Station of the Month

W2PV

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This article describes one of the most extraordinary amateur radio stations in the world. You may being thinking to yourself, "who cares, I can never build a station like that." True, but you should read on anyway, because there are lessons to be learned by all of us from the approach which Jim chose for the demanding arena of multi-operator multi-transmitter contesting.

The most obvious feature of any amateur station is, of course, the antennas. Here is a list of the HF antennas at W2PV:

160 meters	- inverted vee @ 170 ft
80 meters	- 2 el quad @ 160 ft
	- low and high dipoles
40 meters	- 3/3 el yagis @ 180/90 ft
	- 3 el @ 85 ft
20 meters	- 7/5/5 el yagis @ 150/100/50 ft
	- 6/6 el yagis @ 106/42 ft
15 meters	- 8/8 el yagis @ 99/49 ft
	- 4/4 el yagis fixed south
10 meters	- 10/10 el yagis @ 91/57 ft
	- 6/6 el yagis @ 70/40 ft
	- beverages for 160/80 meters

The illustration of Jim's antenna system is from the Japan Crazy Contesters Club bulletin, *CQ Test*. The dipole labeled 1.8 is in fact the high 80 meter dipole; the 160 meter inverted vee and low 80 meter dipole are not shown. Also, the 10 meter antennas shown on tower II are 6 el yagis rather than 5 el yagis, and rotate 300 degrees around the tower (the dead zone is towards ZL). The Big Bertha is a self-supporting 120 ft rotating mast and includes a 6 meter yagi between the lower 10 meter yagi and the 40 meter yagi, and a 2 meter yagi at the top -- a total of 77 elements on 9 booms. The guyed towers are Rohn 45 which Jim installed with help from local hams. All of the rotators are Telrex except for the the side-mounted 10 meter yagis, which are turned by the big Wilson rotator. There are three beverages running roughly NE-SW, E-W and N-S, with switching arranged to select uni-directional patterns in one of the six directions.

There are several stations with more antennas than listed here, but as will be seen, the PV system is engineered for maximum effectiveness in the contest environment. Furthermore, each antenna was carefully evaluated after installation to be sure that it was performing as expected; for example, the commercially-designed 3 element 40 meter yagis on tower II required drastic adjustments of the element lengths to achieve proper operation.

Inside, the operating positions for the six bands are divided between two rooms. The 40 meter and 15 meter positions are upstairs in the den, while the other four bands are downstairs in a large room which also serves as electronics lab and operations center. The modus operandi for these positions is best explained one band at a time.

The 160 meter position is least complex, since the only transmitting antenna is the inverted vee. The beverage receiving antennas are shared with the 80 meter position through separate matching networks. Jim found that the commonly-used toroidal transformer matching systems could not be used at his QTH because nearby broadcast stations generated enough voltage on the beverages to saturate the cores and cause severe intermodulation. So, his beverage matching networks look like low-power antenna tuners. In addition, a filter is installed in the receive antenna line to eliminate interference from the BC stations. The rig at the 160 meter position is a Signal One CX7A with an ETO Alpha 76 amplifier.

The 80 meter position has a choice of two transmitting antennas, the quad and the dipole at about 140 ft. The quad fires towards Europe or southwest at the flip of a switch, while the dipole is broadside to South America. The low dipole (60 ft) is available for SS by swapping some transmission lines. Each of the 80 meter antennas has a remotely-controlled network at the feed point to tune for either the phone or cw end of the band. The rig at this position is a CX11 and Alpha 77. In addition, there is a 75S3 spotting receiver which has its own antenna switch to allow listening on any antenna independent of the one selected by the primary rig. Each receiver has an 80 meter bandpass filter, and the output of the amplifier passes through another bandpass filter. Every band has similar bandpass filtering, which reduces inter-station interference to nil.

The 40 meter position includes a primary station with CX7A/Alpha 77 and a 75S3C spotting receiver. The antennas are the 3 element yagi on the Bertha, and the two yagis on the 180 ft tower. The latter two antennas can be selected separately, or driven together in-phase or out-of-phase. The lower antenna of the stack is fixed towards Europe; in addition to the usual application of stacking to control wave angle, the "both" mode with the top antenna towards VE3 is effective for digging out daytime QSOs in the CQ WW by spraying RF towards VE1, 2 and 3 all at the same time. The rotator control box for the Bertha is located where either the 40 meter or 15 meter position can reach it, so the 40 meter operator can position the Bertha after the 15 meter position shuts down at night.

The 20 meter position has two complete stations. The primary rig is another CX7A/Alpha 77 combination, and the secondary rig is a CX7A and Alpha 76. The primary station has a selection of the stacked 6's on the Bertha, stacked 5's (KLM) fixed towards Europe, and the 7 element at 150 ft. The stacked 5's and the 7 el yagi can be driven together, which allows CQing towards both Europe and Japan during the morning opening. The antenna switching is interlocked so that the secondary station automatically transmits on the antenna system not in use by the primary op (i.e., Bertha or stacked 7/5/5). In addition to the rotator control box for the 7 el yagi, the 20 meter position has a remote readout showing the direction of the Bertha arrays. Using the intercom discussed below, the 20 meter position can easily ask 40/15 to turn the Bertha if needed.

The 15 meter position upstairs uses either the stacked 8's on the Bertha or the stacked 4's fixed south. This position is the boss of the Bertha rotator, and with some changes in coax connections it serves as the focus for

single-operator activties. Like 20 meters, 15 has two complete stations, a CX11 and Alpha 77 primary rig and a TR-7/Alpha 76 secondary station.

Finally, the 10 meter position has the side-mounted 6's as the primary antenna system, and can also use the pair of 10's on the Bertha (there is another remote Bertha position indicator at the 10 meter position). The gear on 10 is a CX7A and Alpha 77.

You may have noticed the reoccurence of "CX7/11" and "Alpha" in the description above. In addition to those listed, there is a backup Alpha 77, a backup Alpha 76, and a TS830. All of the gear is modified for the peculiar rigors of multi-multi. For example, the Signal One radios normally operate in full break-in mode on cw, which quickly uses up the limited lifetime (number of cycles) of the expensive vacuum relays in the Alpha 77s. So, the PV CX7/11s are modified to operate in the typical semi-breakin mode. Another example: the Alpha 77s have RF detectors which are used to prevent hot-switching the relays. In the multi-multi environment, these detectors can sense the signal from another rig, and incorrectly lockout the amplifier. The PV Alphas are revised to prevent this effect.

A key component of the multi-op setup is the use of CB radios at each position for inter-position communications. Each band is assigned its own channel, for example, 80 meters = 1, 40 meters = 2, etc. Thus the 40 meter position can talk directly to the 80 meter op (perhaps to pass a multiplier) without bothering any other position, merely by dialing up channel 1. In addition, the operations center mentioned above monitors channel 0 and the 2 meter spotting nets. Multipliers are passed out to the net from any position by announcing it on channel 0 (again without bothering other positions), while multipliers extracted from 2 meters are piped directly to the appropriate position on its private CB channel. The audio from the CB set is mixed with the audio from the primary receiver, along with the audio from a CQ tape deck, with switches to cut out any source momentarily when necessary. This audio box and another for the second receiver also include switching which allows either operator to listen to the other operator's audio. This is especially helpful when two pairs of ears are needed to dig out an inaudible signal, or when the spotting receiver has found a multiplier operating split frequency.

Often an operator will bring his own transceiver to use in place of an existing rig for one reason or another. The interfacing problems are minimal because every position uses exactly the same connectors, and because each cable is thouroughly documented. The importance of documentation cannot be overstressed. A station of this complexity involves considerable maintenence, which is enormously compounded if the systems being maintained are not well-described on paper. For example, last fall the 160 meter inverted vee was found to exhibit unusually high SWR. With time-domain reflectometry, Jim was able to localize the problem to near the feed point, at the top of the 180 ft tower. From his notebooks, he determined the length of the jumper cable from the feedline the the balun, the type of connectors on the jumper, and the type of balun. With the proper jumper and balun on hand, only one trip up the tower was needed to repair the problem (a connector frazzled by a lightning hit). Just before the next contest, the 80 meter quad failed to switch to cw, which made the antenna useless due to very high SWR. The documentation of the relay control wiring included resistances between each pair in the cable, so that it was possible by measurements at the station end to determine that a particular wire was broken, and that the broken wire was between the base and top of the 180 ft tower, rather than between the station and tower base. Again, one trip up the tower to connect a temporary jumper at the quad switchbox resolved the problem.

There is much more to be said concerning attention to detail, ranging from extensive spare parts and test gear, to a diesel generator capable of powering the entire operation in case of power outages. Beyond the technical, however, Jim pursued another means for increasing contest scores: he was very active in DXing all year round. This activity over the years has built up a circle of friends both locally and around the world. The local hams enjoyed spending the contest weekend searching the bands for multipliers to pass on 2 meters, or helping out with the less glamorous operating chores at W2PV such as manning 75 during the day. And the DX acquaintances searched the bands looking especially for PV, often volunteering to band-hop for additional points and multipliers.

In summary, the strong point at W2PV is the lack of weak points. The only problem area is occasional line noise. The QTH is located on a major highway complete with high-voltage power lines in a well-developed residential neighborhood. Although the property is more than 3 acres, there remains enough nearby man-made noise to sometimes degrade signal-to-noise ratio.

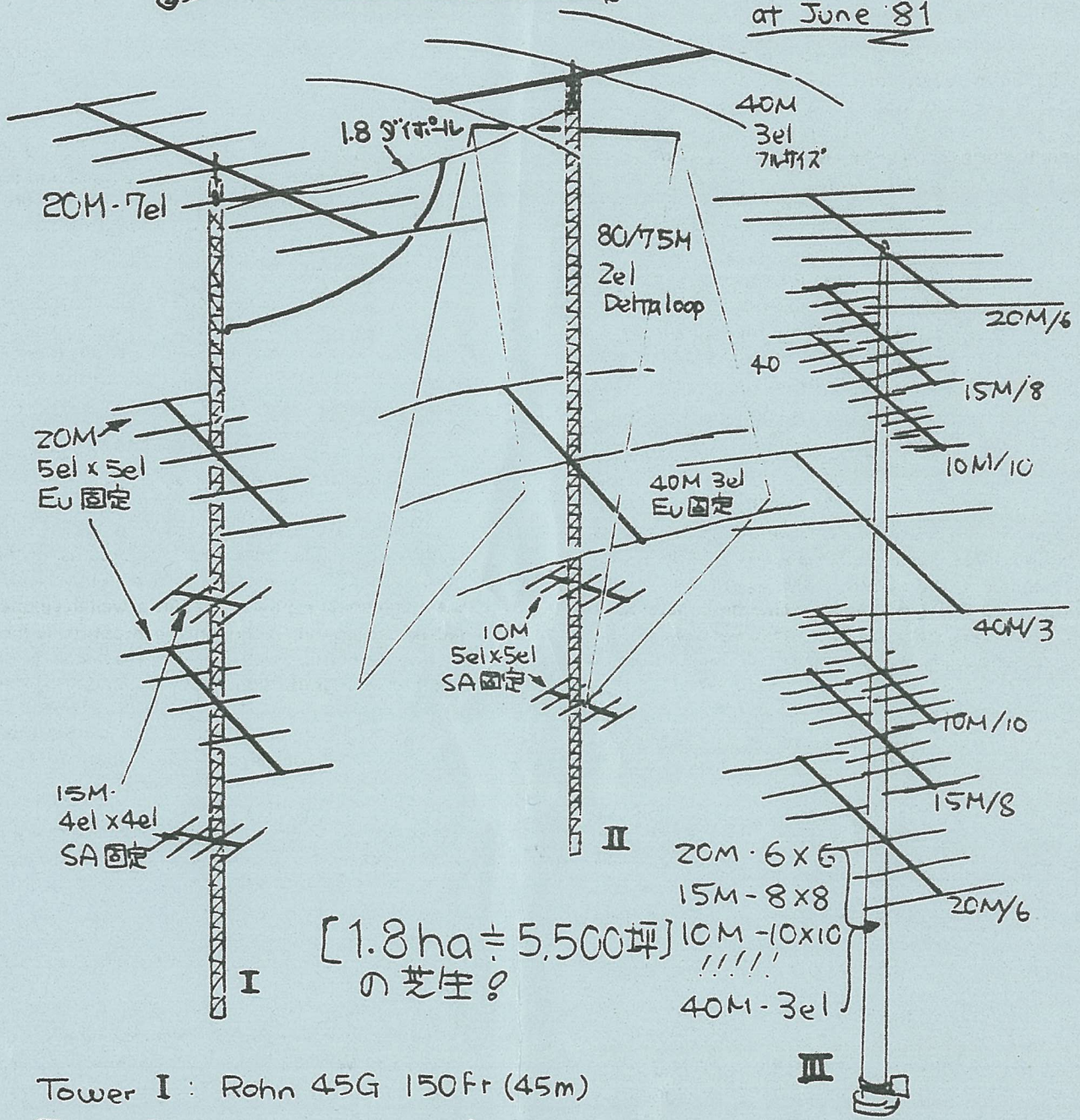
One final note about W2PV has nothing to do with the station at all. A contributing factors to the success at W2PV over the years was Jim's wife, Mollie. Anyone who has ever operated from W2PV can attest that Mollie was one of the nicest people you could ever meet. She became famous among the W2PV contest crew for her "contest stew" and emptyless icebox. Even more significant than "feeding the boys" was her smiling face, and her willingness to be a part of a group of crazy people who were the best at what they do and were doing it at the best place in the world.

In all, W2PV won an incredible number of awards, finishing his contest career by placing first in the *world* in last year's CQ WW cw contest in the multi-multi category! A fitting end to a station built on technical excellence, superb operating, and integrity.

[The first place mentioned above is believed to be the only time a USA station has won the category. In addition, the W2PV entry on phone was the top USA score — one of the very few times the same station has won both modes in the same year. Through John's efforts and cooperation from the people at **CQ**, the trophies for these accomplishments were presented to Jim at his home the weekend before he passed away. — ed.] ■

W2PV Antenna System

at June '81



[1.8ha ≒ 5,500坪] の芝生?

Tower I : Rohn 45G 150ft (45m)

Tower II : 〃 180ft (54m) (Illustrated by JE1CKA)

Tower III : Telrex Big Bartha 100ft (30m) タワーごと回転! (1.5分/回)

アンテナは全てTelrex製!・スタック八木は上/下シングル, 同相/逆相給電がシャックからSW切換す。