N.E.W.S. LETTER

The Publication of the North East Weak Signal Group

MARCH 2005 VOLUME FOURTEEN ISSUE TWO

President: WA1MBA, Tom Williams
V P: Stan Laine, WA1ECF

CURRENT OFFICERS

Secretary: WIGHZ Paul Wade
Treasurer: K5GMX Bill Conner

NEXT MEETING
SATURDAY THE 12TH OF MARCH
AT THE RADISSON HOTEL IN ENFIELD, CT
OUR TALK WE BE A SHOW-AND-TELL
ON 24, 47 AND 78 GHZ RADIOS

IN THIS ISSUE

31ST EASTERN VHF/UHF CONFERENCE: APRIL 8-10, 2005
RADISSON HOTEL (860)-741-2211

4/8/05 Friday LODGING
6:00pm 'til HOSPITALITY ROOM Socializing, Photo displays Snacks, Refreshments and More.
4/9/05 Saturday REGISTRATION, FORMAL TALKS, BANDSESSIONS, NOISE FIGURE MEASUREMENTS & MUCH, MUCH MORE.
7:00am REGISTRATION BEGINS
8:00am TALKS BEGIN We have the following set up so far:
8:15am LVA 144 MHz Broad Beamwidth Array, Dave Olean K1WHS
9:15am Exotic Operating Location, Chris Patterson W3CMP
9:15am 6&2 METER BANDSESSION, Roger Amidon K2SMN
10:00am Antennas, Paul Wade W1GHZ
10:00am 222 & 432 BANDSESSION, Del Schier K1UHF
10:45am AUCTION/BR

MEMBERSHIP in the N.E.W.S. Group is $15 per year. Apply to Bill Conner K5GMX, K5GMX@arrl.net. You may download an application from our web page http://www.newsvhf.com

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PREZ SEZ
DE WA1MBA

Hope that you all had a great January contest, and a safe winter (so far). We had a total of 9 people show up at the January meeting - yes we managed to call a snow storm again. Not to worry, there will be a recap of the main talk at our next meeting. Speaking of our next meeting (March 12th), we will have a show-and-tell for our talks. Several of us have been working on 24, 47 and 78 GHz radios, and will bring them-some working and some still in planning stages. You will probably see as many approaches as radios. Even if you think you will never get on these bands, it sure is interesting. 47 GHz right now is probably where narrow band 10 GHz was about 20 years ago.

Don't forget to bring some items for the duct tape auction. Bring items in pairs - this way you might get some cash for that nice trinket that you don't need, and along with it, get rid of some boat anchor. You don't have to duct-tape the pair together, but they are auctioned together.

Bye the way, our original date for the July picnic and elections meeting had to be changed because the K of C pavilion was not available on the date we wanted. Mark in your calendars July 16th as the new date. I hope this does not interfere with other plans you have this summer,

And - don't forget that the Eastern VHF/UHF conference is coming up pretty soon - April 8th through 10th. The program looks really good, so please register. You can always get information at the NEWS website (thanks Ron and Bruce) www.newsvhf.com/vhfconf.htm

See you March 12th!

Tom WA1MBA

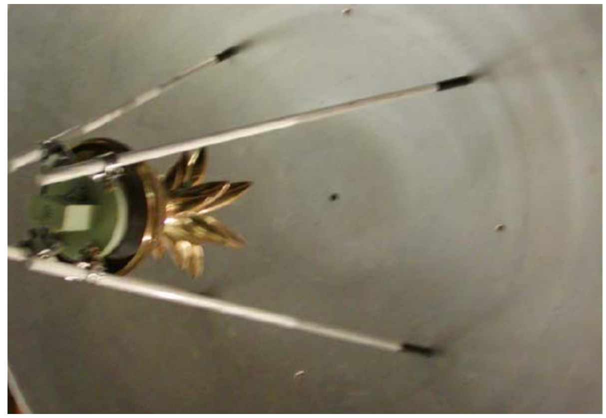
SECRETARY'S REPORT OF THE NEWS NOV 13TH MEETING DE W1GHZ

There were only nine members in attendance with the bad weather and there is no secretary's report.

TOP-SECRET DISH FEED
BY LIRPA LOOF

A new, formerly top-secret, dish feed has been developed providing high-gain, widebandwidth, and universal polarity. The feed, shown in the photo, has a wide diversity of element lengths and directions, so it is broadband with no dominant polarity. The feed is known by the Hungarian nickname elp-paenip, but Google will not find the feed since it is secret.

The mathematics behind the feed are thick and impenetrable, but it is said to operate by aggregation of the electrostrictive inhibiters, leading to framistat intensification.



According to highly unreliable sources, the dish feed was developed in a secret Air Force laboratory near Roswell, NM. (Of course, the Air Force will deny that it exists.) After extensive testing, production was contracted with a major antenna manufacturer. Seeking higher profits, the manufacturer outsourced production to a contract manufacturer near Calcutta. To save money, rejects and excess production units were not gold plated, but became mixed with other brass artifacts being produced in the factory. These artifacts were shipped to stores in malls in the USA specializing in Indian brass.

If you are lucky, you may find a feed like the one shown in the picture in one of these mall stores. Do not bother asking for them – the worthy gentlemen managing these stores have been instructed to deny having any feeds, only objets d'a t. r

The feed gives great performance. In front of an old Primestar dish, it was 5½ S Units better than a Super-QRP antenna (from www.qrp.ru) shown in the picture. Since an S-Unit is 6 dB, the gain is 33 dB! For wireless networking, it gives more range than the legendary Pringles can.

Bibliography
Because our sources must remain confidential, we cannot provide all the details and must use a pseudonym. But if you hurry down to the mall, you might have a chance to try one of these feeds before they are all rounded up by a nameless agency.

[1] Reverence Data for Radio Engineers, Artech Diocesan Press, 1640,revised 1947, 1983.

[2] Feed Characteristics Explained, Spike/Jones Associates, technical memorandum 33 1/3, $1.95

[3.14159] The Teapot Song, "I'm a Little Teapot", author unknown. Copyright Sony/Microsoft corporations.

[4] <reference to area 51 documents removed under provisions of the Digital Millenium Copyright and Antiterrorism Act>

JANUARY RUMORED SCORES DE KB1VC AND WZ1V

Call	Grid	News	CL	Points	6m	2m	222	432	903	1.2G	2.3G	3.4G	5.7G	10G	24G	47G	75G	120G	145G	240G	LAS
W2FU	FN13	N	U	349160	166/51	212/47	76/27	113/31	27/12	36/15	16/8	18/7	16/6	17/6	6/4	-	-	-	-	-	4/1
K1JT	FN20	N	U	135808	256/41	207/39	66/16	81/18	25/4	27/6	12/4	-	-	-	-	-	-	-	-	-	-
K5QE	EM31	N	U	135807	80/42	161/53	64/41	94/40	14/14	14/13	-	-	-	-	-	-	-	-	-	-	-
W6TE	DM06	N	U	77385	44/14	105/17	20/10	104/14	36/4	68/6	9/4	9/5	-	6/3	-	-	-	-	-	-	-
N2GCZ	FN31	N	U	8528	44/13	44/12	20/7	28/7	-	6/2	-	-	-	-	-	-	-	-	-	-	-
W6QE	DM13	N	U	4750	35/7	57/8	-	31/5	-	9/5	-	-	-	-	-	-	-	-	-	-	-
K3EAR	FM19	N	L	356998	524/70	513/65	142/33	206/38	-	-	-	-	-	-	-	-	-	-	-	-	-
W3SO	FN00	N	L	174064	236/49	290/51	103/33	140/39	-	-	-	-	-	-	-	-	-	-	-	-	-
KB1DFB	FN41	N	L	40434	188/21	208/24	37/12	58/12	-	-	-	-	-	-	-	-	-	-	-	-	-
W3DOG	FM28	N	L	7755	66/14	49/18	16/10	9/5-	-	-	-	-	-	-	-	-	-	-	-	-	-
K1KC	EM73	N	L	1817	24/7	37/12	-	9/4	-	-	-	-	-	-	-	-	-	-	-	-	-
K1TEO	FN31	Y	H	376950	227/39	326/48	92/31	129/34	34/15	54/17	25/10	15/8	5/3	11/5	-	-	-	-	-	-	-
K1RZ	FM19	N	H	191334	141/22	185/24	58/19	106/23	27/13	44/14	15/7	10/5	11/8	14/8	-	-	-	-	-	-	-
WA3NUF	FN20	N	H	133292	128/17	190/21	68/12	76/14	31/6	42/7	19/5	15/5	11/2	15/3	2/1	-	-	-	-	-	3/1
K3TUF	FN10	N	H	97706	168/22	105/21	61/15	79/17	23/5	30/7	16/5	10/4	-	3/2	-	-	-	-	-	-	-
W3SZ	FN20	N	H	69759	33/4	92/14	44/11	51/9	27/6	39/8	18/5	11/4	11/3	14/5	-	-	-	-	-	-	-
K8EB	EN73	N	H	67072	121/35	129/34	33/20	54/23	6/6	16/13	-	-	-	-	-	-	-	-	-	-	-
WZ1V	FN31	Y	H	60610	131/20	155/29	55/21	57/15	8/3	8/3	3/2	5/2	-	-	-	-	-	-	-	-	-
K8MD	EN82	N	H	59474	117/36	85/28	37/22	41/22	10/10	12/12	1/1	-	-	-	-	-	-	-	-	-	-
N3HBX	FM19	N	H	47816	166/20	170/28	35/16	53/18	-	11/4	-	-	-	-	-	-	-	-	-	-	-
W0GHZ	EN34	N	H	44540	61/15	87/20	27/12	51/16	8/5	17/9	3/2	2/1	-	8/3	2/2	-	-	-	-	-	-
WB9Z	EN60	N	H	44512	90/26	116/31	30/15	53/20	-	14/12	-	-	-	-	-	-	-	-	-	-	-
K8TQK	EM89	N	H	35631	95/41	86/30	17/13	23/15	6/5	7/6	1/1	-	-	-	-	-	-	-	-	-	-
KA1ZE/3	FN01	N	H	32718	-	301/57	-	49/25	-	-	-	-	-	-	-	-	-	-	-	-	-
W4WA	EM84	N	H	29700	53/22	85/35	32/18	49/24	-	-	-	-	-	-	-	-	-	-	-	-	-
KE8FD	EM84	N	H	24795	45/21	80/34	27/18	35/19	-	3/3	-	-	-	-	-	-	-	-	-	-	-
VE3TFU	EN92	N	H	22848	23/11	47/21	26/16	25/17	11/9	8/7	3/3	-	-	-	-	-	-	-	-	-	-
WA2ONK	FN20	N	H	20790	42/6	86/15	43/11	44/7	17/3	23/3	-	-	-	-	-	-	-	-	-	-	-
W0ZQ	EN34	N	H	20557	40/11	51/16	27/12	40/13	6/2	12/4	2/1	2/1	-	1/1	-	-	-	-	-	-	-
W6KBX	CM98	N	H	18780	47/14	84/19	24/10	41/11	-	13/6	-	-	-	-	-	-	-	-	-	-	-
K1TOL	FN44	N	H	17043	247/69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W1RZF	FN42	Y	H	13294	62/12	101/17	25/8	38/9	-	-	-	-	-	-	-	-	-	-	-	-	-
N2CEI	FN20	Y	H	12543	339/37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K2UOP	FM09	N	H	11799	32/11	47/15	20/10	24/12	4/4	6/5	-	-	-	-	-	-	-	-	-	-	-
W1ZC	FN42	Y	H	5890	51/11	41/12	-	29/6	-	10/2	-	-	-	-	-	-	-	-	-	-	-
NJ2F	EL96	N	H	5796	41/14	44/11	15/4	23/7	-	-	-	-	-	-	-	-	-	-	-	-	-
W1AIM	FN34	Y	H	4725	27/12	30/15	10/8	10/8	1/1	1/1	-	-	-	-	-	-	-	-	-	-	-
K0HA	EN10	N	H	3840	80/48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KV1J	FN42	N	H	3256	35/6	29/6	15/5	19/4	-	4/1	-	-	-	-	-	-	-	-	-	-	-
N3DB	FM18	N	H	2842	98/29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W5UWB	EL17	N	H	950	-	12/7	5/4	6/5	-	2/2	-	-	-	1/1	-	-	-	-	-	-	-
K5DYY	EL07	N	H	855	3/3	14/8	4/3	4/3	-	1/1	-	-	-	1/1	-	-	-	-	-	-	-
VE2PIJ	FN35	N	H	624	10/4	16/5	2/1	7/2	1/1	-	-	-	-	-	-	-	-	-	-	-	-
W5SIX	DM54	N	H	182	4/2	8/3	3/1	4/1	-	-	-	-	-	-	-	-	-	-	-	-	-
NN5DX	DM80	N	H	70	-	4/4	2/2	1/1	-	-	-	-	-	-	-	-	-	-	-	-	-
K1FJM	DM04	N	Q	756	9/4	23/6	-	11/4	-	-	-	-	-	-	-	-	-	-	-	-	-
N0JK	EM17	N	Q	1	1/1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N6NB	ROV	N	R	2202200	213/22	229/22	207/22	218/22	195/22	201/22	195/22	195/22	195/22	193/22		-	-	-	-	-	-
N6ZZ	ROV	N	R	2164206	197/22	204/22	195/22	196/22	195/22	195/22	195/22	195/22	194/22	191/22		-	-	-	-	-	-
N6MU	ROV	N	R	2153800	194/22	194/22	194/22	194/22	194/22	194/22	194/22	194/22	193/22	192/22		-	-	-	-	-	-
K1DS	ROV	N	R	29489	51/4	84/6	53/5	50/5	17/3	23/3	-	10/2	8/2	10/2	2/1	-	-	-	-	-	7/2
N1XKT	ROV	N	R	24864	40/4	70/6	40/5	37/5	14/3 1	8/3	-	9/2	8/2	9/2	2/1	-	-	-	-	-	7/2
K3LFO	ROV	N	R	17372	76/9	82/10	41/8	44/7	-	19/4	-	-	-	-	-	-	-	-	-	-	-
N1QVE	ROV	N	R	6262	-	48/10	19/6	18/5	5/2	9/3	-	-	-	2/2	1/1	-	-	-	-	-	-
WW1M	ROV	N	R	3400	30/6	34/5	8/2	28/4	-	-	-	-	-	-	-	-	-	-	-	-	-
K2DRH	EN41	N	S	133216	135/48	157/44	42/22	88/33	14/14	26/17	3/3	-	-	-	-	-	-	-	-	-	-
K1TR	FN42	N	S	71820	105/16	125/22	46/13	78/15	10/2	28/8	10/5	6/5	2/2	3/2	-	-	-	-	-	-	-
AF1T	FN43	Y	S	70288	96/20	108/19	43/13	59/14	18/5	19/5	11/5	4/3	2/2	8/5	-	-	-	-	-	-	1/1
K8GUN	FM09	N	S	51744	83/19	135/22	50/18	85/20	-	25/9	-	-	-	-	-	-	-	-	-	-	-

Call	Grid	News	CL	Points	6m	2m	222	432	903	1.2G	2.3G	3.4G	5.7G	10G	24G	47G	75G	120G	145G	240G	LAS
W4SHG	FM18	N	S	35471	82/15	79/20	29/12	49/14	6/5	11/6	4/3	2/2	2/2	-	-	-	-	-	-	-	-
WB2SIH	FN31	N	S	30600	57/13	116/22	41/14	55/15	8/4	7/4	-	-	-	-	-	-	-	-	-	-	-
KB8U	EN71	N	S	24621	59/24	60/19	24/16	32/16	5/5	6/6	1/1	-	-	-	-	-	-	-	-	-	-
N0KP	EN34	N	S	23870	51/12	70/14	26/11	46/14	7/3	13/5	3/2	2/1	-	-	-	-	-	-	-	-	-
W1PM	FN41	Y	S	22800	53/7	63/15	25/8	33/9	8/5	10/4	6/4	4/3	-	2/2	-	-	-	-	-	-	-
K8MR	EN91	N	S	20000	66/24	72/26	23/16	27/12	-	3/2	-	-	-	-	-	-	-	-	-	-	-
K3EGE	FM29	N	S	19035	74/13	79/12	34/7	48/9	10/3	10/2	-	-	-	-	-	-	-	-	-	-	1/1
N1DPM	FN32	Y	S	18535	34/11	41/11	19/8	32/10	7/3	11/4	7/4	1/1	-	3/3	-	-	-	-	-	-	-
KC6ZWT	CM98	N	S	16779	39/7	98/20	32/13	64/11	-	-	-	-	-	-	-	-	-	-	-	-	-
W0QPS	FM19	N	S	15096	86/16	90/19	-	42/11	9/5	-	-	-	-	-	-	-	-	-	-	-	-
K9MU	EN44	N	S	12876	65/21	61/21	15/6	33/10	-	-	-	-	-	-	-	-	-	-	-	-	-
N1JEZ	FN44	Y	S	11741	33/13	56/20	21/12	20/10	-	7/4	-	-	-	-	-	-	-	-	-	-	-
K2KJ	FN31	N	S	8037	67/16	52/17	13/7	13/7	-	-	-	-	-	-	-	-	-	-	-	-	-
W6OAL	DM79	N	S	7954	38/12	32/11	13/5	29/8	2/1	4/2	1/1	-	-	1/1	-	-	-	-	-	-	-
KA1MDA	FN32	N	S	7458	94/12	70/12	2/1	21/6	-	4/2	-	-	-	-	-	-	-	-	-	-	-
N0LL	EM09	N	S	6820	23/14	37/20	12/9	16/10	-	2/2	-	-	-	-	-	-	-	-	-	-	-
VA3KA	FN15	N	S	6475	33/8	48/13 1	2/6	25/7	-	5/3	-	-	-	-	-	-	-	-	-	-	-
W8RU	EN82	N	S	6030	35/13	37/16	12/8	19/8	-	-	-	-	-	-	-	-	-	-	-	-	-
W8CMK	FM19	N	S	4428	31/6	49/11	17/4	25/6	-	-	-	-	-	-	-	-	-	-	-	-	-
VE3CVG	FN25	N	S	4147	28/8	39/10	8/4	22/4	-	4/3	-	-	-	-	-	-	-	-	-	-	-
K8WW	EN81	N	S	4140	9/4	18/9	10/6	16/9	4/4	5/4	-	-	-	-	-	-	-	-	-	-	-
AG2A	FN30	N	S	3451	44/13	75/16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB1CMG	FN42	Y	S	2790	19/3	15/2	13/2	15/2	7/2	11/2	3/2	-	-	-	-	-	-	-	-	-	-
KF6MXK	CM87	N	S	2502	33/5	42/5	7/3	25/5	-	-	-	-	-	-	-	-	-	-	-	-	-
K1LPS	FN34	Y	S	2378	11/5	19/9	11/6	5/4	2/2	3/3	-	-	-	-	-	-	-	-	-	-	-
K7CW	CN87	N	S	2204	-	116/19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K1EP	FN42	N	S	1356	53/5	38/5	2/1	9/1	-	-	-	-	-	-	-	-	-	-	-	-	-
N1RR	FN41	N	S	1328	21/4	62/12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3STU	FM19	N	S	1216	13/4	19/6	6/4	10/5	-	-	-	-	-	-	-	-	-	-	-	-	-
N6ZE	DM04	N	S	680	10/9	24/11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AI3Z	FM19	N	S	572	26/6	26/5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KU4VQ	EL99	Y	S	342	4/1	20/5	-	7/3	-	-	-	-	-	-	-	-	-	-	-	-	-
NU4SC	EM93	N	S	230	12/5	9/4	1/1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM2Z	FN31	N	S	198	4/3	18/6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NH6CJ	EM04	N	S	160	3/2	11/7	-	1/1 -	-	-	-	-	-	-	-	-	-	-	-	-	-
KC9FVW	EN44	N	S	48	4/1	4/1	-	4/1 -	-	-	-	-	-	-	-	-	-	-	-	-	-
W8PAT	EN81	N	S	12	1/1	3/2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3CQH	FM19	N	S	10	5/2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N2SLN	FN22	N	S	1	-	1/1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CLASSES: H=SingleOp Highpower, S=SingleOp Lowpower, L=LimitedMulti, U=UnlimitedMulti, Q=QRPPortable, R=Rover

Club Total Score: 602886

A LOSSLESS CURRENT MONITOR
PAUL WADE W1GHZ © 2005

w1ghz@arrl.net

Measuring high currents at low voltages has always been a problem. The classic way to measure current is to measure the voltage drop across a series resistor – easy in the vacuum-tube era when we had lots of voltage and low current, but transistor circuits won't tolerate much voltage drop without affecting circuit operation. An ammeter just combines the resistor and voltmeter – I've used one for years, but it doesn't have very good accuracy or resolution. The choice of resistor is a problem: while a large resistance produces too much voltage drop, a very small resistor produces a small voltage drop, so getting good resolution is difficult. To get decent resolution, we must accept some loss.

Another problem is that it is difficult to measure a small voltage difference between two large voltages; for example, if we are measuring a 50 millivolt drop from a 12 volt battery, we might be trying to accurately measure the difference between 12.8 volts and 12.75 volts. Some commercial "power analyzers" avoid this problem by putting the resistor in the negative lead. This works fine if there is no other path for current, but care is required. Suppose we wanted to measure the current drawn by a mobile transceiver; if we simply inserted the power analyzer in the power wires, the voltage drop in the negative wire would cause some of the current to flow through the coax braid and back to the car frame. The stray current would not show up in the measurement, so the reading would be too low. This is not a defect, just a caution for the user (who should have read the instruction manual).

However, there is another way to measure current. Current passing through a conductor creates a magnetic field around the conductor. If we can measure the magnetic field, we can calculate the current – AC current meters use the magnetic field by making the conductor part of a transformer. Transformers don't work on DC, but semiconductors called Hall-effect devices respond to magnetic fields.

Recently, I came across some current sensors using Hall-effect devices made by Allegro Semiconductor (www.allegromicro.com). The smallest, the ACS750SCA-050 is rated at 50 Amps. Since you can buy them with no minimum quantity, I got hold of a couple. They look like plastic power transistors with two humongous extra leads coming out the sides. Current passes directly from one large lead to the other, so there is essentially no voltage drop. The chip measures the magnetic field created and amplifies it to a calibrated output voltage. The only power needed is 5 volts at a few milliamps. The three small leads are for power, ground, and the output voltage.

To make this device useful, we need a convenient readout. One approach would involve an analog-to-digital converter and a computer, but I prefer cheap and simple. I looked through the spare parts bin and found a couple of small LCD digital panel meters. These are readily available for under $10, but most of them cannot measure the circuit powering them – they must be powered from a floating 9V battery. However, there are a couple that do not have this limitation and can be powered from the circuit being measured so a separate battery is not needed (I used model 14505ME from www.mjpa.com).

The output from the Allegro current sensor is 50 millivolts per amp, starting from approximately 2.5 volts with zero current. The maximum output at 50 amps is 5 volts with current in the forward direction and 0 volts in the reverse direction. For direct reading, we must amplify the output to 100 millivolts per amp, shift the decimal point to read amps directly, and offset the resting voltage to zero. These functions are readily accomplished with inexpensive op amps. My first attempt wasn't really satisfactory, so I consulted an expert, Byron, N1EKV, and came up with the circuit shown in the schematic, Figure 1.

Two of Byron's special circuits are included. The first, consisting of R1, R2, R3, and R4, provides an adjustable offset voltage to zero the meter; R4 limits the adjustment range to a small variation around the nominal value, 2.5 volts. The second is a variable gain differential amplifier using U2a and U2d and the associated resistors, to amplify the sensor output with reference to the offset voltage. The other two op amp sections buffer the offset voltage: U2c for the negative terminal of the meter, and U2b to raise the meter power to the offset voltage. The latter is necessary because the digital power meter has limited common mode range (the difference between the negative side of the meter power and the voltage being measured). The power for the meter is regulated at 5 volts above the offset voltage by U4, while power for the Allegro current sensor, U1, is regulated at 5 volts above ground by U2. (R12 and D1 are not used, they were for an alternative offset scheme).

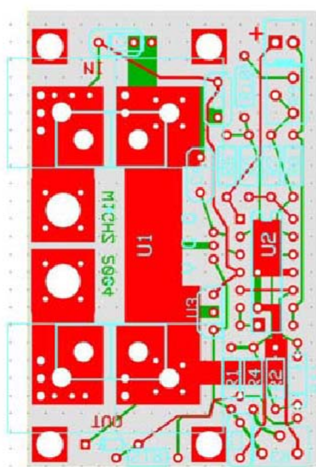


Figure 2

The circuit fits on a small printed circuit board from Express PCB (www.expresspcb.com) shown in the photo of the interior, Figure 3. The PC board layout is shown in Figure 2, and is available on my web page, www.w1ghz.org. I built two versions of the current monitor, shown in Figure 4 and 5. The one on the left is limited to 20 amps since I set the meter range jumper to 2 volts full-

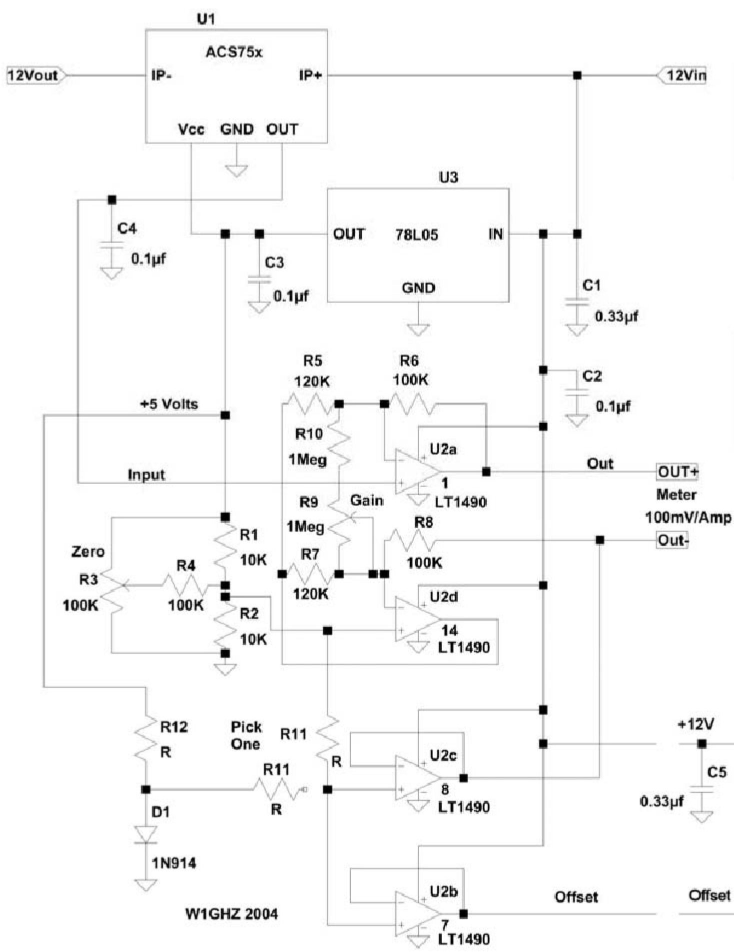
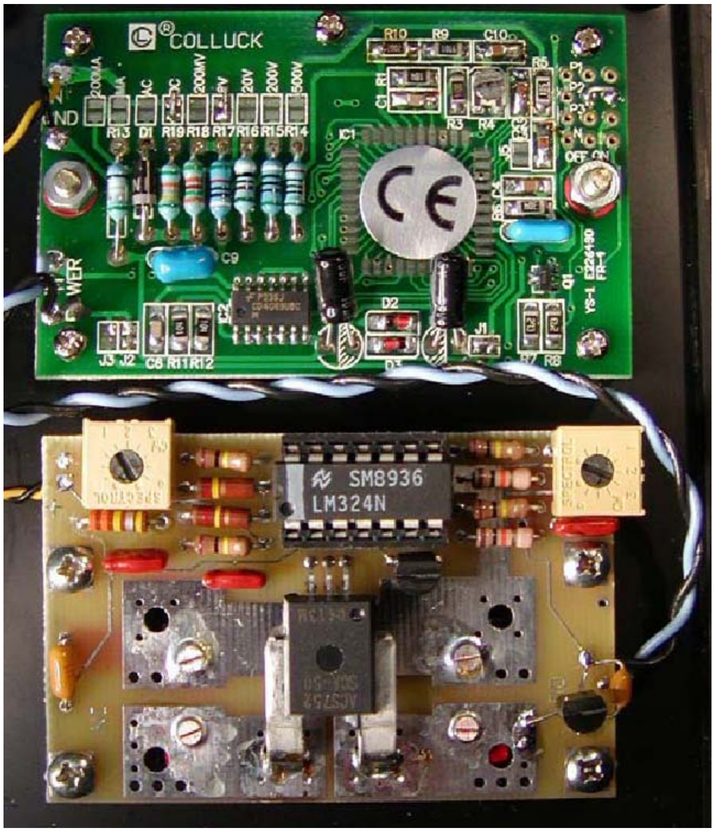


Figure 1 Lossless Current Monitor

scale for better resolution, and shifted the decimal point in the meter. The one on the right, with the larger 75-amp PowerPole connectors that I prefer for batteries, is limited to 50 amps by the current sensor (higher current sensors are available). The meter is measuring 5 volts to display 50 amps.



Calibration is pretty straightforward: connect the input side to 12 volts and adjust R3 until the meter reads 0.00 amps. Then connect a load to the battery and adjust R9 to read the correct current; I used a good digital multimeter, rated at 0.7% accuracy, for comparison. There is a slight interaction between the two adjustments, so go back and forth a couple of times.

Figure 4

Operation should be obvious: put the current monitor in the power lead of whatever you wish to measure – the PowerPole connectors make this easy. Since the meter reads in either direction, you can't go wrong; if the monitor is placed at Figure 3 the battery, you can monitor charging and discharging current. Since the current measurement is isolated, you don't have to worry about overcurrent, unlike a digital multimeter (Mine uses special $11 fuses! Guess how I know.), and voltage drop is minimal – I measured 6 millivolts at 10 amps, less than the drop in a foot of heavy power wires. The LCD meter and op amp consume about 10 milliamps, hardly enough to notice. The only slight problem I have found is that the zero drifts slightly; since the sensor operates on magnetic fields, it senses changes in stray and residual magnetic fields when no current is flowing.

Figure 5

Operation is not limited to 12 volts circuits. The circuit shown should operate up to 28 volts, as long as all the capacitors are rated for 50 volts or higher. For completely isolated operation, the meter and op amp could use an ordinary 9-volt battery – the Allegro sensor is rated for 3KV isolation. The response is fast enough to for AC as well as DC current; with the high isolation, one could be used to monitor AC power1. If 50 amps isn't enough, higher current sensors are available, as well as bigger PowerPole connectors.

This simple project allows measurement of high currents with no losses due to voltage drops. It doesn't do anything fancy, like calculate power – you'll just have to multiply by the voltage. The Hall-effect current sensor is an interesting bit of technology that stimulated the project.

1. J. Bachiochi, "Intelligent Current Sensing," Circuit Cellar, March 2004, pp. 74-77.

A BATTERY-SHARING SWITCH
PAUL WADE W1GHZ © 2005

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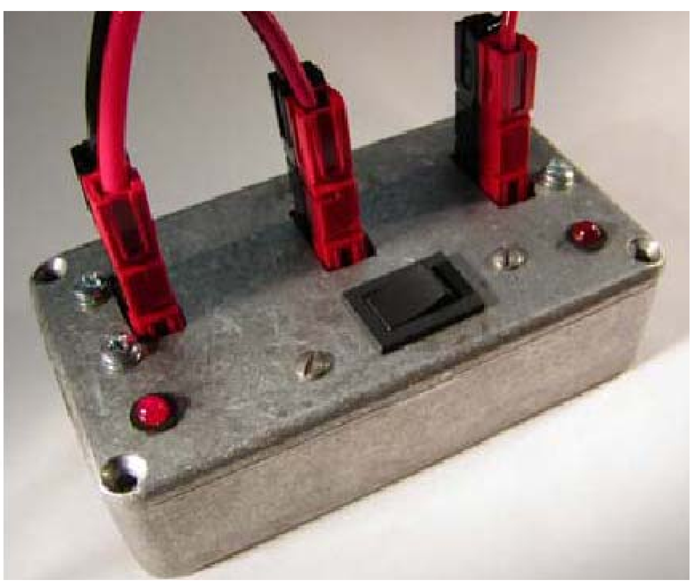
If you have ever tried rover operation, you know that batteries fade out at the least opportune times – usually in the middle of a difficult QSO (generators just run out of gas). Most of us have spare batteries, but don't want to shut down and risk losing a weak signal. What we need is a way to switch batteries without shutting down. It would be nice to have some warning or indication before the battery gets too low, other than equipment misbehavior – my IC-706Mk2g just goes blank on transmit if the battery is low.

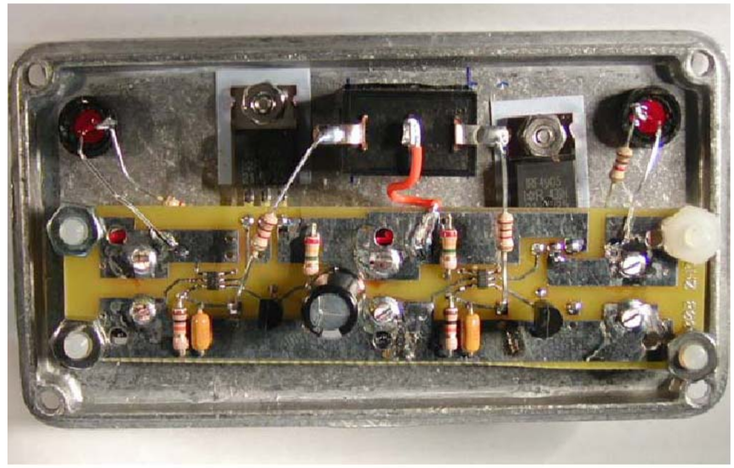
RV drivers have similar problems, and use a box with two diodes to connect two batteries. I'm told that these fail frequently, which may be due to poor design, inadequate heatsinking, or just plain abuse. For ham use, West Mountain Radio (www.westmountainradio.com) offers the PWRgate, which uses Schottky diodes for reduced voltage drop – roughly 0.4 volts rather than 0.7 volts for ordinary diodes.

Modern low-voltage power supplies use FETs as synchronous rectifiers rather than diode rectifiers. The FETs offer less voltage drop, are probably cheaper, and they are controllable.

Laptop computers also use multiple batteries, want to switch between them without shutting down, and minimum voltage drop is desirable for longest battery operation. Since laptops are made by the million, clever semiconductor solutions are available.



One IC that seems like an attractive solution is the LTC4412, available from www.linear.com for under $2. The chip is designed for automatic battery sharing – if the battery voltage is within 20 millivolts of the voltage at the output, the battery is connected through a FET switch. If the battery voltage is lower, then it is disconnected. Manual override is also available. Voltage drop depends on the FET chosen for the switch – I chose the IRF4905, an inexpensive PMOS power FET with an ON resistance of 0.02 ohms. It is rated at 74 amps, which should be sufficient, and is available from Digikey.



I designed a simple printed-circuit board to share two batteries, with an LTC4412 and power FET switch for each. Adding more batteries or power supplies is a simple matter of adding more copies of the circuit in parallel, feeding a common output. The circuit has LEDs to show that a battery is supplying current, and a switch to disconnect either battery – for instance, to swap out a dead one without powering down.

Figure 1 is photos of the completed unit, inside and out, Figure 2 is the schematic diagram, and Figure 3 is the PCB layout. I used ExpressPCB (www.expressPCB.com) free software to design the board and had them built there using the Miniboard service. The board file is on my web page, www.w1ghz.org. Since this board does not fill an entire Miniboard, I am able to combine it with other designs, have several different designs built on one Miniboard, and end up with three copies of each for $59 total.

Performance is pretty good. Voltage drop is less than 0.25 volts at 10 amps, about as expected (0.02 ohms x 10 amps = 0.2 volts), and switching between batteries seems smooth. One test was to run a transceiver from a small power supply and a battery; only the supply was active during receive, but the battery supplied additional current on transmit, as soon as the voltage from the power supply was pulled down to the battery voltage.

Some potential enhancements are pretty obvious, like an undervoltage warning or a battery charge circuit. I would wire the switch so the disconnected battery would be recharging if AC power were available – maybe I'll build another this way. Bigger FETs with lower ON resistance could reduce voltage drop even further.

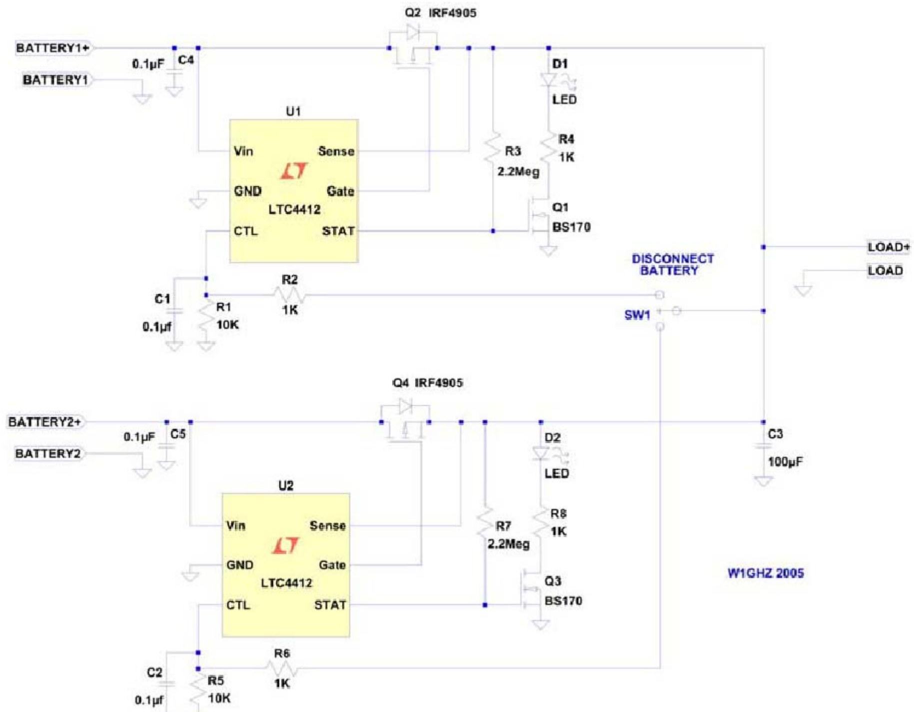


Figure 2 Battery-sharing switch

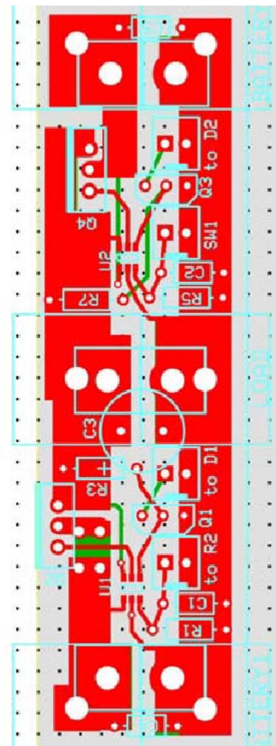


Figure 3

Compared to a simple diode box, this battery switch provides more control and visibility, and possibly a bit less voltage drop at moderate currents. Is it worth the additional complexity? I'm still not sure – I'll decide after a season of roving. I'm still learning how hard it is to reduce losses with high currents and low voltages.

NEXT MEETING
SATURDAY THE 12TH OF MARCH
AT THE RADISSON HOTEL IN ENFIELD, CT
OUR TALK WE BE A SHOW-AND-TELL
ON 24, 47 AND 78 GHZ RADIOS

31ST EASTERN VHF/UHF CONFERENCE: APRIL 8-10, 2005
RADISSON HOTEL (860)-741-2211

4/8/05 Friday LODGING
6:00pm 'til HOSPITALITY ROOM Socializing, Photo displays Snacks, Refreshments and More.
4/9/05 Saturday REGISTRATION, FORMAL TALKS, BANDSESSIONS, NOISE FIGURE MEASUREMENTS & MUCH, MUCH MORE.
7:00am REGISTRATION BEGINS
8:00am TALKS BEGIN We have the following set up so far:
8:15am LVA 144 MHz Broad Beamwidth Array, Dave Olean K1WHS
9:15am Exotic Operating Location, Chris Patterson W3CMP
9:15am 6&2 METER BANDSESSION, Roger Amidon K2SMN
10:00am Antennas, Paul Wade W1GHZ
10:00am 222 & 432 BANDSESSION, Del Schier K1UHF
10:45am AUCTION/BR

North East Weak Signal Group

North East Weak Signal group

c/o K5GMX
Bill Conner
8 Andrew Dr
Canton, CT 06019

Check your membership expiration date on the mailing label!!