

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 Headquarters' 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 — C_4 , L_9 , etc. — refer to Fig. 1, pages 14 and 15, *QST*, January, 1954.

Modifications and Improvements

The specifications for L_9 stated that the coil should be wound with $\frac{1}{4}$ -inch copper tubing. Actually, the inductor shown in the original photographs was wound with $\frac{3}{16}$ tubing. If $\frac{1}{4}$ tubing is used, L_9 should have 6 turns of $\frac{1}{4}$ -inch tubing, with an inside diameter of $2\frac{1}{4}$ inches, and a length of $2\frac{3}{4}$ inches. A $2\frac{1}{8}$ -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 $\frac{1}{2}$ -inch coil-supporting insulators on the condenser frame with more rugged 1-inch cones (Millen type 31012 or equivalent). Leads between L_9 and C_9 are also made with $\frac{1}{4}$ -inch tubing.

In the original amplifier, C_8 was supported by heavy leads which connected to L_7 and RFC_1 . This arrangement resulted in some strain on the plate end of L_7 , eventually causing a slight deformation of the

• Correspondence indicates that the 813 transmitter (January, '54, *QST*) is going over with a bang. However, a few of the parts used in the rig have been difficult to locate in some areas. In addition, some of the gang have asked for supplementary data pertaining to construction, theory, and modification of the layout. This follow-up on the original article will attempt to augment previous data as thoroughly as possible.

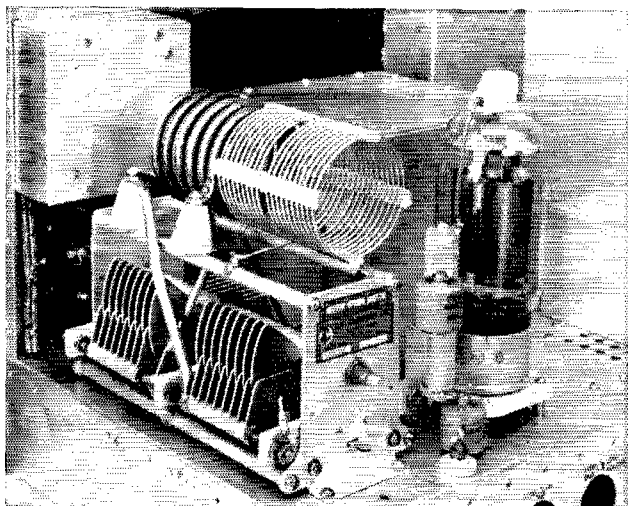
coil. In the new layout, C_8 is mounted between the top of RFC_1 and the rear-stator terminal of C_9 by means of $\frac{1}{2}$ -inch-wide aluminum brackets, as shown in the close-up view of the tank. This also removed C_8 from the immediate field of the tank coil.

Some sharp eyes have detected a discrepancy between the photograph on January *QST*'s cover, and the text regarding the VFO tuning condenser, C_1 . 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 $\frac{1}{2}$ -inch isolantite cone just below the high-voltage terminal at the rear of the chassis. The holder is wired in series with the lead between RFC_3 and the posi-

* Technical Assistant, *QST*.

◆
A close-up view of the new multiband-tuner layout for the three-control 813 transmitter. L_9 is now wound with $\frac{1}{4}$ -inch copper tubing. The specifications for L_7 and L_8 have not been changed. The plate-blocking capacitor, C_8 , is mounted by means of aluminum brackets to the right of the plate tuning capacitor.



tive terminal of the meter, and holds a 0.5-amp. Type 8AG fuse.

A recheck of components shows that it might be a good idea to provide a larger safety factor for the 100- μ f. 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- μ f. 600-volt capacitors can be wired in series as a replacement, or a 1000-volt disk similar to the Sprague type 10GA-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.¹ 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

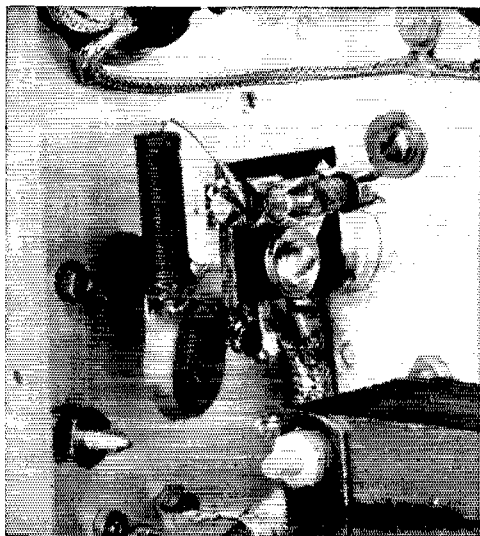
Many of the brands of components used in the 813 transmitter were selected because of certain electrical or physical characteristics. In some sections of this country, and particularly in foreign sections of the world (four countries heard from so far), some of these parts apparently are not readily 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 shoot the order along. 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

¹ The 813 amplifier was used for testing the chokes described in this article.



The fuse holder is mounted on an isolantite cone that previously served as the tie-point for RFC_2 and the lead to the plate meter. C_{11} and RFC_2 are shown with the high-voltage ends mounted on a Millen type 37001 high-voltage terminal.

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 2S-H14 aluminum, 0.051 inch thick, perforated with pattern No. 14, straight $\frac{1}{8}$ -inch holes on $1\frac{3}{4}$ -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. $9\frac{1}{2}$ by 12 inches (ends of cover)

1 pc. $9\frac{1}{2}$ by 17 inches (back of cover).

Type 63ST42 angle aluminum measuring $\frac{1}{2}$ by $\frac{1}{2}$ by $\frac{1}{16}$ 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 L_3 and L_4 .

Small Components

Both Allied Radio, Chicago, and Radio Shack Corp, 167 Washington St., Boston, Mass., handle the blower-motor assembly B_1 .

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_6 , is a Sprague type 10GA-D1.

Almost any small 55-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 describes 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 *Handbook* furnish constructional details for a speech amplifier-driver for the 811-As.

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.

² Enlargements of the photographs shown in this article are also available at \$1.00 per print, postpaid.

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 course.

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_3 , left; V_2 , front; V_4 , V_5 and V_7 , left; V_6 (underneath 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 interest. For an early issue of *QST*, an article is being prepared which will discuss the principles involved 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_9 , 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 considered. 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 c.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 × 10-inch prints of any or all of the photographs illustrating the article, as mentioned on page 52 of *QST* for April.² To avoid any confusion, please identify any picture

(Continued on page 118)

NOW IN PRODUCTION!

TWO ELEMENT

20 METER BEAM

Elements only 16 feet, tip-to-tip
with 10 foot boom

Shortening achieved effectively by extremely High Q center coils in combination with end-flared elements. A completely practical electrical and mechanical design, field-tested by cooperating amateurs for nearly a year. This is a miniature beam so widely discussed on 20 meters.

OTHER FEATURES:

- Rugged, lightweight, designed for TV rotor.....
- Single 52 ohm coax line balanced at antenna for complete symmetry.....
- Excellent front-to-back ratio.....
- Low standing wave ratio.....
- FACTORY ADJUSTED! No subsequent tuning required

Net \$59.50 (less line)

GONSET COMPANY

801 South Main St., Burbank, Calif.

813 Transmitter

(Continued from page 39)

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

Allen D. Cardwell Mfg. Corp., Plainville, Conn.
Insuline Corp. of America (ICA), Manchester, N. H.
E. F. Johnson Co., Waseca, Minnesota.
Radcliff's, Box 547, Postoria, Ohio.
Tekni-Labels, 232 No. Glenoaks Blvd., Burbank, Calif.

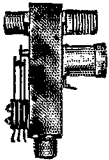
Recent Equipment

(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.v.c. 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.

LOOK WHAT HAPPENED!

Further recent improvements in our new type magnet provides thrust pressure of over 200 grams and 300% increase in relay contact pressure — Dow relays have now definitely set a new standard for the industry.



Type DKC
1000 Watts
Length 4 1/2"
Width 3"

FIXED



Type DKM
500 Watts
Length 3 1/4"
Width 2 1/4"

MOBILE

FEATURES:

1. AC types entirely free of hum, guaranteed equally as silent as DC. Transmit contact pressure now increased to over 100 grams; receiver contacts 45-50 grams.
2. Causes negligible change in s.w.r. up to 100 mc.
3. Special type receiver connector automatically grounds receiver contact inside of connector during transmit and protects receiver from RF — (Optional — not available for DKM).
4. External SPDT switch available (Optional).
5. Relays supplied with UHF connectors — type 'N' on request. Add \$1.00 for SPDT external switch. Add \$1.00 for special receiver connector.

AC types (All voltages). Amateur net. \$10.50
DC types (All voltages). Amateur net. 9.50

See your distributor — if he has not yet stocked Dow Co-axial relays, order from factory. Send cheque or money order, or will ship COD. Prices net FOB Warren, Minn. Shipping weight 9 oz. Dealers' inquiries invited — literature on request — Watch our ads for line of open type relays, using our new magnet.

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

Strays



The ham population of the Syrian Desert is undeniably sparse but QST really gets around. Note the catchy name of the area shown dotted above, this called to our attention by W6BCS.

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 L10, page 13.