Kilowatt Mobile Linear Amplifier installed in WBN引起的 station wagon over the left rear wheel housing. Power supplies delivering 2,000 volts DC for the 6L621/4/25A amplifier tube grids, and 600 volts DC for the screen grids, are in the metal box under the floor. The metal box next to the amplifier contains a motor-drives, variable-tuned oscillator, heterodyning and driver stages for the amplifier. The SSB generator, and audio and VOX circuits are under the front seat.
AIDS FOR AMATEURS

We often run across handy operating aids and gadgets of interest to radio amateurs and call attention to them in this column. Here are some of the latest items:

Global NHQ Cameraman - Simple is a chart which unfolds to 17 x 22 inches in size, which will help radio amateurs establish the correct local time at almost any specific point on earth. It contains an easy-to-use charting of complete global time information, and even has a listing of time data for major cities in the United States - even our home QTH of Owensboro, Ky. Look for it at electronic parts distributors which handle John F. Rider publications.

New Call-Letter Sign - a 2½ x 7-inch call-letter sign, with letters permanently embossed in sheet aluminum, can be mounted on the rig, car, bicycle, ham shack door, etc. Finished in baked enamel, the call letters are reflected with glass beads for good nighttime visibility. A postal card to Radicraft Products, Box 1244, Studio City, Calif., will bring you details.

Call-B-Call - a handsome decal in six colors with call letters and home state will adhere to any smooth surface, including glass. Excellent for identifying your mobile station, this 4 x 4½ decal may be ordered individually, or ten or more at special club rates. Obtain details from Call-D-Cal, P.O. Box 8911, Terminal Annex, Los Angeles 54, Calif.

Call-Letter Jewelry - one of the many items personalized for radio amateurs; others include ties, plates, tie clips, lapel pins, ash trays, pecan candies, etc., all with call letters on them. Complete catalog listing may be obtained from KPTVA, 6429 North Glenwood Avenue, Chicago 26, Ill.

ARRL ANTHOLOGY BOOK - a completely revised edition of the famous ARRL Antenna Book has recently been announced. Expanded to 150 pages, the book presents the latest trends and practices in amateur radio antenna design and construction, problems which often cannot be solved simply with manufactured equipment. The book is available from electronic parts distributors, or may be ordered from ARRL.

EMERGENCY POWER SOURCE

The 3-phase AC alternator system described in the July-August, 1969 issue is a good source of emergency power, according to WEHL, a long-time user of the alternator is closely balanced, a kilowatt of power is available for lighting or operating appliances, and even AC-powered communication equipment. In emergency situations, the alternator is in best to hold the engine speed below 1,000 rpm, so that the alternator frequency does not go above 200 cycles. Transformers in some equipment designed for 60-cycle operation may not operate efficiently on frequencies less than this.

Till our first "King-Size" issue, Lighthouse Larry

NOTE: The disclosure of any information or recommendations herein appears on forma under any patents of General Electric. C. Litton Industries, Inc., in the United States and elsewhere and no license under such patent rights is granted by this publication. This publication contains c腧 confidences and the use of such information by others.
TABLE 1 — PARTS LIST MOBILE LINEAR AMPLIFIER

C1...10 — 200-μfd variable (Part of Har-
nings GP-50 tuned circuit).
C1...1-11-μfd electrolytic capacitor.
C1...10-200-μfd variable, 3,000- volt
voltage rating.
C1...20 — 1140-μfd variable (3-section
broadcast receiver capacitor with 10 —
390-μfd part). [DEST]
L1, L2...chassis cable connector.
L3...grid coil assembly (part of GP-50).
L4...10-microhenry coil with taps and switch
to (Quinter & Williams Model 821
pi-network tank circuit).
L5...L6, L7, L8...4-parallel suppressor chokes
rated at 4 turns of No. 16 enam-
ol wire on 2 watt, 47-ohm compo-
nitive resistors.
M1...D...50-milliampere DC milliammeter
(G.E. Model 8G-9W, or equivalent).
R1...R...6.67 ohms, 1 watt; resistance wire
wound on 2-watt resistors.
RFC, RFC...2.5-milliary, 4 pi-r.f. choke,
115-milliampere rating.
RFC1...200-microhenry 500-volt r.f.
choke (National R-175A, or Barker &
Williams No. 800).
S1...2-pole, 2-position ceramic rotary top
switch (Part of GP-50).
S2...1-pole, 2-position top switch (Part of
R & W 811 coil).
S3...2-pole, 3-position rotary top switch,
T1...T2...3-223, 6.3-ampere filament tran-
sformers, 12 or 115-volt primaries.

FIG. 1, SCHEMATIC DIAGRAM of the GL-4201/4-25-A mobile linear amplifier. The 0.001, 0.005
and 0.01-mfd capacitances shown as bypasses in various circuits are also ceramic capacitors, with DC
voltage ratings at least double the operating voltage of each circuit. Resistances are in ohms. L5
watt rating unless otherwise specified. Components C1, L1 and L2 are included in the Harrington GP-50
grid tank circuit. L3 and L6 are included in the R & W 821 pi-network plate tank circuit.
Capacitive bridge neutralization was included in the circuit to ensure stability on all bands. The bridge is formed by the tube capacitances, plus C, and the 0.001-mfd capacitor from C, to ground.

Separate current metering was provided for the screen grid and cathode circuits of each tube to check on the balance of power between them. A 0 to 50-milliampere DC current meter is switched across resistors in the control grid (A) and across grid (B & C) metering positions of S. In the cathode circuits (D & E), 0.667-ohm shunts multiply the meter reading by 4 times for a full scale reading of 200 milliamperes in each circuit. If the separate metering of cathode currents is not necessary, a single filament transformer may be used.

If GL-4-250A/33252 or GL-4-600A tetrodes are used in this amplifier, larger filament transformers were needed. Also, if these tubes will be operated near maximum power, a heavier plate tank coil, the B & W Model 850A, which requires more space, should be substituted for the Model 851 coil. Type 15-113 pentodes also may be used in this amplifier by installing the proper sockets and filament transformers.
THE SHIELDED ENCLOSURE for the amplifier, shown in Fig. 2, was fabricated from %

thick sheet aluminum. All sides were made as separate pieces with flanges on them for
assembly to adjacent pieces with machine screws and nuts, or self-tapping screws.

The shelves and vent holes should be added be-

fore holes are cut for mounting the com-

ponents. Vent holes may be covered with

aluminum screening or perforated sheet.

The front panel layout, Fig. 3, and the sub-chassis shelf layout, Fig. 4, are correct

for the components specified in the PARTS

LIST. Holes should be relocated to suit other

brands of components as necessary. Loca-

tions for small parts can be determined from

the pictures.

Although no commercially made enclosure of similar dimensions is available, a 6 x 16 x

inch aluminum chassis or Mintbox (Bud

CU-3001) could be used as a chassis base

and fitted with the 6 x 16-inch front panel.

A frame of aluminum angle covered with

perforated sheet aluminum would make a

good rf shield and support the upper shelf.

COMPONENT SUBSTITUTIONS

as long as their electrical and mechanical
characteristics are the same as the controlling

capacitor, C, may be a Cenco 805, Milles

15511, or Johnson 155-125. Or, a suitable

capacitor may be made by mounting two

aluminum plates about 1 x 6 inches spaced

apart in a compartment giving a good

all-round access to the components.

The upper shelf may be dropped about an

inch if necessary to allow room for a larger

B & W Model 809A plate tank circuit which

should be used with the larger tubes. The

vernier tuning dials for the grid and plate

circuits are Lafayette type 2436, 3 inches

in diameter. National type AK dials also are

suitable.

Power wiring was run with insulated wire

of sufficient size to carry the voltages and

currents in the various circuits. Leads carry-

ning plate grid and plate rf currents should be

of % x %4-inch copper strip. In the plate tank

circuit, use joints fastened with brass ma-

chine screws instead of solder when possible.

The fan shown is simply a small 12-volt

DC motor with a fan blade. It pulls cool air

into the chassis through the % x % inch

vent in the chassis, forces it up through the

holes in the tube sockets, and out through

the upper vents in the box.

The antenna changer relay was mounted

on the outside of the cabinet where it would be easier accessible. Power for the

(continued on page 41)
relay coil was brought into the amplifier through the 12-pin plug (Jones P-515-AB),
along with the other low and medium voltage circuits. Bypass capacitors were connected
to each pin on this plug, as well as used liberally throughout the amplifier, to keep
r.f. currents off the power wiring.

INITIAL TESTING should preferably be done
in a home station where checks and adjust-
ments can be made more easily than in a
vehicle. The test setup should preferably
have a dummy antenna load, and have pro-
vision for reducing and turning off plate and
screen voltages. First apply filament power,
bias voltage and r.f. excitation to the am-
plifier so that the neutralizing adjustment
may be made. About 1/4 megacycles r.f.
excitation at 24 megacycles or higher is necessary.
This will give a grid current reading of 10 to 15 milliamperes.

Set C5 in position No. and run the grid
circuit for maximum current, making sure
that the grid and plate bandwires are
in the proper position. Then, with loading ca-
pacitor L1, near maximum capacitance, "rock"
the plate tuning capacitor, C5 back and forth,
watching for a quick fluctuation in grid current at one point on the dial for C5. Adjust
the neutralizing capacitor, C6, until
the grid current is constant.
As a final check for neutralization, remove the r.f. drive, apply about half of normal plate and screen voltages, and reduce the grid bias so that the plate current increases to near maximum plate dissipation for the tubes used. Rotate both the grid and plate tuning capacitors to see if the amplifier will break into oscillation at any combination of settings. This test should be tried on all bands. If no oscillation is noticed, readjust C1 slightly until the oscillation disappears.

After turning off power, connect the amplifier to a suitable dummy antenna load having a 50-ohm impedance and power capability of at least 200 watts. Insert a standing wave ratio bridge in the coaxial cable between the amplifier and dummy antenna. Apply r.f. drive, and adjust half of normal plate and screen voltages, and tune the amplifier for maximum output.

If the amplifier appears to function normally, apply full plate and screen voltages. Adjust C1 so that each tube draws about 150 milliamperes plate current (for GL-4131/4-12BA tubes). Check to see if maximum power output on the SWR indicator occurs at the same setting of C1 as the minimum plate current dip. Any major differences in plate or screen currents drawn by each tube indicates that one tube may be bad.

Preferably, a SSB exciter should be used to drive the amplifier, so that linearity tests can be run on the amplifier before installation in the vehicle. If accurate driving power is available from the exciter, a 5,000-ohm, 25-watt non-inductive resistor (Sprague 25NT-2500 or equivalent) can be connected across C1 to sweep the screen drive. Complete descriptions of linearity tests are given in the 1959 edition of AMATEUR HAM RADIO handbooks, as listed in the bibliography on page 6.

INSTALLATION IN THE VEHICLE is simply a matter of mounting the amplifier securely so that it will not shake or vibrate excessively while the vehicle is in motion. Connect each filament transformer primary across a different phase of the 3-phase AC power source in the vehicle. Header power for the exciter should be obtained from the third phase to balance the heater load.

In WSWFII's installation, bias voltage is obtained from a small 200-volt negative single-phase AC supply, while 600 volts for the GL-4131/4-12BA screen grids is delivered by a 500/600-volt 3-phase star bridge rectifier supply which also powers the exciter from the 200-volt tap (Fig. 9 on page 7 of the July-August, 1960 issue). A 2500-volt 3-phase plate supply is used, but plate voltages up to 3000 are suitable.

WSWFII does not recommend regulating the bias and screen grid voltages for the amplifier. Plate voltage may fluctuate more than 10 percent due to variations in the alternating output voltage with engine speed — from 100 volts at idle, to 120 volts at road speeds — and plate current peaks during modulation. By allowing the bias and screen grid voltages to fluctuate in accordance with the plate voltage, a fairly constant ratio is maintained among these three voltages, and amplifier linearity is improved.

A bulky mobile antenna is required for this amplifier. W8HLD and W8PHE have constructed their own antennas with separate center-loading coils for each band. Details will be published in a forthcoming issue. Check with the manufacturer of the mobile antenna you may be considering, to ensure that it will withstand the several hundred watts of power output delivered by this amplifier.

If you want real performance in your mobile station, follow the proven recommendations published in this 5-part series in G-E HAM NEWS.
New 6C10 and 6D10 feature separate
element connections via 12-pin base

**TWO TRIPLE TRIODES** are the first types to be registered in General Electric's new line of "Compactron" multi-
function devices. Only 1½ inches in seated height (see view at right), these devices feature separate connections to all elements via a new 12-pin base. Previous triple tri-
odes with 9-pin miniature bases (6E9A and 4G7S) each had combined element connections to some pins.

* One type, the 6C10, contains three triode sections, each with characteristics similar to a section in the 6AX7 high-
nut twin triode. The 6D10 has sections similar to the 6AB6 single, and 15AT7 medium-mu twin triode. This permits the 6C10 and 6D10 to be used in present circuits without redesign, and where three separate triode functions are re-
quired. Both tubes have 6.3-volt heaters.

In addition to the usual applications in resistance coupled amplifiers, phase inverters, automatic frequency control
service, and combined mixer-oscillator-grounded grid r.f.
ampifiers in FM receivers, the following typical amateur radio circuits may be combined in a single triode section
"Compactron" device: VHF Converter — grounded-grid r.f.
ampifier, mixer and oscillator; Product Detector  —  circuit
requiring three triodes; Twin Triode Product Detector and
AVC Amplifier. VHF Exciters — crystal oscillator, first and
second frequency multipliers, and Cascode r.f. Amplifier
and Triode Exciter.

These are just a few of the many multi-function ideas
possible with these and other new "Compactron" devices.

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**TERMINAL CONNECTIONS**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heater</td>
</tr>
<tr>
<td>2</td>
<td>Plate (Section 3)</td>
</tr>
<tr>
<td>3</td>
<td>Cathode (Section 3)</td>
</tr>
<tr>
<td>4</td>
<td>Cathode (Section 1)</td>
</tr>
<tr>
<td>5</td>
<td>Plate (Section 2)</td>
</tr>
<tr>
<td>6</td>
<td>Cathode (Section 2)</td>
</tr>
<tr>
<td>7</td>
<td>Grid (Section 2)</td>
</tr>
<tr>
<td>8</td>
<td>Internal Connection</td>
</tr>
<tr>
<td>9</td>
<td>Grid (Section 1)</td>
</tr>
<tr>
<td>10</td>
<td>Plate (Section 1)</td>
</tr>
<tr>
<td>11</td>
<td>Grid (Section 2)</td>
</tr>
<tr>
<td>12</td>
<td>Heater</td>
</tr>
</tbody>
</table>

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