



PVRC Newsletter

May 2018

President's Letter – Bud W3LL

Hello, PVRC - April is one of those rare months having no 5M contests.

Since there's little material for the Sports Page, what has the "Front Office" been up to during the month?

Tom K3AJ is busy working on the Olympics Award determining where everyone stands to date. Look for his update on the PVRC reflector and in the newsletter.

Dan K2YWE, in addition to chairing the Annapolis meetings, completed a successful International Marconi Day event from the nuclear-powered ship Savannah berthed in Baltimore. Look for his article and photos elsewhere.

Dan and the Annapolis chapter plan to activate NSS from Greenbury Point for its 100th anniversary during the annual Armed Forces Day crossband test on 12 May. NSS Annapolis, officially known as Naval Communications Station Washington, D.C. Transmitter or NavCommStaWashingtonDC(T), was a Very Low Frequency (VLF) and High Frequency (HF) transmitter station operated by the United States Navy. It was located at Greenbury Point, across from the Naval Academy. The four towers are now gone along with the transmitter building. Read Dan's article in this issue.

Jay W3MMM, along with Uli K3LU as QSL manager, are wrapping up the highly successful PVRC 70th Anniversary On The Air special event.

Tim N3QE just continues to do it all, including graphics depicting chapter locations. See Tim in CQ magazine on page 88 of the April issue to read about this amazing PVRC contester.

WRTC-2018 is getting closer. Let's again recognize WRTC-2018 PVRCers among the competitors and referees: AA4NC, KE3X, KD4D, N4YDU, N3KS, KU1CW (out-of-area) and NN3W.

You'll notice photos elsewhere in this issue showing a four element SteppIR being installed at W3LL. Here's the backstory:

The W3LL antenna/tower criteria was formulated some 40 years ago in combination with "WIFE". The basic requirements/restrictions were a single 100' self-supporting tower surrounded by four self-supporting 80M 4-SQ antennas. No guy wires allowed. The plan was refined to include an antenna 30 feet below the top of the tower fed in phase with the top antenna. The "antenna supporting structure" must not be an "Eifel Tower" but did need to support antennas for 432 MHz, 144 MHz and 6M thru 40M. An impossible task at the time. We purchased a couple of wooded acres adjacent to ours for Beverages. Much later we figured that one European segment of an 8 circle would also fit.

In a 2001 Dayton visit we encountered Dan Simmonds K3AN selling a very high wind rated tower with a relatively slender profile. Thus, the AN Wireless HD 90 tower came along. Just down from Dan was the SteppIR booth selling a full size 40M thru 6M antenna including every frequency in between. Three full size elements on 40 and 30 meters and four elements from 20M thru 10M and 6 elements on 6M. Thus came the SteppIR MonstIR at the top the tower. That combination with a slender tower allowed the 300-pound MonstIR to be raised and lowered like an elevator. Just ask Mike W3MC.

Somewhere over a year ago a 4 element SteppIR was posted on the PVRC reflector It was still for sale after being in storage for many years. Thus, the addition of the 4 element SteppIR at 60 feet. That antenna is bolted to the side of the tower facing toward Europe. Both the MonstIR and 4 element are now selected independently thru a 6-Pak antenna switch.

While at Dayton the intention is to obtain a Stack Match II to phase both antennas - including a choice to connect both independently to two transceivers. With the 4 element SteppIR and MonstIR able to operate in either forward or reverse direction there may be no need to mount the 4 element antenna onto a Tic Ring in the future. Terrain Analysis shows phasing both antennas allows W3LL to match Marty's K2PLF exceptional performance to Europe. FYI, Marty's location slopes downhill for some miles toward the Susquehanna river in the direction of Europe.

That's all for filler material. Hope to see all in Dayton.

73, Bud W3LL

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Cycle 24 Solar Minimum– Frank W3LPL

Solar precursors at the tail end of Cycle 24 may be indicating that we will potentially see a lengthy period of very low solar activity as we move into Cycle 25.

What is a solar precursor?

Solar precursors correlating solar physical phenomena to the level of future solar activity are more reliable indicators of the progress of solar minima. They have proven more accurate than trying to forecast specific events, such as the date for the onset of Solar Cycle 25 by extrapolating the statistical behavior of physical phenomenon such as solar flux. Precursors also provide *estimates* of the future intensity and timing of the Cycle 25 solar maximum.

One type of precursor -- spotless days -- can be used to assess progress towards what is likely to be another deep and potentially lengthy solar minimum, potentially similar to the deep and lengthy Cycle 23 solar minimum. But it's important to understand that Cycle 24 has many unique characteristics, unlike any other solar cycle in many of its physical phenomena. Likewise, Cycle 25 will have its own unique characteristics, distinguishing it from any prior cycle.

What precursors of solar minimum have already occurred?

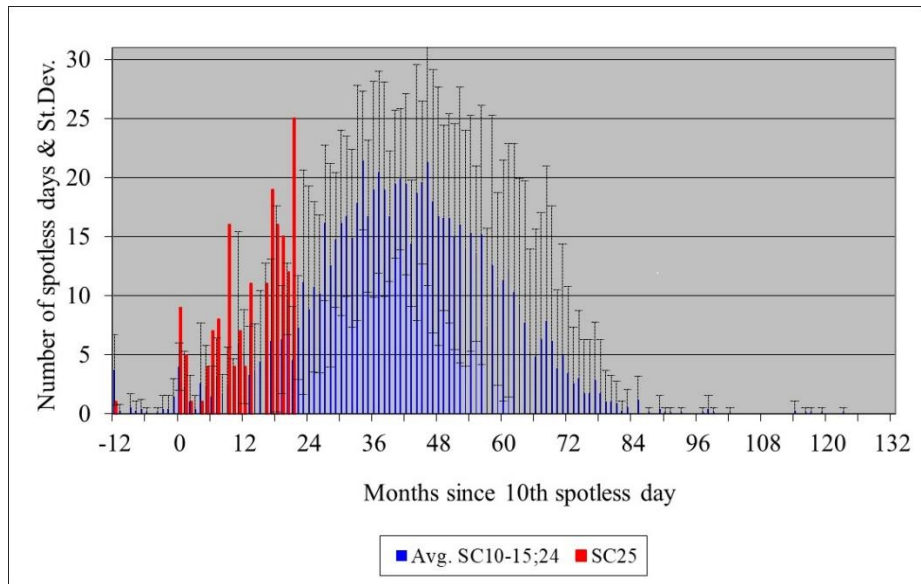
The first precursor of the Cycle 24 solar minimum occurred when nine spotless days occurred in June 2016. There was a total of 31 scattered spotless days during 2016, meaning only 9 percent of the days were spotless.

Periods of spotless days lasting more than two weeks *in a row* are precursors of a *deep solar minimum* with potential similarities to the last solar minimum. 16 spotless days in a row occurred in March 2017 followed by 14 in a row from late July through mid-August. The frequency of spotless days accelerated when 13 in a row occurred in early November followed by more than 50% spotless days during every subsequent month through at least April 2018, signaling the beginning of the *period* of very low solar activity known as solar minimum. 109 spotless days occurred during 2017, meaning 30 percent of the days were spotless.

The frequency of spotless days accelerated again when 14 spotless days in a row and 25 total spotless days occurred during March 2018. 54 spotless days were reported during the first 25% of 2018 and 61% spotless days through mid-April.

How long will this solar minimum last?

Frequent spotless days are forecast to continue at least through June and are likely continue through at least part of 2019 and perhaps 2020. This chart shows the number of spotless days -- in red -- since the tenth spotless day during the first precursor of solar minimum in July 2016. Shown in blue are the average numbers of spotless days during solar minimums following weak sunspot cycles similar to Cycle 24. This data suggests that we've just begun a deep solar minimum with frequent lengthy periods of spotless days that are likely to continue at least into 2019.



Recent published reports suggest that solar minimum may have already been reached based on the unexpectedly frequent incidence of spotless days during March and early April 2018. The continuing slow increase of north solar polar magnetic field strength through at least April 2018 suggests that we've *just begun* a deep and potentially lengthy solar minimum extending at least into 2019.

Will this be another deep solar minimum like we experienced last time?

A precursor of a **deep** solar minimum -- which is just beginning to emerge -- is frequent periods of spotless days *each lasting more than two weeks*. In addition to the stretches mentioned above, we had 13 spotless days in a row in November, 14 in a row in March 2018 and 9 in a row so far in April 2018. Long periods of spotless days will occur much more frequently as we progress deeper into a potentially lengthy solar minimum. By contrast, during the 24 months of the deepest part of the last solar minimum there were 15 lengthy periods of spotless days, *each* having a duration greater than two weeks.

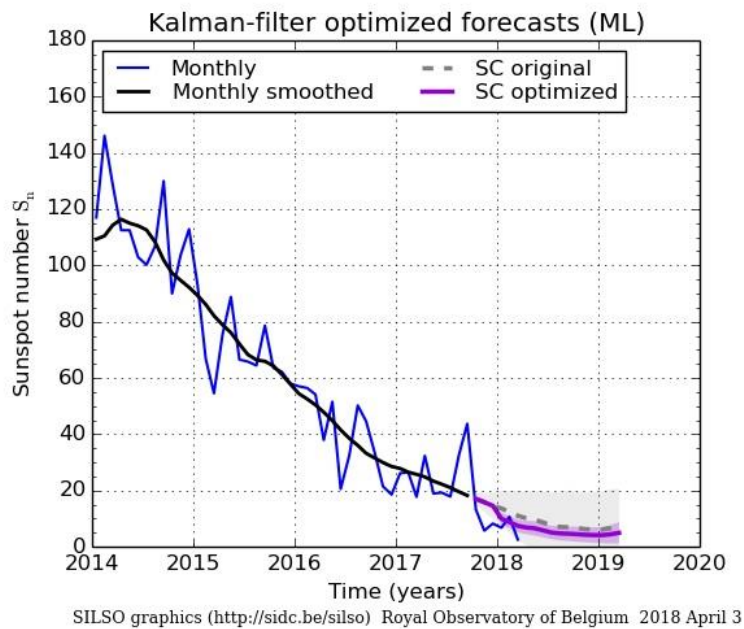
Another precursor of a deep solar minimum is a sustained *monthly average adjusted 10.7 cm solar flux index* less than 72. Monthly average solar flux below 71 in November 2017 and below 70 from December 2017 through April 2018 signals that Cycle 24 has entered a deep and potentially lengthy solar minimum. See the adjusted flux column (second column from the right) of this web page:

Monthly averages of Solar 10.7 cm flux

Year	Month	Observed Flux	Adjusted Flux	Absolute Flux
2017	10	76.39	75.90	68.31
2017	11	72.28	70.70	63.62
2017	12	71.70	69.46	62.52
2018	01	70.01	67.78	61.00
2018	02	71.63	69.96	62.97
2018	03	68.26	67.58	60.82

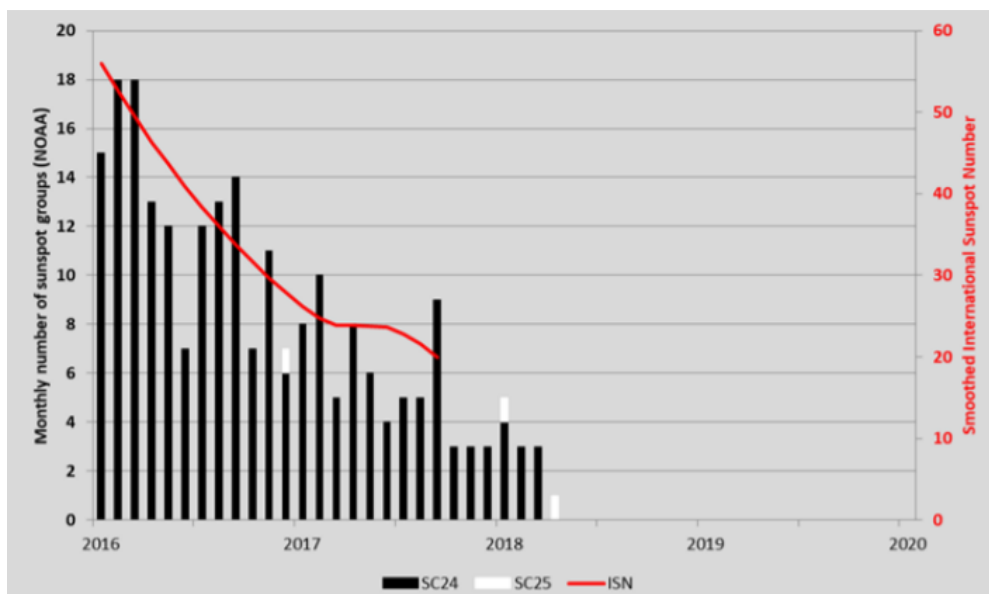
When will the next solar cycle begin?

This is the SIDC forecast of the remainder of Cycle 24 using statistical analysis:



A precursor of the onset of Cycle 25 will occur when more intense high latitude, opposite polarity sunspots *begin to appear*, perhaps later this year or during 2019.

The onset of Cycle 25 occurs approximately when the number of sunspots from declining Cycle 24 and emerging Cycle 25 are about equal. The graphic on page 6 of the 2-8 April Solar- Terrestrial Centre of Excellence (STCE) Newsletter shows the progress of Cycle 24 sunspots in black and new Cycle 25 sunspots in white. As of April 2018, only four very weak and short duration Cycle 25 sunspots have thus far been observed, signaling that the onset of Cycle 25 is likely to occur after 2018.



What about the future intensity Cycle 25 solar maximum?

Although *accurate forecasting* isn't possible until a few years after the onset of Cycle 25, a precursor providing a more refined *estimate* of the intensity of solar maximum is likely to occur very soon. A precursor providing an estimate of the *timing* of solar maximum will occur several years in the future.

A precursor of the intensity of solar maximum is the *total solar polar field strength*. A more refined estimate of the intensity of solar maximum can be made when both the north and south polar field strengths stabilize, likely in the next few months. The onset of Cycle 25 is likely to occur at least a year after both the polar fields become stable.

While the south solar polar region field strength reached a stable peak last year, the north polar region has not yet peaked, suggesting that onset of Cycle 25 will occur no earlier than 2019. The good news is that the polar field strengths are already slightly stronger than they were prior to the last solar minimum, providing physical evidence that Cycle 25 solar maximum will be *somewhat more intense* than Cycle 24.

A precursor of a more intense solar maximum will occur if lengthy periods of spotless days end by early 2019. Conversely, a less intense solar maximum will be indicated if lengthy periods of spotless days continue into 2020.

What about the future timing of Cycle 25 solar maximum?

Steady, sustained increase in monthly average solar flux -- perhaps as early as 2019 but more likely in 2020 or perhaps even later -- will signal the onset of Cycle 25. The rate of increase of solar flux will provide an *early estimate* of the timing of solar maximum. Monthly average solar flux increased unusually slowly during the initial years of Cycle 24, hopefully Cycle 25 will exhibit a more rapid increase. Accurate forecasts -- rather than estimates -- of the intensity and timing of solar maximum will be possible about two years after the onset of Cycle 25.

Petar 9A6A at Rappahannock Chapter Meeting in April – Dave K3ZJ

(from the [PVRC Facebook group](#))



Petar, 9A6A with host Steve, NR4M at PVRC's Rappahannock Chapter meeting on April 7 describing the 9A1A M/M station.

100th Anniversary of NSS Operations at Greenbury Point – Frank W3LPL

The historic NSS callsign will be reactivated on Saturday May 12th, commemorating the 100th anniversary of initial NSS operations on Greenbury Point in August 1918.



Please look for PVRC members operating on CW and SSB from 9:00 a.m. to 10:00 p.m. Saturday May 12th during this year's Armed Forces Day Crossband Military/Amateur Radio HF Communications Test – see the announcement below.

Operations will take place from the location of the former Navy High Power Radio Station on Greenbury Point in Annapolis. NSS frequencies are **4,038.5, 7,533.5, 9,947, 14,487, and 17,545 kHz**. We'll have four transmitters operating simultaneously.

NSS began operations in 1918 as the Navy High Power Radio Station using a Federal Telegraph Company 500 KW arc transmitter and four 600 foot towers operating in the VLF band, at that time VLF provided the only known capability for trans-oceanic communications. NSS began continuous operations in the short wave (HF) bands about ten years later until 1976 when its HF mission was transferred to NAM in Norfolk, VA. Visitors are welcome from 9 a. to 8 pm Saturday at 150 Hooper High Road, Annapolis.

Annual Armed Forces Crossband Test – Frank W3LPL

The Army Military Auxiliary Radio System will host this year's Armed Forces Day Crossband Test, scheduled for May 12, 2018. This annual event is open to all radio operators, and will not impact any public or private communications. For more than 50 years, military and amateur stations have taken part in this event, which is only an exercise scenario, designed to include hobbyist and government radio operators alike.

The AFD Crossband Test is a unique opportunity to test two-way communications between military communicators and radio stations in the Amateur Radio Service (ARS), as authorized in 47 CFR 97.111. These tests provide opportunities and challenges for radio operators to demonstrate individual technical skills in a tightly-controlled exercise scenario that does not impact any public or private communications.

Military stations will transmit on selected military frequencies and will announce the specific ARS frequencies monitored. The following stations will be making two way radiotelephone contacts with stations in the ARS between the time periods listed on the

frequencies listed in kilohertz below. All times are ZULU (Z), and all frequencies are Upper Side Band (USB) unless otherwise noted. WAR, WUG-2 and NSS will also make CW contacts.

AAZ / FT HUACHUCA, AZ

1500Z - 2359Z 5,330.5 14,438.5 18,211.0

AAC / BARROW ARMY RESERVE CENTER, KY

1300Z - 0100Z 5,346.5 7,542.0 13,963.5 20,920.0

ABH / SCHOFIELD BARRACKS, HI

1600Z - 2300Z 5,357.0 14,438.5 18,272.0 20,997.0

ABM1 / CAMP ZAMA, JAPAN

1500Z - 0100Z 14,487.0 20,994.0

ADB / CAMP FOSTER, OKINAWA

1500Z - 0100Z 14,487.0 20,994.0

WAR / PENTAGON WASHINGTON, DC

1200Z - 2400Z 5,357.0 13,963.5 18,211.0 24,760.0 USB + CW

WUG-2 / ARMY CORPS OF ENGINEERS, TN

1300Z - 0200Z 5,403.5 13,910.5 18,293.0 20,973.5 USB + CW

AIR / ANDREWS AFB

1200Z - 2400Z 4,517.0 7,305.0 15,807.0 20,740.0

AGA2SY / HANCOCK FIELD, NY

1200Z - 2400Z 4,575.0 7,540.0 13,993.0

AGA5SC / SCOTT AFB, IL

1600Z - 2300Z 3,308.0 4,872.0 7,545.0

AGA9TR / TRAVIS AFB, CA

1600Z - 0100Z 5,346.5 7,329.0 13,996.0 14,411.0

AFM4AF / NAVAL SUPPORT ACTIVITY MID-SOUTH MILLINTON, TN

1200Z - 0300Z 7,375.5 13,498.0

NMC1 / COAST GUARD ISLAND, ALAMEDA, CA

1700Z - 2359Z 7,542.0 15,740.5 22,924.5

NIIW / USS MIDWAY CV-41 SAN DIEGO, CA

1400Z - 0400Z 4,013.5 5,371.5 7,493.5 14,383.5 18,211.0

NWKJ / USS YORKTOWN CV-10 CHARLESTON, SC

1200Z - 2200Z 4,000.0 7,360.0 14,663.5

NEPM / USS IOWA BB 61 LOS ANGELES, CA

1500Z - 2359Z 4,043.5 6,903.5 14,463.5 18,293.0

NWVC / LST-325 EVANSVILLE, IN

1200Z - 0400Z 4,007.0 6,913.0 9,988.5 13,974.0

NSS / US NAVAL ACADEMY ANNAPOLIS, MD

1300Z - 0200Z 4,038.5 5,330.5 7,533.5 9,447.0 14,487.0 17,545.0 USB + CW

An AFD test message will be transmitted utilizing the Military Standard (MIL-STD) Serial PSK waveform (M110) followed by MIL-STD Wide Shift FSK (850 Hz RTTY) as described in MIL-STD 188-110A/B. Technical information is provided [here](#).

The AFD test message will also be sent at 0300Z in CW mode. The message will be transmitted on the following frequencies in kilohertz and at the listed times:

1400Z	AGA2SY	13,506.5 kHz	ACC	17,443.0 kHz
1420Z	WAR	13,506.5 kHz	AGA2SY	17,443.0 kHz
1440Z	ACC	13,506.5 kHz	WAR	17,443.0 kHz
1500Z	AAZ	13,506.5 kHz	AAZ	17,443.0 kHz
2200Z	ADB	13,506.5 kHz	AGA2SY	17,443.0 kHz
0300Z	NWVC	5,346.5 kHz		

For those who wish to document their contacts with a QSL card, go to and complete the request form [here](#).

W3LL Adds a Sister to the MonstIR – Bud W3LL

I added a four element SteppIR antenna at 60 feet to complement the MonstIR at 91 feet.



Photos by Kayren (WIFE)

Ground crew assistance came from Tom K3AJ, Ted WA3AER, Jack W3KX. Up on the tower was Jon AA1K directing the installation. Mounting brackets to secure the antenna boom to the AN Wireless HD 90 were fabricated from 1/4 inch 304 stainless by PVRCer Doc K3OUD.

PVRCers and 2018 International Marconi Day - Dan K2YWE

The Nuclear Ship Savannah Radio Club (NSSRC) was on the air on April 21 as an official Award Station during the 2018 International Marconi Day event sponsored by the Cornish Amateur Radio Club. PVRC members K3LU, K3AJ, WA3AER, ND3D and K2YWE operated the station along with PVRC prospect KC3CHL and club founder KB3VQU.

The club was required to show a historic connection between Guglielmo Marconi and Baltimore to qualify as an official IMD Award Station. After some research, we were able to use the presence of a Marconi regional office in Baltimore and other connections to qualify in 2017. Ours was one of 11 US and 73 worldwide IMDAS and we made more contacts than any other Award Station. This year we made 350 QSOs on 20m and 40m SSB and CW in six hours of operation as K3S.



K3AJ operating K3S



ND3D, K2YWE, WA3AER, KC3CHL, K3LU

PVRC members use IMD and other operating events aboard N/S Savannah as opportunities to mentor operators in contest-style operation and as a PVRC recruitment tool. The station runs 500W into dipoles 45 feet off the deck. K3SAV is the club's regular call sign. The ship is berthed in Pier 13 of the Canton Marine Terminal. Complete information about IMD and the award can be found on the Cornish club's [website](#).

N/S Savannah will next be on the air during National Maritime Day on May20. The ship will be open for visitors and there will be festivities and other ships on Pier 13 that day. A schedule of planned radio operation may be found on the K3SAV QRZ.com page. Contact K3LU or K2YWE for more information about N/S Savannah and its radio club.

PVRCer Tim N3QE Featured in CQ Magazine – Howie N4AF

Appreciate that your dipole will detect signals from directions that your beam would exclude.

John has kept his "big station" mojo by doing regular sprints at K3LU. My advice to anyone with a small station is to gain experience at a bigger station with top operators. If you do this, you will learn many tricks even if all you do is help out at one of multiplier stations. I had a similar experience in the 1970s at W3AU, then one of the largest multi-multis in the world. My scores miraculously increased when I operated at my tribander-and-wires title club station. Inevitably I had acquired some new operating skills while at the W3AU superstation.

Looking South

Can someone outside New England also have success? Success should be measured against your peers in your own geographic area. Having just wires to take on the beams and wire arrays in your vicinity may seem to be a losing proposition, but it isn't if you develop sufficient skill.

Tim Shoppa, N3QE (Photo D), operates from his Bethesda, Maryland, home with just one single wire in the trees at his suburban lot. It is a 130-foot doublet hung between some trees at 80 feet high and fed through tuners and ladder line from his basement (Photo E). His station equipment, like that of K1AR, is modest. He uses two Ten-Tec Eagle transceivers feeding an Armitron AL-1500 amplifier. His tuners are home brew and switched through a homebrew relay matrix so that he doesn't have to adjust the tuners each time he changes bands.

Like John, Tim also puts in operating time at superstations. In his case, some contest weekends he operates at W3PL and N3HBX. As a newer contest operator located in suburban Maryland just outside of Washington, D.C., Tim has been consistently increasing his scores against stations equipped with beams and phased arrays. In the CQ WPX RTTY con-

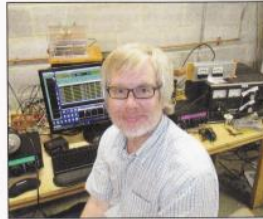


Photo D. Tim Shoppa, N3QE, at his station in Bethesda, Maryland. (Courtesy of N3QE)

test, with the single wire doublet in the trees, he has climbed from number 11 in North America in 2015 to number 8 in 2017 in the competitive single-operator high-corer category. In the just-completed 2018 contest he had an even higher score than in previous years. Not bad for 130 feet of wire and some ladder line!

John and Tim are getting their money's worth out of their copper wire. For us, their operating accomplishments demonstrate how well one can do with a simple wire antenna and modest station equipment. Now it's your turn!
—Until next month, 73, Dave, K3ZJ

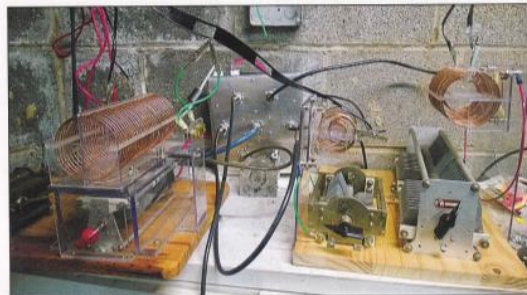


Photo E. N3QE uses multiple matching networks to load his single 130-foot Windom antenna on 160-10 meters. On 160 meters, the ladder line is shorted at the end and fed against ground to form a "Tee" radiator. (Courtesy of N3QE)

Membership News – Tim N3QE

Since March 2018, PVRC has added 9 new members:

- Wayne KM4JNT, Matt W4GO, Jeff KE4WKX, and Mila W6LRG in the Rappahannock Chapter.
- John K3GHH and Forrest WA3FAE in the Northwest Chapter.
- Keith AE3D and Frank WA3MD in the Annapolis Chapter.
- Joe W3TTT in the MD Metro Chapter.

Chapter leaders please remember to complete the [Meeting Attendance Report](#). Members can check and update their roster details via the [Roster Lookup](#).

Upcoming Contests and Log Due Dates

Contests This Month

- May 5 – ARI DX
- May 12 – CQM DX
- May 12 – VOLTA RTTY
- May 19 – EA CW
- May 19 – Baltic Contest
- May 26 – WPX CW

Logs Due This Month

- May 2 – YU DX
- May 9 – JIDX
- May 9 – Yuri Gagarin
- May 16 - Manchester Mineira

See WA7BNM's [Contest Calendar](#) for more detail and the latest information.

Editor's Last Word

Thanks for great contributions this month from Frank W3LPL, Dan K2YWE, Dave K3ZJ, Bud W3LL and Howie N4AF. For those of you going to Dayton, take some pictures and send them in for use in the June PVRC newsletter! For those of you not making the trip to ham radio fantasy-land, put together a short writeup or take some pictures of your latest project and send them in to jpescatore at aol dot com!

I'll be heading out to Dayton a week early and biking from Cleveland to Columbus with an old friend who moved out to Columbus, Rick WA3UOO. On Saturday, we'll bike an easy 5 miles from his sister's house in Xenia to the hamfest site – if you see two wide-bodied, middle-aged (we both plan on living to 120) men on green Trek 520s, we'll probably be listening on .43

From the PVRC Treasurer – Tom K3AJ

PVRC has chosen not to implement an annual Dues requirement. We depend on the generosity of all of our club members to finance our annual budget. In addition, active PVRC members are expected to participate and submit logs for at least two PVRC Club Competition contests per year.

When contemplating your donation to PVRC, each member should consider the benefit you are receiving from PVRC and its many opportunities for your personal growth in our wonderful hobby, then donate accordingly.

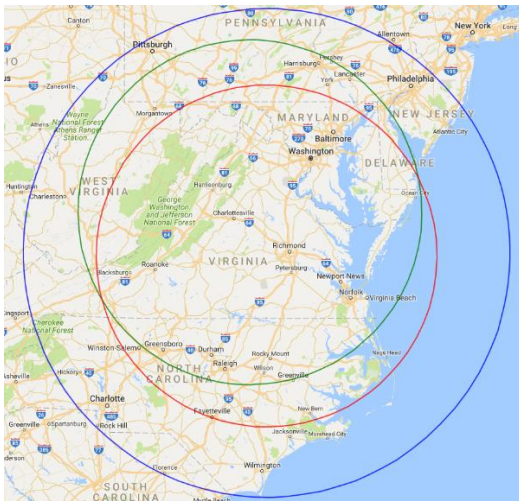
Direct donations to PVRC via Credit Card or PayPal may be made by clicking this "Donate" button and clicking the next Donate button that appears on your screen:



Donations to PVRC are not tax deductible

Eyeball QSO Directions

The latest info on local club meetings and get togethers will always be sent out on the [PVRC reflector](#) and posted on the PVRC [web site](#).



Green: ARRL VHF Circle
175 mile radius
Around 38.075N,
78.171W

Red: ARRL HF Circle
175 mile radius
Around 37.43168N,
77.858482W

Blue: CQ HF Circle
250 mile radius
Around 37.43168N,
77.858482W



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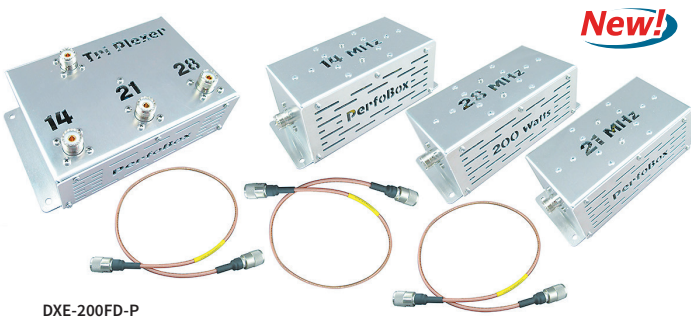
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DXE-200FD-8X-P...\$599.99 DXE-200FD-P...\$699.99



Coaxial Cable Assemblies

Don't wait until the week before Field Day to ensure you have enough cable to build a temporary station. These low-loss cable assemblies are available in standard lengths with DX Engineering's revolutionary PL-259 connector, featuring the best qualities of both crimp-on and solder-on connectors. Use the online Custom Cable Builder at DXEngineering.com to build assemblies made to your exact specs. DX Engineering's coaxial cable is also available by the foot or in bulk spools.



Field Day Essentials: Mics, Footswitches and Headsets

DX Engineering has everything you need for trouble-free and more enjoyable Field Day operation, including lightweight, hands-free headsets; premium desktop microphones; and DX Engineering's own rugged footswitches for your PTT keying needs. We carry leading audio accessories from Heil, Pryme, Kenwood, Inrad, Yaesu and other top brands. Don't accept anything less than clear, intelligible speech fidelity whether you're doing the speaking or listening. Click on "Audio" at DXEngineering.com for our full lineup of accessories.



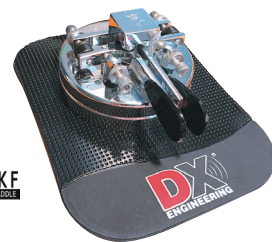
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CW Keys and Accessories

DX Engineering carries a range of iambic, single and double paddles, and straight keys, plus key and keyer cables, dust covers and other accessories. Choose from the best brands: N3ZN, H8K F, Vibroplex, Bencher and Kent. Enjoy smooth CW operation and durable performance from these finely crafted instruments. Then keep your key from sliding around on your desk and allow your wrist to stay at a comfortable angle with DX Engineering's washable PaddlePads available in two sizes.

DXE-PADDLEPAD-L 5.75" x 7.50"\$8.99

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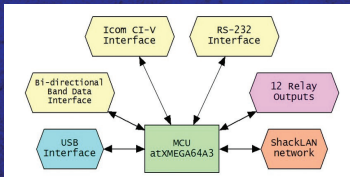
Announcing the new BM-5 BandMaster V

The next generation of the popular BM-3 with direct USB support for FLEX Radios

NEW!



The BM-5 BandMaster V is a full featured unit that contains a universal band decoder and antenna switch controller. It features five communication channels. All channels are active simultaneously and provide data translation for your station accessories. In other words, if you are using an Icom radio on the CI/V interface the BandMaster V will output 4-bit band data as well as RS-232 data in Yaesu or Kenwood format. In reverse, when using a radio on the RS-232 interface the BandMaster V will output 4-bit band data as well as an Icom CI/V data stream. The USB interface may be connected to your PC for radio control. **The USB interface may be connected directly to a Flex SDR with no additional cables or interfaces required.**



RatPack Remote Antenna Switch

Six antenna remote switch with rotary switch controller. Push button controllers available. HF and 50 MHz. Power rating is 5 kW CW.



StackMatch

The original, not the imitations. For phasing 2, 3, 4 and even 6 antennas. Also it can be used to combine vertical and horizontal polarized antennas to diminish fading.



TwoPak

Two antenna switch, 12V DC via wires or optional via coax cable. DC to 150 MHz. HF 5 kW rating. Metal box.



Off-Center Fed Dipole Antenna

AS-OCF-2K, AS-OCF-5K Seven bands antenna (80 to 6 m). Heavy duty materials. 4:1 balun included. Ratings: 2 or 5 kW or higher available.



PowerMaster II



RF Power and SWR meter. Couplers for 3 kW, 10 kW or higher available for HF/6 m. VHF and UHF couplers for 1.5 kW. You can connect up to 5 couplers to the display to monitor RF power on different TX lines.



OM Power Amplifiers, The New RF Power Benchmark!



OM Power Amplifier Sales Program

Lower prices than the competition's equivalents, most modern design, and strongest warranty in the market!

OM4000HF	Manual 160-10 m 4 kW
OM4000A	Automatic 160-10 m 4 kW
OM2500HF	Manual 160-10 m 2.5 kW
OM2500A	Automatic 160-10 m 2.5 kW
OM2000+	Manual 160-6 m 2 kW
OM2000A+	Automatic 160-6 m 2 kW

OM Power was founded in 2004 as an initiative of two enthusiastic Slovak ham operators. Since that time OM Power has become a successful and well established company in the production of amplifiers. OM Power amplifiers can be found on all continents and in almost every country of the world. All of the amplifiers have state of the art design, and are solidly built.

The automatic amps can drive an antenna switch of up to 10 antennas and select up to ten bandpass filters applies to all automatic models

OM4000A - OM4000HF OM2500A - OM2500HF

The A-series are automatic band change amplifiers.

The HF-series are manual band change and tuning amplifiers.

OM4000: 4 kW SSB and CW, 3 kW RTTY, AM and FM

OM2500: 2.5 kW SSB and CW, 2 kW RTTY, AM and FM

OM2000A+ - OM2000+

The **OM2000A+** is the lightest and smallest 2000 W fully automatic HF/6 m power amplifier in the market. Its manual tuning version, the **OM2000+**, is our affordable unmatched best-seller.

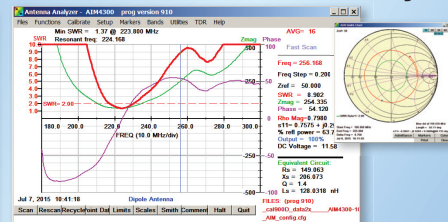
Frequency coverage:

Amateur bands 1.8 - 29.7 MHz including WARC + 50 MHz

Power output: 2000+ W in SSB/CW on HF bands, 1500 W in RTTY
1500 W CW/SSB on 50 MHz



Laboratory Grade Antenna and Vector Network Analyzers

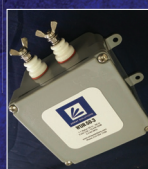


One Port Analyzers and Two Port Vector Network Analyzers ranging from 5 kHz up to 1 GHz

AIM 4300	\$495
AIM UHF	\$695
VNA 2180	\$995
VNA UHF	\$1,295
PowerAim 150 Broadcasting Engineers Choice. 150 V peak RF capable	\$2,495

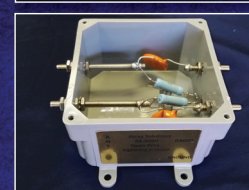
Surge Arrestors

AS-302, AS-303 Coaxial cable arrestors. DC to 500 MHz. N-type or SO-239 connectors. **AS-300SB** Stacking fixture available. **AS-309H**, ladder line arrestor. All have static bleed function. **AS-8SP, AS-12SP** and **AS-16SP** control cable arrestors. Protect your rotator's and other control cables.



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Ratios 1:1, 1:2, 2:1, 4:1 and more. RF line isolators. Ratings 3, 5, 10 kW+. Get the most out of your antenna by stopping the coaxial cable from becoming part of it.



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IC-9100 | The All-Round Transceiver

- HF/50MHz 144/43vuv0 (440) MHz and 1200MHz*1 coverage
- 100W on HF/50/144MHz, 75W on 430 (440) MHz, 10W on 1200MHz*1 • Double superheterodyne with image rejection mixer



IC-7200 | HF Transceiver

- 160-10M • 100W • Simple & tough with IF DSP • AGC Loop Management • Digital IF Filter • Digital Twin PBT • Digital Noise Reduction • Digital Noise Blanker • USB Port for PC Control



IC-PW1 | HF/50 MHz Amplifier

- Wide freq. coverage - 1 kW from 1.8 MHz to 50 MHz (amateur bands only) • Wide ALC adjustable range • Full duty cycle • Auto antenna tuner built-in • Auto AC input voltage selector is employed



IC-7851 | HF/50MHz Transceiver

- 1.2kHz "Optimum" roofing filter • New local oscillator design • Improved phase noise • Improved spectrum scope • Dual scope function • Enhanced mouse operation for spectrum scope



IC-7100 | All Mode Transceiver

- HF/50/144/430/440 MHz Multi-band, Multi-mode, IF DSP • D-STAR DV Mode (Digital Voice + Data) • Intuitive Touch Screen Interface • Built-in RTTY Functions



ID-5100A Deluxe

VHF/UHF Dual Band Digital Transceiver

- Analog FM/D-Star DV Mode • SD Card Slot for Voice & Data Storage • 50W Output on VHF/UHF Bands • Integrated GPS Receiver • AM Airband Dualwatch



IC-7700 | HF/50MHz Transceiver

- The Contester's Rig • HF + 6m operation • +40dBm ultra high intercept point • IF DSP, user defined filters • 200W output power full duty cycle • Digital voice recorder



IC-718 | HF Transceiver

- 160-10M** • 100W • 12V operation • Simple to use • CW Keyer Built-in • One touch band switching • Direct frequency input • VOX Built-in • Band stacking register • IF shift • 101 memories



ID-4100A | VHF/UHF Dual Band Digital Xcvr

- Compact, Detachable Controller for Flexible Installation • DV/FM Near Repeater Search Function • Apps for iOS™ and Android™ devices • Wireless Operation with VS-3 & UT-137 Bluetooth® Headset & Module • MicroSD Card Slot



IC-7610 | HF/50 MHz All Mode Transceiver

- Large 7-inch color display with high resolution real-time spectrum scope and waterfall • Independent direct sampling receivers capable of receiving two bands/two modes simultaneously

NEW



IC-2300H | VHF FM Transceiver

- 65W RF Output Power • 4.5W Audio Output • MIL-STD 810 G Specifications • 207 alphanumeric Memory Channels • Built-in CTCSS/DTCS Encode/Decode • DMS



IC-V80 | HD 2 Meter FM Transceiver

- Tough construction • 750mW loud audio • Powerful 5.5W of output power • IP54 and MIL-STD-810 rugged construction • Built-in CTCSS/DTCS • WX channel & weather alert function



IC-7300 | HF/50MHz Transceiver

- RF Direct Sampling System • New "IP+" Function • Class Leading RMDR and Phase Noise Characteristics • 15 Discrete Band-Pass Filters • Built-In Automatic Antenna Tuner



IC-2730A | VHF/UHF Dual Band Transceiver

- VHF/VHF, UHF/UHF simultaneous receive • 50 watts of output on VHF and UHF • Optional VS-3 Bluetooth® headset • Easy-to-See large white backlight LCD • Controller attachment to the main Unit

ID-51A PLUS2

VHF/UHF D-STAR Portable

- RS-MS1A, free download Android™ application
- New modes for extended D-STAR coverage • Terminal Mode & Access Point Mode allow D-STAR operation through Internet • DV & FM repeater search function • Dplus reflector link commands



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FTDX5000MP Limited | 200W HF + 6M Xcvr

- Internal Power Supply • Two Totally Independent Receivers
- Super Sharp "Roofing" Filters • High Performance Yaesu Custom- designed 32-bit Floating Point DSP • True Analog Meter Precision



FTDX3000 | 100W HF + 6M Transceiver

- 100 Watt HF/6 Meters • Large and wide color LCD display • High Speed Spectrum Scope built-in • 32 bit high speed DSP /Down Conversion 1st IF



FT-991A | HF/VHF/UHF All Mode Transceiver

- Real-time Spectrum Scope with Automatic Scope Control • Multi-color waterfall display • State of the art 32-bit Digital Signal Processing System • 3kHz Roofing Filter for enhanced performance • 3.5 Inch Full Color TFT USB Capable • Internal Automatic Antenna Tuner • High Accuracy TCXO



FTDX1200 | 100W HF + 6M Transceiver

- Triple Conversion Receiver With 32-bit Floating Point DSP • 40 MHz 1st IF with selectable 3 kHz, 6kHz & 15 kHz Roofing Filters • Optional FFT-1 Supports AF-FFT Scope, RTTY/PSK31 Encode/Decode, CW Decode/Auto Zero-In • Full Color 4.3" TFT Display



FT-891 | HF+50 MHz All Mode Mobile Transceiver

- Rugged Construction in an Ultra Compact Body • Stable 100 Watt Output with Efficient Dual Internal Fans • 32-Bit IF DSP Provides Effective and Optimized QRM Rejection • Large Dot Matrix LCD Display with Quick Spectrum Scope • USB Port Allows Connection to a PC with a Single Cable • CAT Control, PTT/RTTY Control



FT-857D | Ultra Compact HF/VHF/UHF

- 100w HF/6M, 50W 2M, 20W UHF • DSP included • 32 color display • 200 mems • Detachable front panel (YSK-857 required)



FT-2980R | Heavy-Duty 80W 2M FM Transceiver

- Massive heatsink guarantees 80 watts of solid RF power • Loud 3 watts of audio output for noisy environments • Large 6 digit backlit LCD display for excellent visibility • 200 memory channels for serious users



FTM-100DR | C4FM FDMA/FM 144/430 MHz Xcvr

- Power Packed System Fusion Transceiver • High Audio Output Power • Rugged Powerful Transmitter • Integrated 66ch High Sensitivity GPS • 1200/9600 APRS Data Communications



FTM-400XD | 2M/440 Mobile

- Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 memory per band



FT-70DR C4FM/FM 144/430MHz Xcvr

- System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or Fm Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging

FT-2DR C4FM/FM 144/430 MHz Xcvr

- Analog/C4FM Dual Monitor (V+V/U+U/V+U) • System Fusion compatible • 1200/9600 APRS Data Communications • Integrated 66ch High Sensitivity GPS • Wide Band Receiver • Snapshot Picture Taking Capability With Optional MH-85A11U



NEW

FT-65R | 144 MHz Transceiver

- Compact Commercial Grade Rugged Design • Large Front Speaker Delivers 1W of Powerful Clear Audio • 5 Watts of Reliable RF Power Within a compact Body • 3.5-Hour Rapid Charger Included • Large White LED Flash-light, Alarm and Quick Home Channel Access



FT-60R | 2M/440 5W HT

- Wide receiver coverage • AM air band receive • 1000 memory channels w/alpha labels • Huge LCD display • Rugged die-cast, water resistant case • NOAA severe weather alert with alert scan



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TS-990S | 200W HF + 6M Transceiver

- World's first dual TFT display • 200W output on all bands
- ± 0.1 ppm TCXO ensures both high stability and reduced power consumption • Triple 32-bit DSP's dedicated to main/sub receivers and band scope • Main receiver employs full down conversion, new mixer & narrow band roofing filters • Third order intercept point (IP3) +40dBm for highest level of RX performance (main receiver)

Call For Special Price!



TM-D710G | 2M/440 Dualband

- V+V/V+U/U+U operation • Built-in GPS • Built-in TNC for APRS & DX-Cluster operation • 50W 2M & UHF • 1,000 memories • Dual receive • Green or amber backlight colors • Latest APRS firmware w/new features • Sky Command II remote functions

Call For Special Price!



TS-480SAT/HX | HF + 6M Transceiver

- 480HX 200W HF & 100W 6M (no tuner) • 480SAT 100W HF & 6M w/AT • Remotable w/front panel/speaker • DSP built-in

Call Now For Low Price!



TS-590SG | HF/50MHz Transceiver

- Equipped with 500 Hz/2.7 kHz roofing filter as standard • ALC derived from TS-990S eliminating spike issues • Antenna output function (shared with DRV connector) • CW - morse code decoder function • Improved 1st mixer • New PFB key with multi-function knob • New split function enabling quick setting • LED backlight with selectable color tone



TM-V71A | 2M/440 DualBand

- High RF output (50W) • Multiple Scan • Dual receive on same band (VxV, UxU) • Echolink® memory (auto dialer) • Echolink® Sysop mode for node terminal ops • Invertible front panel • Choice of green/amber for LCD panel • 104 code digital code squelch • "Five in One" programmable memory • 1000 multifunction memory

Call Now For Your Low Price!



TH-D72A

2M/440 HT w/extended RX

- 5W TX, RX 118-524 MHz, VxU, VxV, UxU
- APRS w/built-in 1200/9600 TNC • Built-in GPS, Built-in USB, digipeater • Echolink® compatible, • Mil-Spec STD810

Call For Special Low Price!

TH-D74A

M/220/440 HT w/D-STAR!

- D-STAR compatible • APRS ready w/built in GPS • Color weather station information • Built-in KISS mode TNC • High-performance DSP voice processing • Standard compatibility for Bluetooth

Call For Low Price!



TS-2000/2000X | HF/VHF/UHF Transceiver

- 100W HF, 6M, 2M • 50W 70CM • TS-2000X 10W 1.2GHz
- Built-in TNC, DX packet cluster • IF Stage DSP • Backlit front key panel

Call For Special Price!



TM-281A | 2 Mtr Mobile

- 65 Watt • 200 Memories • CTCSS/DCS • Mil-Std specs • Hi-quality audio

Call For Special Low Price!



TH-K20A | 2M Handheld

- 2M 5.5W • VOX • CTCSS/DCS/1750 Burst built-in • Weather alert

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- Single 4CX800a Tube • Vacuum Antenna Relays

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THE WORLD'S FAVORITE SDR RECEIVERS

- Continuous SDR receiver coverage from 1 kHz to 2 GHz
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- Also works with other platforms and popular SDR software
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- Backed by the biggest and best SDR support community
- Excellent value starting at \$99.95



MA-40

- 40' Tubular Tower

Call For Latest Pricing!

MA-550

- 55' Tubular Tower • Handles 10 sq. ft. at 50 mph • Pleases neighbors with tubular streamlined look

Call For Latest Pricing!

All US Towers shipped by truck; freight charges additional.



TX-455

- 55' freestanding crank-up • Handles 18 sq. ft. @ 50 mph • No guying required • Extra-strength construction • Can add raising and motor drive accessory • Towers rated to EIA specifications • Other models available at great prices!



218XATC-PL-(length) RG8x (240UF) w/PL259 Connectors Each End.

Weather-Proof Heat Shrink Tubing.

- Stranded Center Conductor.
- 95% TC Braid + bonded 100% Foil Shield.
- Very Flexible, Light Weight, and Smaller than RG8 sizes.
- Non-Contaminating-UV Resistant-Direct Burial-Black Jacket.



233/2-G4-(length).

- Unique design (Nickel Grommets 4" Spacing) allows for easy attachment to a vehicle's body or truck bed to create a "ground-plane".
- Good option as a "buss-bar" in the shack.
- 1/2" wide tinned copper 38x48x8/384 10ga 53 Amps.
- Stocked in 1.5', 3', 5', and 10' foot lengths.

REMOTE RIG



RRC-1258 MkII-S-Set

This set of interfaces allows remote control of your Amateur Radio Station via Internet in a user-friendly and cost effective way! RemoteRig gives you control of the radio coupled with crystal clear TX & RX audio and sending CW with your own Paddle!

New! Now Stereo Version for Dual Receiver radios.

Works with all Computer-controllable radios from: **Alinco - Elecraft - ICOM - Kenwood - Yaesu**

For radios with detachable front panels no PC is required for: TS-480HX/SAT; TS-2000 (RC-2000 req'd); IC-703/Plus; IC-706 series; DX-SR8T; IC-2820H; IC-R2500

Just simply insert your control box in place of your front panel interconnect cable, place the body of the radio on the remote end and you are on the air as if you are there! Extra Controller and Remote interface units sold individually for multiple sites/users.

Now includes 12V power supply, \$12.95 value!

Available exclusively from all HRO locations!

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