Multi/2 Operation

http://gofrc.org/handbooks/multi2.html

If you have the equipment, or can borrow what you don't actually own, I suggest you think about entering the ARRL DX Contest in the Multi operator, Two transmitter (M/2) category. It is a fun category and can generate some really big numbers for the Club.

The M/2 category is a very competitive and rewarding category. Even though the number of rigs on the air at a given time is limited to two, the score produced by an efficiently run M/2 station can be well above two times the score of a single operator station. This means that the output for the effort you put in is multiplied by more than the number of stations you actually use. It can also be the most effective use of our limited operator pool, in terms of net score per man.

Station Requirements

Let's consider what you will need to run an efficient M/2 effort. Of course, you will need at least two transceivers, amplifiers, computers, headsets, keys or microphones and last, but not least, an antenna system that will permit the use of two stations simultaneously.

Transceivers

The transceivers can be of any make, as long as they can be interfaced with a computer. This is necessary if you want to take full advantage of rapid band switching and computer logging, which is currently the preferred approach in the contest community. Since you will be operating on two bands simultaneously, some sort of filtering between the antenna and receive line is wise. That means that the transceiver must support insertion of a filter network between the receiver input and the receiving antenna, whether or not it happens to be the transmit antenna. Modern Kenwood, Icom and Yaesu equipment all support this feature. If at all possible, attempt to use the same transceiver at each position. This minimizes operator fatigue when moving from one rig to another, assuring layout of tuning, filtering, RIT/XIT and gain controls are the same.

Amplifiers

I will assume that you intend to use an amplifier at each position. Some folks like to run low power, but the M/2 category is really intended for stations that want to maximize their score. Running 100W one or both of the stations is really not the wise choice. Even if you cannot have two 1500W capable amplifiers, you really need to run as much power as possible (legally) on each station. Common amplifiers in use by the community are those manufactured by Alpha/Power, Ameritron, Command Technologies, ICOM, Kenwood, QRO Technologies, Ten Tec, and Yaesu. When picking an amplifier, remember that a serious contest effort is a strain on the amplifier, so err on the side of selecting a beefy amp, lest it break down in the middle of a contest.

Computers/Software

The use of logging software and a computer is the standard today. The days of cross check sheets and the paper log are now history. You can select any of the popular software programs, but be sure to install the same software on each computer (one per operating position). The computers can be virtually anything that you have available that is more modern than a 486 33DX based machine. Even hard drives as small as a few hundred megabytes are suitable. If you can, try to dedicate the computers for use in the station. This will permit the use of a small HD and will minimize IRQ conflicts that tend to pop up when sound cards and other peripheral devices are in the machine. Keep the computer HD as clean as possible. Unless you are using a logging program such as Writelog, which requires Windows, all you really need is your logging program, it's support files, and a modern version of DOS (Ver 6.22) installed on the HD. The most common software program in use in the FRC is K1EA's CT logging program. Others in common use are NA (by K8CC), and TR Log (by N6TR). It is important that each station be reliably networked to all other stations. I am most familiar with CT, which has built in networking support. With the addition of a free networking program from K1TTT (available on the Internet) and a network card for each computer, a very robust ethernet network can be employed. This has proven to be rock solid at N3RS over the past several years.

Accessories

The station will need several accessories to help make operating more pleasant. While the use of a bug is possible, I suggest using a good electronic keyer for the few times you will need to send CW without using the computer. Some rigs have internal keyers, but in some instances (e.g the Yaesu FT 1000MP) it is not possible to use the internal keyer and also have the computer key the rig automatically from the logging program. In this case, an external keyer, such as the Idiom Press K1 or K3 is very useful. The power for these devices can be taken from the transceiver or a battery pack can be employed. If you use a battery pack, don't forget to check the batteries before the contest, unless you want to be changing batteries in the middle of the contest.

In the SSB contests, use of voice keyers is commonplace. It is really important in the M/2 category, since you spend nearly all of your time calling CQ's or answering the calls generated by those CQ's. There are several options available to you when it comes to voice keying. For many years we used an endless loop tape recorder at my station. It was awkward and I do not recommend it for use today. Next we used a DVK, which I believe is no longer manufactured. In any event, the DVK was an external device with several solid state memories that could be used to send CQ's, give reports, send your call, or QSL a QSO and ask for the next station to go. We used such a device for many years. A more elegant solution is to employ a specialized sound card in the computer. The CT program supports a special card called a digital voice processor (DVP). This card has many features that are rarely used, but is an outstanding solution for sending repetitive information, such as CQ's and the like. Other solutions are available, most notably, the use of a common sound card with the Writelog program to provide essentially the same functionality.

The use of a headset mounted microphone is a great solution for those of you that suffer from back and neck strain from hunching over a desktop microphone. This type microphone permits you to move around and turn your head while still keeping the microphone at a constant distance from your lips. The Heil headset and several others available at Radio Shack and through mail order houses include a good quality microphone attached to the headset. If you use a Heil headset, be sure to look into replacing of the speakers in the headset with more sensitive units supplied by the factory. The Yaesu FT 1000MP transceiver has low audio output when used with the standard Heil headset, but after we replaced the speakers with new ones provided by Heil, the audio was quite acceptable.

Needless to say, if you will be operating in a multi operator category, use of packet spotting is allowed. Not only is it allowed, it is essential if you expect to generate a good multiplier total. That means that you need a reliable connection to the FRC packet network and all of the gear that goes with that. All of the logging programs facilitate the use of packet spotting, so that will not be a problem. Judicious use of the spots, however, is worth mentioning. In a M/2 operation you do not want to be a packet spot chaser. That is, do not rely on packet to produce the volume of contacts for you. Always call CQ and run as fast as you can on both stations. Learn to use the packet spots wisely. Jumping into a gigantic packet pileup when you are running 100+ QSO's per hour is not wise! Unless you have a gangbuster signal, it will take you some time to work the callout and you will have lost your run frequency in the interim. Later on in the contest, when you rate is lower, many of those same stations will be around and the pileups will be much smaller. That is a far better time to move from your run frequency.

Of course, packet is a bi directional medium. This means that when you are tuning across the band and find a new multiplier, or even a station that you haven't worked before, do send out a spot so that others may benefit from your hard work in digging up that QSO. Remember, you will probably not be in line to win a category, or even place in the top 10, but by passing good spots to your fellow FRC members, perhaps you will help our Club to win the contest!

The last item I will touch on in the area of accessories is the use of automatic antenna switching devices. At N3RS, we use the Top Ten Devices Band Decoder and many single pole, double throw (SPDT) and single pole, six throw (SP6T) relay boxes. These are used to detect the band in use by the transceiver, produce the necessary drive voltages to operate A/B relays and to energize antenna relays and 6 position switches used to insert band pass filters in the transceiver lines. The details of how this is done is the subject of another paper, dealing with station setup.

Antennas

Needless to say, it is not likely that you will be doing a full fledged M/2 operation if all you have is a single tri band yagi and a trapped dipole for the LF bands. It is possible, however, to use two tri band yagis and a set of individual dipoles or verticals for the LF bands. Even wire beams on each band can provide good results in a M/2 setup. The key

is to avoid putting RF into the same antenna from two or more different stations. This type of activity will result in a fried receiver section of your transceiver on one or more rigs.

It is also wise to provide as much spacing as possible between antennas that will be in use simultaneously. At N3RS we have multiple stacked arrays on the same tower, but have attempted to separate the antennas as much as possible. Minimum spacing is about 9 feet between adjacent 20M and 15M yagis. Since these are stacked vertically, a minimum of coupling occurs. Band pass filters in the shack help to minimize RF from one band getting into the second (or third) station. Even with 7 different antennas, all on the same 130 ft. tower, no inter station interference is observed due to fundamental overload. By employing mono band yagis, the natural rejection of the antenna to out of band energy aids in reducing interference. Tri band yagis or multi band wire arrays do not offer this additional rejection and thus more filtering or greater spacing is required to avoid front end overload.

It is worthwhile to note that if separate antennas are available for the LF bands, and a tri band yagi can be paired with a tri band trapped vertical for the HF bands, M/2 operation can be employed. The vertical will not perform as well as the yagi, but by judicious selection of times when the yagi is used on each band, the total score can be significantly increased over a M/S or single op score. Remember, two stations on the air at all times is a powerful point generator.

Operators and Tactics

When you select operators for this category of operation, remember that teamwork is essential for good results. Pick fellows that you will be able to get along with when interference from second harmonics or other problems arise.

Number of Operators

The number of operators is really up to you, but I have found that at least one and a half operators per station is the minimum you should employ. If everyone is to get sufficient time on the rigs, no more than 2 operators per station seems to be a reasonable maximum. That means that if you employ two operating positions, you should have between 3 and 4 operators. This assumes that all of the operators are there for the duration of the contest. Part time operators are useful, but numbers tend to increase if you employ part timers. That is, you will need more operators if some are only part time.

Experience and Objectives

It is always beneficial to have at least one operator experienced in multi operator efforts. He will be a valuable resource when questions arise regarding short term strategy or band selections for maximum results. If you do not have an experienced operator available, don't let that deter you from trying M/2. You and your group will learn how its done the old fashioned way hard work and on the job training. There is nothing more satisfying than to set a goal as a group and then doing your best to reach the goal. The goal may be expressed in terms of contacts, total score, or simply beating last years results or perhaps beating one of the old timers this year. Try to keep your team together from year to year and communicate with one another before the contest. You can really enhance the fun of M/2 operation when you work together setting goals, working on station upgrades, and then actually operating successfully as a team to meet or exceed your goals.

Scheduling

With three or more operators you will want to have some sort of plan regarding how to deploy your operators for best results. Perhaps you have a diverse set of skills on your team. In this case, be sure to schedule your best operators to operate when high rates are possible. That is usually when Europe or Japan first starts coming through. The fellows that are a bit slower can be the run operator when things tame down a bit. During these high speed periods, it is sometimes beneficial to have a less experienced operator listen in as the more seasoned op runs the pileup. This type of lesson is valuable to the newcomer especially. Some operators are really good at search and pounce technique. Use of the “band map in CT and skillful tuning is an art that must be learned by practice during a contest. The use of a third station to insert calls needed on a band not currently in use into the band map is most rewarding, especially near the end of the contest. Quick QSY's to the unused band for a short time then back to the previous band can result in the addition of numerous QSO's to the log, including some multipliers. We often use

three stations in our M/2 efforts at N3RS. Only two stations on the air at a time, but the third station all set to go at full speed as soon as conditions dictate a band switch.

Getting enough sleep is an important aspect of scheduling. Make sure that everyone gets at least 4 contiguous hours of sleep each day. Being out of the chair, but not sleeping is OK, only if you get those 4 hours per day. Some people require more than 4 hours, so you will have to adjust the schedule to accommodate them. Of course, if you have 2 or 3 stations set up, they should all be manned 24 hours a day, unless the bands dry up and you can hear no DX on the band. Excuses like, “we have worked everyone on this band are just that, excuses! It takes dedicated hard work to do well in contests, much less win them.

Passing Multipliers

All of the software logging programs that I am familiar with have the ability to determine if a station has been worked on other bands or not. In the case of multipliers, it is extremely important to take advantage of this feature when you are called by a station in response to your CQ's. By having a window open that shows if you need the country entered into the active QSO field, you can determine if it is possible to move that station to another band where he is still needed. Of course, moving stations to another band must be done tactfully and thoughtfully. Asking a VR2 to move from 20M to 40M at 1600Z is not a wise decision. Perhaps you might be able to make a sked with him for 40M at a more appropriate time. Don't be reluctant to ask the multiplier to move if the timing is proper. The worst thing that will happen is that he will say no. Most of the time they take the bate and move for you. Of course, it goes without saying, if you are calling a multiplier that you found via a packet spot and half the world is calling him, don't be so impolite as to ask him to move. That is, unless he happens to be a close friend and you know he will not be on for very long.

Passing multipliers is a skill that is very difficult to master. At N3RS we are still learning how to do this as well as the masters at K1AR! Many times, it is possible to make a QSO on a second or third band when propagation is very marginal. Knowing the fellows call ahead of time really helps in pulling out a really weak station. Working that multiplier this way is sometimes the only way to get it in your log. It may even be the difference between achieving that goal you set before the contest, or not. Remember, multipliers usually carry many times the value of a simple contact. Their importance cannot be overstated.

Rate...Rate...Rate

It has often been said that rate isn't everything it's the only thing when it comes to score. Practice will improve your rate. Watching the rate meter in CT is very useful. It tells you when you are falling behind your goal. Setting the rate meter to all bands is not particularly valuable. After all, you really want to know how you are doing, not the guy in the chair next to you. Set the meter to the band you are on. That way you can monitor your effort real time. If your rate is high, you will have to do less multiplier hunting or packet chasing. Why? Well, if you think about it, the number of multipliers you work calling CQ always exceeds the number you get chasing packet spots (unless that is all you do!). With high rate comes a large volume of QSO's. That large volume will have a percentage of QSO's that are multipliers. This percentage is nearly fixed from one year to another. Thus, if you make more QSO's by keeping your rate up, you will also work more multipliers.

One way to keep your rate up near the end of the contest, when QSO's are harder to come by, is to set the packet window in CT to “needed QSO's on this band . That way, as stations are called out on the band you are on, you can judiciously add QSO's to your total by CQ'ing and also quickly jumping to a packet spot of a needed station, working the station, then returning to your CQ'ing on your run frequency. It takes some practice and a good signal that gets through quickly to do this, but it is certainly worth learning this technique.

Lastly, it goes without saying that your rate is severely impacted by the amount of time spent out of the seat. Contesting is hard work. That is why most of us collapse at the end of the contest. Staying in the seat, even when things get slow is important. Your results will always be better, if you persevere. Keep every station manned 24 hours a day!

Good luck and have fun in the M/2 category.