REVIEW:
KW Ten-Tec Argosy

Review of the KW-TEN-TEC "Argosy"
By Richard Davis G3TDL

The view has often been expressed in these and other columns that there is a distinct lack in the new equipment market these days of rigs designed with the CW operator in mind. Usually CW seems to have been included as something of an afterthought, and to obtain a transceiver with anything more than very basic CW facilities from any of the Japanese manufacturers it is usually necessary to buy one of the more 'up market' models, thus paying for features such as RF speech clipping, IF shift, variable selectivity and so on, none of which are of any great use to the amateur who operates exclusively CW. It is a refreshing change, therefore, to come across a rig like the KW Ten-Tec *Argosy*, which appears to have been designed with just such an operator in mind. This is not to say that it will not appeal to the SSB enthusiast who is looking for a cheap rig, but it comes in the form of a basic, no-frills transceiver of good performance with a large number of optional extras, enabling the CW man to improve the rig's CW performance without having to pay for an improved SSB performance as well.

General description

The *Argosy* is a small, lightweight, well constructed, all transistor rig covering all the HF bands with the exception of 1.8, 18 and 24MHz, and produces 50 watts output with a switchable power reduction to 5 watts. In its basic form it provides all the features to get one on the air, and there is an extensive range of additional modules and accessories. These are listed in **Table 1**, and it can be seen that, by suitable selection, the rig can be optimised for SSB or CW as desired. All the additional modules and filters can be fitted by the user and thus the rig can be bought in its basic form and upgraded later; a useful feature for anyone whose bank account is not too healthy.

The general appearance of the Argosy suggests that it has been designed with ease of operation in mind. The front panel is neat and uncluttered with all unnecessary controls eliminated — indeed, the writer was surprised to note the absence of an RF gain control or attenuator, and more will be said about this later. Besides the main tuning and the band selector switch, the front panel controls are the mode selector, (the modes being SSB NORMAL, SSB REVERSE, CW and LOCK, the latter putting the rig into transmit with inserted carrier for ATU adjustment), OFFSET (RIT), AUDIO NOTCH, DRIVE/MIC GAIN, and AF GAIN. In addition, six pushbuttons select forward or reverse power metering, noise blanker, calibrator, crystal filter, audio filter and wide or narrow settings for the latter. With the exception of the SWR meter all the facilities controlled by the pushbuttons are optional extras, although all wiring for them is already fitted which means that, as mentioned earlier, the user can buy any of them at a later date and just plug them in. The front panel layout is completed by a sliderule tuning dial, an illuminated meter which indicates forward or reverse power on

transmit and signal strength on receive, quarter inch jack sockets for microphone and headphones, and an LED labelled ALC which lights whenever the ALC circuit operates. This is used in conjunction with the DRIVE control to set the output level, the control being adjusted so that the LED just lights on speech peaks (or when the key is pressed).

On the rear panel, besides a generous heat sink, are the power connector (a four pole locking type which also carries mains to and from the ON/OFF switch), an SO239 socket for the aerial, and six phono sockets, one for the key, two providing a 12 volt DC power output for operating accessories, and the other three being left unwired for possible future modifications. In addition the rear panel carries a screw terminal for an earth connection, and the HIGH/LOW power switch, which bypasses the PA and connects the driver stage direct to the aerial, thus reducing the power output from 50 watts to 5 watts. The internal loudspeaker is mounted in the base of the rig, presumably with mobile operation in mind. For base station use a fold-away stand (described as a "bail" in the handbook) is fitted at the front of the rig, the effect being to raise the front about two inches above the surface on which it is standing so that the sound can escape. No provision is made for an external speaker, although it would be possible to plug one into the headphone jack.

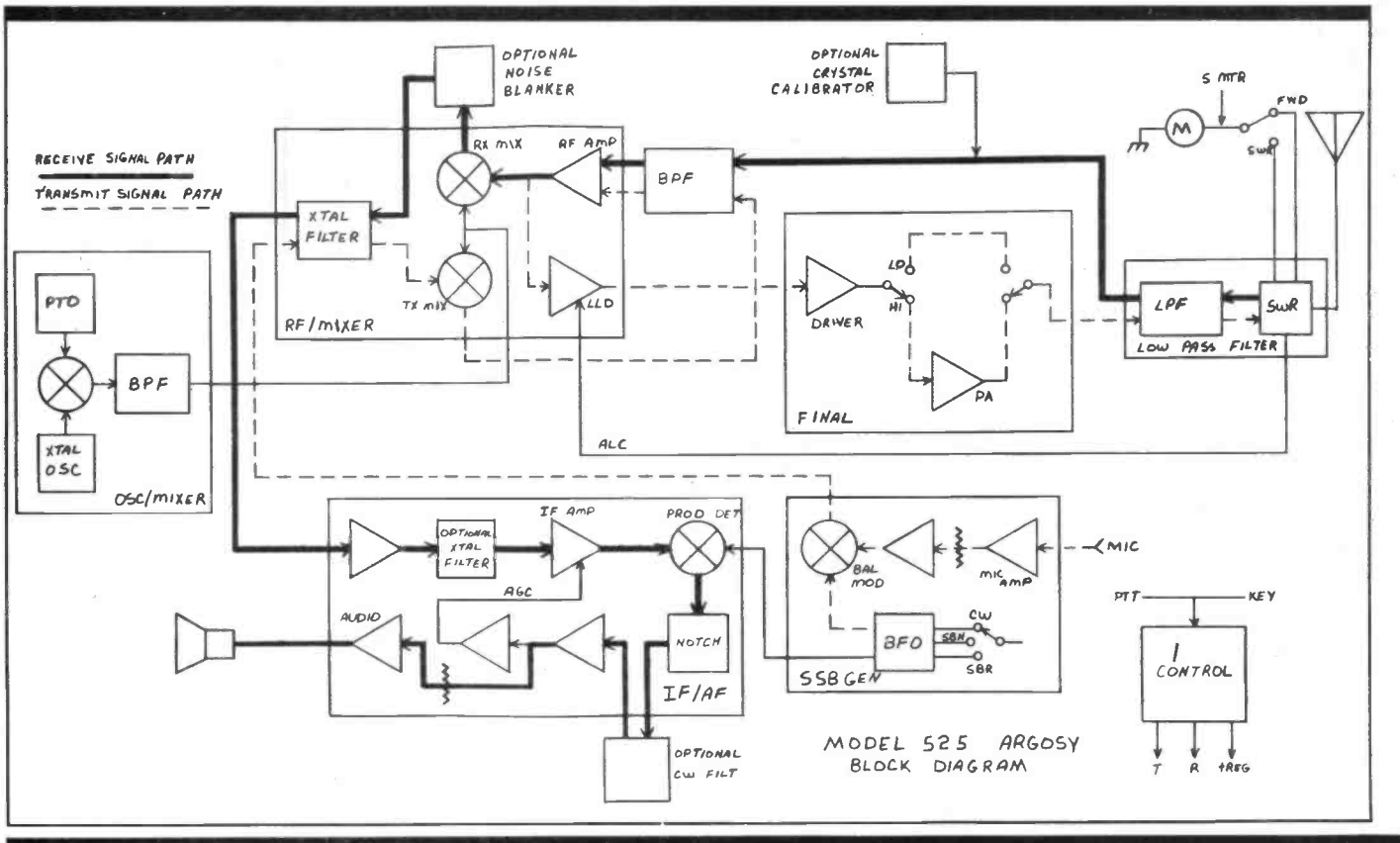
Circuit description

The *Argosy* uses a single conversion system, the IF being 9 MHz; a block diagram is shown in **Fig. 1.** On receive, the signal from the aerial passes through the SWR bridge and then through a switched low pass filter for the selected band. PIN diode switches route it from there to a further filter, this time a bandpass type, again switched to cover the selected band. The signal then passes through a bipolar RF amplifier to a Schottky diode ring mixer, where it is mixed with the local oscillator signal to produce the IF of 9 MHz.

The local oscillator consists of a VFO tuning 5 to 5.5MHz (called the 'PTO' by the manufacturers, due to its permeability tuning). The output of the VFO is combined in a double double balanced mixer with the signal from a crystal oscillator, the crystals being switched to select bands. The output from this mixer is passed through a bandpass filter, which is selected by the bandswitch to cover the required frequency range for the band in use, and then amplified by a two transistor buffer amplifier before being fed to the RF/Mixer board. Here it feeds both the receive mixer described above, and the transmit mixer, which will be mentioned later.

Receive path

Returning to the receive signal path, the IF signal from the receive mixer is amplified by a power transistor buffer before being fed to the optional noise blanker (Model *223*); this unit is replaced by a link when not fitted. From here it returns to the RF/Mixer board and passes through the main crystal filter before being fed to the IF amplifier. The crystal filter fitted as standard is a four pole device, built on to a small plug-in circuit board which mounts on top of the RF/Mixer board. This can be replaced by an optional 8-pole filter (Model *220*), giving better adjacent channel rejection and sideband suppression; this improved filter simply plugs in place of the standard one. From the crystal filter the signal passes to the IF/AF board, where it passes through a single transistor buffer amplifier, and then to a socket which feeds an optional narrow crystal filter. This filter mounts on the IF/AF board and is selected by the XTAL push-button on the front panel of the transceiver.



Model Number	Description
217	500Hz IF crystal filter
218	1.8kHz IF crystal filter
219	250Hz IF crystal filter
220	8 pole SSB filter
223	Noise blanker
224	CW audio filter
226	Calibrator
227	ATU without SWR bridge
228	ATU with SWR bridge
645	Dual paddle keyer
670	Single paddle keyer
700	Hand mocrophone
215	Desk micorphone
214/234	Desk microphone and speech processor
222	Mobile mount
1125	DC circuit breaker
1126	Linear amplifier switching kit

Table 1 Optional modules and accessories

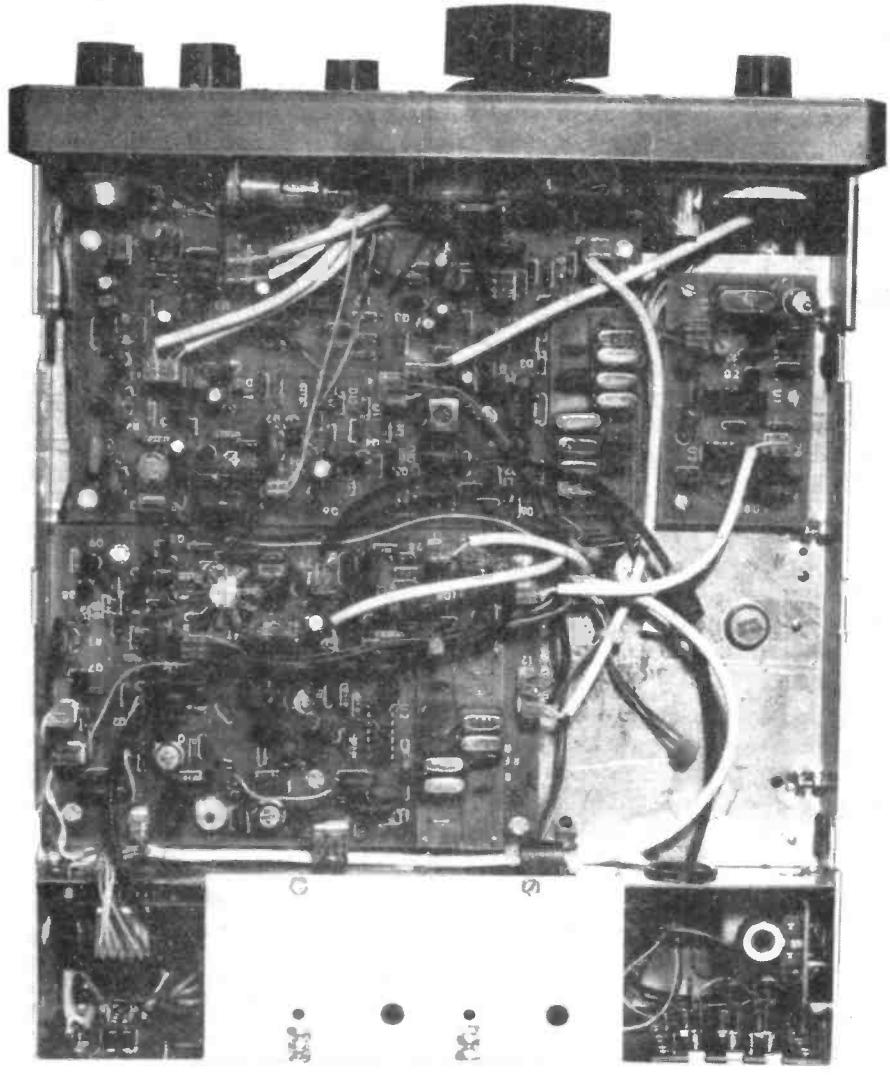
Three types of filter are available, the Model *218*, which is a 1.8kHz filter for SSB reception, and the models *217* and *219* for CW, these being 500Hz and 250Hz wide respectively. The optional filter is followed by the main IF amplifier, an MC1350 IC, which then feeds a dual gate MOSFET product detector. The audio from this is fed via an active notch filter to the optional CW audio filter, model *224*, which is a separate board. This filter narrows the bandwidth to 450Hz or 150Hz, selected by two push buttons on the front panel. If the filter is not fitted, a shorting plug is fitted in its socket, from which the signal passes to the AF output stages. The AGC, which is audio derived, is fed from this point and controls the IF amplifier; no AGC is applied to the RF stage.

*The change from LSB on 3.5, 7 and 10MHz to USB on the remaining bands is achieved by placing the local oscillator on the high side of the signal frequency on the lower bands and on the low side on the higher bands.

Transmit path

The transmit signal is generated at 9MHz by the SSB GEN board. The crystal in the carrier oscillator has different values of load capacitance, switched in by transistor switches, to give the correct carrier frequencies for SSB normal, SSB reversed and CW.* The output of the carrier oscillator is fed to a CA3053 balanced modulator, and also to the receive product detector. The transmit audio signal from the microphone is amplified by a two stage IC amplifier, the mic gain control (labelled DRIVE on the front panel) being placed between the two stages, and is then applied to the balanced modulator. In the CW mode a DC voltage is applied to one port of the balanced modulator, unbalancing it and hence introducing carrier. At the same time a variable voltage from a second gang of the DRIVE control potentiometer is applied to another pin of the balanced modulator IC, varying its gain and hence controlling the amplitude of the CW signal.

The output from the balanced modulator is fed to the RF/Mixer board, where it pases through the main 9MHz crystal filter and is then fed to the transmit mixer, an MC1496 double balanced mixer IC. Here the signal is mixed with the local oscillator signal to produce the output frequency. After passage through a buffer amplifier it is fed to the main bandpass filter, and then to the recceive RF amplifier, which is used as a buffer amplifier on transmit. ALC, derived from the built-in SWR bridge, is applied to this stage. Following the RF amplifier is another stage, also ALC controlled, before the signal is fed to the final amp board. This board houses the driver and PA stages, both operating in class AB1 push-pull. The output of the driver stage is fed away from the board to the high/low power switch and then back to the PA input. This allows the driver to be routed direct to the aerial in the lower power position, bypassing the PA. The PA stage has negative feedback to improve its



linearity, and its output is fed via the high/low power switch to the low pass filter board, where it passes through the low pass filter and the SWR bridge before being fed to the aerial.

Keying for CW is full break-in, the key actually operating on the PTT line. The writer was surprised to hear a relay chattering away whilst operating CW, since the send/receive switching was said to be all solid state. Careful examination of the circuit diagram revealed that a relay was indeed present, presumably to switch an external linear since its contacts are simply wired to one of the spare phono sockets on the rear panel. It is puzzling to find that this facility is not mentioned in the handbook.

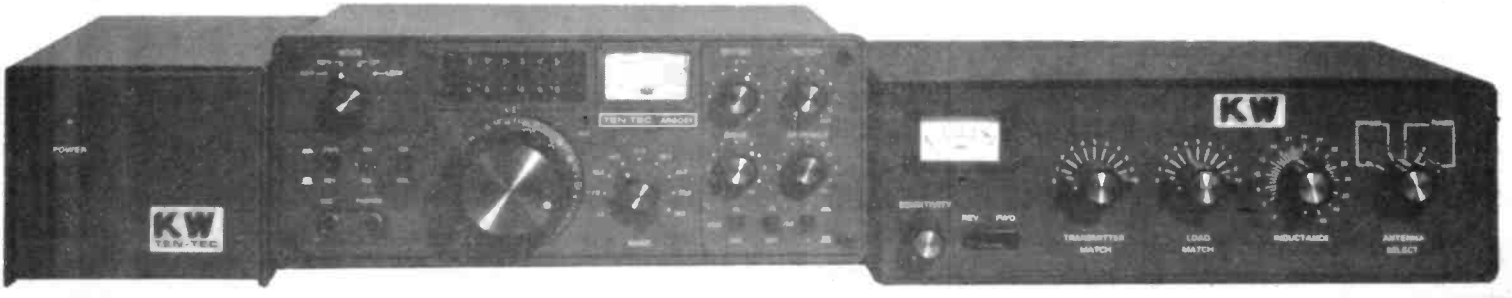
In operation

Once the *Argosy* was safely installed on his workbench, the writer's thoughts turned to the absence of an RF gain control. Surely the lack of any form of gain control on the RF stage (it is not even controlled by the AGC) was asking for cross modulation problems to occur in the mixer; this had to be investigated. The band which probably causes most problems in this respect is 40 metres, which at night is occupied (illegally) by broadcast stations, leaving only a few kHz at the bottom end free for amateur use. It will be obvious that trying to receive weak CW signals within two or three kHz of hundreds of kilowatts of broadcast transmission is a severe test of any receiver. As valve equipment has generally proved to be rather better in this respect than transistor equipment (hence the fitting of RF attenuators to most modern HF rigs) it was decided to compare the receive performance of the writer's trusty old *KW2000A* (which has been modified as described in this magazine's series to improve its overload performance) with that of the *Argosy*. The two rigs were connected to the same aerial via a changeover switch and the *KW2000A* was tuned to various 40m CW signals; the *Argosy* was then set to the same frequency and the aerial switched over so that a comparison could be made. The results of this test were striking, but not in the manner expected! Signals which were only just audible above the background hash on the *KW2000A* suddenly sprang into clarity when received on the *Argosy*, and weak signals heard on the *Argosy* were completely inaudible on the *KW2000A!* On the older rig, the 'clear' spots in the band were filled with a continuous hash running at about S7, whereas with the Ten-Tec they were completely noise free. Once the rig was tuned off a broadcast channel no trace of the signal occupying it remained. It was clear that the reason that no form of gain control had been used on the RF amplifier was that none was necessary! This outstanding cross modulation performance was undoubtedly due to the use of Schottky diode ring mixer, a device which must represent one of the most significant advances in receiver technology of recent years.

As may be gathered, the reviewer's first impressions of the receiver performance were favourable, and these impressions were confirmed by subsequent experience. The stability was good, very little drift occurring even from cold, and none that could be detected after the rig had been switched on for a few minutes. The additional filters worked well and were useful, the 500Hz crystal filter being used for CW operation, with the audio filter providing a further reduction in bandwidth. The narrower position of this filter (150Hz) was very useful, and was capable of providing true 'single-signal' reception even on a crowded band, but the wider 450Hz position provided little, if any, improvement over the performance of the 500Hz cyrstal filter, and in practice was never used by the reviewer. Perhaps it would have been better if the 1.8kHz crystal filter had been fitted, which would then have enables the bandwidth to be reduced progressively from 2.5kHz to 150Hz in four steps. Since the AGC is audio derived, and is taken out of the AF amplifier after the audio filter, there is little to choose between providing extra selectivity at AF or IF, especially in view of the receiver's excellent overload performance.

Tuning dial

The analogue tuning dial proved easy to use and was smooth in its operation. However, its calibration accuracy was not particularly good, the calibration varying not only from band to band but even between different ends of the same band. This is annoying since a little more care in the setting up of the VFO, and the provision of trimmers to adjust the frequency of the HF oscillator crystals, would have corrected this fault without any significant addition to the cost of the rig. It is made the more annoying in that the system provided for calibration adjustment, while simple, is rather fiddly and the necessity of its frequent adjustment proved tiresome in practice. The adjustment is made by moving the calibrated skirt of the tuning knob relative to the knob itself. The skirt is coupled to the slow motion drive by a friction clutch arrangement, one revolution of the skirt covering a frequency range of 100kHz. However, if the skirt is grasped it can be rotated relative to the slow motion drive. It is the grasping of the skirt that is the difficult part of this procedure, since not only is it only about ¼'' wide but it is mounted very close to the panel and partially recessed behind the tuning knob! The reviewer's fingers are not very large but he found some difficulty in this operation, and for anyone with large hands it would be very difficult in-



deed. The calibrator, which is, incidentally, an optional extra, provides signals at 25kHz intervals and is pulsed at a rate of two or three times a second to assist identification.

On SSB, the speech quality provided by the *Argosy* when used with the model *700* hand micropone was generally liked by the stations worked. The model *700* is an electret mic, and is fitted with an internal 9 volt battery, which, the manufacturer's states, should last for about a year in normal operation. It seems strange that the operating voltage was not derived from the *Argosy* itself. However, it is not necessary to use the model *700* with the rig, and any high impedance microphone can be used. In practice, the lack of a speech processor was felt, especially in view of the comparitively low power of the *Argosy*, but again this is available as an optional extra. The notch filter was effective and was useful in eliminating heterodynes. Receive audio quality was good, despite the position of the internal loudspeaker.

Power supply

The *Argosy* requires a supply of 13.8 volts at 9 amps, and a mains power supply, model *225*, is available for base station use. The two are obviously tailored to each other, the connection between them being made via a four way ribbon cable which carries not only the DC supply but also the live side of the mains to and from the ON/OFF switch on the *Argosy*. The circuit is so wired that this switch is in series with the one on the power supply, so that if the PSU switch is left in the ON position the switch on the *Argosy* will turn the PSU on and off. It does not, however, control the DC, so that if the *Argosy* is used with any other power supply its ON/OFF switch will be inoperative. For mobile use the model *1125* circuit breaker is inserted into the DC lead; this unit functions as both ON/OFF switch and overcurrent protection.

There is very little else to say about the power supply arrangements, except that the model *225* became very hot after the rig had been switched on for some hours, when its thermal trip tended to operate on peaks, despite the fact that the transceiver was operating

ARGOSY LAB TEST RESULTS

All tests were carried out using the equipment in the upper sideband mode

RECEIVER SECTION

Receiver sensitivity for a measured receiver SINAD of 12dB. All voltages quoted as PD.

3.5MHz	0.22uV
7MHz	0.22uV
10MHz	0.9uV
14MHz	0.25uV
21MHz	0.25uV
28MHz	0.4uV
29MHz	0.4uV

Test for dynamic range of equipment. The intermodulation performance was measured by connecting two signal generators through a 3dB hybrid combiner. Generator 1 was set to 7.051MHz and generator 2 to 7.101 MHz. The receiver section was tuned to 7.000MHz and the generator levels were increased until an intermod product was observed equivalent to an S4 (1.4uV) received input signal.

The generator output levels required to induce this condition were 4.5mV. This is equivalent to an uncorrected dynamic range of 70dB. The corrected figure, for a 12dB SINAD intermod level and with the hybrid taken into account, would be 77dB.The noise blanker circuitry on the review set did not affect the intermodulation performance.

Susceptibility to internally generated spurious signals.

With a 50ohm load connected to the aerial socket, the receiver was tuned over the entire range. Birdies were noted at the following frequencies:

3.58MHz	below AGC
3.9MHz	below AGC
14.4MHz	below AGC
21MHz	S2
21.3MHz	below AGC
21.49MHz	below AGC
28.9MHz	S4
30MHz	S6

S meter characteristics

Meter	Input level	dB change
S1	0.63uV	0
S3	1.2uV	5.5
S5	2uV	4.5
S7	3.6uV	5
S9	10uV	9
+20dB	90uV	19
+40	2.5mV	29

The review set was loaned by KW Electronics of Dartford , Kent.

TRANSMITTER SECTION

Unfortunately, the testing facility encountered difficulties when it came to the testing of the TX portion of the equipment. The results of the two tone intermod test indicated that there was a linearity fault causing IM products of only 8dB below a single tone.

A real signal at this level of IM product would splatter all over the band causing complaints from other users several 10's of kHz away. As it happened, the received signal reports which we acheived in the practical part of the review drew no criticism whatsoever.

The importers, KW Electronics also tested the review sample for a TX fault and drew a blank. They said it was working fine. As it happens, we've also seen a full test report of the Argosy in the American magazine Ham Radio which showed no design defect. We therefore assume that something went wrong in the our test laboratory.

When we tested the set, the two tone generator level was arrived at by looking at the peak microphone output on a scope (15mV) and using that as the base. In the event, it seemed to have been too high. Excessive test tone level at the mic input seems to be the only thing which can account for the shocking intermod figures which we recorded. Since we think that they are junk, we are not going to print them.

OUR CONCLUSIONS

The Ten-Tec Argosy feels very different to the normal run of amateur radio gear. Perhaps this is because it originates in America rather than the Far East. Having used the review equipment for a day, I'm not sure how much I like the difference but...

Performance appears quite satisfactory although the dynamic range on receive is not outstanding. Against this, G3TDL reckons on the Argosy as being excellent in this area and I would rather trust him than a pair of signal generators.

Given the reasonable £399 price tag, the Argosy appears to be good value for money.

G4JST

into an SWR close to 1:1. However, shorter periods of operation did not produce this effect.

Model *670* keyer

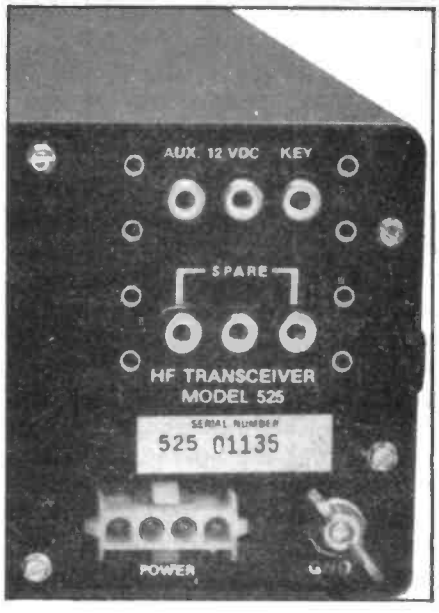
Most types of keyer can be used with the *Argosy*, and the handbook gives guidance as to suitable types. Ten-Tec themselves, of course, produce two suitable keyers, the model *645* dual paddle with dot and dash memories, and the model *670* single paddle which is a basic 'elbug'. Both types are designed to draw their power from the auxiliary sockets on the back of the *Argosy*. The *670* was supplied with the review transceiver, and was used by the reviewer throughout his operational tests. It operates satisfactorily, the only criticism being that the feel of the paddle is rather spongey, resulting in some sending errors since it was not obvious whether the paddle had been pressed over far enough to make contact. The writer's CW speed is not very fast (about 12 wpm) and it was thought that this problem would assume an even greater significance at higher speeds. The *670* is about the same price as other similar units on the market. Side-tone, adjustable both in volume and pitch, is provided by the *Argosy* itself.

Model *228* ATU

Like most transistor transmitters the *Argosy* is broadband tuned, so no PA tuning adjustments appear on the front panel. The PA is designed to work into a 50 ohm load and this means that full output wil not be obtained into any other impedance; in practice it will be necessary to use an ATU with the rig, unless one is able to use a separate dipole for each band. Ten-Tec produce two suitable units, models *227* and *228*, the only difference being that the *228* includes an SWR bridge whereas the *227* does not. The units are well constructed and provide for the matching of a variety of aerials, both balanced and unbalanced. The tuner is in the form of a T-match, all three elements being variable, and is very easy to use, the inductor first being set for minimum reflected power and the match then being trimmed by varying the two capacitors. The matching unit is unbalanced and is obviously designed for coax-to-coax matching, but facilities are provided for the connection of a single wire aerial or a balanced line, the latter being converted to unbalanced by a built-in balun. This feature, however, is one of the two minor shortcomings of the unit, since the balun is unable to cope with lines having a high SWR without becoming lossy, and this sets a limit to the range of impedances which can be matched, particularly at low frequencies. A maximum value of 500 ohms is quoted in the instruction leaflet, and this strikes the writer as being rather low in terms of the impedances likely to be encountered on open wire feeders; however, this limitation does not apply to the unbalanced configuration. A useful feature of the unit is the ability to select any of the three aerials plus a dummy load (not supplied) by the use of a front panel mounted switch. One position bypasses the tuner and routes the transceiver direct to Aerial 1. Connections to these three aerials, the dummy load and the transceiver are all made by S0239 connectors on the back of the ATU. Additional screw terminals are provided for the single wire and balanced feeder for Aerial 3 only. The writer would have liked to see the switch arranged to earth the aerials not in use, but this is a minor point. The only other minor criticism is that the SWR bridge is rather insensitive; it was necessary to be radiating about 5 watts to obtain a full scale power reading, whereas the author likes to tune up at milliwatt levels.

Handbook

The *Argosy* handbook is very good; whilst not as 'glossy' as those for some Japanese rigs it is well written (with no Japanese English) and comprehensive, including circuit diagrams, very good layout photographs, complete parts lists, voltage measurements and circuit descriptions of all modules. There is also a two page essay on the virtues and vices of solid state power amplifiers! The quality of the handbook combined with the simplicity of design of the *Argosy* (due to the absence of synthesisers, microprocessors and digital displays), and the neat, uncluttered construction of the transceiver means that the rig should be quite easy to service, a point to be borne in mind in these days when most rigs are so complex that they need to be returned to the manufacturer in the event of a breakdown.



Rear connections, except aerial socket at other side

Conclusions

To summarise, the *Argosy* performs well and is easy to operate. The receiver performance is particularly impressive. As a general purpose rig it does not represent better or worse value for money than its Japanese competitors, although the ability to buy the basic rig and to add extra facilities at a later date is useful, particularly for someone starting in amateur radio for the first time. One point where the *Argosy* does score over its competitors is as a CW rig, as it is possible to customise it for a top flight CW performance at a much lower price than other rigs, since one does not have to pay for improved SSB performance at the same time. A further, though hidden, cost saving feature is the ease of maintenance, since it is unlikely that a competent amateur would ever need to return it to the manufacturers for repair. This saving is further helped by the simplicity of design which will, of course, increase reliability; and by the very conservative rating of the PA, which can operate into a considerable mismatch without damage. All in all, the writer has thoroughly enjoyed reviewing the *Argosy*; it was a great wrench to have to give it back. ●