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Multi-One and Multi-Two Contesting

Do you want to participate in or host a multioperator contest? Do you want build a multioperator station? In this article, we'll look at the world of multioperator contesting and peek into the future.

Hosting

Hosting a multioperator contest involves three considerations: Operators and operator availability, station design, and contest operation. Location and propagation, while important, are largely beyond our ability to control. With the advent of remote-site contesting, this aspect can be addressed, if your budget allows.

Consider the rules associated with M1, M2, and multioperator operation for contests you'd like to enter. There are differences between CQ-sponsored and ARRL-sponsored contests, so read the rules. A multioperator (i.e., multi-multi) requires you to have radios, amplifiers, and antennas to cover the six contest bands. That means six stations and operators to fill the chairs.

The number of operators is key to the design of your station. There is no sense in building a station for multi-multi operation if you cannot host or attract sufficient operators.

What are your contest goals? Are you out to win it all, to win your area, zone, section or state? Do you want to set a personal-best? Do you want to set a record? Who are your competitors and can you beat them? You will need to assess your goals, select operators to achieve them, and then build a station capable of achieving them.

As a team it is important that you know *how* to win. You must know the rules, have high ethics, and be capable of high rates and maximizing multipliers. It is extremely important that you know the propagation for your location, that your team has the needed experience and synergy, and that you design your station to be as automated as possible with the best affordable technology.

Building a Team

Team selection is critical both for station design and to winning. Not all operators enjoy or do well on all modes, and some like to specialize. Take a look at the NAQP participants in your region and see if you can get enough operators from the Top 10 to fill the seats for a multioperator contest.

An important factor: Do they play well

Team photo from a CQ WPX CW (L – R) K9FA, W9ILY, NQ6N, N9CK, WT2P and K9CT. [Courtesy of Craig Thompson, K9CT

Anthony, AB9YC, signals for Relu, NJ9R, to work a multiplier. Relu is letting Anthony know to wait. We ring the bell to celebrate working new mults.

with others. Can they interleave QSOs or hold a CQ frequency? Some important considerations should be full-time versus part-time operators, team player or not, high ethical standards (they will be using your call sign), and, yes, personal hygiene and habits.

My experience is that I need six full-time operators for an M2 operation. Why? Two should be running, two should be assisting, and two should be resting at all times. Any less than this causes stress from lack of rest, and any more may cause some friction over operating time. I would think that three operators are needed for M1 for much the same reasons. A multi-multi station requires at least two operators per open band.

Invite successful team members back *as a team*. Your score will improve each year as the members become more practiced in their team skills and more familiar with your station. Consider the operating and living conditions at your station. Operators need to feel welcome and comfortable. Thought needs to be given to station layout. Are they going to be focused on the logging screen? Ergonomics, comfort, heating or air conditioning, sleeping, bathroom, food, drinks, and other team members will determine if a really good operator will return for the next contest.

Do you want to be invited to operate at a multi station? First you must be an active contester who is constantly working on improving. The NAQPs are a great way to show that you can compete. You need to let the station owner know that you are interested in operating. You never know when an opening will occur, even at the last minute. Remember the criteria that will get you invited back. Teamwork is key.

Operating Categories

To many, M1 means one radio and a number of operators taking turns. But,

Power Levels in dBm
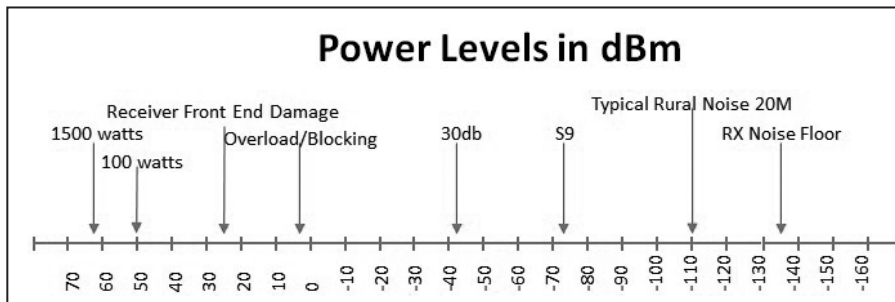
The range of signal strengths and noise-floor issues that must be accommodated in station design.
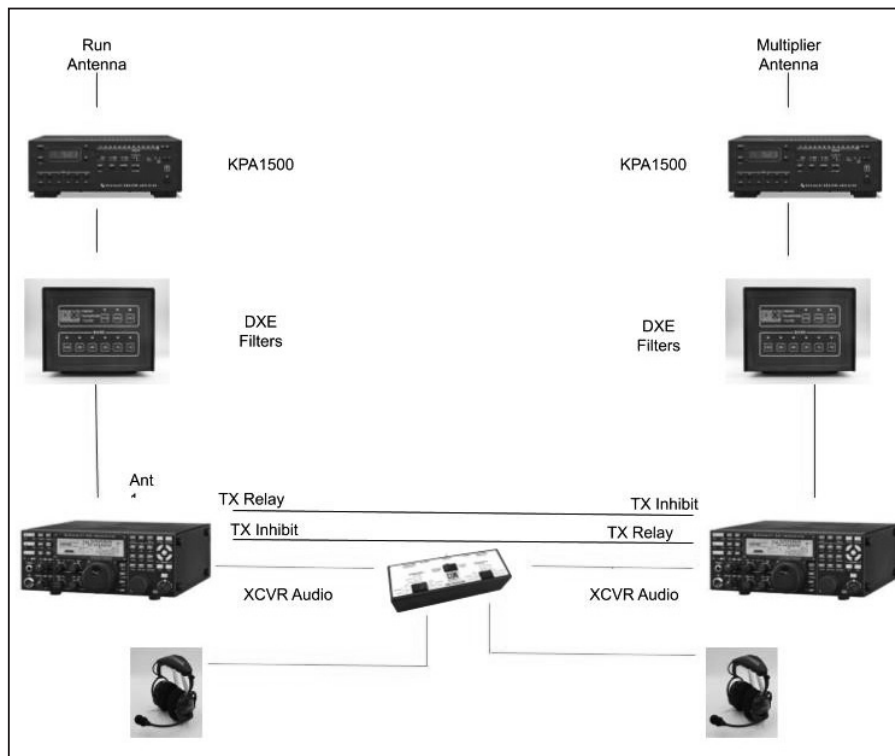
A **Conventional M1 setup.**

there's a difference between just having a good time and winning. A serious multioperator effort means more than one radio on each band. The rules typically allow only one transmitted signal per band. So, if you use two or more radios, each transmitter must be locked out when any other transmitter is keyed on the same band. Inferred here is that you have at least two antennas on each band, sufficiently separated to allow listening on the same band without interference from the other transmitter.

M1 has one radio running and the other radio looking for multipliers on another or same band, and some important differences exist between the CQ WW and the ARRL DX rules for this category. When operating on the same band, you can have one or more radios interlocked. In CQ WW, you can use a second, non-interlocked radio for working multipliers only. You could have many radios interlocked in the CQ WW, and many high scoring stations do just that.

M2 is really two run stations assisting each other. These must be interlocked. Most use one radio per band and have another radio on the same band or chasing multipliers on another band, with radios interlocked. Band changes per hour are limited.

Once you've determined how many operators you can count on to participate, then you can build appropriately — M1, M2, or multi-multi. Design and cost are directly related to the number of operators and the number of same-band operation required. Think of this as being able to operate and listen on each band, as if you are doing SO2R on the same band. High power at 63 dBm levels need a lot of isolation from a same-band receive station that

is listening for weak multipliers at –90 dBm.

Give some thought to the size of the property, arrangement of towers and antennas, feed line losses, and filters. Do a careful analysis, band by band.

In actual operating, the run station must be loud enough to hold a frequency. This means having a signal that can compete with the other well-designed stations on the same band. The assist station must be able to quickly call the station and get answered on the first call, if possible. Assist stations will initially be calling only rarer multipliers, and then as time passes, double mults, then single mults, and then just interleaving higher-point QSOs with the run station.

As you can see, a lot of significant variables come into play when designing a successful multioperator station.

Know the Competition

What will it take to beat your peers? You can easily find out who the operators are and how skilled they are. Can you get better operators? Station building requires you to build a station that's at least equal in signal level. In DX contests, EU is critical for NA stations to work. A west coast station needs to be able to run Asia/JAs. Many stations active, and they will provide many multipliers.

You should know what your competitor has for antennas to EU/AS and how effective they are — and then meet or exceed their antenna systems' capabilities. The assist station needs effective antenna to work multipliers quickly. Some stations are designed to use the same antennas as the run station but with a remote receive antenna between contacts.

You may want to compete in both DX and domestic contest. This is an important factor, as antennas that are effective for a DX event may not be as helpful for working the highly populated areas of North America. Take a look at the top scorers for your area in both domestic and DX contests and study their antenna systems.

If you can start from scratch, the best site would be flat and far from noise sources. A property that is rectangular and longer north to south is ideal. I would place the towers north to south, as this allows antennas to be aimed at EU and AS with the isolation then side to side from the Yagi pattern. No site is quite this ideal, but this may give you an idea of how to maximize the best setup for multi-station design.

You will also want to think about isolating receive or multiplier antennas from the main "run" antenna systems. Distance and antenna patterns are keys to success. With good planning, you will be able to operate within just a few kilohertz of each other on the same band. Try to avoid any circumstance where you'd need to aim di-

rectly at a same-band antenna from either the run or multiplier antenna.
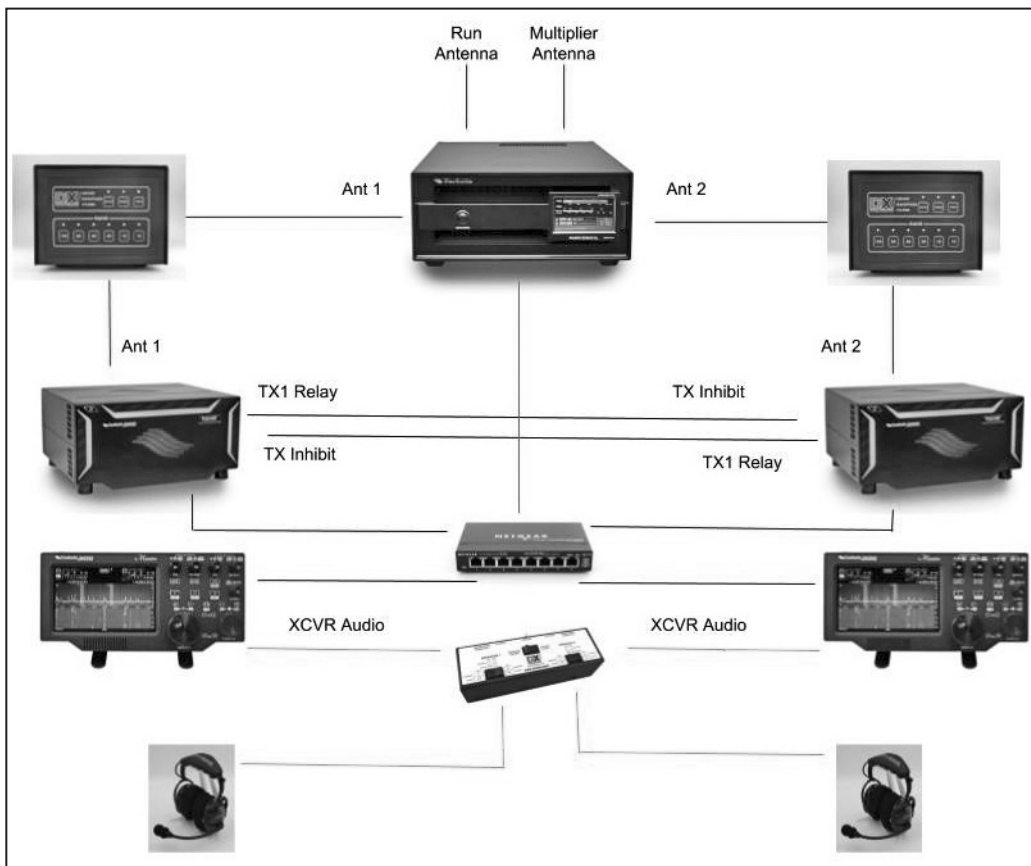
More Mults, More Qs

What are M1 and M2 station builders doing to make more contacts and work more multipliers? Technology is always evolving; the first multioperator station was probably one radio and several operators taking turns. To be in the Top 10, you need at least two radios per band. Some major players deploy two to three stations on the run frequency, stacking call signs for the run operator, plus several other multiplier stations interleaving their QSOs on the same interlocked run station. This gives you an idea as to how they can work more than 10,000 stations in a weekend.

A typical Top 10 M1 station would consist of two radios, filters per band, two amplifiers and a run stack and a multiplier antenna system. Double that for an M2 station. The run and assist radio must be interlocked except for M1 when looking for multipliers

A traditional multioperator setup.

on another band. The radios must be interlocked so that only one transmitter will operate at a time. One way to interlock is to break the PTT of the other radio. Most newer radios use an inhibit circuit for the associated transmitter that is tied to the output of the other radio.

The choice of radios for multi-operating is very important. Each must have low transmitted noise, produce a clean signal, and have a great CW waveform to be successful. Carefully read the "Product Review" articles for contest radios in *QST*. All major manufacturers have radios that meet these criteria, including the Elecraft K3S, Yaesu FTDX5000, Icom IC-7610/7851, and the FlexRadio 6000 series.

Add an audio monitoring system, so that you can listen to your partner on CW and SSB. This lets you hear when the contact is completed without having to wait for your partner to signal. Another method is to observe the TX light or some indication of your partner's activity on your logging screen.

Most multi stations use a large stacked array for the run station, and a lesser antenna system for the multiplier station. The multiplier or assist station needs to get the station as quickly as possible, so that the run station is not interrupted. Otherwise, it can be aggravating and time consuming.

Some will just switch, so that that multiplier station can use the stack and the run station will CQ on the lesser antenna to catch the double multiplier.

How about doing this automatically? Commercial interconnection boxes are available that allow you to switch antennas quickly. Some multioperator stations use a shared stack and then use a separate RX antenna system for the multiplier station. Both the run and assist station use the receive antenna while the other is transmitting. All of this requires additional interconnecting devices. The technology is there, so automate your station as much as possible. Antenna and filter selection should not be left to the operator.

FlexRadio has taken a step in simplifying switching and interconnecting for run and assist operators. They use a server radio such as the 6600 and 6700 and allow two operators to share the same radio using an operator interface as a client. One significant advantage here is that you need just half the radios and filters than a conventional setup. You are able to select two antennas at each client allowing the two clients to share the same stack or multiplier antenna or receive antennas. This is all done using Ethernet connections rather than hard-wired interface boxes.

Logging software should be networked

among stations. Incorporate time synchronization, spot filtering and sharing, operator communication, rate goals, and other things. We used *Logger+* while operating as NU1AW/9 during the IARU between WB9Z and ourselves last year. It was as if all of the stations were in the same room instead of 100 miles apart.

Do you want to improve your location and propagation to the most dense ham radio populations? Then build a station where it can make a difference. Remote Ham Radio and the BeLoud.us teams are building many stations in prime locations in eastern Maine. These are killer locations for the DX contests from NA to EU. Remote capabilities are available to most hams considering building a station, or they can purchase land in Maine and operate remote from anywhere there's internet. The BeLoud team has already been successful operating a Maine station remotely from Tennessee in the ARRL DX CW.

Accommodating your Team

Gather your team together at least a couple of hours before the contest, so that everyone is situated and ready to operate. We put together a team email several months prior to the actual contest for group planning. Team meals are discussed as well as competitive information and propagation.
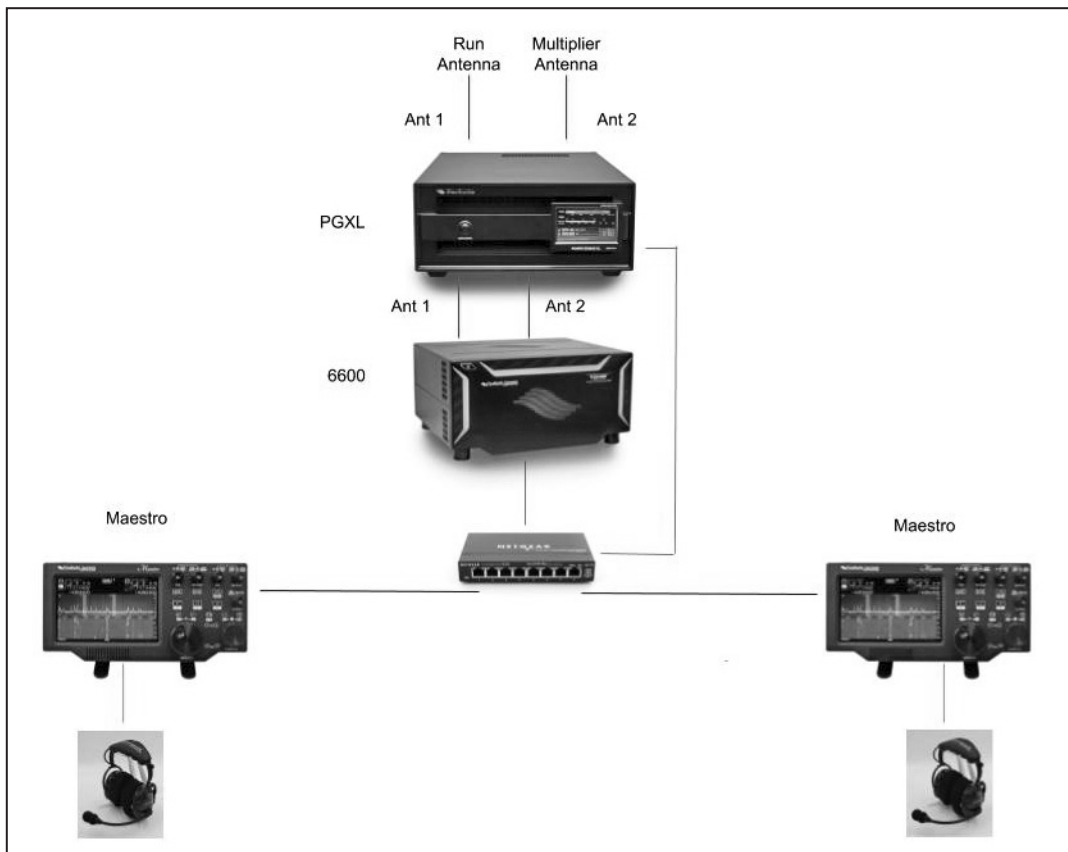
A FlexRadio multioperator setup at K9CT.

We start with a sit-down team meal. This is the only time the team is together until the end of the contest, as there should always be several operators on the radios. I always go over any changes that have been made to the station since the last time we were together. Any new operator is quickly shown the station and given time to adjust. We discuss propagation and band activity over the last week and set some team goals.

Operators have their own beds and are given some time to get situated. They don't need to be fumbling around in the dark trying to make a bed or find their clothes. It is important that every operator feel as though they were at their home station. We want them to be able to get some rest when they get a break. The key is to keep error rates low.

The station area should be isolated from the sleeping and social areas. Noise in the operating room should be kept to a minimum. When the rates are high and the pileups are deep, the signal-to-noise ratio in the room should not be a factor.

Personnel Placement

The run operator should sit next to the assist operator. The assist operator will interleave QSOs and not hurt the run operator's rate or effectiveness. The run operator knows that a multiplier the assist operator works may be worth several QSOs and difference between winning and not. A give and take is implied between these two operators. Several ways can make this work. We use hand signals to get the attention of the other operator. You let the other operator know you have someone on the hook, and they acknowledge for you to go. Timing is everything, and both operators are watching the TX light of the other radio. The S&P operator has to time his calling to coincide with the other station's CQ.

We have had great success in interleaving QSOs to the point where the run and assist operators are able to alternate between transmitting to make two QSOs in the same period of time. One station cannot transmit while the other is transmitting, so operator patience is necessary to make this work successfully. The run operator is cautious about losing the run frequency and needs to share that with the assist operator.

In M2, I like having the two run operators next to each other with the assist operators on the outside. You will often work a station or multiplier that we need on the other run band. It is then easy to pass the station to the other run operator and signal your intention.

When we first start the contest in M2, we put two of the most experienced operators in the run positions. The assist operators will be next up to run and will know the band very well by the time it's their turn. The resting operators may be any newer operator who can watch the operation before sitting in the assist chair. As the station owner, I quite often don't operate until later, just in case something needs to be fixed or changed in the station that was not discovered in contest setup.

We always have experienced operators in the run chair during major band openings with high rates. *This is crucial!* You can predict these, and the team should discuss them in advance. Staff the station at all times. It may get very quiet during the early morning hours, but you need to have an operator on each run station throughout. Many surprises can occur, from band openings to multipliers, at any time during any conditions. We usually take turns operating for a couple hours at a time during this period and then elevate to four operators at first sign of the morning openings to EU.

Sometimes you can work more stations doing S&P than calling CQ. You may not be able to run effectively and can work stations faster just moving up and down the band. We quite often will have the run operator and the assist operator start on

opposite ends of the band and interleave S&P QSOs during low rate times. This helps to clear out the band to let you focus on multipliers. You will soon find a clear spot for calling CQ while doing this, and the run operator can get some traction.

We use spotting networks and also send our S&P QSOs to the spotting networks. We filter our networks for area QSOs and make sure we are getting good spots. I would encourage all stations to use the real-time scoreboards. You will see how you and your competitors' scores compare, and this may motivate your team to stay in the chair and really work at getting every single multiplier without any cajoling. It is only a matter of time before we will do real-time contesting. This is just a step from fruition. Within a few minutes of the last QSO, you would see how you placed — plus all errors that your team had made.

So there you have it. Mix in some good operators with a well-designed station and you can have a lot of competitive fun. The team aspect is a great way to enjoy ham radio contesting. You will feel that no one will let the team down and will do their best to win. Every team event will create memories for a lifetime. Time to get started!