

The LG.300 Mk. II band-switched transmitter assembly standing outside its cabinet. As this and the other photographs show, the LG.300 is a well-engineered design, on a rigid chassis, and is very well finished throughout. The panel is a light grey crackle, toning with the darker, smooth grey of the cabinet. Dimensions overall, excluding handles, are 19½-ins. high by 14-ins. wide by 11-ins. deep, and the weight is about 50 lbs. The full 150-watt carrier can be obtained on all bands 3.5 to 28 mc.

Labgear Band-Switching Transmitter

REPORTING ON THE
LG.300 Mk.II

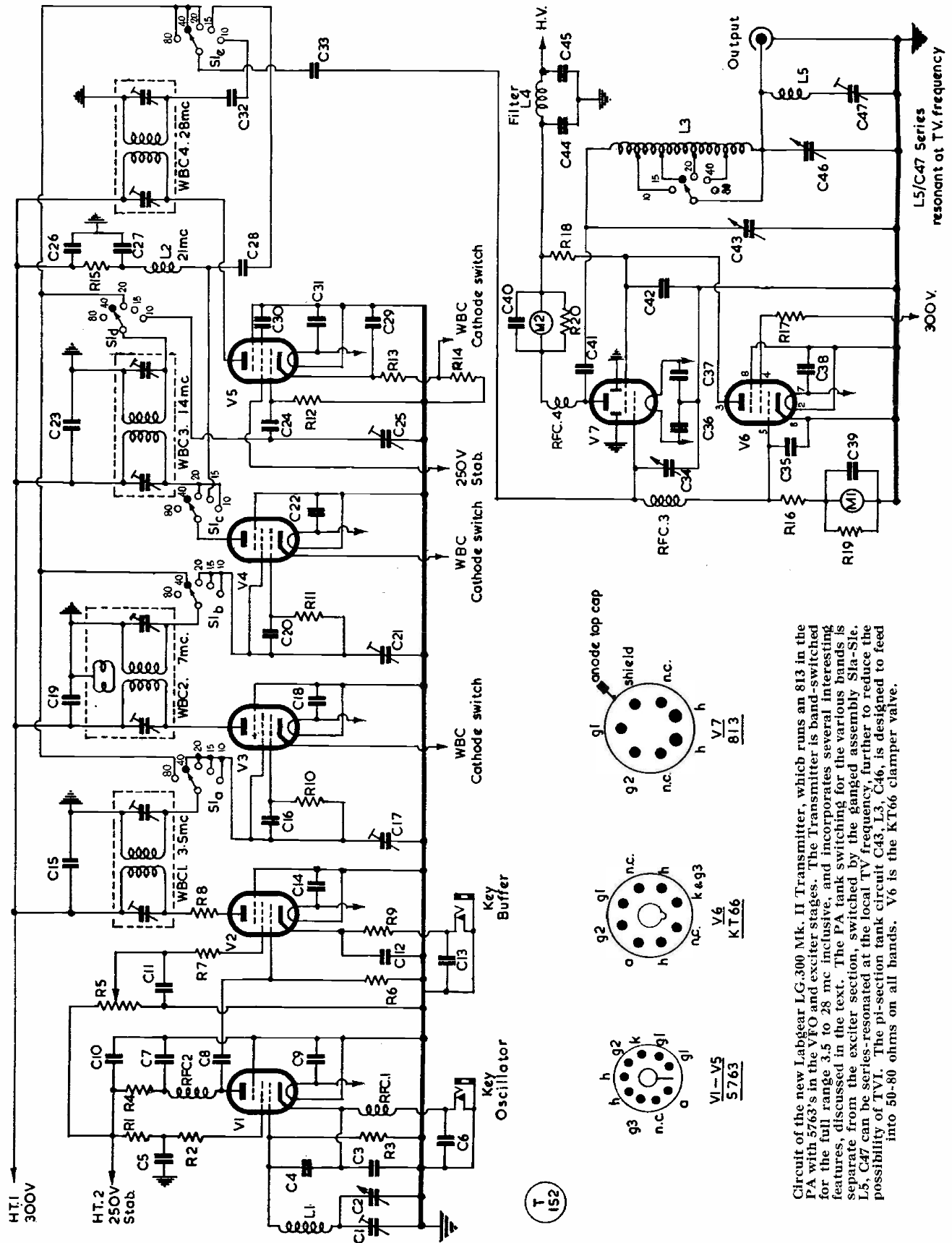
THE advent of a new British transmitter, commercially produced and designed exclusively for the amateur bands, is naturally a matter of great interest—even to those who may not at this moment be thinking of buying one.

In this country, the market for factory-built equipment of this sort, something you just switch on and tune up, is relatively restricted. However, it is growing, because in the same way that most British amateurs buy themselves a receiver—knowing they are unlikely to be

able to build something good enough to compete under the conditions now obtaining on our bands—so many are coming round to the idea of buying a transmitter which measures up to the requirements of today.

Let it be said straight away that the Labgear LG.300 Mk. II is a good job. It looks nice, it performs well, and it is easy to handle. It is designed by engineers with a clear notion of what the amateur needs and expects, and in operation nothing is stressed or overloaded. The aim of the designers has been to produce a well-engineered VFO-Exciter-PA assembly, for which it is a simple matter for the customer to provide power supplies—and a modulator, if he wishes to use phone. The frequency coverage is five-band, 3.5 to 28 mc inclusive. Mechanically and electrically, the construction of the LG.300 is excellent throughout; it is on a rigid chassis and out of its cabinet the transmitter can be handled without fear of damage.

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Circuit of the new Labgear LG.300 Mk. II Transmitter, which runs an 813 in the PA with 5763's in the VFO and exciter stages. The Transmitter is band-switched for the full range 3.5 to 28 mc inclusive, and incorporates several interesting features, discussed in the text. The PA tank switching for the various bands is separate from the exciter section, switched by the ganged assembly S1a-S1c. L5, C47 can be series-resonated at the local TV frequency, further to reduce the possibility of TVI. The pi-section tank circuit C43, L3, C46, is designed to feed into 50-80 ohms on all bands. V6 is the KT66 clamper valve.

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Circuit of the LG.300

The general arrangement is shown in the diagram and several of the sections can be identified in the various photographs.

The VFO is constructed as a separate unit, the buffer V2 being incorporated in that part of the Exciter section marked "WBC pack" in one view. Drive control is by the resistor R5 in the screen of V2, and is brought out to the panel. Brimar 5763's are used throughout the VFO-Exciter stages, and it is worth noting that on each band a 5763 as a multiplier is sufficient to drive the 813 PA to full input.

On the PA side, the 813 is really much under-run at 150 watts input. As an RF valve with 2,000v. on the plate, the 813 is rated for around 400 watts input with about 4 watts of grid drive. On a test with a dummy load, it was found that in this transmitter the PA could be pushed to nearly 300 watts DC input on 14 mc—and with 1,500v. HT it was given a soak-run of an hour under these conditions. On the HF bands, adjustment of C34, the peak drive control, with R5, is necessary for full drive into the PA. Once set for a particular band, no further attention is required.

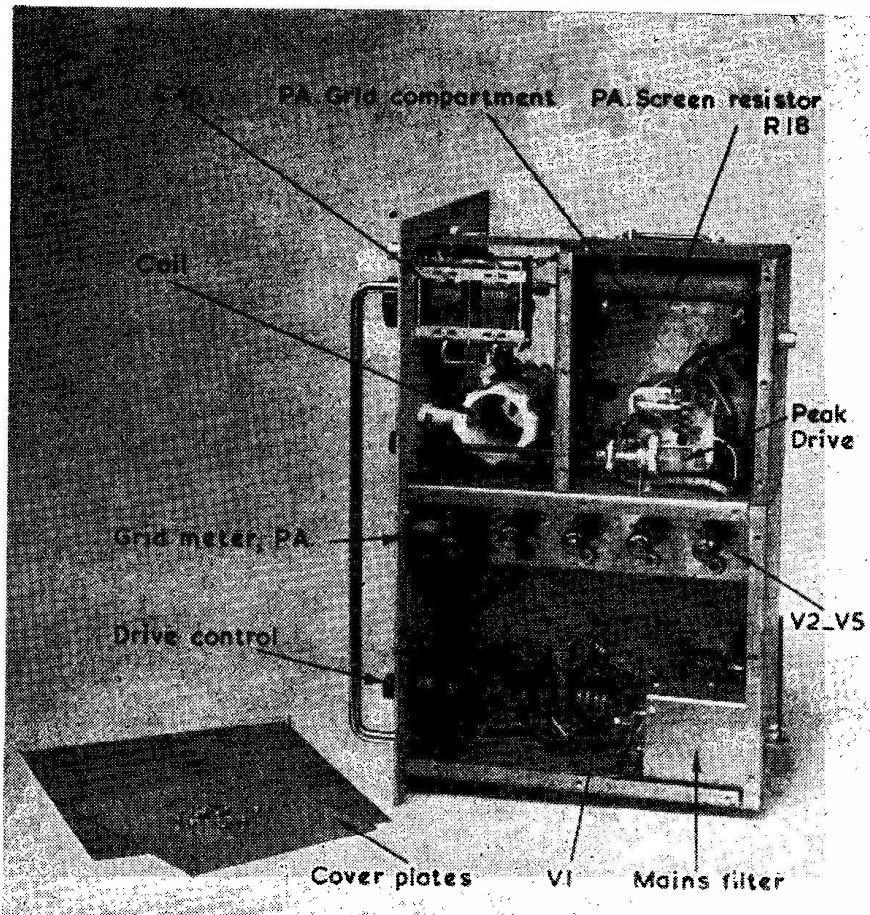
It will be noted from the diagram that clamping of the PA is obtained by a KT66 in the circuit of V6. This fully protects the PA; on a test, with 1,700v. on the 813 and no HT on the Exciter, the PA plate meter reading was about 20 mA.

The PA tank switching is separate from the Exciter band selection. A heavy-duty ceramic-mounted switch taps the coil assembly L3, and the layout is such that the leads involved are only a few inches long; the 10-metre section of this winding is mounted at right angles to the main coil. The pi-network tank circuit matches into 52-80 ohms on all bands and, generally speaking, a separate aerial tuning panel is necessary to enable the aerial to be properly matched and loaded—unless, of course, some 70-ohm current feed system is in use. L5, C47, will be noted in the diagram; this

Table of Values

Circuit of the Labgear LG.300 Mk.II

C1 = 100 μ F, pre-set	R3 = 100,000 ohms, $\frac{1}{2}$ -w.
C2 = 20 μ F, variable	R4 = 5,000 ohms
C3, C4 = .001 μ F, \pm 2%	R5 = 30,000 ohms, w/w
C5, C7, C9, C10, C11, C12, C14, C15, C18, C19 = .01 μ F	R6 = 18,000 ohms, $\frac{1}{2}$ -w. pot'meter
C6, C13, C22, C26, C29, C30, C31, C35, C38, C39 = .001 μ F	R7, R8 = 47 ohms, $\frac{1}{2}$ -w.
C8, C16, C20, C24, C28, C32, C33 = 100 μ F	R9, R13 = 68 ohms, $\frac{1}{2}$ -w.
C17, C21, C25 = 3-30 μ F, pre-set	R14 = 2,500 ohms, w/wound
C23, C27 = .005 μ F	R15 = 100 ohms, $\frac{1}{2}$ -w.
C34 = 15 μ F, variable	R16 = 8,000 ohms
C36, C37, C40, C41, C44, C45 = .002 μ F	R17 = 10,000 ohms, w/wound
C42 = .002 μ F, high-volt	R18 = 30,000 ohms, 100w.
C43 = 100 μ F, variable	R19 = Meter shunt, M1.
C46 = 800 μ F, variable	R20 = Meter shunt, M2
C47 = 50 μ F, trimmer	RFC1, RFC2, RFC3 = Standard RF chokes
R1, R10, R11, R12 = 47,000 ohms, $\frac{1}{2}$ -w.	RFC4 = Labgear E.5032
R2 = 1,000 ohms, $\frac{1}{2}$ -w.	L1, L2 = Built in
	L3 = Labgear E.5033
	L4, L5 = Built in
	M1 = 0-15 mA, grid
	M2 = 0-250 mA, PA plate
	V1-V5 = Brimar 5763
	V6 = Osram KT66
	V7 = 813



Side view of the LG.300 Mk. II with cover plates removed and main items identified. The exciter section V2-V5 is completely screened, electrically and mechanically, from all other parts of the circuit. Apart from the PA tank tuning, the only on-the-air adjustment called for is to the grid drive for the 813, which is by panel control.

is adjustable over a range of 40-70 mc and, in conjunction with a simple harmonic checker plugged into the left-hand Pye socket (see front view) can be set for minimum harmonic indication on the local TV channel. This is a most valuable refinement — it was tried for effectiveness against an S.27 receiver (which covers all TV channels and receives most of them) fitted with an S-meter, and it was found possible to attenuate the harmonics in any part of Band I.

Points on the VFO

So far as the user is concerned, the factors that matter in any VFO are its stability, accuracy of adjustment, and ease of swinging and netting. In the LG.300, the VFO dial is calibrated at main points, and there is ample swing over all bands. The test applied to the VFO for accuracy of adjustment was simply to use it as a BFO on DX signals on the 14, 21 and 28 mc bands: its stability on the HF bands was checked over long periods against a BC-221. In both cases, the results were entirely satisfactory. The actual calibration markings of the VFO dial are near-enough for practical purposes; it is not intended to be a band-edge marker and should not be used as such. The VFO trimmer is set for coverage in the factory.

The Exciter Section

The stages V2-V5 in the circuit diagram are factory-set and no adjustment to the trimmers is necessary—indeed, unless there is something radically wrong, the trimmers should not be touched.

On applying power to the low level stages, *i.e.*, no HT on the PA, a grid current reading will appear at any setting of the VFO on any band. This reading can be varied by the “drive-increase” control on the panel (R5 in the circuit) and on the HF bands it can be peaked by the panel control C34, marked “peak drive”; on 3.5 and 7 mc, C34 is quite flat.

With the drive set at about 7 mA on any band, it will be found possible to swing the VFO dial through most of the band with only the slightest variation in the drive mA reading. In other words, each stage in the Exciter is sensibly flat; any variation can be taken up on the controls.

Keying

Two key positions are provided. The note is better when the key is in the upper, marked “key buff,” jack and normally this is the best way to key the LG.300 when using a muted or

de-sensitised receiver, monitoring on the operating frequency. The beat level from the free-running VFO depends, of course, entirely upon the “degree of coupling” between transmitter and receiver and also the extent to which the latter is muted during transmission. But the VFO on the LG.300 being totally screened, there is very little RF leakage and under the test conditions the muting normally used on several different receivers was adequate. For full BK working, however, it is necessary to key in the oscillator jack. The note then tends to be a bit “soft,” whereas in the buffer position, it is clean and sharp.

Modulation

The makers, in their instruction pamphlet, discuss high level (full plate-screen) modulation. This is, naturally, the easiest to apply—provided the audio power is available—because it is simply a matter of putting the secondary of the modulation transformer in series with the PA HT lead, having adjusted the impedances to match, in the usual way. For this, a Woden UM2 would be a very suitable transformer to use. High-level modulation can be obtained by a pair of TZ40's, DA41's or DA42's. For those wanting a speech-amplifier sub-modulator design, the G.E.C.'s new Osram-912 can be used as the audio driver unit for the high-level stage.

Recommended PA setting for high-level modulation of the LG.300 is 1,000v. at 150 mA, though some deviation from this is permissible. The modulator should be capable of giving 75 watts of audio at the secondary of the modulation transformer, though audio outputs down to 50 watts or so will give reasonable results. For good quality phone with full modulating power available, the drive setting for the 813 needs to be about 10 mA. As the makers point out, low drive results in low *harmonic* output, so that the lowest drive to give a satisfactory result should always be used.

For the owner who is mainly a CW operator and has only a casual interest in phone, the fact that the PA is an 813 with a KT66 clamper suggests that a less expensive modulation system could be used. For those who know what they are about there are two possible ways of doing this in the LG.300. The first is straight screen modulation of the 813, by taking out the screen HT lead; this is got at quite easily. The second possibility is by applying modulation to the KT66 (“Clamp modulation”), though this is not so easy and would involve more interference with the circuitry.

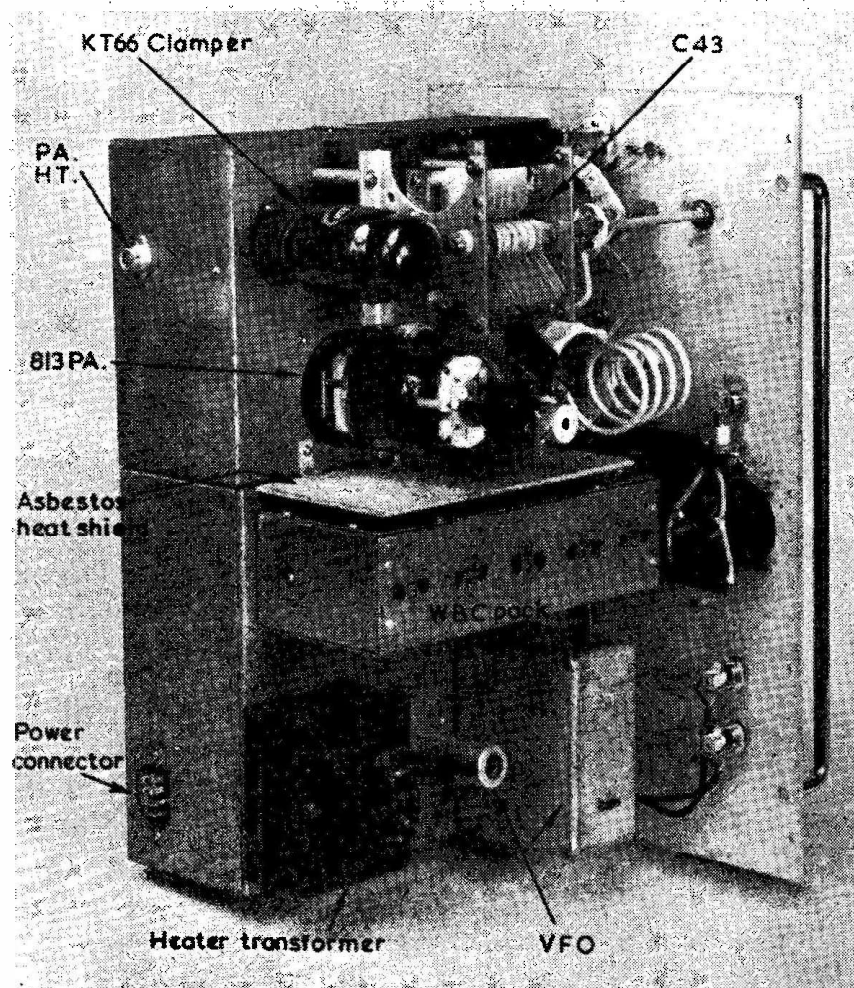
It should be noted that the makers do *not* discuss either of these methods of modulation, nor have we actually tried them on this transmitter. But both methods are clearly feasible, and it also happens that in another of our transmitters, having a PA stage somewhat similar to that of the LG.300 and also using an 813, adequate phone can be obtained by screen control. The advantage is that full modulation is possible with but a few watts of audio—though, of course, at lower RF output efficiency, since the standing screen voltage must be considerably reduced for good quality.

The TVI Factor

In some respects, this is the most important consideration of all in the design of the LG.300. Straight away, one must make the point that while in certain locations the LG.300 will give entirely TVI-free operation, in others it may not. The problems of TVI are extremely complex and no two cases are the same. This means that to say the LG.300, or any other transmitter, is TVI-proof would be as misleading as to say that it is not.

So far as the LG.300 is concerned, all possible TVI-proofing has been built into it. It is fully screened. All leads associated with RF are themselves screened, right up to the terminal point. As already mentioned, the rejector circuit L5,C47, is incorporated, and is on the screened side of the cabinet. All input leads are filtered for TVI. Short of suppressing any RF output at all, everything possible has been done to keep the RF in our prescribed bands. More than this is not a practicable proposition and, in any case, need not be attempted. For interference with TV generally is now on a much greater scale and comes from many more sources than any that could be laid at the door of a licensed amateur using a transmitter like the LG.300.

If the operator's own TV receiver is one of those archaic designs with its IF's in an amateur



Another side view of the Labgear LG.300 Mk. II, showing general layout. The WBC pack is factory-set and no adjustment should be required in this section, which gives sensibly "flat drive" on all bands. The VFO circuitry is totally enclosed and the keying jacks, either "Osc" or "Buffer," are on the panel, on the right in this view. All leads associated with RF are fully screened, right up to the terminal. The PA band switch is above the coil assembly, behind C43 in this photograph.

band, then obviously the LG.300 cannot be operated in close proximity to it on that particular band. The same applies to a near neighbour's TV receiver with the same sort of IF's, and even perhaps to one similar half-a-mile away. In such a case a rejector circuit or high-pass filter in the TV receiver's own aerial lead may effect a cure—on the other hand, it might not. Likewise, the perfect and complete suppression of all harmonics is a near-impossibility—even the BBC cannot do it.

What it comes to is that it should be possible to operate the LG.300 TVI-free in areas of reasonably high TV signal level, provided there are no neighbouring TV receivers with IF's in or near the amateur bands—such cases are then a matter for the Post Office. It should also be possible to work TVI-free in areas of low TV signal level if the TV receivers within range are themselves fitted with high-pass filters and

have adequate front end gain. The combination of possibilities between these two *desiderata* are almost limitless! But if the owner of an LG.300 has a clear idea of the nature of the problems involved in TVI, then he can start to find a solution in offending cases secure in the knowledge that his transmitter is as near faultless as it reasonably can be.

The makers themselves do not claim that the LG.300 is completely TVI-proof—they would be very foolish if they did. What they do claim, with entire justification, is that the LG.300 ensures “the maximum possible efficiency together with an absolute minimum of spurious emissions.” The instruction pamphlet with the transmitter deals quite fully with TVI problems and suggests that, in cases of particular difficulty, the addition of the Labgear Low-Pass Filter, as an external unit in series with the coax'd output from the transmitter, should be used.

Some General Points

The external power supply requirements for the LG.300 are: 300v. at about 200 mA; 250v. at 30mA, stabilised; and 1000-1500v. at 200 mA. A mains connection is also necessary, for the heater transformer. A full set of plugs and sockets for the transmitter is supplied; it is only a matter of making the necessary lead connections.

Fitted handles at the front and on top of the cabinet allow the transmitter to be handled easily. The cabinet stands on rubber feet and the ventilation is adequate. Radiated heat is greatest in that part of the transmitter marked

“PA Grid Compartment” in one of the photographs. This is mainly from the heavy-duty screen resistor R18, while the 813 itself normally runs warm on filament power alone. As seen, a heat shield is fitted below the PA to insulate the Exciter pack from radiated heat.

The only constructional points that we can fairly criticise are minor ones. The knob on the Exciter band switch is not sufficiently secure; this is a high-torque assembly and requires a better knob, fitted so that the set screw bites on the flat of the shaft. Another small point is that the control on C43 (the left hand dial in the front panel view) is a little sticky; this condenser is of Labgear's own make and the bearing tends to be stiff. Also, it might have been worth having a panel on-off switch for the mains supply (which is to heater transformer only on the transmitter itself) though the intention is that all control switching should be external.

The LG.300 supplied to us was a normal production model, delivered in the ordinary way. It is well packed in a protected carton and should suffer no damage in transit.

We have not the slightest doubt that at its nett price of 55 guineas (exclusive only of the 813) this excellent transmitter, backed as it is by the Pye organisation, will find a ready market both in this country and abroad (where its full power capabilities can be used) and that all models sent out will perform as outlined in these notes. We congratulate Labgear on having made a worthy contribution to the line of British-built equipment for the radio amateur.

Clean Keying

CONTACT REPLACEMENT ON A BUG

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IN keeping with the fact that CW is the basic form of Amateur Radio communication, the venerable and descriptive term “brass-pounding” implies exactly what it says: The manipulation of a solid straight key with heavy contacts that meet in a determined manner for the clean making of a keying circuit. In more recent years the semi-automatic key has gained considerable popularity, and when correctly adjusted and handled in the way intended by its inventor (which is for the comfort of saving unnecessary wrist-action and not for incoherent fast-sending frenzies), it is to the

receiving end indistinguishable from a straight key. This desirable state of deception is unfortunately not always attained, and when heard lamentably failing in its intention, solid brass-pounding devotees are apt scornfully to remark that “it *sounds* like a bug”!

When not directly due to faulty adjustment, the causes of such tell-tale “scratchiness” are usually four in number, and, if appearing on the dash side, may indicate the presence of a high resistance between the pivot bearing and the dash contacts. A condenser between the fixed dash contact pillar and the key base will usually remove the unwanted effect. On the dot side, dirty contact faces and poor setting-up, preventing the surfaces from meeting evenly, can be cured by careful cleaning and parallel re-alignment. The surfaces rarely pit unless high voltages are passing, but the very sparing use of a fine oil stone will remedy this where necessary.