



The Terado 300 watt inverter. The frequency control reed is visible between the 12-volt d.c. input terminals on the main unit. Cables at the right of the photograph are for connections to the battery and to the control unit at the left. The control unit, which can be mounted at a remote location, houses the output receptacle, voltage selector switch and indicator lamp. Although they are partially hidden in this photograph, cooling fins for the transistors are at each end of the main unit.

Terado Model 50-191, 300 Watts

Called the "Continental Converter," the Terado transistorized inverter not only represents a high-power model but also one of good frequency stability. Rated at 12 volts d.c. input, it has a continuous output rating of 275 watts

and 300 watts intermittent, and can hold the output frequency at 60 cycles regardless of changing input voltage or load. The secret to this stability is a tuned vibrating reed that controls the switching action of the four-transistor circuit.

As shown in the accompanying photograph, the necessary cables for installing the inverter are part of the package, including those for connecting to the 12-volt battery. The main unit, which measures 11 inches wide, 6 inches deep, and 7½ inches high, can be mounted in the car trunk and controlled remotely from the under-the-dash control head. On the head, which is 4 inches wide, 2½ inches deep and 1½ inches high, is the output receptacle, a voltage selector knob and lamp indicator. The voltage selector has five positions and is advanced from the lowest numbered position until the indicator lamp just barely lights. This indicates that the output voltage is at the correct value. If a larger or smaller load is applied to the inverter, the voltage selector can be adjusted to compensate for a voltage fall or rise.

One interesting feature of this particular unit is that some of the inverter output is used to run a built-in fan for forced-air cooling of the transistors.

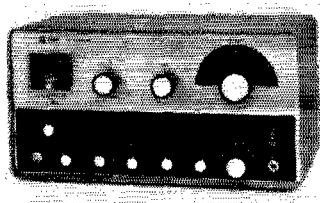
With the power available from this supply even relatively large — up to ¼ h.p. — electric motors and appliances can be operated. If the d.c. power were available, a complete 100-watt station, including receiver, could probably be handled. On Field Day this could mean a healthy battery multiplier!

Terado also has a complete line of inverters, including cigarette lighter plug-in models. They are manufactured by the Terado Co., 1068 Raymond Ave., St. Paul 8, Minn. — E. L. C.

Knight T-150 Transmitter Kit

AMONG the many reasons for the drift toward buying rather than building, one stands out crystal-clear — in the case of kit equipment, it's cheaper. Most kits can't be matched in price by buying individual components to build up the same circuit. As an added inducement, kits also offer a kind of coordination — in the form of specially tooled cabinets, chassis, and mechanical parts — that are beyond reach for the designer who must use the materials listed in catalogs. The Knight T-150 is an excellent example; a quick tabulation shows that the cost of individually purchased components of equivalent characteristics — exact duplication of many features is of course impossible — would run to nearly 20 per cent more money than the kit price.

With this observation out of the way — and it's intended as a statement of simple fact, not as an argument for or against — a look at the kit itself shows that it appears to fill a niche that hasn't earlier been occupied by the many transmitter



kits now on the market. Its final-stage c.w. input is 150 watts. There is a built-in v.f.o., as well as provision for crystal control. The range of ham bands covered is 80 to 6 meters, inclusive. It has a.m. phone, in the form of controlled-carrier screen modulation. The power supply uses semiconductor rectifiers. The entire transmitter is smaller than many receivers, and weighs less than most.

The tube line-up is shown in Fig. 1. The v.f.o. uses the series-tuned Colpitts circuit with electron coupling. There are three frequency ranges, as shown in the block diagram, with each range spread over the entire 180 degrees of dial movement. Individual calibration scales are given on the v.f.o. dial for all bands.

The 6C16 second stage has a dual purpose: it is

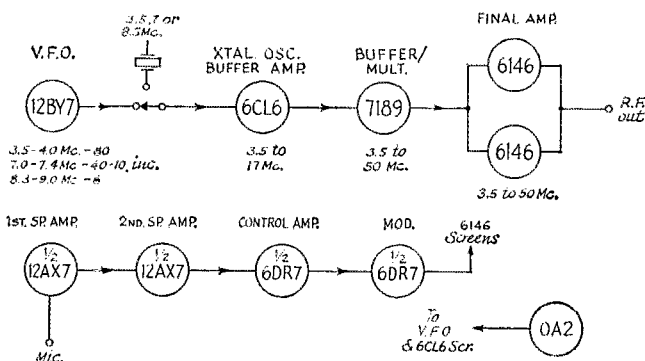


Fig. 1—Block diagram of the T-150 transmitter.

a Pierce crystal oscillator when crystal control is used, and is a buffer or frequency multiplier when the v.f.o. is in operation. The third stage operates either straight through or as a frequency multiplier, depending on the frequency band. It uses a 7189, a type which so far as we know has not previously had any attention for r.f. use in amateur transmitters. Made for audio hi-fi amplifiers, it is a rather "hot" tube and takes some taming in r.f. work. In the T-150 the input and output circuits of this stage are resistance loaded on those bands where the stage operates straight through, to prevent self-oscillation. Also, — rather a rarity in anything except a final stage — there is a v.h.f. parasitic suppressor in the plate lead.¹ The plate circuits of the 6CL6 and 7189 are individually tuned by variable capacitors, appropriate coils being cut in by the band switch. The same switch takes care of band changing in the output amplifier.

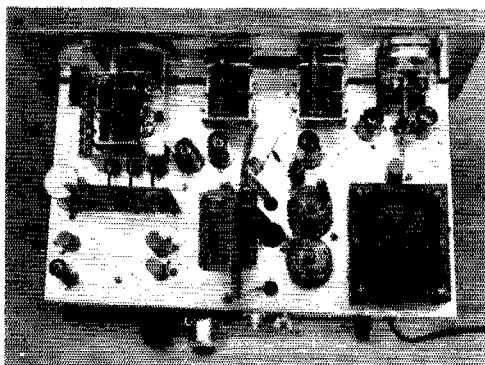
The final stage has a pair of 6146s in parallel, neutralized by the capacitive bridge method. The plate tank is a (what else is there?) pi network with constants adjusted for working into coax lines. The two tubes have individual v.h.f. parasitic suppressors. The stage operates straight through on all bands. The frequency combinations for various output frequencies are as follows, in round figures:

Band	V.F.O.	6CL6 Plate	7189 Plate	6146s
3.5	3.5	3.5	3.5	3.5
7	7	7	7	7
14	7	7	14	14
21	7	7	21	21
28	7	14	28	28
50	8.5	17	50	50

The phone line-up is much like that in the earlier T-60 kit², with minor changes in circuit values because the modulated tube is of a different type — besides, there are two in parallel. The

modulation percentage at the point of maximum peak capability of the transmitter is not quite as high as in the T-60. Up to the overload point the audio quality is excellent, the distortion being negligible as compared with most systems of this type. There is plenty of speech gain for amateur-type microphones.

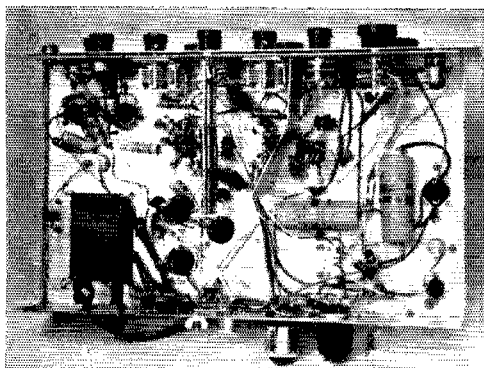
The keying is very good, especially considering the handicaps that have to be overcome in order to make break-in operation available in a low-cost transmitter. All four stages are keyed in the cathode circuits of the tubes. A 2200-ohm resistor across the key limits the rise in voltage across the contacts with the key open, but the voltage developed in it is enough for cutting off the oscillator. The final amplifier takes a small resting plate current with the key up. On the two lowest bands some care is required in tuning the 6CL6 and 7189 stages in order to get the cleanest note and chirpless keying: with four stages all working on the same frequency in one rather small box this is not surprising. The signal should be monitored when making these adjustments. On the higher bands, where the v.f.o. is on a lower frequency than the final stage, the tuning from this standpoint is much less critical. (Parenthetically, 7-Mc. also can be made noncritical by putting the v.f.o. on 3.5 Mc. for this band. This requires mentally



The v.f.o. tuned circuits are in the subchassis at the left in this view of the T-150. The shield between the v.f.o. and the rest of the transmitter minimizes interaction between the circuits. The two variable capacitors on the panel are for final tuning and loading. Speech circuits are at the right close to the meter.

¹ The kit described here includes modifications made after the transmitter was marketed initially. These modifications include a number of component substitutions and some rearrangement of parts underneath the chassis, plus the shields shown in the top and bottom views. Owners of the original transmitter can obtain modification kits free of charge by writing Allied Radio Corp., 100 North Western Ave., Chicago 80, Ill., specifying modification kit 040159 and giving the date of purchase of the T-150 kit.

² "Recent Equipment," *QST*, May, 1962.



The band switch is a little to left of center, with the 7189 and 6CL6 plate tuning capacitors on either side. Speech-circuit components are at the upper right. The v.f.o.-crystal switch, function switch, and key jack are on the right hand part of the panel. The small shield runs between the 12BY7 and 6CL6 sockets to help isolate the v.f.o. from the buffer. A.c. input, fuse, and line filter are on the bottom chassis apron at the left. The components near the coax connector are in the r.f. rectifier circuit for the output meter (other positions on the four-point meter switch read amplifier plate current, amplifier grid current, and 7189 grid current).

doubling the 3.5-Mc. dial readings to get the actual output frequency.)

The function switch has a position for v.f.o. spotting along with the usual a.m., c.w., and standby positions. There is an accessory socket at the rear, from which heater and plate voltages can be taken for auxiliary equipment, along with a 115-volt circuit which is activated when the function switch is in the a.m. and c.w. positions. The obvious use for this is in operating an antenna change-over relay.

One feature which should head off some "how-do-I-do-it" queries is a rear-mounted socket to which the plate and screen connections of the final stage are brought out. Plate-and-screen modulation can be introduced through this socket if the owner wants to up his phone power. A jumper plug completes the d.c. circuits when such an accessory modulator is not used. This plug makes a handy disconnect device for the final when the set is out of the cabinet for working on other parts of the transmitter, and for neutralizing the final stage.

The power supply uses the full-wave voltage-doubler circuit with silicon rectifiers. The output voltage at full power is approximately 600. A tap taken between the series-connected filter capacitors supplies 300 volts for the r.f. stages and the 6146 screen (through a dropping resistor in the latter case). A gas voltage regulator stabilizes the voltage for the v.f.o. tube. The 6CL6 screen voltage also comes from the regulated source.

Although the transmitter is not physically large, considering the power level, there is little or no crowding in its layout. The v.f.o. chassis is wired separately before installation on the main chassis, and is quite rigid mechanically; the oscillator is substantially unaffected by mechanical

T-150 Transmitter Kit

Height: 9 inches.

Depth: 9½ inches.

Width: 17¼ inches.

Weight: 26¾ pounds.

Power Requirements: 115 volts, 60 cycles; 350 watts at maximum input.

Price Class: \$120.

Manufacturer: Knight Electronics (Allied Radio), 100 North Western Ave., Chicago 80, Ill.

shock and vibration. The extra shield between the v.f.o. and final, and the small interstage shield underneath the chassis, contribute to the isolation that is necessary between circuits working on the same frequencies.

We were quite favorably impressed by the excellent packing of this kit and the way in which parts are segregated for easy identification. Composition resistors are mounted on cards, arranged with the resistors in numerical order according to circuit designation. Other small parts are grouped in a number of plastic transparent bags and do not require pre-sorting. Hook-up wire comes cut to the proper lengths (a different color of insulation is used for each length) and with the ends trimmed. Assembly and wiring took a little under 20 hours.

The cabinet is a welded one-piece wrap-around with a welded back having an opening for the terminals on the rear chassis apron. Six sheet-metal screws around this opening fasten the chassis to the back (the set slides in from the front) and ensure good electrical contact between the chassis and cabinet if the paint is scraped from the inside of the latter where the chassis butts against it. This over-all shielding is probably enough to take care of harmonic leakage in most TV locations, but since there is no electrical bond between the front panel and cabinet there can be leakage out the front. It is possible that something would have to be done about this in TV fringe areas.

The cabinet finish is gray, with the upper half of the panel gray of lighter tone and the lower half black. Bright metal trim is used on control knobs. The appearance of the set, to us, strikes a nice balance between the modern styling that fits into living-room surroundings and the technical flavor that a piece of transmitting equipment ought to have.

—G. G.

IMPORTANT NOTICE Changes of Address

Important postal changes in handling second-class mail matter are now in effect. Please advise us *direct* of any change of address. Four weeks notice is required to effect change of address. When notifying, please give old as well as new address. Your promptness will help you, the postal service and us. Thanks.