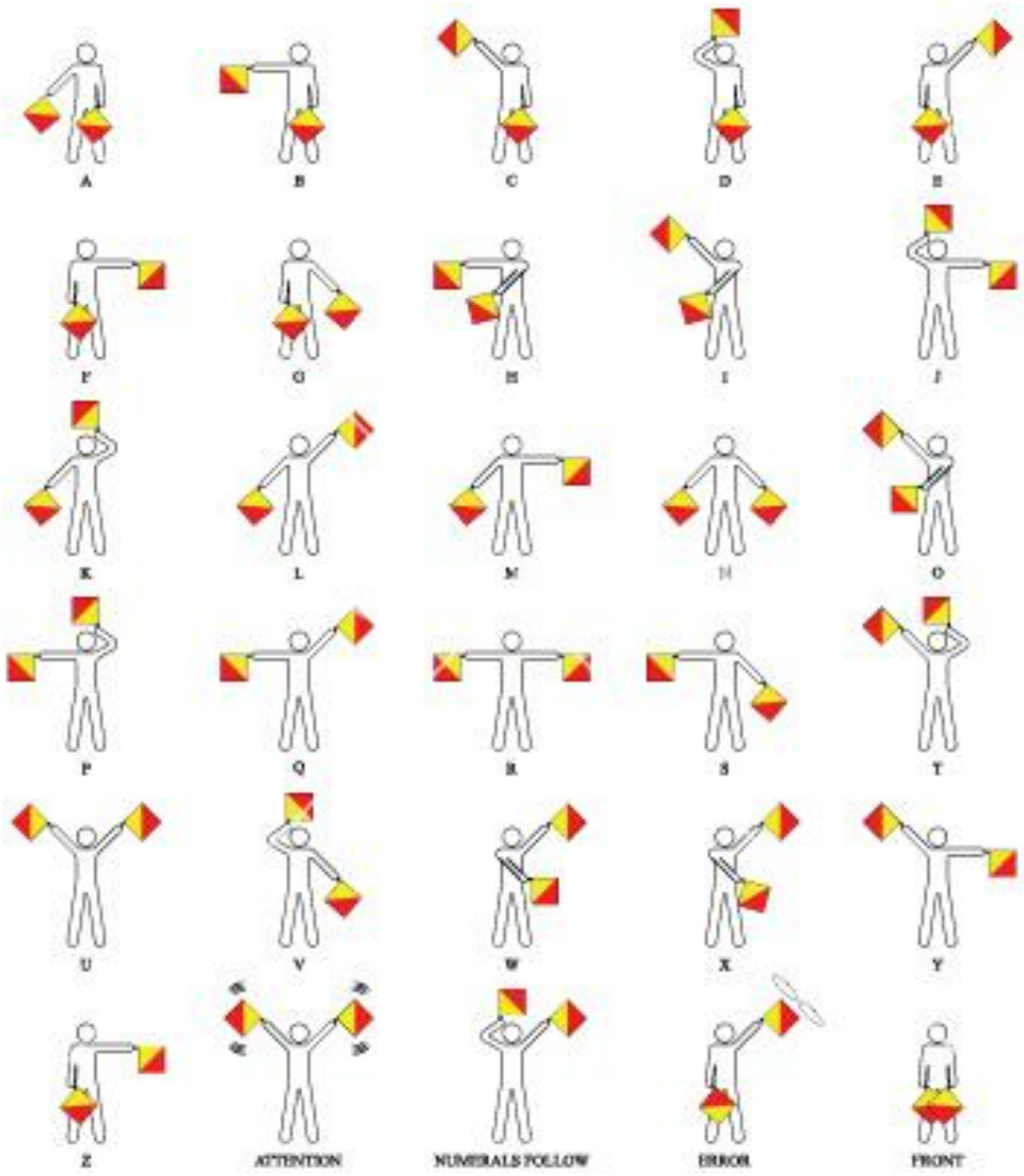
Although Q-codes were created when radio used Morse code exclusively, they continued to be employed after the introduction of voice transmissions. To avoid confusion, transmitter call signs are restricted; no country is ever issued an ITU prefix starting with "Q".

Codes in the range QAA–QNZ are reserved for aeronautical use; QOA–QQZ for maritime use and QRA–QUZ for all services, including amateur radio operators.

| **Q Code** | Description / Meaning |
|---|---|
| **QRA** | Name |
| **QRB** | Distance |
| **QRG** | Frequency |
| **QRK** | Intelligibility |
| **QRL** | Busy |
| **QRM** | Interference |
| **QRN** | Noise |
| **QRO** | High power |
| **QRP** | Low power |
| **QRT** | Shut down the station |
| **QRV** | Ready |
| **QRX** | Stand by |
| **QRZ?** | Who is calling me? |
| **QSB** | Fading |
| **QSD** | Defective keying (Morse Code) |
| **QSK** | Break in |
| **QSL** | Confirmation *or* card to confirm contact |
| **QSO** | Radio contact |
| **QSY** | Change frequency |
| **QTC** | Message |
| **QTH** | Location |
| **QTR** | Time |

## Semaphore flags (Rating 7)

Youth members can use red and yellow Semaphore flags to send messages to each other over any distance which is “line of site”. Messages can be spelt out using the flags in various positions, as shown below.




**Equipment required:**

- Minimum of four (4) flags, which can be made from coloured paper, glued to an A4 size sheet of card, which is then glued to a length of cardboard tubes or timber dowel.
- Paper and pens / pencils

## Morse code with Light (Rating 4)

Use Morse code to send signals with light to each other over a distance, this activity requires two sites within visual range of each other.

Each Morse code symbol is formed by a sequence of *dits or dots* and *dahs or dashes*. The *dit* duration is the basic unit of time measurement in Morse code transmission. The duration of a *dah* is three times the duration of a *dit*.

Youth members can try sending Morse code using a simple battery torch, by turning the torch light on and off quickly to form the dits and dahs.

Alternatively, youth members can make a Morse code project using a wooden clothes peg as the keyer, with a bright Light Emitting Diode (LED) instead of the buzzer. (Refer Wooden clothes peg Morse code project)

Each *dit* or *dah* within an encoded character is followed by a period of signal absence, called a *space*, equal to the *dit* duration.

The letters of a word are separated by a space of duration equal to three *dits*, and words are separated by a space equal to seven *dits*.

### Equipment required

- Two battery torches or wooden clothes peg Morse code projects.
- Supply of paper, pens or pencils.
- Morse Code

## Battleships (Rating 6)

Team up with a friend and practice your grid reference skills with a classic game of battleships. Either the Phonetic Alphabet or Morse Code can be used with this activity.

Setup the Battleship grid template and choose a position for your ships on the grid positions. Youth members take turns guessing where each other's ships are - try to sink your opponent's ships before they sink yours.

Players use the phonetic alphabet to communicate the grid position, e.g. the top left hand grid square is "Alpha One". opposition team notifies them of a hit (H) or miss (M) and marks it off on sheet. First team to sink all of the opposition's ships is the winner

Alternatively, more experienced youth members could try using Morse code instead of the phonetic alphabet.

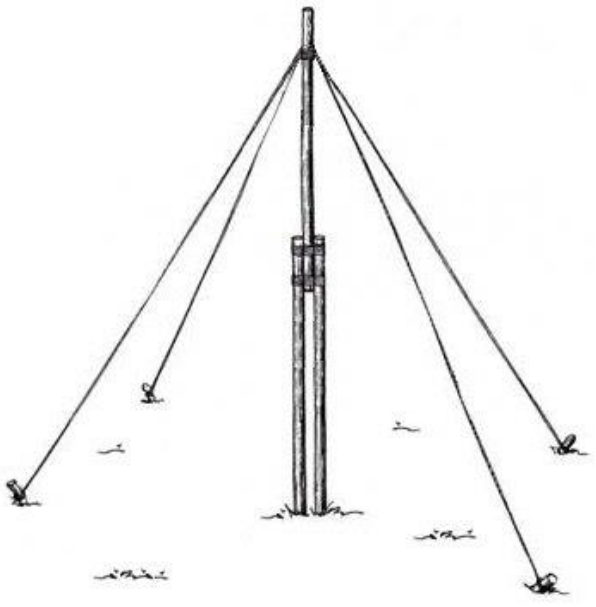
**Equipment required**

- Enough printed battleship grid sheets for each player.
- Supply of pens or pencils.
- CB Radios or use smart devices or Morse Code kits (either light or sound), per team.
- Phonetic Alphabet or Morse Code

## Building a Radio Mast (Rating 10)

For radio equipment to receive (and transmit) radio signals over a long distance, the antenna should be as high off the ground as possible.

Youth members can design and assemble a mast suitable for a radio antenna, using poles and ropes, with assistance from a leader / parent.



First choose and open area away overhead power lines. Using rope, lash poles together to gain extra height. Attached additional ropes near the top of the mast, which will be used to guy the mast.

Walk the mast up with one person to hold the mast in the vertical position, while another person secures the guy ropes in place using tent pegs.

**Equipment required**

- Wooden, plastic or aluminium poles.
- Rope.
- Tent pegs and hammer or mallet.
- Personal Protective Equipment (PPE)

## String phone (Rating 6)

Speech can be converted into vibrations by talking into a tin can. Connect the tin can with a piece of string to another tin can, the vibrations travel along the string and then are converted back to sound.

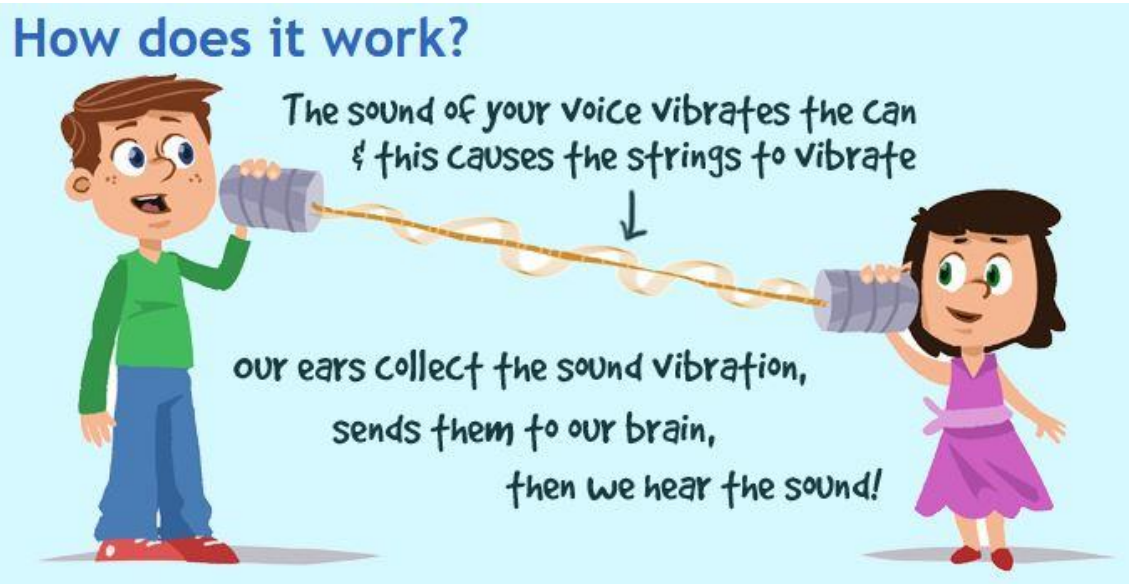
Under leader / parent supervision, drill or punch a small hole in the bottom of two tin cans, just large enough to pass through a length of string from the bottom of the can.

Knott the string inside the cans, then hold the cans so the string is tight and not touching anything else.

One person speaks into one can and another person holds the other can to their ear and listens.

**Equipment required**

- 2 tin cans of approximately 400 ml, such as a soup can.
- Drill and drill bit size just large enough to pass the string through
- Length of string
- Personal Protective Equipment (PPE)



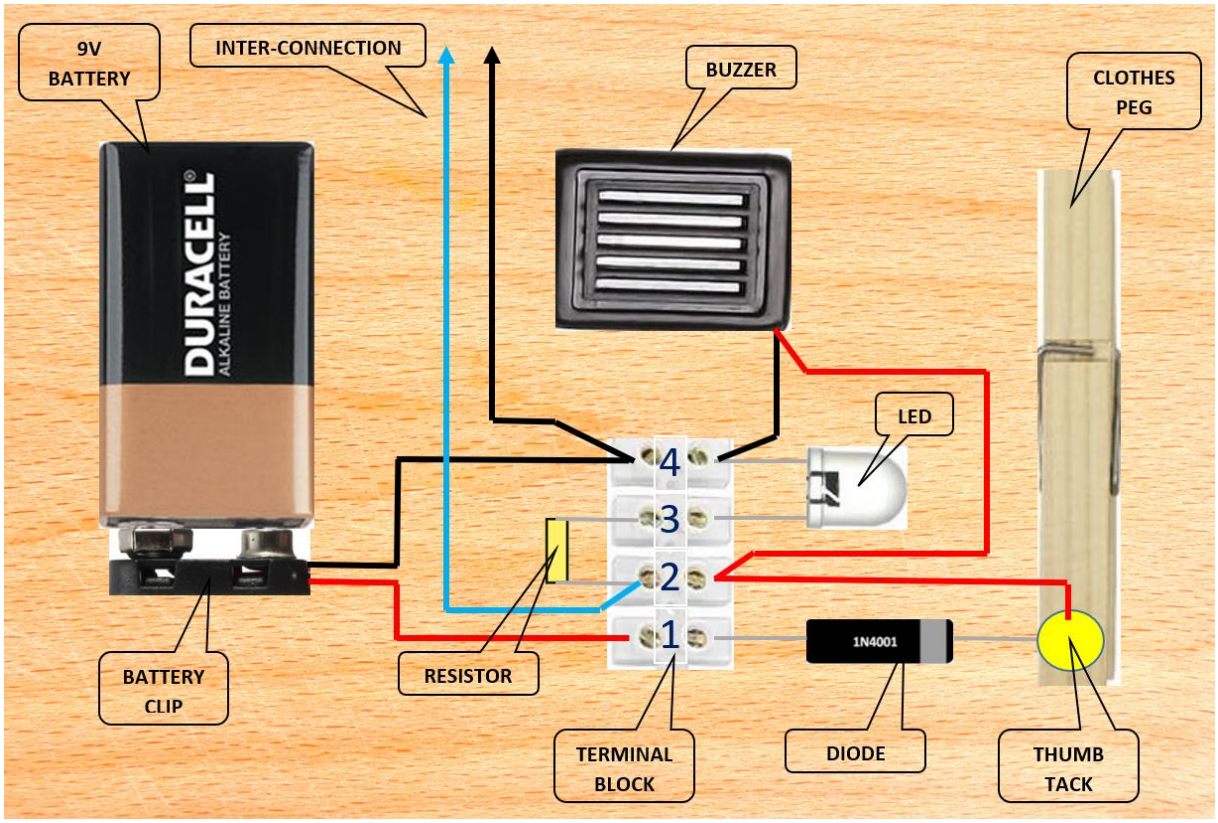
**Wooden clothes peg Morse code project (Rating 10)**

Youth members can make a simple Morse code keyer, from a wooden clothes peg, to send messages using Morse code.

Morse code is sent using a key, made using two thumb tacks pushed into the open end of a wooden clothes peg. Wires connected to a battery, thumb tacks and to a buzzer or bright Light Emitting Diode (LED) or both. Using your finger to press down on the end of the clothes peg, the thumb tacks come in to contact to send power, from a battery, to a buzzer and / or LED. A Morse code unit can be used individually or connected to another unit using a wire cable.


This project uses some common electronic components (available from electronic suppliers such as Jaycar) and is powered using a 9 volt battery. Some hand tools will be required to construct this project. Youth members should be supervised by leaders / parents.

**Morse Code Keyer Layout**




Full construction details and parts list can be found at the end of this document.

## Search for Radio Station (Rating 6)

In Australia there are hundreds radio stations broadcasting news, weather, music, sport, etc. These radio stations broadcast either in the FM VHF band (88 to 108 MHz) or AM MF band (526.5 – 1605.5 KHz). Each radio station has a unique call sign, e.g. 2GB or 2MMM.

In the FM band many of the radio stations are community based, transmitting with a lower power output to the commercial radio stations, to be heard by smaller communities. An example of a community radio station is 2SSR transmitting on 99.7 MHz.

AM radio stations were first used by amateur radio operators to broadcast entertainment such as music or reading poems, for only a couple of hours in the evening. Later AM radio stations were used by business to provide entertainment and advertise their products. Later the government established the ABC to provide commercial free content. In the major cities some commercial AM radio stations moved to the FM band, however in regional areas many AM radio stations are still transmitting.

Using a broadcast receiver, similar to the small portable radio in the photo below left, youth members can listen and find as many radio stations as possible. The telescopic antenna is only used for the FM band.


Find a location away from sources of interference, such as TV, computers, microwave oven, etc. Adjust the antenna to the vertical position and extend it fully. Starting at the bottom end of the FM band, slowly move the “tuning” knob until you hear a radio station. Note the approximate frequency, then using the list of FM radio stations, try to identify the call sign of the radio station in your local area (about 100 km radius). Adding a length of wire to the end of the telescopic antenna may improve reception.

Next try listening on the AM band, which uses a wire coil around a ferrite rod located inside the top of the radio, to receive AM radio stations. Radio stations are best heard when the ferrite rod is at 90 degrees or perpendicular to the location of the radio station.

Find a location away from sources of interference, such as TV, computers, microwave oven, etc. Starting at the bottom end of the AM band, slowly move the “tuning” knob until you hear a radio station. Note the approximate frequency, then using the list of AM radio stations, try to identify the call sign of the radio station in your local area. Turning the radio around may improve reception.

Some older AM radio receivers, similar to the photo above right, may have a connection for an external antenna. Look for either terminals marked “A” and “E” or two wires possibly coloured “white” and “black”. Connecting a length of wire to the terminal marked “A” or the end of the “white” wire, may improve reception. **WARNING: Do not attached anything to the 240 VAC mains cable and plug.**

Try listening to the AM band at different times of the day, as you may be able to hear more radio stations, further away. Times to try listening are;

- From one hour before sunset to one hour after sunset,
- Later in the evening,
- From one hour before sunrise to one hour after sunrise.

**Equipment required**

- Portable AM / FM radio receiver
- Length of copper wire (optional)
- Older AM radio receiver (optional)

**Ambulance Dispatch (Rating 6)**

This activity provides an opportunity for youth members to give clear instructions using voice only and for another to follow the instructions, with minimal or no mistakes.

This activity involves an ambulance dispatcher providing directions to an ambulance driver, using a two-way radio.



Each person has an identical maps and a miniature vehicle (such as Matchbox) which can be moved around the map. The dispatcher gives directions to the ambulance driver to proceed to an emergency, giving one instruction at a time, such turn left at the next intersection, etc.

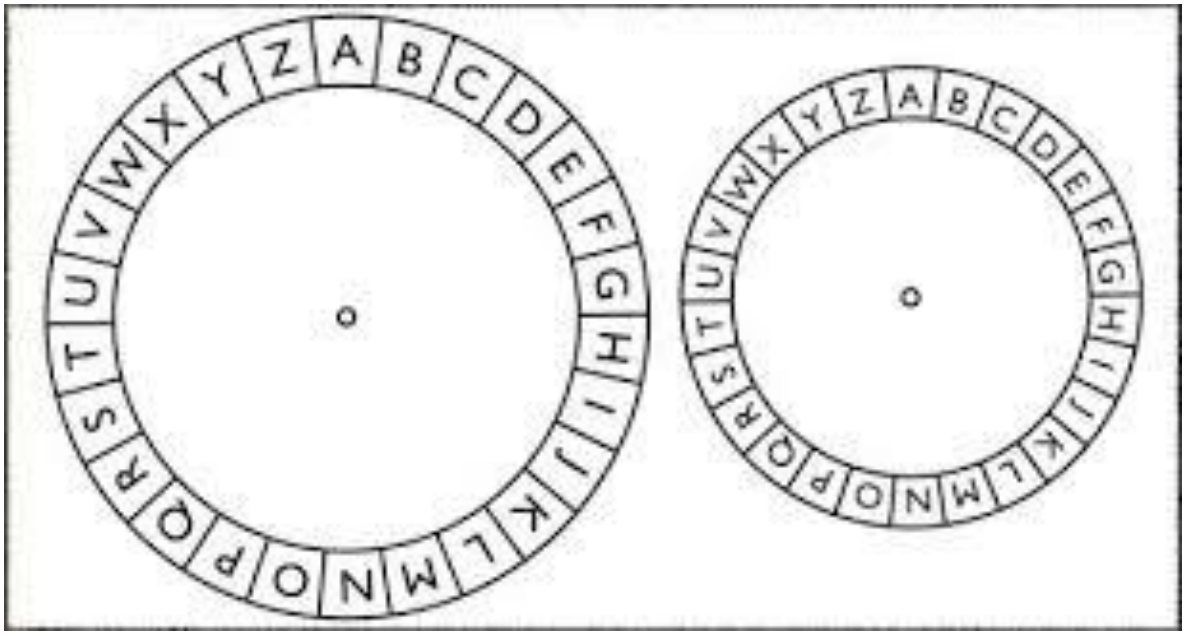
The driver acknowledges each instruction before the dispatcher gives the next direction. To challenge the dispatcher, the ambulance can start from different locations, and traffic congestion and road blocks can be added to the map.

The dispatcher and driver are located out of sight from each other. An audio intercom or audio smart chat can be used instead of two-way radios.

**Equipment required**

- Two Way Radios or audio intercom or audio chat
- Two road maps
- Road blocks
- Two Matchbox Cars

## Code wheels (Rating 5)




Messages can be coded and de-coded using a simple code wheel, consisting of two disks with the letters of the alphabet around the circumference.

Print out the code wheels above and paste onto some stiff card. Let to dry and cut around both wheels. Punch a hole in the middle of both wheels and secure together with a paper fastener.

Spin the inner wheel around so the letters do not match. For each letter in the message, match with the outer wheel and write down the corresponding letter on the inner wheel.

The encoded message can be sent using Morse code, Phonetic alphabet or Semaphore flags. By using the code wheel in reverse, the encoded message can be de-coded. If de-coded correctly should match the original message.

**Equipment required**

- The sheet of paper printed with the code wheel image.
- Stiff paper card
- Pens / pencils and paper.
- Scissors
- Paper fasteners

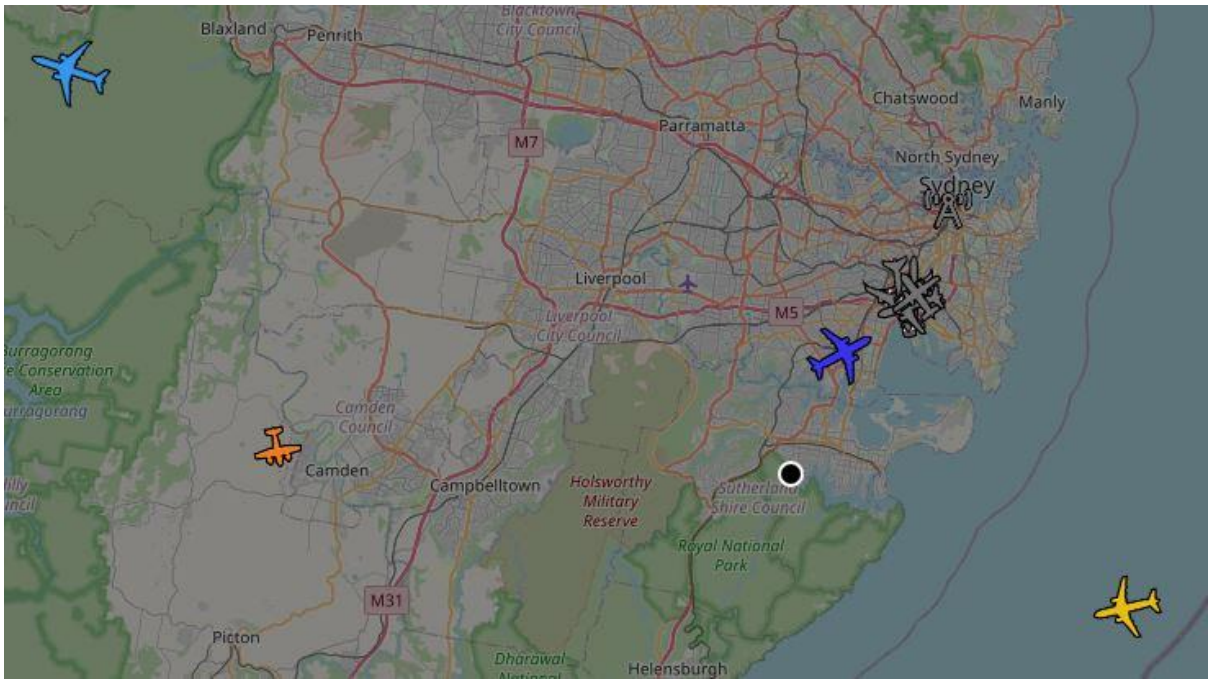
## Aircraft Spotting (Rating – 4)

Aircraft or plane spotting is a popular past time for enthusiast, by recording the planes call sign and taking photos of planes taking off and landing at the airport. Youth members can still watch for aircraft passing overhead, but how can you see the plane's call sign from the ground?

Nearly all aircraft are fitted with a special device called Automatic Dependent Surveillance - Broadcast or ADS-B for short, which uses a radio transmitter to send out information about the aircraft including the call sign, aircraft type, position (latitude & longitude), altitude; speed, etc. This information is used by air traffic controllers to monitor aircraft movements within flight corridors and around airports.

Other aircraft enthusiasts listen to the ADS-B radio frequency. The aircraft ADS-B information received on the ground, is sent to an online world maps which show aircraft position, call sign etc.

When an aircraft is seen or heard overhead, with leader / parent supervision, youth members can use a website like https://globe.adsbexchange.com to identify and record the aircraft. By allowing "globe.adsbexchange" access to your location, the map will centre on your location and show aircraft in the area. Hovering the mouse over the aircraft show the ADS-B information.




Youth members can become a plane spotter by recording the call sign of aircraft flying overhead.

### Equipment required

- Smart device or laptop or PC with internet access

## Build an Electronic Project (Rating – Varies)

Youth members may like to try their hand at building a small electronic project, depending on their ability and expertise. Information and instructions on constructing various electronics kits can be found on-line. Parts can then be sourced to complete the chosen project.

Alternatively, many electronics suppliers such as Jaycar, also provide kits complete with instructions and parts. Depending on the project, some hand tools will be required, soldering iron, solder and a multi-meter.

## Software Defined Radio (SDR) (Rating – 8)

RTL-SDR is a low cost USB dongle that can be used as a computer based radio scanner for receiving live radio signals in your area (no internet required).


Depending on the particular model it could receive frequencies from the bottom of the AM broadcast radio band (MF - 500 kHz) up to above the 23cm amateur radio band (UHF - 1.75 GHz).

Radio signals that be received include broadcast radio both AM and FM, HF amateur and marine bands, Aircraft band, VHF and UHF commercial, government and amateur radio users.

The RTL-SDR receiver works with open source software, compatible with Windows, IOS and Linux, allowing the user to select the receive frequency range and mode including FM, AM, SSB and many digital modes. Most RTL-SDR software is community developed, and provided free of charge.

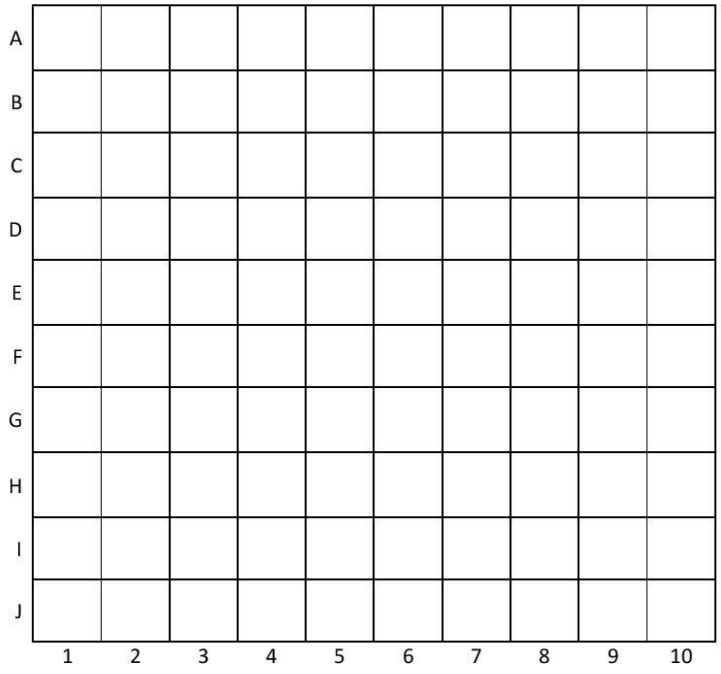
https://www.rtl-sdr.com/big-list-rtl-sdr-supported-software/

The RTL-SDR dongle will require an antenna, which will vary on size and type, depending the frequency of the radio signal to be received. As a general rule, the lower the frequency the larger the antenna.

RTL-SDR dongles can be purchased from a number of the on-line shopping web sites for under $50.00. Some sites may also offer a package of SDR dongle with a small antenna.

# Battleship Game Grid Sheet

**OPPONENT'S SHIPS**




Aircraft Carrier
AAAAA

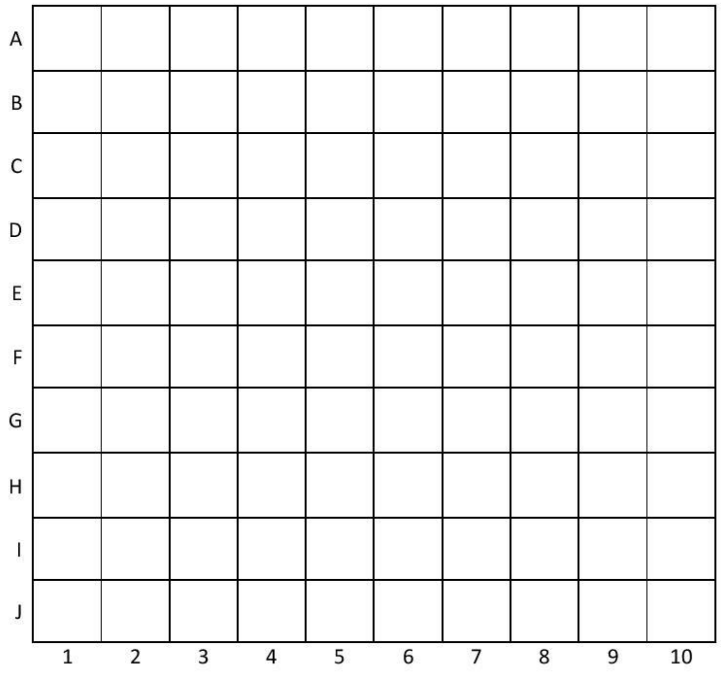
Battleship
BBBB

Cruiser
CCC

Submarine
SSS

Destroyer
DD

**MY SHIPS**




Aircraft Carrier
AAAAA

Battleship
BBBB

Cruiser
CCC

Submarine
SSS

Destroyer
DD

## Phonetic Alphabet Sheet

# PHONETIC ALPHABET

The International Radiotelephony Spelling Alphabet, commonly known as the ICAO phonetic alphabet, sometimes called the NATO alphabet or spelling alphabet and the ITU radiotelephonic or phonetic alphabet.

| | | |
|---|---|---|
| A - ALFA | M - MIKE | Y - YANKEE |
| B - BRAVO | N - NOVEMBER | Z - ZULU |
| C - CHARLIE | O - OSCAR | 1 - WUN |
| D - DELTA | P - PAPA | 2 - TOO |
| E - ECHO | Q - QUEBEC | 3 - TREE |
| F - FOXTROT | R - ROMEO | 4 - FOW-ER |
| G - GOLF | S - SIERRA | 5 - FIFE |
| H - HOTEL | T - TANGO | 6 - SIX |
| I - INDIA | U - UNIFORM | 7 - SEV-EN |
| J - JULIETT | V - VICTOR | 8 - AIT |
| K - KILO | W - WHISKEY | 9 - NIN-ER |
| L - LIMA | X - XRAY | 0 - ZEE-RO |

# AM Broadcast Radio Station NSW & ACT List

| Area Served | Callsign | Frequency(kHz) | State |
|---|---|---|---|
| Kempsey | 2PM | 531 | NSW |
| Cumnock | 2CR | 549 | NSW |
| Cumnock | 2CR | 549 | NSW |
| Broken Hill | 2BH | 567 | NSW |
| Sydney | 2RN | 576 | NSW |
| Sydney | 2RN | 576 | NSW |
| Bourke | 2WEB | 585 | NSW |
| Nowra | 2RN | 603 | NSW |
| Sydney | 2PB | 630 | NSW |
| Coffs Harbour | 2HC | 639 | NSW |
| Tamworth | 2NU | 648 | NSW |
| Tamworth | 2NU | 648 | NSW |
| Byrock | 2BY | 657 | NSW |
| Canberra | 2CN | 666 | ACT |
| Canberra | 2CN | 666 | ACT |
| Corowa | 2CO | 675 | NSW |
| Corowa | 2CO | 675 | NSW |
| Kempsey | 2KP | 684 | NSW |
| Kempsey | 2KP | 684 | NSW |
| Sydney | 2BL | 702 | NSW |
| Sydney | 2BL | 702 | NSW |
| Armidale | 2RN | 720 | NSW |
| Murwillumbah | 2ML | 720 | NSW |
| Murwillumbah | 2ML | 720 | NSW |
| Grafton | 2NR | 738 | NSW |
| Grafton | 2NR | 738 | NSW |
| Taree | 2TR | 756 | NSW |
| Bega | 2EC | 765 | NSW |
| Gosford | | 801 | NSW |
| Bega | 2BA | 810 | NSW |
| Bega | 2BA | 810 | NSW |
| Glen Innes | 2GL | 819 | NSW |
| Glen Innes | 2GL | 819 | NSW |
| Canberra | 2RN | 846 | ACT |
| Canberra | 2RN | 846 | ACT |
| Sydney | 2GB | 873 | NSW |
| Sydney | 2GB | 873 | NSW |
| Lismore | 2LM | 900 | NSW |
| Lithgow | 2LT | 900 | NSW |
| Cooma | 2XXL | 918 | NSW |
| Sydney | 2UE | 954 | NSW |
| Sydney | 2UE | 954 | NSW |

| Area Served | Callsign | Frequency(kHz) | State |
|---|---|---|---|
| Griffith | 2RG | 963 | NSW |
| Cobar | 2DU | 972 | NSW |
| Murwillumbah | 2MW | 972 | NSW |
| Muswellbrook | 2NM | 981 | NSW |
| Broken Hill | 2NB | 999 | NSW |
| Nowra | 2ST | 999 | NSW |
| Sydney | 2KY | 1017 | NSW |
| Wollongong | 2EA | 1035 | NSW |
| Muswellbrook | 2UH | 1044 | NSW |
| Canberra | 2CA | 1053 | ACT |
| Gunnedah | 2MO | 1080 | NSW |
| Orange | 2EL | 1089 | NSW |
| Goulburn | 2RN | 1098 | NSW |
| Sydney | 2EA | 1107 | NSW |
| Canberra | 1RPH | 1125 | ACT |
| Armidale | 2AD | 1134 | NSW |
| Newcastle | 2HD | 1143 | NSW |
| Wagga Wagga | 2WG | 1152 | NSW |
| Sydney | 2CH | 1170 | NSW |
| Sydney | 2CH | 1170 | NSW |
| Sydney | 2CH | 1170 | NSW |
| Sydney | 2CH | 1170 | NSW |
| Inverell | 2NZ | 1188 | NSW |
| Canberra | 2CC | 1206 | ACT |
| Canberra | 2CC | 1206 | ACT |
| Grafton | 2GF | 1206 | NSW |
| Bowral | | 1215 | NSW |
| Sydney | 2RPH | 1224 | NSW |
| Newcastle | 2NC | 1233 | NSW |
| Newcastle | 2NC | 1233 | NSW |
| Dubbo | 2DU | 1251 | NSW |
| Sydney | 2SM | 1269 | NSW |
| Sydney | 2SM | 1269 | NSW |
| Tamworth | 2TM | 1287 | NSW |
| Wollongong | | 1314 | NSW |
| Canberra | | 1323 | ACT |
| Newcastle | | 1341 | NSW |
| Young | 2LF | 1350 | NSW |
| Goulburn | 2GN | 1368 | NSW |
| Penrith | | 1386 | NSW |
| Lithgow (City) | 2LG | 1395 | NSW |
| Parkes/Forbes | 2PK | 1404 | NSW |
| Newcastle | 2EA | 1413 | NSW |
| Wollongong | 2RN | 1431 | NSW |
| Wollongong | 2RN | 1431 | NSW |

| Area Served | Callsign | Frequency(kHz) | State |
|---|---|---|---|
| Canberra | 1EA | 1440 | ACT |
| Mudgee | 2MG | 1449 | NSW |
| Newcastle | 2PB | 1458 | NSW |
| Wilcannia | 2RN | 1485 | NSW |
| Wollongong | 2EA | 1485 | NSW |
| Albury | 2AY | 1494 | NSW |
| Newcastle | 2RN | 1512 | NSW |
| Newcastle | 2RN | 1512 | NSW |
| Deniliquin | 2QN | 1521 | NSW |
| Moree | 2VM | 1530 | NSW |
| Sydney | | 1539 | NSW |
| Taree | 2RE | 1557 | NSW |
| Wollongong | | 1575 | NSW |
| Narooma | 2EC | 1584 | NSW |
| Wilcannia | 2WA | 1584 | NSW |
| Cooma | 2CP | 1602 | NSW |

## FM Broadcast Radio Station Greater Sydney Metropolitan List

| Area Served | Callsign | Frequency (MHz) |
|---|---|---|
| Bankstown | 2BAC | 100.9 |
| Blacktown | 2SWR | 99.9 |
| Burwood | 2RDJ | 88.1 |
| Byron Bay | 2BAY | 99.9 |
| Camden | 2UUS | 88.3 |
| Campbelltown | 2MAC | 91.3 |
| Campbelltown | 2MCR | 100.3 |
| Chatswood | 2NSB | 99.3 |
| Gosford | 2BL | 92.5 |
| Gosford | 2SNR | 93.3 |
| Gosford | 2GCB | 94.9 |
| Gosford | 2CCC | 96.3 |
| Gosford | 2PNN | 98.1 |
| Gosford | 2CFM | 101.3 |
| Gosford | 2GOS | 104.5 |
| Gosford | 2GGO | 107.7 |
| Hornsby | 2HHH | 100.1 |
| Illawarra | 2PNN | 90.9 |
| Illawarra | 2ABCFM | 95.7 |
| Illawarra | 2ILA | 97.3 |
| Illawarra | 2JJJ | 98.9 |
| Katoomba | 2BLU | 89.1 |
| Katoomba | 2ONE | 96.1 |
| Katoomba | 2ICE | 99.5 |
| Katoomba | 2LT | 101.1 |

| Area Served | Callsign | Frequency (MHz) |
|---|---|---|
| Katoomba | 2ONE | 96.1 |
| Katoomba | 2ICE | 99.5 |
| Katoomba | 2LT | 101.1 |
| Liverpool | 2GLF | 89.3 |
| Manly North | 2MWM | 88.7 |
| Manly South | 2MWM | 90.3 |
| Narwee | 2NBC | 90.1 |
| Parramatta | 2CCR | 90.5 |
| Penrith | 2WOW | 100.7 |
| Penrith | 2WOW | 100.7 |
| Ryde | 2RRR | 88.5 |
| Sutherland | 2SSR | 99.7 |
| Sydney | 2RSR | 88.9 |
| Sydney | 2MFM | 92.1 |
| Sydney | 2MFM | 92.1 |
| Sydney | 2ABCFM | 92.9 |
| Sydney | 2LND | 93.7 |
| Sydney | 2LND | 93.7 |
| Sydney | 2FBI | 94.5 |
| Sydney | 2PTV | 95.3 |
| Sydney | 2SYD | 96.9 |
| Sydney | 2SBSFM | 97.7 |
| Sydney | 2OOO | 98.5 |
| Sydney | 2UUS | 101.7 |
| Sydney | 2UUS | 101.7 |
| Sydney | 2MBS | 102.5 |
| Sydney | 2CBA | 103.2 |
| Sydney | 2DAY | 104.1 |
| Sydney | 2DAY | 104.1 |
| Sydney | 2MMM | 104.9 |
| Sydney | 2MMM | 104.9 |
| Sydney | 2JJJ | 105.7 |
| Sydney | 2WFM | 106.5 |
| Sydney | 2WFM | 106.5 |
| Sydney | 2SER | 107.3 |
| Sydney Eastern Suburbs | 2RPH | 100.5 |
| Waverley (NSW) | 2RES | 89.7 |
| Wollongong | 2RPH | 93.3 |
| Wollongong | 2UUL | 96.5 |
| Wollongong | 2WIN | 98.1 |
| Wollongong | | 105.3 |
| Wollongong | 2VOX | 106.9 |
| Wollongong / Nowra | 2LIV | 94.1 |

## Morse Code project - construction details and parts list

Youth members can make a simple Morse code keyer, to send messages, using a wooden clothes peg and some other electronic parts, mounted on a piece of soft (pine) timber about 4 to 6 inches (10cm to 15cm) square or rectangle.

Following is a list of parts which can be found at a hardware, department and electronics store, or purchased on-line. Quantities are for a single Morse code unit. Double the quantity for two units and add the interconnecting cable.

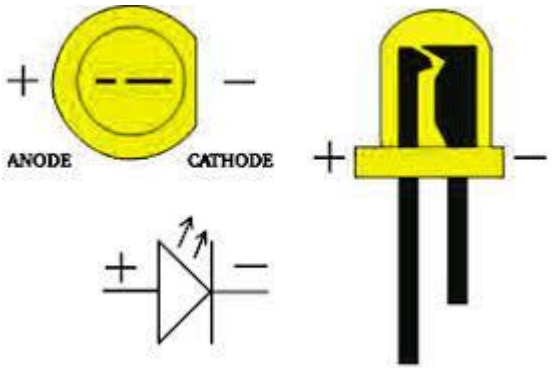
A diagram showing the layout and connection of the parts is shown at the end of this document. Construction of the wooden peg Morse code keyer is shown below. The insulation should be removed at the end of connecting wire and wrapped under the head of thumb tacks, same for one end of the diode.

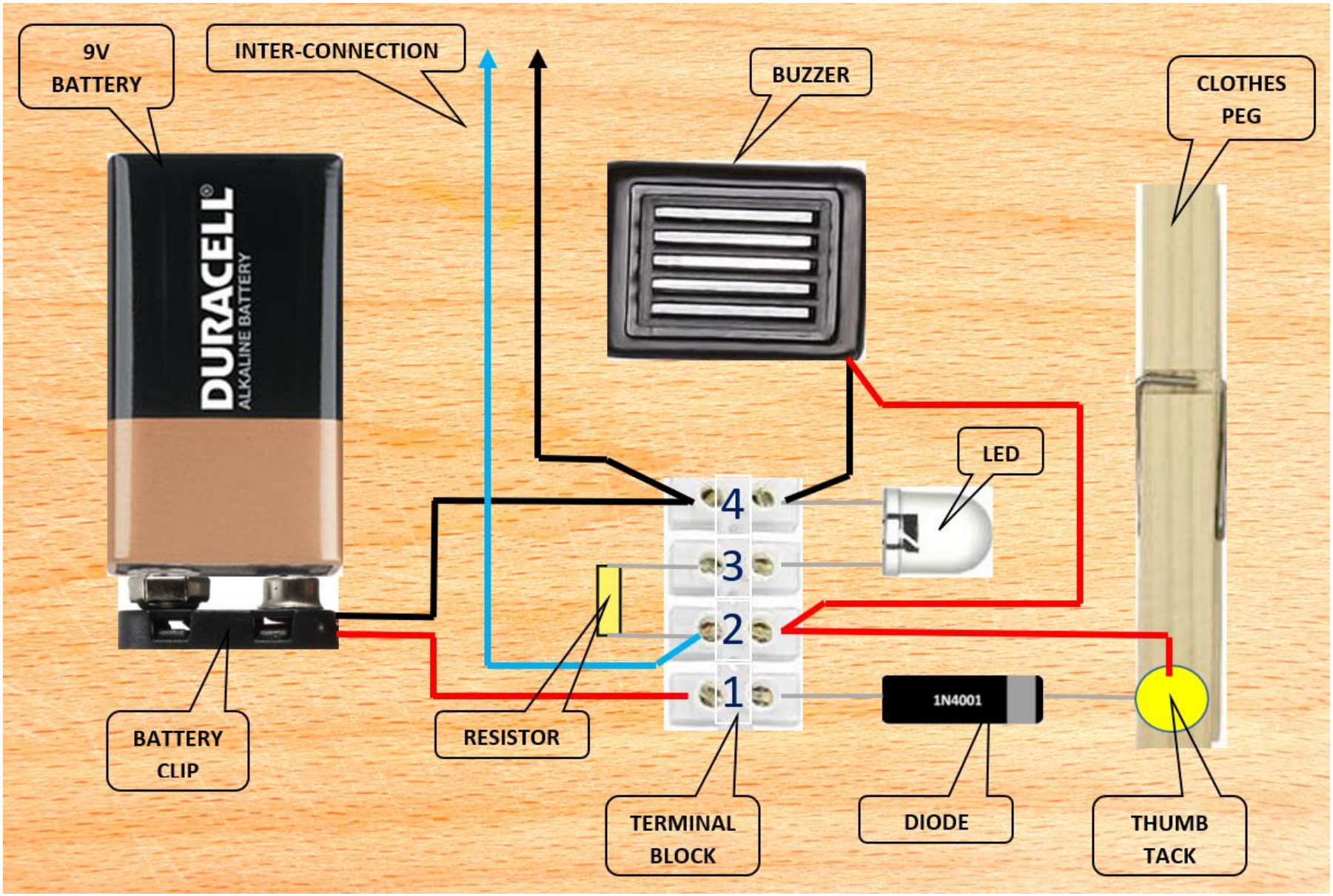

## Equipment required

| Quantity | Description |
|---|---|
| 1 | Wooden Clothes Pegs |
| 4 | Thumb Tacks |
| 1 | 9 Volt Battery |
| 1 | Battery Connectors to suit (Jaycar Cat No PH9234) |
| 1 | Mini Buzzer 5 to 15 VDC (Jaycar Cat No AB3452) |
| 1 | **Optional** - Light Emitting Diode (LED) 10mm White (Jaycar Cat No ZD0220 ) or other colour of your choice |
| 1 | **Optional** - Resister 300 ohm ¼ watt (Jaycar Cat No RR0559) See Note 1 |
| 1 | 4 way terminal strip (Jaycar Cat No HM3200) See Note 2 |
| 1 | Diodes IN4001 or IN4004 (Jaycar Cat No ZR1004 or ZR1007) See Note 3 |
| 1m | Hook up wire (Jaycar Cat No WH3041) or similar |
| 6 | Small wood screws See Note 4 |
| 1 | Timber mounting block - about 4 to 6 inches (10cm to 15cm) |
| 1 | Wide elastic band (to secure the 9 volt battery) See Note 5 |
| | |
| Per metre | Light Duty Fig 8 - 2 core Cable (Jaycar Cat No WB1702) See Note 6 |

## Construction Notes

1. Pack from Jaycar contains two more or resisters. An additional pack is not required to construct a 2nd Morse code unit.
2. Terminal strip from Jaycar is a 12 way strip. 4 terminals will need to be cut off. The off cut can be used to construct a 2nd Morse code unit.
3. Pack from Jaycar contains two more or diodes. An additional pack is not required to construct a 2nd Morse code unit. Ensure the diode is connected as shown in the layout diagram.
4. Parts such as the wooden peg, terminal strip and buzzer can be secured to the timber mounting block by drilling a small hole in the block and fixing in place with small wood screws. An alternative method is to secure to the block using a hot glue gun.
5. The 9 volt battery can be secured to the wooden block using a wide elastic band over the battery and secured either side with thumb tacks.
6. The 2 core cable is only required to interconnect two of the Morse code units. This cable is not required if only constructing one of the units. If used, ensure terminal 3 is connected to terminal 3, and terminal 4 is connected to terminal 4.
7. The LED is polarity sensitive and will only work when connected correctly. Connect the Anode (+) to terminal 3 and the Cathode (-) to terminal 4.




9V
BATTERY
INTER-CONNECTION
BUZZER
CLOTHES
PEG
DURACELL
ALKALINE BATTERY
LED
4
3
2
1
1N4001
BATTERY
CLIP
RESISTOR
TERMINAL
BLOCK
DIODE
THUMB
TACK