Supplementary Data on the Three-Control 813 Transmitter

More About the Six-Band 500-Watt Rig

BY C. VERNON CHAMBERS.* WIJEQ

During the last few weeks, Headquarters has been the recipient of hundreds of inquiries concerning the 813 transmitter that was described in QST for January, 1954. Many of the questions were related to the procurement of parts, some referred to constructional detail, others were of a more technical nature, and a few were aimed at any modifications or improvements that might have been made since the article went to press. Naturally, as is Headquarter's policy, each inquiry has received individual attention. However, it is felt that similar information should be of assistance to others contemplating the building of the rig.

In the following, any component designations—C₄, L₉, etc.—refer to Fig. 1, pages 14 and 15, QST, January, 1954.

Modifications and Improvements

The specifications for L₉ stated that the coil should be wound with 1/4-inch copper tubing. Actually, the inductor shown in the original photographs was wound with 5/16 tubing. If 1/4 tubing is used, L₉ should have 6 turns of 1/4-inch tubing, with an inside diameter of 2 1/4 inches, and a length of 23 1/4 inches. A 2 5/8-inch form should be used to allow for spring in the tubing.

Pipe can be found in this diameter. This coil is shown in one of the accompanying photographs.

With the heavier coil, it was deemed advisable to replace the original 1/2-inch coll-supporting insulators on the condenser frame with more rugged 1-inch cones (Millen type 31012 or equivalent). Leads between L₉ and C₄ are also made with 1/4-inch tubing.

In the original amplifier, C₄ was supported by heavy leads which connected to L₇ and RFC₃. This arrangement resulted in some strain on the plate end of L₇, eventually causing a slight deformation of the coil. In the new layout, C₄ is mounted between the top of RFC₃ and the rear-stator terminal of C₄, by means of 1/2-inch-wide aluminum brackets, as shown in the close-up view of the tank. This also removed L₉ from the immediate field of the tank coil.

Some sharp eyes have detected a discrepancy between the photograph on January QST's cover, and the text regarding the VFO tuning condenser, C₄. It is the last rotor plate that is removed, and the last stator plate that is bent to obtain the desired bandspread.

 Principally to protect the plate milliammeter in case of accident, it is suggested that a fuse be added in the high-voltage lead. A photograph shows how a meter-back fuse holder (Littlefuse type 383002) can be mounted on a 1/2-inch isolanlite cone just below the high-voltage terminal at the rear of the chassis. The holder is wired in series with the leads between RFC₃ and the posi-

A close-up view of the new multiband-tuner layout for the three-control 813 transmitter. L₉ is now wound with 1/4-inch copper tubing. The specifications for L₇ and L₉ have not been changed. The plate-blocking capacitor, C₉, is mounted by means of aluminum brackets to the right of the plate tuning capacitor.

*Technical Assistant, QST.

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tive terminal of the meter, and holds a 0.5-amp. Type SAG fuse.

A recheck of components shows that it might be a good idea to provide a larger safety factor for the 100-μf. 600-volt coupling capacitor connected between the 6146 and the 813. This capacitor operates with positive 400 volts on one terminal, and the full negative grid voltage of the 813 on the other side, bringing the voltage up pretty close to rating. A pair of 200-μf. 600-volt capacitors can be wired in series as a replacement, or a 1000-volt disk similar to the Sprague type 10CA-T1 can be used.

No doubt, many of those who have read “R.F. Chokes for High-Power Parallel Feed” in the May issue will ask about substituting the choke described in that article. If space can be made available for the larger choke, the change is a desirable one. However, the choke specified in the original article was designed along similar lines and will give entirely satisfactory performance. It differs from the one described in the May issue only in that the losses are somewhat higher at the lower frequencies, since its inductance is lower. Those who are contemplating construction can easily provide sufficient space by placing the 813 a little farther from the tank condenser.

Locating Materials

Many of the brands of components used in the 813 transmitter were selected because of certain electrical or physical characteristics. In some sections of this country, and particularly in foreign sections of the world (four countries heard from so far), some of these parts apparently are not readily available. Attempts to order them through local dealers who do not regularly handle one or more of the lines have resulted in delay. However, in only one instance that we know of has the difficulty been attributable to a manufacturer being out of stock. At the present time, all components appear to be ready for delivery to dealers, and it is just a case of finding one who will ship the order alone. If this doesn’t solve the problem, it is recommended that the prospective buyer write directly to the manufacturer for information on how and where his products may be found.

A list of manufacturers’ addresses, requested by many, appears at the end of this article. Remember, though, the manufacturer almost always prefers that your order pass through a dealer’s hands.

Parts Specifications

A source of aluminum — both angle stock and perforated sheet — seems to be one of the greatest stumbling blocks in completing the 813 transmitter. Sheets measuring 30 by 96 inches are obtainable from Whitehead Metal at a cost of $25.20 per sheet. If you can’t use a full sheet, or can’t find someone who will share a sheet with you, smaller quantities of similar material are handled by Radcliff’s (see ad in April QST).

The Whitehead sheet used in the original model has the following specifications: Alcoa 28-H14 aluminum, 0.051 inch thick, perforated with pattern No. 14, straight ½-inch holes on 1½₄-inch centers, 25 holes per square inch, open area 31 per cent. The perforated sheet advertised by Radcliff’s has less open area, but would doubtless be equally satisfactory.

The sizes of the various pieces required for shielding the transmitter are as follows:

- 2 pcs. 12 by 17 inches (top of cover and bottom plate)
- 2 pcs. 9½ by 12 inches (ends of cover)
- 1 pc. 9½ by 17 inches (back of cover).

Type 63ST42 angle aluminum measuring 3½ by 3½ by ½ inch was used at the corners of the perforated cabinet and along the top and the side edges of the panel. Approximately 8 feet of stock is required for the job. Actually, any type of angle can be used provided it is thick enough to handle self-tapping screws. Both Whitehead and Radcliff’s carry the angle stock.

The aluminum boxes used to shield the meters, the VFO compartment and the multiplier plate coils are made by ICA. Meter shields are Type 29804, the VFO box is No. 29843, and Type 29841 is used for shielding L₃ and L₄.

Small Components


National type R-50 50-ma. chokes are used in the oscillator-cathode, multiplier-plate and grid circuits of the 6146 and the 813. National type R-100S 125-ma. chokes are used in the plate cir-
cuits of the oscillator, the buffer, and the 6146.
The selenium rectifier connected in the bias
circuit for the 813 is rated at 65 ma.
Johnson type 135-55 insulators are used to
carry r.f. leads through the chassis.
A National type ACD-1 right angle drive is
used with the VFO-set control and the small
tuning knobs are Types HRS-4 (single etched
line) and HRS-5 (0–10).
The 1000-volt disk capacitor, C\(_8\), is a Sprague
type 10GA-D1.
Almost any small 85-ma, audio or filter choke
may be used in the screen circuit of the 813.
The one shown in the bottom view of the transmitter
is a Thordarson T-20C59.
Tekni-Labels No. 100 (white) are used to
identify controls on the panel of the rig and No.
108 (black) mark the components on the rear
wall of the chassis.
RG-8/U 52-ohm coaxial cable is connected
between S\(_{2A}\) and J\(_2\) of the output-coupling
circuit.
Centralab ceramic Hi-Kaps, type D6-101, are
used for r.f. coupling to the control grids of V\(_3\),
V\(_4\), V\(_5\) and V\(_6\).

Power-Supply and Audio Circuits
Circuit diagrams for low- and high-voltage
power supplies for the 813 rig are shown in Fig.
6-59, page 176, 31st edition (1954) of the ARRL
Handbook. The Handbook, page 262, also de-
scribes a Class B modulator designed for Type
811-A tubes, the type of modulator tube that
most of the fellows seem to want to use along
with the transmitter. Pages 247–249 of the Hand-
book furnish constructional details for a speech
amplifier-driver for the 811-A.
Information concerning cathode modulation of
the amplifier is included in the original article,
upper left-hand column, page 14, January QST.
(Also see footnote 1, same page.) The circuit for
the simple grid modulator mentioned appears on
page 250 of the 54 Handbook.

General Information
For those who ask if a Type 2E26 tube can be
used instead of the 6146 as the driver for the
813, we can say that the substitution was tried,
but excitation was inadequate at frequencies
above 14 Mc.
Disk capacitors — connected across the meters
— may be found useful as a TVI preventive
measure if the transmitter is to be operated in a
fringe area.
The fact that the amplifier in the original
model was perfectly stable without neutralization
does not necessarily guarantee that this will be
true in all cases. It may need only minor departures
from an exact duplication of the original to
introduce sufficient feed-back for oscillation. If
neutralization is necessary, one of the single-
ended neutralizing systems shown on page 145 of
the Handbook will not be difficult to add.

Incidentally, following accepted practice, Fig.
1 does not show a ground connection to pin 5 of
the 813. Failure to ground this pin may result in
instability of the amplifier.
For one reason or another, some inquire about
a substitute for the Type 5763. The most likely
candidate for this assignment is the Type 6AG7.
However, the latter tube has lower plate-
and screen-dissipation ratings than the miniature
tube, and has not actually been tried in the
transmitter. It is much larger physically, of

As seen from the top view of the transmitter
(the photograph on page 15 of January QST),
the tube sockets are oriented with prong No. 1
facing in the following directions: V\(_1\) and V\(_5\),
left; V\(_2\), front; V\(_4\), V\(_5\) and V\(_7\), left; V\(_3\) (un-
derneath the chassis), toward the amplifier end of
the chassis.
With key up, the bias voltages for the 6146
and the 813 (measured across the 10K resistors)
should measure approximately –85 and –100
volts, respectively.
In one or two cases there seems to have been
some doubt concerning S\(_{2A}\) of Fig. 1. As shown
in the diagram, the switch is set for output
coupling at 3.5 and 7 Mc.
The multiband tank circuits employed in
the transmitter have met with extremely wide inter-
est. For an early issue of QST, an article is being
prepared which will discuss the principles in-
volved and other factors. It is hoped that this
will serve to answer most of the questions that
have been asked regarding circuits of this type.
Additional data on the plate tuning capacitor,
C\(_8\), may be of assistance to those planning on
plate modulating the transmitter. The Johnson
200DD35 is designed with an approximate peak
breakdown rating of 3500 volts. The capacitor,
as used in the 813 final, has no d.c. across it and,
as a result, only the peak r.f. voltage need be con-
sidered. On a conservative assumption that the
peak r.f. voltage will be approximately twice the
d.c. plate voltage, the plate spacing should be
sufficient for 100 per cent plate modulation with
the 813 running at 1750 volts d.c. On e.w., it
should easily take the maximum rating of 2250
volts for the 813, so long as the tank circuit is
loaded.
The cost of the 813 transmitter has been
estimated at approximately $150.00. A pair of
power supplies for the rig will probably cost
nearly the same amount. Invariably, there are
many who would like to purchase the original
model of equipment described in QST, and the 813
is no exception! The chief reason, among many,
for our long-standing policy against this is, of
course, that it would be extremely difficult to
satisfy everyone with one rig!
Although templates and blueprints for the
chassis and the panel layouts are not available,
we are able to supply 8 X 10-inch prints of any
or all of the photographs illustrating the article,
as mentioned on page 52 of QST for April. To
avoid any confusion, please identify any picture

(Continued on page 118)
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813 Transmitter
(Continued from page 36)

that you wish to order by referring to the page number on which it appears.

Undoubtedly, this follow-up on the 813 rig will not provide an answer to every question that can be asked about the unit. As heretofore, we will be more than pleased to continue corresponding directly with individuals who run into problems.

Appendix

Hauline Corp. of America (JCA), Manchester, N. H.
E. F. Johnson Co., Winona, Minnesota.
Radeliff's, Box 847, Fostoria, Ohio.

Recent Equipment
(Continued from page 46)

sons for the two positions. Or it may be there to minimize the phase distortion at the detector that can result from insufficient b.f.o. injection. In any event, we found that we needed it when receiving s.s.b. signals with the a.c.e. on and the manual gain turned up. Of course, just having a switch marked “S.S.B.” doesn’t solve all of the problems of receiving a s.s.b. signal — you still have to tune one in more carefully than you do an a.m. signal, and we wouldn’t want you to assume otherwise. But with the wide range of available selectivity, the boosted b.f.o. injection, and the slow tuning rate, the SX-88 engineers did not overlook the features considered necessary for good s.s.b. reception. — B. G.

THE DOW-KAY CO., INC.
WARREN, MINNESOTA

FEED-BACK

In the 2-meter rig described by W1VLH in April QST, the detector tuned circuit should be center-tapped. This information was omitted from the description of the rig on page 13.