QEX

December 1981

Number 1

The ARRL Experimenters' Exchange

This is the premiere issue of *QEX: The ARRL Experimenters' Exchange*. Beginning with this issue, *QEX* is a special League publication by and for Amateur Radio experimenters. It is available to both ARRL members and nonmembers at subscription rates shown on the last page of this issue.

Initially, *QEX* will be published every other month. As soon as we are assured that we can get the quality and quantity of material that we need and get the logistical handling well greased, monthly publication can begin.

It is our intent to achieve a balance in the editorial content. In one respect, we want to feature about as much original research and development as we do practical construction articles. In another, we want to keep some sort of a balance between digital electronics (computers, etc.) and the analog world of receivers and transmitters. Within the digital domain, it makes sense to include some software as well as hardware. But that doesn't mean that *each issue* will reflect that balance. Also, we may concentrate more than a fair share of space on a topic when it's hot and rolling. It seems reasonable to push the newer technology as much as possible, even at the expense of overlooking some more mature topics.

Computer program listings present a special problem. We would like to include computer programs relating to Amateur Radio and have one in this issue by Dave Meier, N4MW. Fortunately, Dave's program listing and sample run were relatively short. Longer ones could completely fill an issue of *QEX*. So, we are happy to print the shorter ones, but suggest that authors of longer ones make the programs available either on diskettes or on hard copies. Of course, we'd like to have the narrative description of the program in article form for *QEX*. In case you do have a short computer listing for printing in *QEX*, please set up your printer to produce a column no more that 43 spaces wide. Use a new ribbon and print on clean, white paper.

Because *QEX* is an exchange, the names, mailing addresses and (where furnished) telephone numbers of the authors will be included with all articles and correspondence. If you are interested in an article, we're sure that the author would like to hear from you. The whole idea is to get dialog going between experimenters who are geographically separated. If you think that other *QEX* readers might benefit in some way from the dialog, please consider dropping a copy to the Editor, *QEX*. In some cases, we can print parts of the correspondence, space permitting. But, we would hope that the exchange will generate one or more good articles for *QEX* and *QST*.

You will note that we have several columns in this first issue. There is one more column that we need as soon as possible -- one called "Components" or "Devices." The column should include the latest semiconductor devices as well as passive components of interest to Amateur Radio experimenters. We have some feelers out but are open to suggestions on this and other possible columns.

What about new technology? The "Data Communications" column by Dave Borden, K8MMO will be a regular feature on packet-radio technology. We expect to carry material on amateur spread spectrum experimentation from time to time. Radio amateurs are experimenting with speech I/O, medium-scan TV, computer control of everything in the shack, error detection and error correction codes, etc., and we need to spread the word on these efforts. The trade journals are full of new developments and new products such as ICs that handle many complex functions. If you want to boggle your mind a bit, find a copy of *EDN* magazine, October 14, 1981 issue and read the series entitled, "Electronic Technology-The Next 25 Years." Perhaps you know a hermit experimenter who is doing neat things in the basement. Team up and try to get the work of the hermit experimenter into print so that the rest of us can benefit. *QEX* is particularly interested in liberating these experimental results. - W4RI

THE AMERICAN RADIO RELAY LEAGUE, INC.

HEADQUARTERS SOCIETY OF THE INTERNATIONAL AMATEUR RADIO UNION

ADMINISTRATIVE HEADQUARTERS NEWINGTON, CONNECTICUT, U.S.A. 06111

HARRY J. DANNALS
CARL L. SMITH
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NOEL B. EATON
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RICHARD L. BALDWIN
QST

November 10, 1981

Mr. Paul L. Rinaldo, W4RI
1524 Springvale Avenue
McLean, VA 22101

Dear Paul:

For years, many of us within the ARRL organization have felt that the League ought to be doing more to promote advanced technical experimentation by radio amateurs. With the appearance of QEX, those feelings have been turned into action. You're uniquely qualified to serve as the editor of the League's technical newsletter, and with the help of enthusiastic and active members like yourself I know QEX will be a source of pride for the officers, directors, staff and the entire membership.

Best of luck with the innaugural issue.

73,

Sincerely,

Harry J. Dannals, W2HD
President

HJD:dlf

SINCE 1914 — OF, BY AND FOR THE RADIO AMATEUR

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554
September 22,1981

Paul L. Rinaldo, W4RI
Editor, QEX
1524 Springvale Avenue
McLean, Virginia 22101

Dear Paul:

This is to wish you and the American Radio Relay League well as you launch QEX.

As you know, the Office of Science and Technology is looking to amateur radio experimenters to play a more active role in new communications techniques. Amateurs are a unique resource possessing not only the talent but the time and energy to devote to projects which may have no immediate commercial payoff. Hams are now experimenting with spread spectrum, packet radio and error-correction codes under recent rules changes or waivers by the F.C.C. We encourage further innovation, particularly those which may contribute to better spectrum management.

Sincerely yours,

S. J. Lukasik

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30 June 1981

Mr. Paul L. Rinaldo W4RI
1524 Springvale Avenue
McLean,Va. 22101

Dear Paul;

Congratulations on taking over the new experiementer's newsletter. QEX. I cannot think of a more competent person for the job!

I will be anxiously awaiting the first publication and I believe so will many other amateurs throughout the nation, and the world.

If there is anything I can do to help you please feel free to let me know. Meanwhile the very best of luck in the new endeavor for the League.

73

Sincerely

Gay W4KG
Director Roanoke Div.

SINCE 1914 — OF, BY AND FOR THE RADIO AMATEUR

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October 1, 1981

Mr. Paul Rinaldo, W4RI
1524 Springvale Avenue
McLean, VA 22101

Dear Paul:

I wish us well in the QEX project. "Us" because you as editor have an important role in whether this is a successful venture and because for "us" the membership this may signal a new facet of the League's services to the membership. If QEX is successful, and I am confident that it will be, I foresee additional specialized newsletters by the League covering other specialized technical and operating areas.

So, you and QEX are blazing a new trail. Good luck!

73,

Sincerely yours,

Richard L. Baldwin, W1RU
General Manager

RLB:dlf

SINCE 1914 — OF, BY AND FOR THE RADIO AMATEUR

VHF and UHF Low Noise Preamplifiers

By G. H. Krauss,* WA2GFP

For the past 4 years, I have been systematically designing, building and testing low-noise-figure preamplifiers (LNAs) for 30, 50, 144, 220, 432 and 1296 MHz. A very early set of results, along with historical background and basic theory, was reported earlier.[1] A full report, covering some 200 LNAs, is presented here, in "cookbook" style. The measurements were done in an engineering lab, using quality equipment; noise figure was measured using the Y technique, a solid-state noise source and calibration/measurement against a hot/cold noise source of known accuracy. Even though I believe I have removed all sources of error, the reader is cautioned to interpret all noise-figure listings as relative, with an absolute accuracy range of -0.1/0.3 dB.

The layout for the vhf GaAsFET LNAs is given in Fig.1, and for the 1296 MHz Π LNAs in Fig. 2. The remaining LNAs were all built on a single-sided pc board (see Fig. 8 of ref),[1] soldered into a fully shielded box; these LNAs differ only in (a) device used and (b) input and output circuits necessary to match the chosen device for best noise figure. I have found that only four different types of matching circuits, with values adjusted for each different band, are required for use with the full range of devices. Several possible bias circuits are also shown.

The result tables list devices, for each band, in order of increasing noise figure. The Ga and Gr figures are forward and reverse gain, respectively, when the LNA is adjusted for minimum noise figure. Generally, greater forward gain can be achieved, but the noise figure will always be worse. The difference between Ga and Gr is the gain margin Gm = -(Ga-Gr). The greater the value of Gm, the more stable the LNA, especially with a reactive bandpass filter (cavity, helical resonator and the like) in front of, or after, the preamp. LNAs with a Gm value of less than about 8 dB may be marginally stable, and one with a value less than about 3 dB will often oscillate when the T/R relay presents an open circuit at the LNA input. The noise measure M is an indication of the input noise figure of a long chain of cascaded LNAs having the same NF and Ga; it is mainly given to show the effect of LNA gain, which should be about 10 dB greater than the noise figure of the following stage. Too high a stage gain will lead to front-end overload, although it is rarely the 1st LNA that is overloaded. However, the GaAsFET devices not only have the lowest noise figures, but have relatively high (and therefore desirable) third-order output IMD intercepts (I_3); the I_3 points of some LNAs were measured and listed in the tables. Another LNA characteristic having a bearing on IMD is bandwidth (BW); most bipolar devices require extremely broad-band (BB) input circuits and substantially resistive output circuits. This leads to higher susceptibility of overload from out-of-band signals (especially near fm and TV stations!). The GaAsFETs, having a much higher input impedance for optimum noise figure, allow a higher Q input circuit to be used, although the Q cannot be too high or input loss (and noise figure) will rise.

*16 Riviera Dr., Latham, NY 12110

TO BREW AN LNA:

(1) Choose a device, based on the table data; you make the most important choices based on availability, cost and performance. A key to the manufacturers, or their agents if they do not sell direct in the U.S., is provided.

(2) For the chosen device, obtain the input and output circuits. If GaAsFET or 1296 Π, see Figs. 1 and 2. Use the best components you can obtain; remember that you want to keep input loss as low as possible.

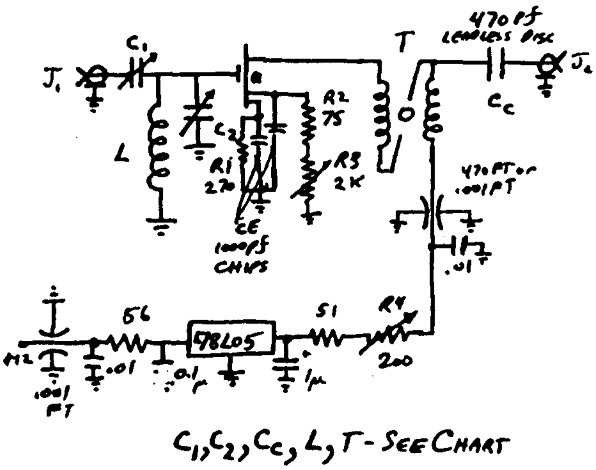
(3) Choose a bias circuit (the "active" circuit - on the right - is recommended). The GaAsFETs have their own bias circuit in Fig. 1; at 1296 MHz, a separate and well-regulated $-V_1$ supply is necessary.

(4) Use the "Universal" layout of Ref. 1, Fig. 8; the vhf GaAsFET layout of Fig. 1 or the 1296 layout of Fig. 2, to build.

(5) Tune: monitor the current into, and voltage at, the collector/drain feedthru capacitor and do not exceed manufacturer's ratings. Tune all L&Cs for maximum gain. Now, set input circuit and bias for minimum noise figure - do not touch output circuit adjustments, if any.

I would be happy to correspond with anyone concerning these, or any other, LNAs if an SASE is provided. Any leads on a reasonably accurate noise source for 2304 MHz would be appreciated.

[1]Krauss, "VHF Preamplifiers," *Ham Radio*, Dec. 1979.



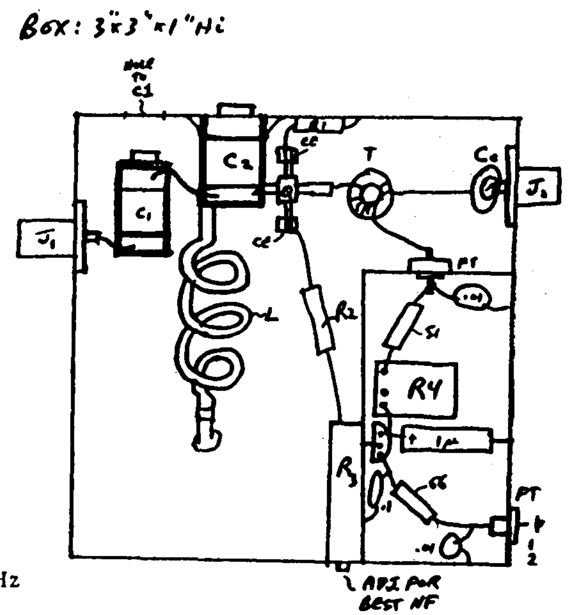
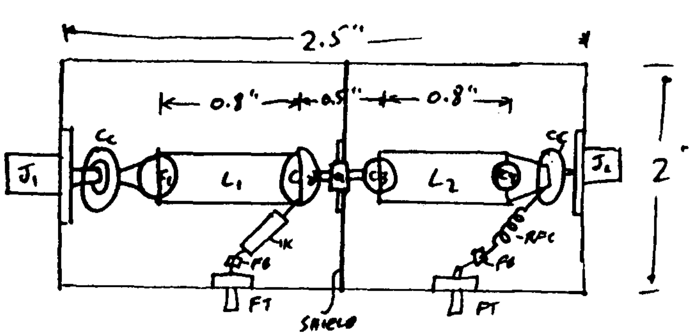
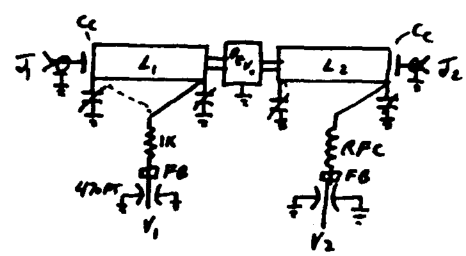


Fig. 1 - GaAsFET Preamp - 144, 220,and 432 MHz





L1, L2 - 0.8"L x 0.2" WIDE BRASS
C1 - C4 · 0.8-10pF PISTON
Cc - 470pF LEADLESS DISC
RFC - 4t #28 on 0.1"D DRILL

BIAS: BIPOLAR DEVICE - SOLID LINE
V1 GOES TO (B), V2 GOES TO (A) - BIAS NTWK.
GaAsFET - BROKEN LINE (INPUT)
V1 IS NEGATIVE Vgs needed for BEST NF.
V2 IS ~+3V.

Fig. 2 - 1296 MHz Π-input/output Preamp.

30 MHz PREAMPLIFIERS

DEVICE	COST $	MFGR	KF (dB.)	Gs (dB.)	Gr (dB.)	Gm (dB.)	M (dB.)	BW (MHz.)	INPUT CKT.	OUTPUT CKT.	REMARKS
MS300H	~10.00	TI	0.82	18.1	-49	30.9	0.83	BB	I	I	
NE41632E-2	3.30	NEC	0.94	25.5	-38	12.5	0.94	BB	IV	III	Rs=200Ω
			1.03	23.5	-34	10.5	1.03	BB	I	I	TUNED
			1.07	21.0	-39	18.0	1.08	BB	III	III	Rs=50Ω
MA42001-509	11.50	MA	1.05	18.0	-33	15.0	1.06	10	II	I	
3N204	2.00	-	1.21	16.6	-38	21.4	1.23	3.4	I	I	DGFET
MA42014-509	~ 9.00	MA	1.32	14.0	-48	34.0	1.37	30	II	I	
2N5109	1.25	-	1.44	14.4	-39	24.6	1.49	BB	I	III	LOW IMD
MRF901	1.55	M	1.47	26.2	-34	7.8	1.47	BB	II	IV	
MPF102	0.35	M	1.60	16.0	-16	*0.0	1.63	1	I	I	FET
2N4416	0.50	-	1.62	13.1	-22	8.9	1.69	1	I	III	FET
MRF904	1.25	M	1.65	23.0	-34	11.0	1.66	BB	IV	IV	
40673	1.75	RCA	2.1	22.0	-23	*1.0	2.1	1	I	I	DGFET
A485	1.75	AMP	2.1	26.7	-49	22.3	2.1	BB	I	III	LOW IMD
NE02135/37	~ 4.00	NEC	2.2	16.7	-47	30.3	2.2	BB	I	IV	
TIS189	0.90	TI	2.6	14.0	-64	50.0	2.7	17	I	I	DGFET
A430	1.90	AMP	4.5	22.9	-51	28.1	4.5	BB	I	III	LOW IMD
A210	2.25	AMP	6.1	18.3	-46	27.7	6.2	BB	I	III	LOW IMD

NOTES:

Rs = source resistance
FET = field-effect transistor
DGFET = dual-gate FET
IMD = intermodulation distortion
SE = single emitter/source lead
DOE - dual, opposed emitter/source leads
BB = Broadband
A = Aertech
AMP = Amperex
AND = AND Transistors
DXL = Dexcel
HP = Hewlett Packard
M = Motorola
MA = Microwave Associates
MIT = Mitsubishi (Applied Invention, Hillsdale, N.Y.)
NEC = Nippon Electric (California Electronic Labs.)
PAN = Panasonic
RCA - RCA
SIL = Siliconix
TI = Texas Instruments

144 MHz PREAMPLIFIERS

DEVICE	COST $	MFGR	KF (dB.)	Gs (dB.)	Gr (dB.)	Gm (dB.)	M (dB.)	BW (MHz.)	INPUT CKT.	OUTPUT CKT.	REMARKS
MGF-1400	23.00	MIT	0.47	20.0	-33	13.0	0.47	11	I	III	GaAsFET I3- ① +23dBm
D432	25.00	DXL	0.49	19.6	-29	9.4	0.50	18	I	III	GaAsFET I3- ① +15dBm
MGF-1200	13.00	MIT	0.51	18.9	-29	10.1	0.52	20	I	III	GaAsFET I3- ① +17dBm
3SK48	4.00	PAN	0.62	27.2	-29	*1.8	0.62	BB	I	I	DGFET I3- +40dBm
NE21937	3.50	NEC	0.89	21.0	-33	12.0	0.90	BB	II	IV	
NE64535	7.50	NEC	1.00	22.0	-36	14.0	1.00	BB	I	IV	
NE73437	1.75	NEC	1.03	22.0	-40	18.0	1.04	BB	I	I	
MS300H	~10.00	TI	1.10	17.0	-36	19.0	1.12	36	I	I	
MA42001-509	11.50	MA	1.10	14.0	-42	28.0	1.14	BB	I	I	
MA42014-509	~ 9.00	MA	1.12	20.5	-28	7.5	1.13	BB	I	I	
3SK97	~ 2.00	PAN	1.17	18.9	-23	*4.1	1.18	21	I	I	DGFET
MA42002-509	~ 7.00	MA	1.22	18.8	-26	7.2	1.23	BB	I	I	
MP-1006	11.00	AND	1.37	16.6	-28	11.4	1.40	BB	I	IV	
MS2110JE	~15.00	TI	1.40	15.0	-35	20.0	1.44	28	I	I	
MRF901	1.55	M	1.40	23.0	-28	*5.0	1.41	BB	II	IV	
MRF904	1.25	M	1.41	17.0	-32	15.0	1.43	BB	IV	IV	
NE41632E-2	3.30	NEC	1.54	13.7	-32	18.3	1.63	BB	I	I	
U310	4.00	SIL	1.60	12.0	-27	15.0	1.69	2	I	I	FET COMMON GATE
3N204	2.00	-	1.64	15.6	-29	13.4	1.68	2	I	I	DGFET
MA42003-509	~ 5.00	MA	1.67	21.5	-25	*3.5	1.68	BB	I	I	
NE02135/7	4.00	NEC	1.81	23.5	-31	7.5	1.82	BB	I	IV	
2N4416	0.50	-	1.90	17.5	-20	*2.5	1.93	2	I	I	FET
2N5109	1.00	-	2.5	12.5	-23	10.5	2.6	BB	I	III	LOW IMD
TIS-189	0.90	TI	2.6	14.3	-39	24.7	2.6	3.1	I	I	DGFET
A485	1.75	AMP	2.6	24.1	-42	17.9	2.6	BB	I	III	LOW IMD
NE22235	4.00	NEC	2.8	17.0	-38	21.0	2.8	BB	I	IV	
40673	1.75	RCA	3.1	13.9	-31	17.1	3.2	14	I	I	DGFET
MPF102	0.35	M	3.7	11.0	-24	13.0	3.9	4	I	I	FET
A430	1.90	AMP	4.1	22.0	-47	25.0	4.1	BB	I	III	LOW IMD
A210	2.25	AMP	5.7	17.3	-43	25.7	5.7	BB	I	III	LOW IMD
J308	1.00	SIL	6.2	13.0	-18	*5.0	6.4	4	I	II	FET COMMON GATE

REF: ① See Figure 1

50 MHz PREAMPLIFIERS

DEVICE	COST $	MFGR	KF (dB.)	Ga (dB.)	Gr (dB.)	Gm (dB.)	M (dB.)	BW (MHz.)	INPUT CKT.	OUTPUT CKT.	REMARKS
MA42001-509	11.50	MA	0.95	15.3	-34	18.7	0.97	2	II	I	
NE41632E-2	3.30	NEC	0.98	24.0	-32	8.0	0.98	BB	IV	III	Rs=200 Ω
			1.07	22.0	-33	11.0	1.08	6	I	I	TUNED
			1.13	22.0	-35	13.0	1.14	BB	III	III	Rs=50 Ω
MS300H	~ 10.00	TI	1.11	15.5	-43	27.5	1.12	BB	I	I	
MA42014-509	~ 9.00	MA	1.15	18.3	-37	18.7	1.17	BB	II	I	
2N4416	0.50	-	1.37	13.0	-15	*2.0	1.43	2	I	I	FET
MA42003-509	~ 5.00	MA	1.50	13.7	-28	14.3	1.57	BB	II	I	
3N204	2.00	-	1.51	17.4	-24.5	7.1	1.53	5	I	I	DGFET
NE02135/7	4.00	NEC	1.55	15.0	-27	12.0	1.59	BB	I	IV	
MRF901	1.55	M	1.67	25.0	-32	7.0	1.67	BB	II	IV	
2N5109	1.00	-	1.72	18.0	-29	11.0	1.74	BB	I	III	LOW IMD
MRF904	1.25	M	2.0	28.0	-36	8.0	2.0	BB	IV	IV	
MPF102	0.35	M	2.0	13.0	-27	14.0	2.1	2	I	I	FET
TIS-189	0.90	TI	2.1	20.0	-40	20.0	2.1	2.2	I	I	DGFET
A485	1.75	AMP	2.1	25.8	-46	20.2	2.1	BB	I	III	LOW IMD
U310	4.00	SIL	2.5	10.3	-26	15.7	2.7	2	I	I	FET
40673	1.75	RCA	2.6	18.2	-27	8.8	2.6	7	I	I	DGFET
MP1006	11.00	AND	3.7	27.0	-29	*2.0	3.7	BB	I	I	
A430	1.90	AMP	4.3	23.0	-50	27.0	4.3	BB	I	III	LOW IMD
A210	2.25	AMP	6.3	17.1	-44	26.9	6.4	BB	I	III	LOW IMD

220 MHz PREAMPLIFIERS

DEVICE	COST $	MFGR	KF (dB.)	Gs (dB.)	Gr (dB.)	Gm (dB.)	M (dB.)	BW (MHz.)	INPUT CKT.	OUTPUT CKT.	REMARKS
MGF-1400	23.00	MIT	0.47	19.9	-28.4	8.5	0.47	16	I	III	GaAsFET I3- ① +23dBm
D-432	25.00	DXL	0.48	18.4	-27.0	8.6	0.49	28	I	III	GaAsFET I3- ① +20dBm
MGF-1200	13.00	MIT	0.54	18.7	-30	11.3	0.55	50	I	III	GaAsFET I3- ① +18dBm
MS2110JE	~15.00	TI	0.86	14.0	-30	16.0	0.89	24	I	I	
NE64535	7.50	NEC	0.96	19.0	-34	15.0	0.97	BB	I	IV	
MS300H	~10.00	TI	1.05	14.5	-26	11.5	1.08	40	I	I	
NE73437	1.75	NEC	1.10	18.5	-29	10.5	1.11	2	I	I	
MA42001-509	11.50	MA	1.13	12.3	-26	13.7	1.20	BB	I	I	
3SK97	~ 2.00	PAN	1.23	16.3	-19.5	3.2	1.26	32	I	I	DGFET
MRF904	1.25	M	1.35	14.5	-28	13.5	1.39	BB	IV	IV	
MA42014-509	~ 9.00	MA	1.35	15.1	-26	10.9	1.39	BB	I	I	
NE21937	3.50	NEC	1.36	13.5	-27	13.5	1.41	BB	II	IV	
MRF901	1.55	M	1.40	18.1	-24	5.9	1.42	BB	II	IV	
MA42002-509	~ 7.00	MA	1.44	14.3	-26	11.7	1.48	BB	I	I	
MP1006	11.00	AND	1.66	15.1	-28	12.9	1.70	BB	I	I	
NE41632E2	3.30	NEC	1.68	13.0	-24	11.0	1.75	BB	I	I	
3N204	2.00	-	1.82	13.5	-26	12.5	1.89	2	I	I	DGFET
NE02135/7	4.00	NEC	1.87	20.8	-30	9.2	1.88	BB	I	IV	
MA42003-509	~ 5.00	MA	1.95	16.5	-23	6.5	1.97	BB	I	I	
2N4416	0.50	-	2.0	10.0	-20	10.0	2.2	4	I	I	FET
U310	4.00	SIL	2.0	9.1	-28	18.9	2.2	4	I	I	FET COMMON GA
NE22235	4.00	NEC	2.1	29.3	-26	-3.3	2.1	BB	I	I	
TIS-189	0.90	TI	2.5	18.0	-23	5.0	2.6	5.2	I	I	DGFET
A485	1.75	AMP	3.1	23.0	-41	18.0	3.1	BB	I	III	LOW IMD
40673	1.75	RCA	4.3	15.1	-21	5.9	4.4	6	I	I	DGFET
2N5109	1.00	-	4.6	7.9	-21	13.1	5.1	BB	I	III	LOW IMD
A430	1.90	AMP	4.9	20.1	-43	23.0	5.0	BB	I	III	LOW IMD
A210	2.25	AMP	5.9	16.0	-59	23.0	6.1	BB	I	III	LOW IMD

432 MHz PREAMPLIFIERS

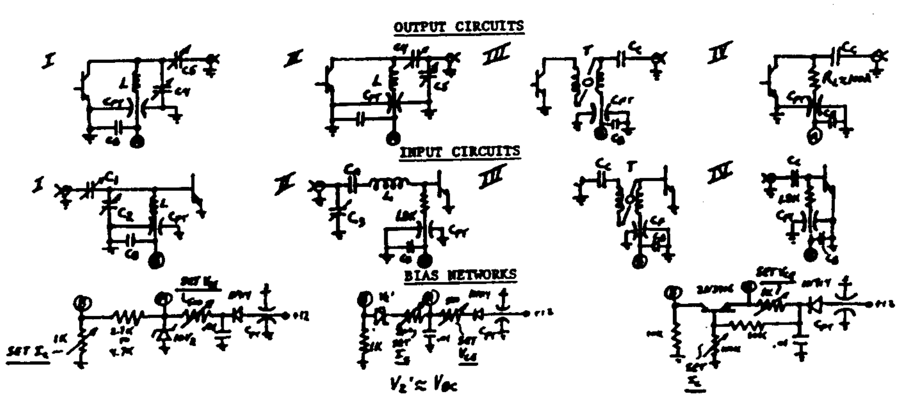
DEVICE	COST $	MFGR	NF (dB.)	Ga (dB.)	Gr (dB.)	Gm (dB.)	M (dB.)	BW (MHz.)	INPUT CKT.	OUTPUT CKT.	REMARKS
MGF1400A	28.30	MIT	0.39	18.2	-27	8.8	0.40	20	I	III	GaAsFET I3-1 +20dBm
D432	25.00	DXL	0.49	18.1	-29	6.9	0.51	50	I	III	GaAsFET I3-1 +21dBm
MGF1400	23.00	MIT	0.52	21.6	-33	11.4	0.52	50	I	II	GaAsFET I3-1 +24dBm
MGF1200	13.00	MIT	0.58	20.4	-28	7.6	0.59	25	I	III	GaAsFET I3-1 +21dBm
NE24483	35.00	NEC	0.75	15.3	-25	9.7	0.76	60	I	II	GaAsFET
NE64535	7.50	NEC	0.86	16.0	-24	8.0	0.88	BB	I	IV	
MS2110JE	~15.00	TI	1.07	20.0	-28	8.0	1.08	BB	I	I	
NE73437	1.75	NEC	1.25	17.1	-25	7.9	1.27	BB	I	I	
NE02135	4.00	NEC	1.27	11.2	-27	15.8	1.36	BB	I	IV	
MRF904	1.25	M	1.38	11.0	-25	14.0	1.48	BB	IV	IV	
3SK97	2.00	PAN	1.39	11.5	-12.8	*1.3	1.48	60	I	I	DG GaAsFET
MRF901	1.55	M	1.40	16.1	-22	*5.9	1.43	BB	II	IV	
MA42111-509	~15.00	MA	1.40	11.3	-19	7.7	1.49	BB	I	I	
MA42141-510	~17.00	MA	1.52	14.0	-25	11.0	1.57	BB	I	I	
MA42161-511	~25.00	MA	1.57	16.3	-26	9.7	1.61	BB	I	I	
MS300H	~10.00	TI	1.59	13.2	-25	11.8	1.66	40	I	I	
NE22235	4.00	NEC	1.60	11.0	-26	15.0	1.71	BB	I	IV	
MA42001-509	11.50	MA	1.73	11.3	-25	13.7	1.89	BB	I	I	
NE21937	3.50	NEC	1.76	20.5	-32	11.5	1.77	BB	II	IV	
BFR91	3.00	AMP	1.78	15.1	-27	11.9	1.83	BB	II	IV	
MP-1006	11.00	AND	1.90	17.7	-28	10.3	1.93	BB	I	I	
TIS-189	0.90	TI	1.98	14.5	-43	28.5	2.04	17	I	I	DGFET
MP-1004	~14.00	AND	2.0	12.2	-34	21.8	2.1	BB	II	I	
MA42142-509	14.00	MA	2.2	13.8	-35	21.2	2.3	BB	I	I	
BFQ-23	3.75	AMP	2.2	16.1	-27	10.9	2.3	BB	II	IV	
BFR-90	2.70	AMP	2.2	16.4	-26	9.6	2.3	BB	II	IV	
ON536	3.35	AMP	2.3	14.0	-25	11.0	2.4	BB	II	IV	
MP-1001	8.00	AND	2.4	16.5	-23	*6.5	2.5	BB	II	IV	
BFR-96	4.30	AMP	3.0	14.6	-23	8.4	3.1	BB	II	IV	
NE4162E-2	3.30	NEC	3.7	10.3	-18.5	8.2	3.9	BB	I	I	
MA42003-509	~ 5.00	MA	4.3	7.7	-23	15.3	4.8	BB	I	I	
U-310	4.00	SIL	4.7	5.0	-30	25.0	5.6	10	I	I	FET COMMON GATE

1296 MHz PREAMPLIFIERS

DEVICE	COST $	MFGR	NF (dB.)	Ga (dB.)	Gr (dB.)	Gm (dB.)	M (dB.)	BW (MHz.)	CKT *	CKT µ	PKG	REMARKS
NE21889	75.00	NEC	0.62	18.7	-27	8.3	0.63	40	X		DOE	GaAsFET
MGF1400	23.00	MIT	0.82	16.2	-23	6.8	0.84	45	X		DOE	GaAsFET
NE24483	35.00	NEC	0.83	17.4	-27	9.6	0.84	50	X		DOE	GaAsFET
D432	25.00	DXL	0.97	14.9	-22	7.1	1.00	90	X		DOE	GaAsFET
MGF1200	15.00	MIT	1.03	13.6	-21	7.9	1.07	60	X		DOE	GaAsFET
NE64535	7.50	NEC	1.40	12.0	-16	*4.0	1.48	60	X		DOE	
MS2110JE	-15.00	TI	1.49	12.0	-18	6.0	1.57	140	X		DOE	
NE645+ MRF901	14.55	-	1.61	19.9	-37	11.1	1.62	160		X	DOE	WA2AAU DESIG
ABT7701	25.00	A	1.63	13.8	-27	13.2	1.69	120	X		DOE	
NE21935	- 4.50	NEC	1.74	9.9	-19.2	9.3	1.90	180	X		DOE	
NE21937	- 4.00	NEC	1.79	9.8	-13	*3.2	1.96	100	X		DOE	PLASTIC
HXTR-6105	28.00	HP	1.81	12.2	-24	11.8	1.90	50		X	DOE	µS ~ BPF
NE73437	3.30	NEC	1.92	6.0	-12	6.0	2.41	200	X		DOE	PLASTIC
HXTR-2101	22.00	HP	2.1	12.0	-21	9.0	2.4	50		X	DOE	µS ~ BPF
MRF901	1.55	M	2.3	10.1	-16.5	6.5	2.6	120	X		DOE	PLASTIC Avg. of 8 unit
			2.3	10.5	-16.6	6.1	2.6	>200		X	DOE	PLASTIC Avg. of 2 unit
NE22235	4.00	NEC	2.3	14.0	-26	12.0	2.4	115	X		DOE	
BFR-91	3.00	AMP	2.5	7.6	-14.0	6.4	2.9	100	X		SE	PLASTIC
NE02135	3.50	NEC	2.6	12.5	-22	9.5	2.7	115	X		DOE	Avg. of 5 unit
			2.6	9.8	-21	11.2	2.9	>200		X	DOE	Avg. of 2 unit
MRF911	2.00	M	2.7	7.8	-17.4	9.6	3.1	150	X		DOE	PLASTIC
BFR-90	2.70	AMP	2.8	7.3	-17.3	10.0	3.2	100	X		SE	PLASTIC
MRF901+ MRF901	3.10	M	3.1	18.3	-36	17.7	3.2	>200		X	DOE	PLASTIC Avg. of 7 unit
NE02137	3.00	NEC	2.8	8.3	-12.7	*4.4	3.2	100	X		DOE	PLASTIC Avg. of 2 unit
NE02135(TWO)	7.00	NEC	3.0	16.6	-40	23.4	3.0	>200		X	DOE	
BFR-96	4.30	AMP	3.0	6.0	-16.5	10.5	3.6	120	X		SE	PLASTIC
MA42162-511	-18.00	MA	3.5	14.7	-18	*3.3	3.6	140	X		DOE	
MA42141-510	-15.00	MA	4.2	7.3	-14	6.7	4.8	140	X		DOE	

* = CKT. of Fig. 2

µ = Microstrip layout



F(MHz.)	C1	C2	C3	CA	CB	Cc	Cft	C4	C5	L	L'	T
30	6-80 pf	6-80 pf	6-80 pf	470 pf	0.05 µf	0.01 µf	0.0015 µf	6-80 pf	6-80 pf	15t #28 on T25-6 core	8-10t #20 formed on 1/4-20 bolt	10t #28 Bifilar on T37-10 core
50	5-25 pf	5-25 pf	5-25 pf	270 pf	0.01 µf	0.005 µf	0.001 µf	5-25 pf	5-25 pf	8t #28 on T25-10 core	5-6t #20 1/8"D, 1/4"L	8t #28 Bifilar on T37-10 core
144	2-20 pf	2-20 pf	1-14 pf	180 pf	0.005 µf	330 pf	680 pf	2-20 pf	2-20 pf	4t #18 1/4"D, 1/4"L	4-5t #18 1/4"D, 3/8"L	6t #28 Bifilar on T25-12 core
220	2-20 pf	2-20 pf	2-14 pf	150 pf	0.005 µf	220 pf	470 pf	2-20 pf	2-20 pf	3t #18 1/4"D, 1/4"L	3-4t #12 1/4"D, 1/4"L	4t #28 Bifilar T25-12 core
432	1-10 pf	1-18 pf	1-10 pf	100 pf	0.001 µf	100 pf	470 pf	1-10 pf	1-10 pf	1t #16 1/4"D or 2" of 1/8"D tube	3-4t of lead of C_A, 1/8"D	4t #28 Bifilar on T25-0 core

EME System Survey

By David G. Meier, N4MW*

This is a computer program entitled "EME System Survey," written in Microsoft BASIC. The purposes of the program are to: (1) help determine what sort of station must be assembled to work earth-moon-earth (EME) or moonbounce paths, (2) compare on-the-air observations with theoretical calculations, and (3) evaluate alternatives for system improvement.

A signal-to-noise ratio of 0 dB represents signal power equal to system noise power. All antenna gains are isotropic. Average lunar distance is assumed; add or subtract one dB for perigee or apogee, respectively. Lunar reflectivity of 6.5% is assumed.

Operation consists of the following steps:

1. Load and run program.

2. Select unknown.

3. Enter variable parameters as prompted.

4. Observe calculated value of unknown.

5. Select new case, new parameter or new unknown.

The program will solve for any of nine parameters. It is not guaranteed to be accurate -- it seems to be conservative. If you can achieve 0 dB, get on the air! I would appreciate your comments.

```
1000 REM EME SYSTEM SURVEY
1010 REM BY DAVID MEIER N4MW
1040 T$(1)="FREQUENCY (MHz)"
1041 T$(2)="TRANSMIT POWER (watts)"
1042 T$(3)="TRANSMIT FEEDLINE LOSS (dB)"
1043 T$(4)="TRANSMIT ANTENNA GAIN (dBi)"
1044 T$(5)="RECEIVE ANTENNA GAIN (dBi)"
1045 T$(6)="RECEIVE FEEDLINE LOSS (dB)"
1046 T$(7)="RECEIVE NOISE FIGURE (dB)"
1047 T$(8)="RECEIVE BANDWIDTH (Hz)"
1048 T$(9)="SIGNAL TO NOISE RATIO (dB)"
1050 CC=1
1200 REM LIST CHOICES
1210 PRINT:PRINT,"*  EME SYSTEM SURVEY  *"
1220 FORI=1TO9:PRINT:PRINT,I"> "T$(I):NEXT
1230 PRINT:INPUT"WHICH IS YOUR CHOICE";CP
1240 IFCC=2ANDCX=CPGOTO1230
1250 IFCC<>2THENCX=CP:IFCC=3GOTO1600
1260 T(CX)=0
1300 REM INPUT PARAMETERS
1310 FORI=1TO9
1320 IF(CC=1ANDCP<>I)OR(CC=2ANDCP=I)THENPRINT:PRI
NTT$(I),:INPUTT(I)
1330 NEXTI
1400 REM CALCULATE AND FORMAT UNKNOWN
1410 X=174-T(3)+T(4)+T(5)-T(6)-T(7)-T(9)
1420 IFT(1)<>0THENX=X-222-20*LOG(T(1))/LOG(10)
1430 IFT(2)<>0THENX=X+30+10*LOG(T(2))/LOG(10)
1440 IFT(8)<>0THENX=X-10*LOG(T(8))/LOG(10)
1450 T(CX)=X:IFCX=4ORCX=5THENT(CX)=-X
1460 IFCX=1THENT(1)=10^((X-222)/20)
1470 IFCX=2THENT(2)=10^(-(X+30)/10)
1480 IFCX=8THENT(8)=10^(X/10)
1600 REM OUTPUT AND CONTINUE
1610 PRINT:PRINT:PRINT
1615 PRINT"*  EME SYSTEM SURVEY  *"
1620 FORI=1TO9:PRINT
1625 PRINTT$(I),INT(10*T(I)+.5)/10,
1630 IFCX=ITHENPRINT"(UNKNOWN)";
1640 PRINT:NEXTI
1650 PRINT:PRINT"1> NEW CASE  2> NEW PARAMETER  3
> NEW UNKNOWN"
1660 PRINT:INPUT"WHICH IS YOUR CHOICE";CC
1670 GOTO1200
```

*3205 Covington Pike, Memphis, TN 38128, 901-377-0834.

See next page for sample run

```
          *  EME SYSTEM SURVEY  *

           1 > FREQUENCY (MHz)
           2 > TRANSMIT POWER (watts)
           3 > TRANSMIT FEEDLINE LOSS (dB)
           4 > TRANSMIT ANTENNA GAIN (dBi)
           5 > RECEIVE ANTENNA GAIN (dBi)
           6 > RECEIVE FEEDLINE LOSS (dB)
           7 > RECEIVE NOISE FIGURE (dB)
           8 > RECEIVE BANDWIDTH (Hz)
           9 > SIGNAL TO NOISE RATIO (dB)

WHICH IS YOUR CHOICE? 9

FREQUENCY (MHz)              ? 144.1
TRANSMIT POWER (watts)       ? 600
TRANSMIT FEEDLINE LOSS (dB)  ? .75
TRANSMIT ANTENNA GAIN (dBi)  ? 27.1
RECEIVE ANTENNA GAIN (dBi)   ? 27.1
RECEIVE FEEDLINE LOSS (dB)   ? .75
RECEIVE NOISE FIGURE (dB)    ? .5
RECEIVE BANDWIDTH (Hz)       ? 100


*  EME SYSTEM SURVEY  *

FREQUENCY (MHz)               144.1
TRANSMIT POWER (watts)        600
TRANSMIT FEEDLINE LOSS (dB)   .8
TRANSMIT ANTENNA GAIN (dBi)   27.1
RECEIVE ANTENNA GAIN (dBi)    27.1
RECEIVE FEEDLINE LOSS (dB)    .8
RECEIVE NOISE FIGURE (dB)     .5
RECEIVE BANDWIDTH (Hz)        100
SIGNAL TO NOISE RATIO (dB)   -1.2          (UNKNOWN)
```

```
1> NEW CASE   2> NEW PARAMETER   3> NEW UNKNOWN

WHICH IS YOUR CHOICE? 2

          *  EME SYSTEM SURVEY  *

           1 > FREQUENCY (MHz)
           2 > TRANSMIT POWER (watts)
           3 > TRANSMIT FEEDLINE LOSS (dB)
           4 > TRANSMIT ANTENNA GAIN (dBi)
           5 > RECEIVE ANTENNA GAIN (dBi)
           6 > RECEIVE FEEDLINE LOSS (dB)
           7 > RECEIVE NOISE FIGURE (dB)
           8 > RECEIVE BANDWIDTH (Hz)
           9 > SIGNAL TO NOISE RATIO (dB)

WHICH IS YOUR CHOICE? 2

TRANSMIT POWER (watts)       ? 700


*  EME SYSTEM SURVEY  *

FREQUENCY (MHz)               144.1
TRANSMIT POWER (watts)        700
TRANSMIT FEEDLINE LOSS (dB)   .8
TRANSMIT ANTENNA GAIN (dBi)   27.1
RECEIVE ANTENNA GAIN (dBi)    27.1
RECEIVE FEEDLINE LOSS (dB)    .8
RECEIVE NOISE FIGURE (dB)     .5
RECEIVE BANDWIDTH (Hz)        100
SIGNAL TO NOISE RATIO (dB)   -.5           (UNKNOWN)

1> NEW CASE   2> NEW PARAMETER   3> NEW UNKNOWN

WHICH IS YOUR CHOICE? 3

          *  EME SYSTEM SURVEY  *

 etc.
```

Data Communications

Conducted by
David W. Borden, K8MMO*

Let me introduce myself. I am an experimenter located in the Washington, DC metro area and a member of the Amateur Radio Research and Development Corporation (AMRAD). I have been a radio amateur for 22 years and have owned some form of home computer for six years. Hooking my computer to my ham radio equipment has always been a desired activity. Networking, that is hooking my computer to a large network of microcomputers has also been a long-standing desire of mine. AMRAD has been doing this sort of experimentation for a number of years, but packet radio has really made the idea of a continent-wide network a possibility. The Canadian radio amateurs have a two-year head start on this sort of activity and thus when ASCII was authorized by the FCC in March, 1980, AMRAD looked to the Canadian technology to begin packet radio experimentation.

The Vancouver Amateur Digital Communications Group (VADCG) Terminal Node Controller (TNC) board has since become the *defacto* standard in use by United States radio amateurs engaged in packet radio communications. It is possible that in the construction of a continent-wide packet-radio network, only a very few gateway stations (interfaces to other types of protocols) will be required. Actually, this is not surprising. The TNC board makes entry into packet-radio experimenting painless. The software running on the board can be varied to cause the board to act as a beacon, terminal-to-terminal communications board, repeater or host node for another computer.

Let us begin to examine closely the terminal node controller and the software contained in the PROMs on the board. We will learn what makes it work and discuss possible enhancements if anyone is interested in making any.

The TNC is a packet-radio controller and is not a totally new idea (except to the Amateur Radio community). Dedication of a microcomputer to communications is an old idea to private industry. The idea has lots of merit. A great number of experimenters own microcomputers. If packet radio is the idea of the moment, why not just build a packet-radio board and plug in the already existing computer owned by the experimenter? That idea has some merit also, and will be examined in future columns. But, the microcomputer owned by the experimenter would have to work almost full time making packets if it were to take on that task. No (or very few) cycles would be left over for computing in that mode. It makes more sense to devote a single-board microcomputer to the communications task and save the "big machine" for normal computing. A few words about applications may be in order here.

In a fully connected network, each end user employs a TNC board. It acts as a "black box" communications controller. One of the RS-232-C ports on the TNC board is connected to a Bell 202 modem and radio (typically two-meter fm). The other port may be connected to any number of devices such as:

- a data communications terminal (teletypewriter or TV typewriter)
- a serial printer
- a serial facsimile machine
- a computer (called "host node")
- a speech interface
- a remote telemetry site serial interface.

Thus it should become clear that the "black box" TNC takes care of all communications, and the experimenter concentrates on using the computer to maximum benefit for network users of like thinking. In fact, greatest benefit to all accrues when a fully connected network is "out there." Building an experimenters network, similar to the commercial GTE Telenet or the government ARPANET is what this effort is all about. Shared data bases, almost instant communication between experimenters of like interests is the desired end result. Puting this newsletter out of business, or at least making it totally electronic, is a possibility. The beginning (and ultimate bottom line) is that all users will own TNC boards and enter data into the network and remove data from the networking using it.

Wait a minute, you say! You mean I have to buy this TNC to just get in on the action? Yes, that is the intent. But stop and think about it a minute. You did not complain when you had to buy a transceiver to join in on fm activity in your area. You did not complain when you had to buy a TV set to receive entertainment from the ether. The TNC board is just another appliance required to gain benefit from the experimenter network. Wait again, you say. I am not an appliance operator or I would not be reading this publication. The truth slips out at last. The true experimentation and developmental work to be done does not lie on the TNC board and will not change much in the next year. It has reached a state of →

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acceptability. The great work to be done lies in the station nodes that enter local area data onto the backbone network. These computers will not be TNC boards. They will require more memory and much more program. But it all begins on Doug Lockhart's TNC board. So, let us begin our study of it as an introduction to packet radio communications.

The hardware of the TNC packet radio communications controller board uses an 8085 microprocessor. This chip is almost identical to the familiar 8080 microprocessor except for the superior interrupt structure it enjoys and a few extra instructions to control the interrupts. 4k of 2708 EPROM memory contains the resident programs (2). 4k of 2114 RAM memory is used to buffer data and maintain needed variables (pointers, etc.). An 8273 high-level data-link controller performs all the actual work of generating a bit-oriented (HDLC) protocol. This bit-oriented approach (as opposed to the start-stop byte-oriented protocol) puts the radio amateur near the state of the art in data communication. Bit-oriented protocols are very efficient. The user connects his/her serial device to an 8250 USART device or an 8255 parallel device as desired (greatest use is made of serial devices currently).

Some features of the serial interface are: asynchronous with 5-, 6-, 7- or 8-bit characters; even, odd or no-parity bit generation and detection; 1 and 1.5 stop bit generation and detection; full double buffering; prioritized interrupts under software control; and, all modem signals (RTS, CTS, DSR, DTR, RI and CD).

The study of the software running on this board will occupy several future columns. The bare board and documentation may be purchased from VADCG, and details on ordering were published on page 30 of *QST* for October 1981.[1] Software is in the public domain and available on CP/M floppy disk from VADCG or on line (300-baud Bell 103 modem) from the AMRAD Computerized Bulletin Board System (CBBS), 703-734-1387.

It is not intended to print the software here, so copies should be obtained for study with the explanations provided in this column.

In the next issue, we will begin study of the Line Interface Program (LIP) which controls the 8273 HDLC chip.

[1]Borden and Rinaldo, "The Making of an Amateur Packet-Radio Network," *QST*, October 1981, p. 28.

Learning

Ed. Note: This column is to let the experimenter know about short courses, technical talks, books and other ways of keeping up with the continuing education process. It is unfortunate that the university short courses and commercial video tape productions cost as much as they do. We will include some of the more interesting ones on the chance that your employer might pick up the tab. What we'd really like to see is some courses and video tapes done by and for amateur experimenters and available at cost. Please let QEX know of any of these about 2 months ahead of time so we can get the word out.

New Book on Packet Switching

This new book entitled, "Packet Switching: Tomorrow's Communications Today," by Roy D. Rosner, K4YV covers techniques, equipment, standards, commercial services and other related topics. It is available at $34 from Lifetime Learning Publications, 10 Davis Dr, Belmont, CA 94002, 415-595-2350 or 606-525-2230.

Long Island 2-Meter Technical Talks

W2KPQ will transmit technical talks for the LI chapter of the IEEE and LIARC on 147.375 MHz at 8:30 P.M. certain evenings. Dec 9 topic will be secure communications, while spread-spectrum communications will be taken up on Jan 13, 1982. For more info contact Ed Piller at 516-349-2484 (work) or 516-938-5661 (home).

Data Communications Chip Workshop

Intel is sponsoring courses in Chicago Dec 14-17 and Feb 15-18 on the following communications chips: 8251A, 8253, 8256, 8273, 8274 and 8051. The 4-day course also covers protocols, modems, X.25 and Ethernet. Fee $795. Contact 312-981-7250.

Protocols for Packet Switching Course

On Jan 7-8, George Washington University, Washington, DC 20052, 202-676-6106, is offering this course in Washington, DC. The course fee is $530.

IEEE Course via Satellite TV Broadcast

The IEEE will begin a course on project management on Jan 12 from TV station WRLK in Columbia, SC. It will be telecast via Satcom I and Westar from 10 A.M. to noon and 2 to 4 P.M. EST for reception by TVRO antennas at universities, cable services and public TV stations. The course fee is $125 members, $150 nonmembers. Call 212-644-7871.

Circuits

Conducted by Bob Heil, K9EID*

Amateur Radio - The Greatest Hobby

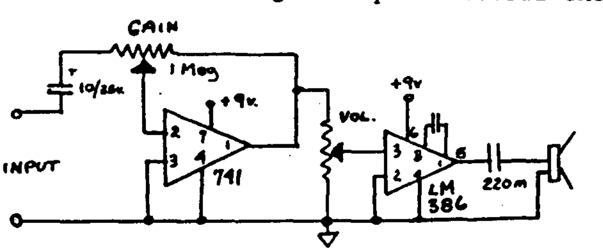
Amateur Radio has been one of the most fascinating hobbies since the early 1900s, when Marconi began experimenting with "wireless." Amateurs have a craving to work with equipment, to achieve things that haven't been done, or to do things that others say can't be done.

It will be the purpose of this column to present some practical solutions. Let us hear from you, and let's make this a useful tool for the fraternity.

Multi-Purpose Preamplifier

This utility amplifier is a valuable tool for the experimenter, for tracing signals, testing for audio changes or listening to weak af signals. Be sure to use a high quality shielded cable for the input test lead. You can also use it for a crystal or dynamic microphone. Mount the microphone in a parabolic reflector such as a large hub cap or saucer sled to listen to things far away. A telephone pick-up coil on the input will allow you to detect electromagnetic signals from motors, power lines and some electronic watches.

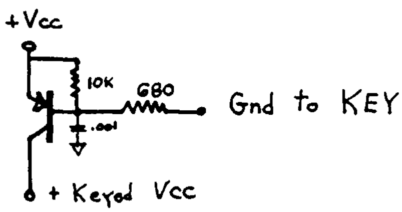
You can spend countless hours experimenting with other transducers and detectors. Adding a tuned circuit and a diode will allow you to hear a-m broadcast stations. A suitable diode (1N21 or 34) and a uhf loop antenna will hear signals up to several GHz.

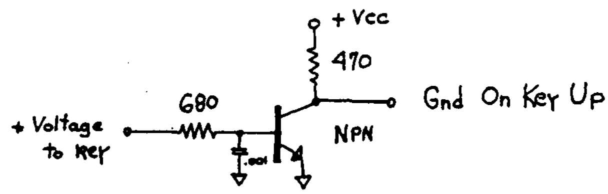


Solid-State Switching

Solid-state technology is making it much easier to switch voltages and currents with transistor switches instead of old mechanical relays. Reliability is much better, transients are reduced, and the keying is much faster. You can also get rid of those horrible "clunking and clicking" sounds of the mechanical devices.

Some circuits do not lend themselves to solid-state switching, but devices are available for switching just about any frequency and current that we could imagine. High-speed diodes will switch uhf antenna systems, SCRs can be used to switch ac power lines, while LDRs (light dependent resistors) mounted with photo cells make terrific devices to hang across signal lines without disrupting the circuit.





In the two circuits shown, the npn device is used to bring a control line to ground, while the pnp circuit is used to produce a positive voltage control. By combining the two, you can have various combinations of switching from zero to + voltages of around 24 volts.

Be cautious not to exceed the current capacity of the device. Should you need more current-handling capability, you can use one small device to drive a larger device such as a 2N3055, to give you 10 to 12 amps of current capacity. Several of the 3055s can even be paralleled to give you lots more.

It is advisable to bypass the inputs and outputs of the devices so that spurs up in the rf spectrum are not created as they can cause all kinds of havoc around radio receivers! Use the good building practice of short leads and proper harnessing to keep things away from rf and magnetic fields.

Have fun and keep those soldering irons hot!

*P.O. Box 68, Marissa, IL 62257, 618-295-3000 work, 618-295-2383 home.

Products

Ed. Note: This column is for calling your attention to new products and perhaps some that have been around for a while and not noticed by the amateur experimenter. This information is based largely on manufacturers' releases and has not been independently verified. New product information is published without ARRL endorsement and without any implication that the products have been examined in the ARRL laboratory. Readers are invited to send new product information on items of particular interest to the experimenter to the Editor, QEX.

Switched-Capacitor Audio Filters

EG&G Reticon, Sunnyvale, CA 94086, 408-738-4266, has announced nine models of general-purpose monolithic audio filters using the switched-capacitor technique. They can be used for low-pass, high-pass, band-pass and notch filter requirements at audio frequencies. The 5609 is a low-pass filter. The 5610 is a programmable array of four state-variable filters, each filter section having a low-pass and high-pass output. The 5611 is a high-pass filter. 300-baud modem filter requirements can be handled by the 5630 which has double band-pass filters for each frequency band. Unit prices (if they exist) are unknown. Large quantity prices are around $7.

Dot-Matrix LCD for Pocket Terminals

The PCIM 200 liquid crystal display (LCD) can display up to 54 ASCII characters. Overall dimensions are 69 by 10 by 38 mm. It operates from a single 5-V power supply and draws 7.5 mA. Price (in 100s) is $48. Contact James Pfieffer, Printed Circuits International, Sunnyvale, CA 94086, 408-733-4603.

RS-232-C Connector Cutouts

MISCO, a computer supply and accessory mail order house, has in their latest catalog some standard 19-inch panels with 16 and 32 cutouts for DB-25 data connectors at $65 and $95 respectively. Write: MISCO Inc., Box 399, Holmdel, NJ 07733. Other computer supply dealers may have them, so you may find a better price by looking around.

The above panels would be difficult for the average experimenter to homebrew using the time-honored drill-and-file technique. Does any reader know of the availability of (Greenlee or other) DB-25 punches?

Computer-Controlled Drill Press

Black & Decker's new 9413 drill press sports a built-in microcomputer which: a) maintains constant speed under varying loads, b) digitally displays depth to 0.02 inch, c) gradually shifts speed when changing drilling speeds, d) remembers last speed used, and e) blinks display and shuts down when incorrect speed and drilling pressure are used. The price is around $200. It is available from Black & Decker consumer products stores.

Clock-Controlled Active Filter

National Semiconductor has announced a type MF10 CMOS monolithic active filter IC in 20-pin DIPs. They can be used to implement classical filter configurations such as Chebyshev, Cauer, Bessel or Butterworth. The MF10 includes separate bandpass, low-pass and high-pass outputs. Contact Art Coon, 408-737-6527. Price is $3.70 each (100s).

Packet Radio Terminal Node Controllers

Dave Borden, K8MMO, Rt 2, Box 233B, Sterling, VA 22170 has Vancouver Amateur Digital Communications Group Terminal Node Controller pc boards for $30 and the basic 8273/8250 chip set for $46.50. Please add $2 for postage. They are also available on the West Coast from Hank Magnuski, KA6M, 311 Stanford Ave, Menlo Park, CA 94025. A complete TNC board (with the other parts added) will cost around $250.

Power Line Noise Detector

Caywood Electronics, Inc., 67 Maplewood St, P.O. Drawer U, Malden, MA 02148, 617-322-4455, is offering Millen type 71001 power line noise interference detectors for $220. It is used with an oscilloscope or panel-meter-equipped receiver.

Monolithic Filter for RS-232-C Ports

ITT Cannon is one of several companies manufacturing one-piece RFI/EMI filters with male and female DB-25 data connectors. The filter is designed to help computer equipment meet FCC Docket 20780. Price is not known. For more info contact Jack Engbrecht, Cannon Electric Division, 2801 Air Ln, Phoenix, AZ 85034, 602-275-4792. The filter is mounted between the normal male and female DB-25 connectors such as I/O ports on a personal computer back panel.

Correspondence

Data on New Products

I hope that your new publication will include some information that is not generally available to those hams not directly active in the electronic design field. Now that I am retired I do not have access to the free publications that announce new products & piece parts. To continue experimentally with electronics I need data on such items as low noise vhf & uhf transistors and rf (power) amplifier transistors. - *Eugene Sternke, K6AЙ, 106 Vancouver Pl, Sequim, WA 98382.*

Theoretical Void

You will be interested to know that your invitation to subscribe to *QEX* which was published in *QST* for August appealed to my curiosity, and I have today sent a check for the first 12 issues to Newington. A particular void that seems to exist in amateur radio publications is the absence of new theoritical work of the kind that appears in engineering and scientific journals, as opposed to descriptions of applications. Of course, hams are not usually concerned with doing new theoretical work, but they must know of it in order to be inspired to use it. I therefore suggest that one feature which would be of value in *QEX* would be regular reviews of information published elsewhere but of interest to hams. - *Michael S. Bilow, N1BEE, 40 Plantations, Cranston, RI 02920.*

Kepro Electroless Tin Plating Kit

Professionally done printed circuit boards have a nice bright silver appearance. This "silver" is actually a tin plating which has been electrochemically bonded to the copper surface with expensive plating machinery. Now, the amateur can make professional looking boards by using the Kepro kit. It consists of one quart of plating fluid, a glass tray, a thermometer and a pair of tongs. The kit will plat a ten-millionths of an inch thick tin coating on up to 25 square feet of pc board.

The tin plating material is very toxic, so caution must be exercised. First, a pc board is etched in the normal manner and dried after washing. Before plating, the board must be carefully scrubbed with steel wool to remove all etch resist. Any remaining resist will result in poor plating of that area of copper. After cleaning, the board is immersed in the plating solution at room temperature for about three minutes, then washed. The result is a professional looking pc board.

The plating serves a more valuable purpose than making esthetically nice looking boards too. The tin gives the builder a good base to solder to and also prevents oxidation of the copper clad surface which can result in resistive traces and the inability to resolder connections after a time.

The kit is reasonably priced (around $20) and may be obtained from your local distributor or from Kepro Circuit Systems, Inc., 630 Axminster Drive, Fenton, MO 63026. - *Mark Forbes, KC9C, 1000 Shendoah Dr, Lafayette, IN 47905.*

For a friend...

Clip or photocopy this subscription order card for a friend who may want to sign up for QEX. Please mail completed order cards to:

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The purposes of QEX are to:

1) provide a medium for the exchange of ideas and information between Amateur Radio experimenters,

2) document advanced technical work in the Amateur Radio field, and

3) support efforts to advance the state of the Amateur Radio art.

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