

AN INTRODUCTION TO FIRST TIME OPERATING FOR THE M3



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Equipment

New or second hand equipment.

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Making Your First Contact

RETAILERS OF BOOKS & EQUIPMENT.

People

Radio

Books

Magazines

Internet

Clubs

EQUIPMENT

New or Second Hand

Just a few words about the purchasing of any equipment whether it's New or Second Hand,

Unless you know someone who has knowledge about Amateur radio equipment the odds are that you don't have much of a clue as to what you are looking for.

As a Foundation Licence holder remember you are only allowed to run 10 watts of power from your radio.

You can purchase a radio that will give 100 watts of output power but you must be able to lower the output to 10 watts or you will be in breach of your licence.

So as you are a beginner I suggest that you seek the help and advice of someone who will point you in the right direction or better still go along with you when you go to purchase your equipment.

As with any Hobbies you can buy new or used items.

The problem with Buying new from Amateur Radio outlets is that they are far and few between so unless you are lucky enough to live locally to one anything that you purchase will have to be mail order.

There are a few ways to order items,

- 1) Order out of a Magazine by post.
- 2) Order over the phone (Get phone No out of a Magazine or Telephone directory).
- 3) Order over the Internet

(This is the easiest & fastest way if you have Internet Accesses).

If you decide to purchase second hand equipment be well advised as above to seek help from someone who is knowledgeable or better still ask them to go along with you to check out the item before you part with your hard earned money.

You never know, the person that you are going to ask for help may have what you need He may even be willing to sell it to you for a very reasonable price.

SO NEVER BE AFRAID TO ASK FOR HELP OR ADVICE.

RADIO TRANSCEIVERS.

Icom, Yaesu, Kenwood & Alinco are just 4 of the many Manufacture's of Radio equipment that you will come across ether on radio or in books & magazines.

The Manufacture's above have all in one way or another produced some very nice pieces of equipment over the years.

They have made use of modern technology and incorporated it into all the equipment that is on sale in radio outlets today.

The radios vary from basic to state of the art and of course so do the price tags.

Here are a few examples of Radio that you may come across.

**Alinco DJ 193E, Budget Vhf 2m
5 watt Handheld Radio.
About £99 New.** →



**Icom IC-2725E Duel band
Vhf/Uhf 2Mtr & 70Cm
Mobile or base if used with
Power supply. About £270 New** ↓



**YAESU FT-847
HF 6M 2M 70CM
All you need in one box. ↓
About £989 New**



**Icom IC-T90 Vhf/Uhf
3 Band Handheld Radio
6Mtr, 2Mtr, & 70 CM.
Up to 5 Watts output.
About £270 New.** →



All of these radios can be bought second hand at very good prices.

Power Supplies

The Power Supply or PSU as it is known is the heart of your shack, because without power you cannot run your radio.

Some larger base station radios do have a built in PSU that enables them to be plugged straight into the Mains supply, but the majority of sets need an external PSU.

So what type do you need, well for a start consider the output of your radio.

As the holder of the Foundation licence you can only run 10 watts output power, so running 10 watts would need about 5-7 amps at 13.8volts from the PSU but its always better to get something that can deliver more amperage than you are using at the present time.

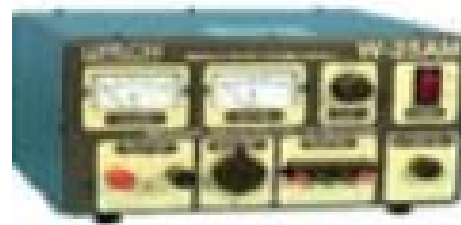
That way when you start adding to your station, items like a second radio for example can be run from the PSU, and you won't have to worry that your PSU won't be able to cope with the work load.

So go for something like a 20-25 amp or 25-30 amp at 13.8volts PSU, one of these could do the job of running your radio and some extras quit easily.

Here are a couple of examples of the types of PSU available

Manson EP-925

A general purpose
3-15V DC, 25A (30A peak) power supply
able to provide the needs of
The modern 100W HF transceiver.
Duel analogue meters, Volts & Amps.
Over current protection
Large power terminals for connecting your
Radio.
Quick snap connectors for ancillaries
About £99.95 New.



Watson W-25 AM

↑ General purpose 25-30 Amp max with 2
Analogue dials for Volts & Amps
2 Large, terminals for the radio,
1 cigar lighter Type socket and a bank of
Quick snap Connectors for ancillaries
About £89.95 New

VSWR METER

The VSWR (Voltage Standing Wave Ratio) meter is a very important piece of equipment as it indicates how well tuned to the coax the antenna is, So should be near the top of your must have list. Also make sure the one you purchase covers the band or bands you are most likely using.

Although these days it has become one of the built in functions of the modern radio there's nothing like a standalone unit that has been purpose built for the job.

When putting up an antenna, whether it's for home base, mobile or out portable it's always important to have one of these meters on hand.

E.g.

You have spent half the day putting up the 2mtr antenna in possibly cold and wet weather.

You stand back looking at the antenna thinking I'm glad that's over.

Then you pack all the tools away get yourself cleaned up, you go in the shack plug the coax into the back of the radio turn the radio on and hear nothing just a shushing noise it's very annoying.

It means that you have got to start over again, get every thing back out and take it all down to try and trace the fault.

Before locking off all the bolts that hold your antenna in place, check where the coax connects to the antenna to make sure that none of the outer screen is touching the centre core the same applies if the antenna is designed to take a plug.

Make sure that the coax is soldered in place correctly and that the outer isn't touching the inner.

Position the antenna where you want it just hand tighten the nuts or bolts, go into the shack solder the plug on the radio end of the coax making sure the screen isn't touching the centre.

Using a patch lead (**short length of coax about 12 inch long with a plug on each end**) connect the VSWR meter to the radio.

One end of the patch lead goes into the antenna socket on the back of the radio; the other end of the patch lead goes into the socket on the back of the VSWR meter labelled TX or TRANSCIEVER.

The end of the antenna coax needs to be plugged into the other socket on the VSWR meter labelled ANTENNA.

Turn the radio on find a clear channel lets say 145.525 make sure it's clear by listening, then make sure your radio is on the lowest power setting available before transmitting.

A basic VSWR meter will have a switch for selecting SWR / CALIBRATE plus a small KNOB to make adjustments in calibrate mode.

Start by selecting CALIBRATE then press the key on the microphone while looking at the meter, you should see the needle move across to the right where you should see the word SET or CAL and a small marker where the needle should rest when calibrated.

If it doesn't reach this point or goes beyond it use the small knob to reposition it, once you have set the calibration let go of the microphone key.

Now move the switch on the VSWR meter to SWR; this time the needle needs to be as low to the left as possible for the best results.

Now key the microphone if the needle hardly moves then things are looking good but if the needle goes over to the right there is a problem some where.

It could be in the plugs or the coax or even the antenna itself, so with help from a friend you would have to eliminate each possible cause.

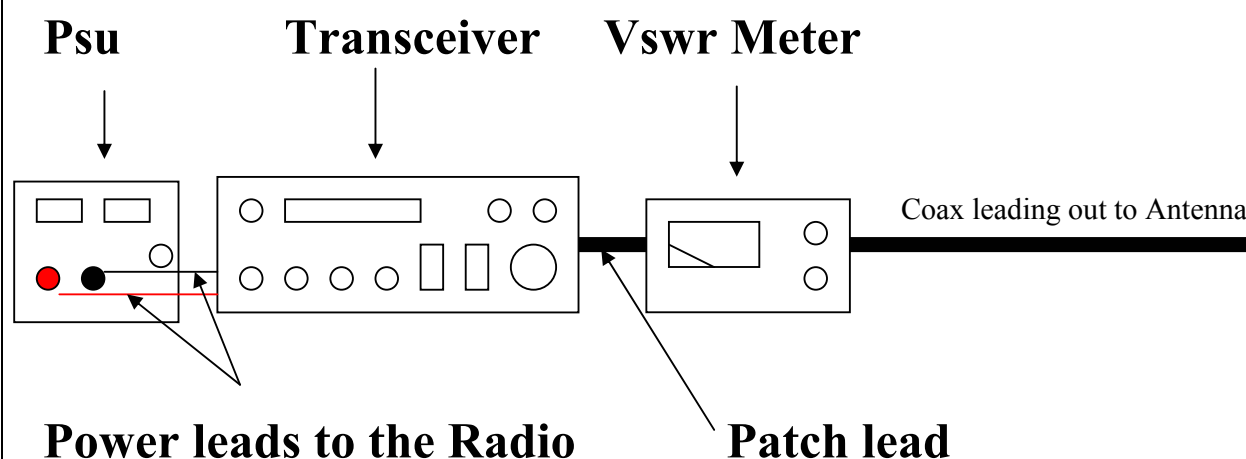
But let's say all is well and the reading you get is low, you can now turn your power up a little higher and repeat the procedure.

Check the CALIBRATION, switch to SWR if all is still ok turn the power up to the ten watts that you are allowed to use and do a final check.

If all is ok you can secure the antenna in place, put your tools away grab a cup of tea and relax in front of the radio with the knowledge that all is well.

It's a good idea to leave the meter in line, that way you can keep an eye on things whilst operating the radio.

A DIAGRAM SHOWING BASIC LAYOUT & CONNECTION OF EQUIPMENT



Connect Radio to power supply **DO NOT** turn anything on until you have checked that it is all connected correctly.

RED wire to RED terminal, BLACK wire to BLACK terminal

Using a Patch lead one end connected to the Radio Antenna socket the other end to the Vswr Meter (Plug into socket named TX), Then connect the antenna up to the Vswr Meter (Plug into socket named Antenna).

Now you are all ready to switch on.

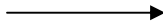
THREE EXAMPLES OF VSWR METERS



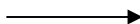
Avair AV-400
140-525 MHz
5W, 20W, 200W, 400W
Vswr / Power meter
About £49.95 New



MFJ-816 VSWR / Watt Meter
1.8-30 MHz, 30/300W
Cross needle meter
Switched Power level setting
About £50 New



MFJ-874 VSWR / Power meter
HF/VHF/UHF, 1.8-525 MHz
5, 20, 200 Watts Power settings
About £70 New



ANY OF THE ABOVE CAN ALSO BE BOUGHT SECOND HAND.

VHF ANTENNA'S

VHF (Very High Frequency) this is where most people start off on the amateur bands, it's generally Quiet and used mostly for local chatter which is good as you can get to know local amateurs in your area. The band used is the 2mtr band 144.000 – 146.000 MHz various Modes are used within the band but mostly the FM portion which is 145.300 – 145.775 where the locals gather to chat. VHF is mainly line of sight when it comes to the distance your signal will travel, so when erecting an antenna it's best to get it up as high as possible away from any obstructions.

There are all sorts of designs for antennas used on 2mtr but a good quality vertical is the place to start, you will need one that will stand up to strong gales in the winter months if it is to be mounted high above the ground.

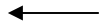
NOTE

The Majority of antennas are Duel Band, which cover VHF & UHF (145MHz & 430MHz).

HERE ARE A FEW EXAMPLES: -



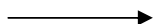
**THE DIAMOND X50
VHF/UHF DUEL BAND
BASE ANTENNA
About £54.95 New**



**SLIM-JIM 2Mtr
FOLDED DIPOLE
IDEAL FOR LOFT
INSTALLATION
About £24.99 New**



**DIAMOND X300
2Mtr/70Cm DUEL BAND
ANTENNA
About £99.95 New**



**WATSON W-30
2Mtr/70Cm DUEL BAND
ANTENNA
About £39.95 New**



YOU, YOUR ANTENNA AND SAFETY.

The following text is taken from a Safety booklet please read carefully.

WARNING INSTALLATION OF ANY ANTENNA NEAR POWER LINES IS DANGEROUS FOR YOUR SAFETY, FOLLOW THE INSTALLATION DIRECTIONS

Each year hundreds of people are killed, or receive severe permanent injuries when attempting to install or remove an antenna. In many cases, the victim was aware of the danger of electrocution, but did not take adequate steps to avoid the hazard.

For your safety, and a proper installation, please READ and FOLLOW the safety precautions that follow - THEY MAY SAVE YOUR LIFE.

GENERAL SAFETY INSTRUCTIONS

- 1/ If you are installing an antenna for the first time, for your own safety as well as others,
HELP & ADVICE
- 2/ Select your installation site with safety, as well as performance, in mind.
REMEMBER: ELECTRIC POWER LINES AND PHONE LINES LOOK ALIKE. FOR YOUR SAFETY, ASSUME THAT ANY OVERHEAD LINES CAN KILL YOU.
- 3/Plan your installation procedures carefully before you begin. Ask for help, it will make the task far Easier and safer.
- 4/When installing your antenna, REMEMBER:
DO NOT try erecting it on very windy or wet days.
DO NOT attempt to do the job on your own especially when it involves using ladders.
DO dress properly, sturdy shoes, gloves & jacket.
- 5/If the assembly starts to drop get away from it and let it fall. REMEMBER: The antenna, mast, Cable and metal guy lines are all excellent conductors of electrical current. Even the slightest Touch of any of these parts to a power line completes an electrical path through the antenna and The installer THAT'S YOU!

6/If any part of the antenna system should come in contact with a power line, **DON'T TOUCH IT OR TRY TO REMOVE IT YOURSELF. CALL YOUR LOCAL POWER COMPANY.** They will Remove it safely.

7/If an accident should occur with the power lines:

DON'T grab hold of the person in contact with the antenna and power line or you too will be Electrocuted.

DON'T let any one touch the injured person; get someone to send for the emergency services.

SITE SELECTION:

Before attempting to install your antenna, think where you can best place your antenna for safety and performance. To determine a safe distance from wires, power lines and trees:

1/Measure the height of your antenna.

2/Add this length to the length of your tower or mast.

3/Then double this total for the minimum recommended safe distance.

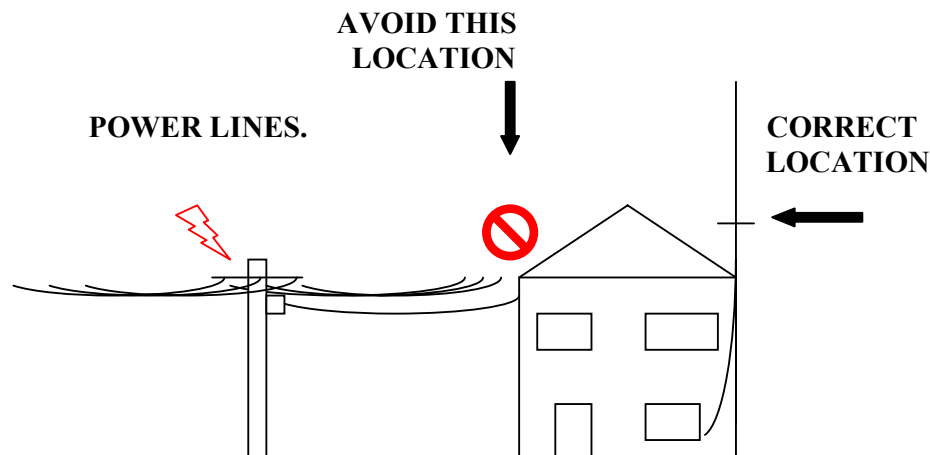
If you are unable to maintain this safe distance, **STOP & SEEK ADVICE.** Or select an alternative location.

Most antennas are supported by pipe masts attached to the chimney or the side of the house.

Antennas can also be attached to self-supporting towers or masts; generally the higher the antenna is above ground the better it performs.

Good practice is to install your vertical antenna about 5 to 10 feet above the roof ridge and away from power lines and obstructions.

If possible find a mounting place directly above your radio, where the antenna feeder can take a short, vertical drop on the outside of the house for entry through a wall or window frame near the radio.



REMEMBER IF YOU ARE UNSURE ABOUT WHAT TO DO OR ARE DOUBTFUL ABOUT WHETHER YOU CAN HANDLE THE JOB -STOP & SEEK ADVICE.

PLUGS & COAXIAL

Plugs and Coaxial are two components that are required to enable the antenna to be connected to the radio.

So let's start with Plugs, there are two commonly used types of plug one is known as the **PL259** and the other is the **BNC**.

Most modern Transceivers have **SO239** sockets on the back panel which takes the **PL259** plug, there are 2 sizes of PL259 plug, one has a large hole in the back to enable it to accept heavy duty low loss coax, the other has a fixed narrow entrance to be used with light weight coax (it is possible to obtain plugs that have a removable insert which is called a reducer, with it fitted it only accepts thin coax, when removed it will accept the thicker low loss coax.).



This picture is of a PL259 plug that was designed to be used with low loss coax (RG213 U) which is quite thick.



This picture shows a PL259 plug that was designed to be used with the thinner coax (RG58C/U), which because it is thin is very flexible and therefore easy to work with when feeding it around inside the car or inside the shack.

Both these plugs are easy to solder when attaching the coax.

To connect to the radio it is just pushed into the socket and the outer sleeve is screwed up tight.



This picture is of a completely different type of plug this is the BNC type, which is used quite often on hand held radios. The handy thing about this plug is that to connect it to the socket on the radio all you do is push it into position and twist it is then locked in place.

The down side to this type of plug is the soldering as it contains small parts, which can be quite a task to try and put together in the correct order.

Soldering a Plug to Coax

To connect the coax to the plug the coax has to be prepared, while preparing the coax it's a good idea to plug the soldering iron in to be warming up this will save time later.

To prepare the coax it has to have the outer cover removed about an inch and a half from the end to reveal the outer braiding.

The braid has to be folded back over the black outer covering; this then reveals the plastic that is covering the centre core of the coax. Taking a sharp knife carefully remove about half an inch of the plastic but don't cut too deep or you may cut into or straight through the copper centre, if you do cut the centre you will have to start again.

After the coax has been prepared you need to select the plug that you are going to use.

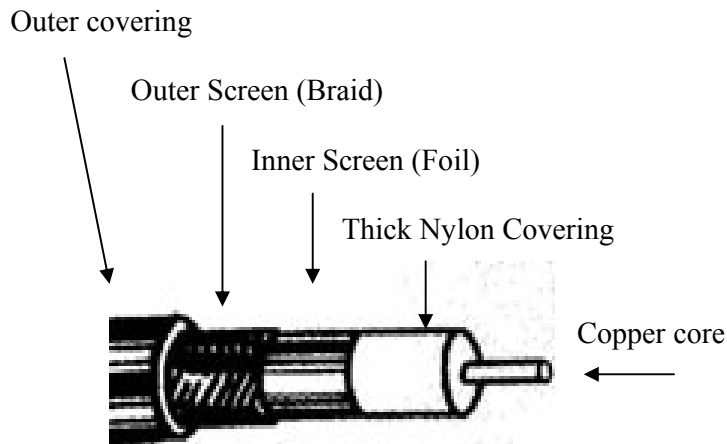
If the Plug you are going to use is a used one it needs to be checked for blockages inside such as any bits of solder or strands of copper from the previous coax it was connected to.

If there is any of the above it needs to be removed before attempting to insert the new coax, this is done by heating up the plug with a good quality soldering iron and tapping it on the bench so that anything inside comes out.

Then with a piece of fine sand paper gently give the centre pin a little rub inside and out this will give the solder grip and strength when it is applied.

The Diagram below is of low loss coax which consists of a centre copper core that has a thick nylon covering.

Next is a fine metal foil this is the first screen that stops any RF (Radio Frequency) escaping, this also has a covering of copper strands that makes up the second screen, then finally the black plastic outer casing which protects it all from the elements and possible damage.



Before soldering the plug on to the coax you need to warm the centre core of the coax and apply a light covering of solder, once you have done that take the outer ring off the PL259 Plug and slip it onto the coax and let it slide down out of the way.

Now take the plug itself and with a screwing method insert the coax into the plug until the core starts to appear out of the end of the centre pin, the outer braid will become trapped between the inside of the PL259 entrance hole and the black plastic outer casing of the coax itself which will make a good tight fit. Any braid that is protruding from the back of the plug can be carefully trimmed off.

When you have done this and you are satisfied that the coax is all the way in, you can apply heat to the centre pin of the plug and the copper core with the soldering iron at the same time adding solder until it has filled up the end of the centre pin.

If the copper core of the coax protrudes out of the end snip it off and file it smooth for a neat finish.

Now retrieve the outer ring of the plug that you slipped on the coax earlier and screw it back into place on the PL259 plug, and away you go.

Practice & Procedure

THE UK PREFIX LIST & CLASS OF LICENCE

A Class, Maximum Power 400 Watts.

G. 0, 1, 2, 3, 4, 6, 7, or 8.

M. 0, 1, or 5.

Special Event Stations

GB, GX, MX,

Intermediate, Maximum Power 50 Watts.

2E0. 2E1.

Foundation, Maximum Power 10 Watts.

M3.

SIGNAL REPORTS

Readability

1	Unreadable
2	Barely readable, some words
3	distinguishable
4	Readable with considerable difficulty
5	Readable with practically no difficulty

Signal strength

1	Faint signals, barely perceptible.
2	Very weak signals.
3	Weak signals.
4	Fair signals.
5	Fairly good signals.
6	Good signals.
7	Moderately strong signals.
8	Strong signals.
9	Extremely strong signals.

Any signal that is fading in and out has what is called **QSB**.

Any static noise with the signal is called **QRN**.

Any interference from local stations is called **QRM**.

So you could give a **57+QSB RPRT**, **57+QRM**, and **57+ QRN**.

Or any combination of the above.

THE LOG BOOK

Below is a sample Log book showing how to fill one in.

The appropriate Date.

The time you started & finished Qso.

The frequency you used .

The mode of operation.

The call sign of station worked.

Signal strength & Audio quality.

Qsl card sent or Received.

Location of station worked.

Any comments or Info.

DATE	TIME		FREQUENCY (MHz)	MODE	STATION WORKED	REPORT		QSL		LOCATION	REMARKS
	START	FINISH				SENT / RECEIVED	IN	OUT			
26FEB06	19:00	19:35	145.300	FM	G3VDV	59	57			MABLETHORPE LINCS	NEVIL, LIKES BIRD WATCHING.
27FEB06	14:15	15:10	145.550	FM	G0CBM/P	57	55 +QSB			STENIGOT	CHARLIE, MANPACK PORTABLE.
28FEB06	12:30	12:45	145.300	FM	M0RJP/M	58	59			HUTTOFT CAR TERRACE	RICHARD, THE DX SHARK OUT IN THE CAR.
01MAR06	09:50	10:30	145.450	FM	2E0NCG	59	58			MABLETHORPE LINCS	MARK, THE STICKELBACK LOOKING FOR DX.

Always remember that in the summer all the clocks in your house will be showing British summer time, but the clock that you use for your log book should be set for GMT (AN HOUR BEHIND ALL THE OTHER CLOCKS IN THE SUMMER).

PHONETIC ALPHABET

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.....

ALPHA
BRAVO
CHARLIE
DELTA
ECHO
FOXTROT
GOLF
HOTEL
INDIA
JULIET
KILO
LIMA
MIKE
NOVEMBER
OSCAR
PAPA
QUEBEC
ROMEO
SIERRA
TANGO
UNIFORM
VICTOR
WHISKEY
XRAY
YANKEE
ZULU

THE Q-CODE

Here are a few samples of the Q-Code that you may come across on the radio. Followed by a list of Terminology.

QRM.....
QRN.....
QRO.....
QRP.....
QRT.....
QRX.....
QRZ.....
QSB.....
QSL.....
QSO.....
QSY.....
QTH.....
QRV.....
QSP.....

MAN MADE INTERFERENCE.
NATURAL INTERFERENCE (ATMOSPHERICS).
HIGH POWER.
LOW POWER.
CLOSE DOWN (OR TO STOP TRANSMITING).
STAND BY.
WHO IS CALLING?
FADING ON THE SIGNAL.
TO CONFIRM CONTACT.
A CONTACT.
CHANGE FREQUENCY.
MY LOCATION IS...
I'M READY / I'M ON.
TO RELAY A MESSAGE.

/M.....
/MM.....
/P.....
PSU.....
PWR.....
DX.....
HF.....
VHF.....
UHF.....
WORK.....
WORKED.....
WORKING.....
XYL.....
YL.....

MOBILE
MARITIME MOBILE
PORTABLE
POWER SUPPLY
POWER
LONG DISTANCE CONTACTS
HIGH FREQUENCY
VERY HIGH FREQUENCY
ULTRA HIGH FREQUENCY
MAKE CONTACT WITH.....
HAD A CONTACT WITH.....
IN CONTACT WITH.....
WIFE
YOUNG LADY (THE GIRL FRIEND)

YOUR FIRST CONTACT

After setting up your station with the help of a fellow Amateur and satisfied everything has been setup correctly, then spent some time listening to other Qso's in order to get some idea of procedure, you may feel that its now time to have ago yourself.

Make sure you have a pencil, a notepad, your logbook and a clock set for GMT (1 HOUR BEHIND IN THE SUMMER MONTHS), you may also find it useful to have a piece of card with your own call sign on it and have it near the radio until you get used to it because when you are chatting to other stations it can become a little confusing for the beginner.

As has already been mentioned earlier in this booklet, The 2Mtr band is where you will most likely make your first contacts, so that's the band where we will assume you are going to start.

It may be useful to arrange with your foundation instructor or another amateur that you know to listen out for you at a pre-arranged time.

It makes it easier when talking to someone you know, the person you are talking to will know and understand any difficulties you may be having.

First of all with everything turned on tune your radio to the calling frequency 145.500 fm, always listen before putting out a call to make sure no one is already putting out a call, if someone is already doing so then wait for them to finish before you start to transmit, when it is clear hold the microphone about 3 inches away from your mouth press the key and call the station you are wanting to talk to.

Do not shout into the Microphone; just speak clearly in your normal tone.

Always give the call sign of the station that you intend to speak to first followed by your own.

Example

The station to be called might be **G0CBM**; your call sign might be **M3ABC**.

So start like this: **G0CBM, G0CBM this is M3ABC calling and standing by.**

Once you have put a call out wait for the station to reply, they may have heard your call but they may be busy at that moment in time.

If that station has heard you they will call you back in a similar way like this: **M3ABC, G0CBM**. When you have received a reply from the other station you reply to them like this: **G0CBM, M3ABC can you just standby while I find a clear frequency, this is M3ABC over.**

ALWAYS LOOK FOR A CLEAR FREQUENCY NEVER STAY ON THE CALLING FREQUENCY TALKING, IT STOPS OTHER STATIONS FROM GETTING CONTACTS.

In reply you will hear **ROGER standing by** or just **ROGER**. Now you need to tune up or down either side of the calling frequency until you find a clear frequency.

When you find what seems to be a clear frequency you need to check by asking, **IS THIS FREQUENCY IN USE, IS THE FREQUENCY OCCUPIED**. if you don't get a reply then its obviously clear, so now you go back to the calling channel and call the station who is waiting for you to tell him which frequency to go to.

G0CBM, M3ABC WOULD YOU QSY TO 145.450 IT SEEMS CLEAR, OVER. In reply you will hear **OK QSY, G0CBM**.

Once you get to 145.450 its always good practice to ask again if the frequency is clear just in case someone got there before you.

IS THE FREQUENCY CLEAR, IS THE FREQUENCY OCCUPIED, if no reply you may continue with the station you called, **G0CBM, M3ABC**, the other station will probably check to make sure it's clear at his side also before he continues?

If all is clear you can start your qso, don't forget to write the **DATE, START TIME, FREQUENCY, CALL SIGN OF THE STATION WORKED, & FINISHING TIME.**

Possible Subjects that can be discussed in your QSO,

The weather (WX), The weather here is -----

The working conditions here are, I'm using -----

What are your working conditions ? -----

General Chat,

I've just been repairing the car, -----

I've just finished putting up my antenna, -----

NOTE try to end an over with a question, it makes it easier for the other station to come back with a reply.

E, g Have you been busy today ?

During and After you have made your first contact you will be very nervous, have sweaty palms, you will make mistakes as we all do and you will be glad that you have got it over with, but that was your first step, it can only get easier from now on and it does.

You will meet new people and make a lot of friends on the radio and become involved with doing things you never thought you could do.

NEVER BE AFRAID TO ASK FOR HELP

Amateur Radio has a lot to offer anyone who has an interest in communications, and it's not just talking to someone in the next town, with minimal equipment and power you can talk to people all over the world.

Other types of communication:

CW (MORSE CODE)

DATA MODES (RTTY, PACKET, AMTOR)

SSTV (SLOW SCAN TELEVISION)

RADIO & INTERNET COMBINED

ECHO LINK (FOR ANYONE WITH ANTENNA RESTRICTIONS, THIS IS ON THE INTERNET)

With modern equipment being produced so small and compact it has made it easier to operate from almost anywhere you wish,

HOME

CAR

WALKING

BOAT

HILL TOP

BEACH

Anywhere at all is possible

INFO SHEET

Possible questions you may be asked.

Call SignM3MUI

MIKE 3 MIKE UNIFORM INDIA

QTH.....HUTTOFT, LINCOLNSHIRE

**WAB (WORKED ALL BRITAIN) MAP GRID
REFERANCE**

WAB.....TF57

RIG.....

TYPE OF MICROPHONE.....

TYPE OF ANTENNA.....

HOW HIGH IS ANTENNA.....

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TO FIRST TIME OPERATING FOR THE M3

COMPILED & PRINTED
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