

While you're working on the 30 meter transceiver described by the author last month, keep this handy companion in mind. This matching amplifier makes a nice project by itself or an even better addition to your homebrew station.

How To Build A 30 Meter 100 Watt Amplifier

BY RICHARD W. STROUD*, W9SR

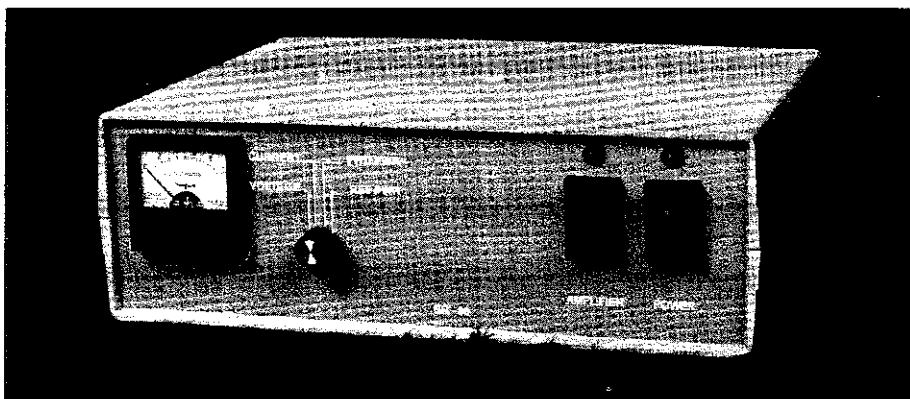
While after I built and used the QRP rig described in the January 1998 issue, I decided that a nice addition would be an amplifier to give me a little more operating time when the band started to die out. This amplifier uses a Motorola MRF 172 FET and has a gain of 14 dB, developing 100 watts when driven from any 4 watt QRP transceiver. It, like the transceiver described earlier, is built in a 7½" x 10" x 3¼" plastic cabinet (Dick Smith H-2507) presently available from surplus outlets.

If following this layout directly, plan carefully before any holes are drilled, as there is very little clearance between components, panel controls, etc. Hole patterns are drilled in the top cover above the fan for air intake, and exhaust air holes are drilled in the side and rear panels. Do not overtighten the four fan mounting screws, as the cabinet can easily craze under pressure.

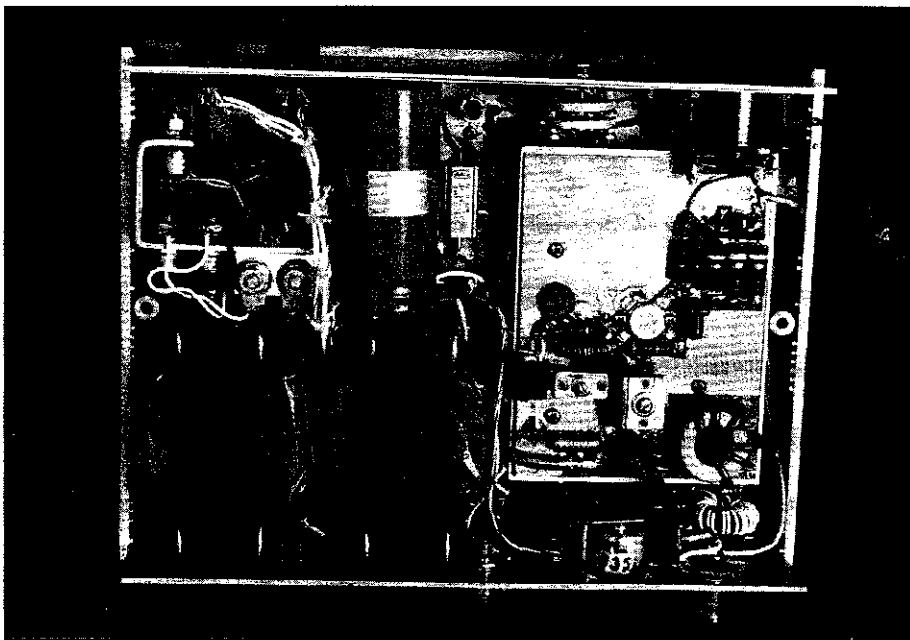
Plastic mounting bosses are built into the cabinet bottom, and these are used for mounting the copper board. Mounting screws are supplied with the cabinet. The bosses can easily be cut away in the area of the transformers and the regulator heat sink assembly to allow mounting of these parts directly on the cabinet base.

The original plastic panels are discarded and the back panel is replaced with a .087 thick aluminum panel. The front is replaced by a sheet of .032 aluminum covered by the engraved plastic panel, giving a total thickness of about .090 inches. These panels fit in the original groove around the front and rear perimeters of the cabinet. Engraved panels are available from L & C Engraving.¹

A copper-clad board houses the bias



The front view of the completed 30 meter amplifier. It would make a handsome addition to any shack.



The top view shows the parts density of this project. The cooling fan is mounted to the top cover.

*Box 73, Liberty Center, IN 46766

Component List (for fig. 1)

R1, R2: 16 ohm, 2 watt carbon
 R3: 47 ohm, 2 watt carbon
 R4, R5, R12: 270 ohm, 1 watt carbon
 R6: 300 ohm, 1 watt carbon
 R7: 1500 ohm, 1 watt carbon
 R8: 510 ohm, 1 watt
 R9: 1800 ohm, 1/4 watt
 R10: 1000 ohm, 1/4 watt
 R11: 82 ohm, 1 watt
 R13: 15 ohm, 1 watt
 R14: 5K potentiometer
 R15: 120 ohm, 1/4 watt
 R16, R17: 4700 ohm, 1 watt
 R18: 100K, 1%
 R19: .1 ohm, 3%, 25 watt, Dale RH25
 R20: 5K potentiometer, 10 turn
 R21: 15K potentiometer, 10 turn
 R22, R23: 100 ohm, 1/4 watt
 R24, R25: 51 ohm, 2 watt carbon
 R26: 948 ohm 1% (parallel 1K 1% and 18.2K 1%)

C1, C9, C23, C25: 1 mF ceramic, 100V
 C2: .1 mF ceramic, 250V
 C3: variable mica, 250 pF, Arco 427
 C4: 750 pF mica 500V
 C5: 680 pF mica, 500V
 C6: variable mica, 470 pF, 43-3517
 C7: C10 C30: .001 mF standoff Allen Bradley FB
 C8, C18, C19 C20, C28 C29: .01 mF ceramic, 100V
 C11: 20 mF, 50 volt tantalum
 C12: 100 pF 500V mica
 C13: 430 pF 500V mica
 C14: 470 pF, 500V mica
 C15, C16: 330 pF 500V mica
 C17: 68 pF, 500V mica
 C21, C22: .15 mF, 100V ceramic
 C24: 3600 mF, 50V computer-type Sprague 36D
 C26, C27: 10 mF, 35 volt tantalum

U1: LM338 IC regulator
 Q1: MRF-172 FET, Motorola
 Q2: 2N657 transistor

D1: zener diode 9.1V, RadioShack 276- 562
 D2, D3, D4, D5: diode, 12 amp 100V PIV IN200A
 D6, D7: diode IN4002
 D8 D9: diode IN34

RY1: relay DPDT, 12V 135 ohms

M1: meter 0-1 mA Simpson 1-3/4', 43 ohms

F: fan 12V, 3' Panflo FBK-08A

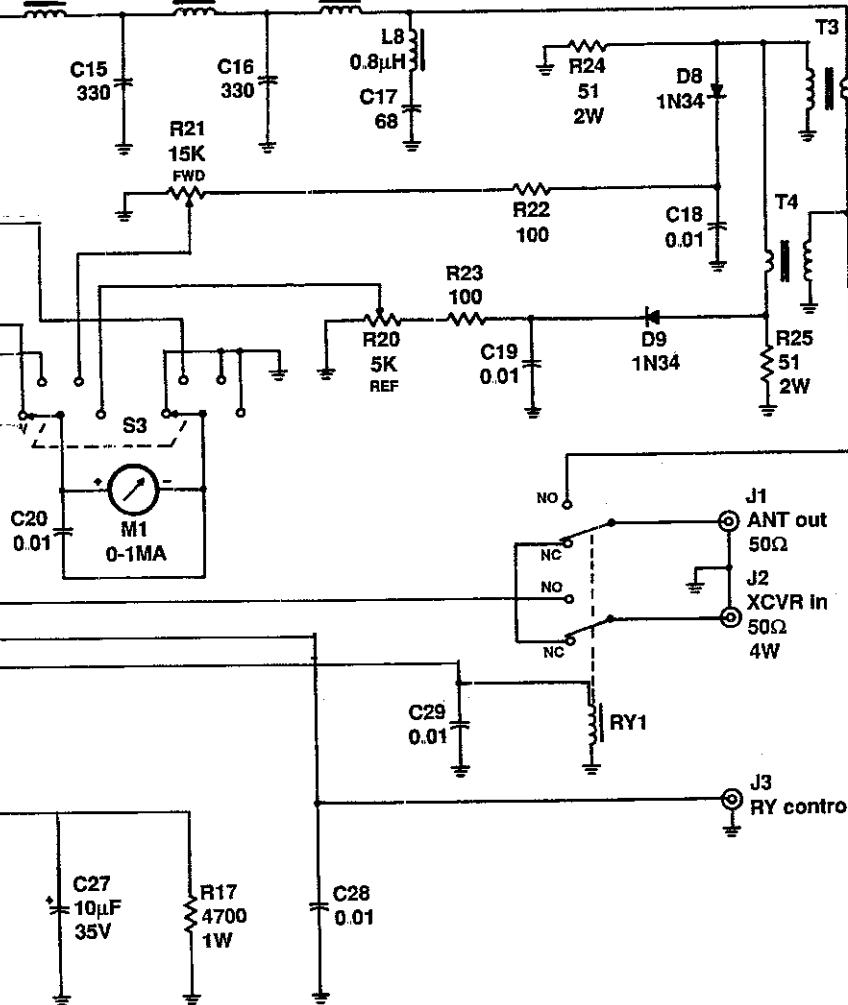
S1 S2: switch DPDT RadioShack 275-691A

T1, T2: power transformer 15V 6 amp (see text)

T3: 30 turns #28E, closewound F50-61 core primary 1/2 turn #18 teflon
 T4: 26 turns #22 teflon, closewound F82-61 core sec 1/2 turn #20 teflon
 L1: .22 μ H 5t #26E, closewound T37-6 core
 L2: 2.5 μ H, 21t #22E on T68-6 core space 3/4 of form
 L3: 2-1/2 turns #20 teflon thru 1/2' ferrite binocular core
 L4: 6 μ H, 6t #10 soft copper on T106-6 core space over 5/8 of form
 L5, L7: .47 μ H 5t #18E on T94-6 core. space wire dia
 L6: .99 μ H .9t #18E on T94-6 core space wire dia.
 L8: .8 μ H 12t #20E on T50-6 core. space wire dia.

LP FILTER

L5 0.47 μ H L6 0.99 μ H L7 0.47 μ H



with an insulated tool for a minimum second harmonic signal. This can be done by monitoring with a communications receiver while a very low drive signal is applied to the amplifier.

The primary winding of T3 is a half-turn loop of hookup wire through the core and between two isolated copper pads in the filter output line. T3 is mounted below the copper board and T4 is mounted above to give isolation between the directional coupler inductors.

Because of space constrictions, two 15 volt, 6 amp transformers are connected in series to develop the voltage required by the FET. The transformers used are marked "19A134324P1." There are probably others that will do the job. These and the plastic cabinets are available from Pembleton Electronics.² The transformers are bolted directly to the bottom of the cabinet as is the heat sink which houses the LM338 regulator and the rectifier diodes. The stud-mounted diodes are attached to

the heat sink with an aluminum bracket. R14, the regulator voltage set potentiometer, is also mounted on this bracket.

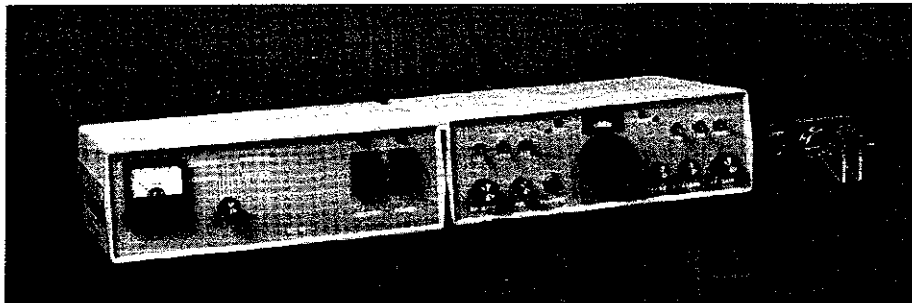
Heat-sink compound should be used under the mica insulators of the regulator and diodes.

Capacitor C24 is held in place by a formed aluminum strap that is bolted to the heat sink.

The LED indicators are RadioShack 276-208 (red) and 276-022A (green) mounted in 276-079 holders. A dot of RTV sealant on the rear holds the LEDs in place.

The change-over relay is mounted on the rear panel near the two coaxial connectors such that the input and output leads to the relay are short. Relay control from the transceiver is routed through an RCA-type panel connector, RadioShack p/n 274-346. When the amplifier is in the off position, the transceiver output is routed directly to the antenna.

R14 is adjusted for a supply voltage of 28 volts. With a 50 ohm load on the amplifier and no drive, adjust the value of R8 if necessary for a Q1 idling current of about 50 milliamperes. With drive applied, adjust C3 and C6 for maximum output, which should be 100 watts with an input of 4 watts. Do not exceed 5 watts input. Normal operating current is about 4.5 amps.



If you've been as careful and exacting as the author, when you complete the amplifier and the exciter you can be as proud of your handiwork as we're sure he is.

The over-current function of the regulator will shut down the supply if the current exceeds approximately 5 amps. This can occur if the SWR is high or the amplifier is over-driven.

The panel meter monitors the supply voltage (100 volts full scale), FET current (10 amps full scale), relative forward power (100 watts full scale), and relative reflected power (10 watts full scale). The forward and reflected power levels are set by R21 and R20.

No problems were experienced in building this amplifier other than trying to crowd it into the small space. Although the unit

is not shielded, no problems have been encountered during operation over several months in a residential area.

Results have been gratifying with good reports received from DX stations on a regular basis. By changing the appropriate output components, the amplifier could be modified for other HF bands. ■

Footnotes

1. L & C Engraving, 111 W. Mill Street, Ossian, IN 46777.

2. Pembleton Electronics, Inc., 1222 Progress Rd., Ft. Wayne, IN 46808-1262.



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| | 100FT/UP | 500FT | 1000FT |
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| LMR 400 SOLID CCA CNTR FOIL + BRAID 2.7dB @ 450MHz WP/UV JKT | 59/FT | 57/FT | 55/FT |
| LMR 400 "ULTRA-FLEX" STRD BC CNTR FOIL + BRAID 3.1dB @ 450 MHz TPE JKT | 79/FT | 78/FT | 77/FT |
| LMR 600 (OD.590") SOLID CCA CNTR FOIL + BRAID 1.72dB @ 450 MHz WP/UV JKT | 1.25/FT | 1.22/FT | 1.20/FT |
| LPF4-50A 1/2" "ANDREWS HELIX" 1.51dB @ 450MHz | 2.5FT/UP | | |
| | 2.10/FT | | |

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| RG8/U STRD BC FOAM 95% BRAID UV RESISTANT JKT 0.9dB/1350WATTS @ 30MHz | 32/FT | 30/FT | 28/FT |
| RG8 MINI(X)95% BRAID UV RESISTANT JACKET 2.0dB/875 WATTS @ 30MHz | 15/FT | 13/FT | 12/FT |
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|--|---------|---------|--|
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| RG11AAU STRD BC (VP-66%) 95% BRAID NC/DB/UV JKT 1.3dB/1000WATTS | 42/FT | 40/FT | 38/FT |
| RG6/U CATV FOAM 18GA CCB FOIL + 60% ALUM BRAID | 14/FT | 12/FT | 10/FT |

LADDER LINE GROUP

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| 300 OHM 20GA STRD (POWER: FULL LEGAL LIMIT) | 15/FT | 13/FT | 12/FT |

ROTOR & CONTROL CABLES

| | 100FT/UP | 500FT | 1000FT |
|--|----------|-------|--------|
| 5971 8/COND (2/18 6/22) BLK UV RES JKT Recommended up to 125ft | 20/FT | 18/FT | 16/FT |
| 1618 8/COND (2/16 6/18) BLK UV RES JKT Recommended up to 200ft | 35/FT | 34/FT | 32/FT |
| 1418 8/COND (2/14 6/18) BLK UV RES JKT Recommended up to 300ft | 47/FT | 45/FT | 43/FT |
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| 2206 22GA STRD 6/COND PVC JACKET | 18/FT | 16/FT | 14/FT |
| 1806 18GA STRD 6/COND PVC JACKET | 23/FT | 21/FT | 19/FT |

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|--|----------|
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| 25FT "FLEXIBLE" 9913 FOIL+95% BRAID 2.7dB @ 400MHz | 24.95/EA |
| 6FT "FLEXIBLE" 9913 FOIL+95% BRAID 2.7dB @ 400MHz | 12.95/EA |
| 3FT "FLEXIBLE" 9913 FOIL+95% BRAID 2.7dB @ 400MHz | 11.95/EA |
| 100FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5dB @ 50MHz | 49.95/EA |
| 75FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5dB @ 50MHz | 39.95/EA |
| 50FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5dB @ 50MHz | 29.95/EA |
| 25FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5dB @ 50MHz | 19.95/EA |
| 6FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5dB @ 50MHz | 11.95/EA |
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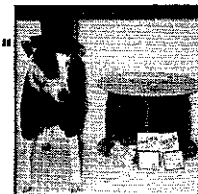
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