

CQ REVIEWS:

The Kenwood TS-440S Transceiver – Part I

BY JOHN J. SCHULTZ*, W4FA/SV0DX

This month W4FA presents the first part of his review of the Kenwood TS-440s HF transceiver. Part I focuses on the technical specifications of this moderately priced rig.

Every now and then I have to sit back in awe to consider the tremendous development of HF transceivers over the past decade. That reflective mood certainly set in when I initially studied the Kenwood TS-440 S.

The front panel of the unit measures only about 10½ by 4 inches, and, yet, it is a full fledged 100-watt-output class transceiver with all band coverage, dual VFO's, 100 memory channels, general coverage receive, etc. There is even space in the unit for an optional automatic antenna tuner! I thought some of the advanced (and extremely expensive) military HF transceivers that I've seen over the years had sophisticated features that amateur radio would never see, but that is no longer the case.

General

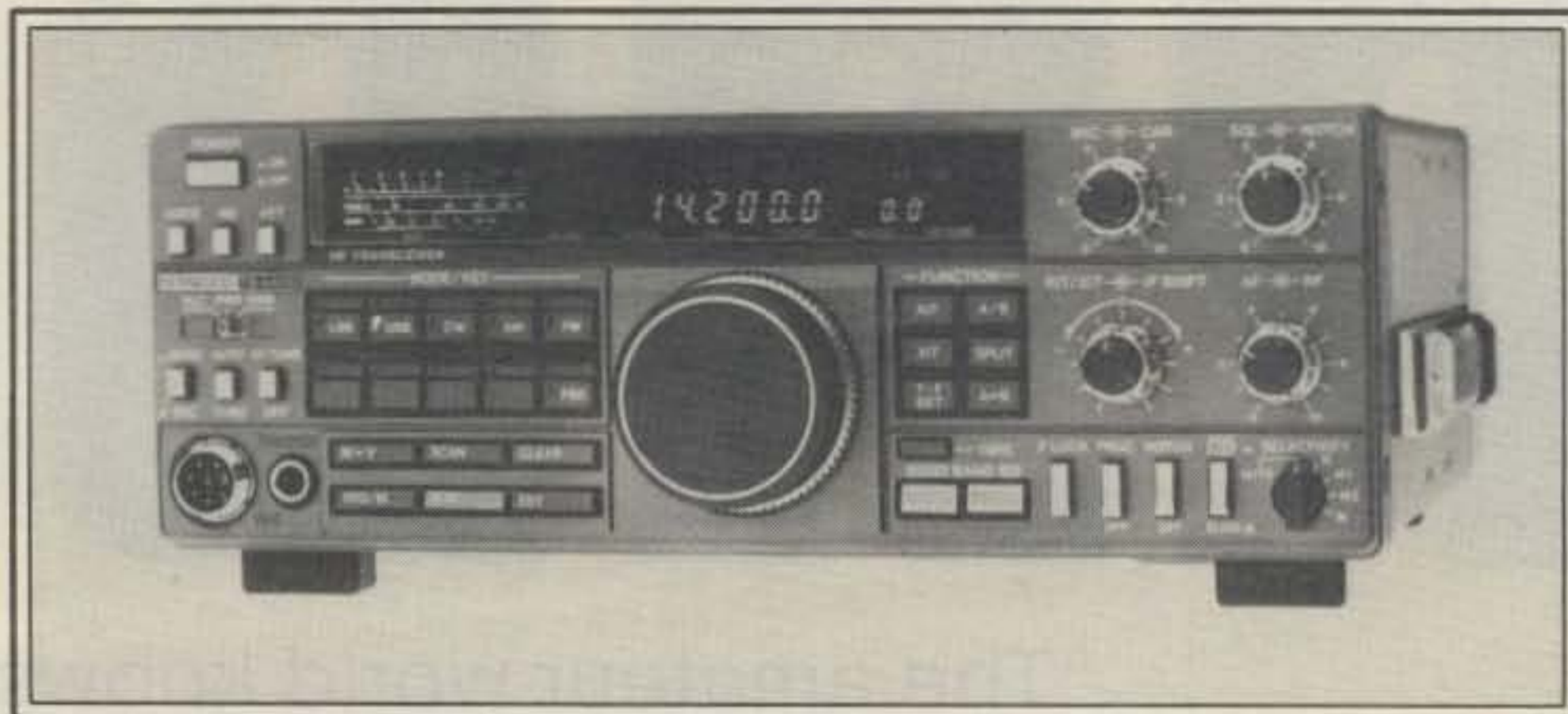
Table 1 presents the technical specifications for the TS-440 in rather exhaustive detail. I realize that some readers tend to regard specification presentations as superfluous. But for those of us who are more interested in the technical side of things, they do make interesting reading. Also, it's the type of presentation most manufacturers do not include in their advertisements for reasons ranging from space availability to the lack of its attention capturing potential.

I would say that the TS-440S presents itself as a compact, light-weight transceiver with technical specifications in some areas just a shade below what one would expect in a twice-as-expensive top-of-the-line transceiver.

Circuitry

Fig. 1 shows a block diagram for the

*c/o CQ magazine



The TS-440S is a sharp-looking transceiver in a very small package.

TS-440S. Although it is a sophisticated and complex transceiver as far as its circuitry is concerned, it isn't too difficult to get at least a basic idea of what happens inside of it. In the receive mode (note the antenna switch position in the upper left corner of fig. 1) the incoming signal is routed through a switchable attenuator and low-pass filter to any one of ten diodes switched high-pass filters. Then it goes to the first RX mixer (not to a preamplifier) and is translated to the first IF frequency of 45.05 Mhz. Only then does the signal encounter an amplifier stage, Q5.

The signal is then further translated in the second RX mixer to the second IF of 8.83 MHz and filtered. A third RX mixer translates the signal to the final IF of 455 kHz, where it is again filtered. Depending upon whether the AM, SSB/CW or FM mode of reception has been chosen, the 455-kHz signal is further amplified and routed to various detectors. The output of each detector passes through a variable AF type notch filter, and the squelch circuitry is active in all modes. Also, in all modes, some elaborate AGC loops are active going back to the various IF amplifiers.

One thing to note is that the only point at which optional filters can be installed is in the 8.83 MHz IF chain. A 2.2-kHz SSB/CW filter is standard, and, as an option, one can add either a 1.8- (narrow) or

2.4- (wide) kHz SSB filter and either a 270- (narrow) or 500- (wide) Hz CW filter. That is, one can add one optional SSB filter and/or one optional CW filter.

On the transmit side, things start out in the lower right hand corner of fig. 1 with the microphone input signal. The signal is routed through an AF type compressor circuit and then to a balanced mixer (IC5) operating at the 455-kHz IF. By looping the DSB signal back to the 455-kHz receive chain filters, the TS-440 forms A SSB signal.

Following the signal through the first, second and third TX mixers, we note that the signal is translated to the output frequency and brought up to the 100-watt output level in the Final Unit. The signal from there is routed through any one of six relay-switched low-pass filters before going to the optional antenna tuner unit.

The other major circuits in the TS-440S are concerned with frequency generation, displays, timing for RX/TX switching and, of course, the all-important microprocessor based control unit. There are two points that might be of interest in all that complex circuitry. All functions are referenced back to a single 36-MHz master crystal oscillator. Second, there is a back-up battery for the microprocessor so it retains memory. The battery is a lithium type which Kenwood says should last five years. Kenwood recommends that

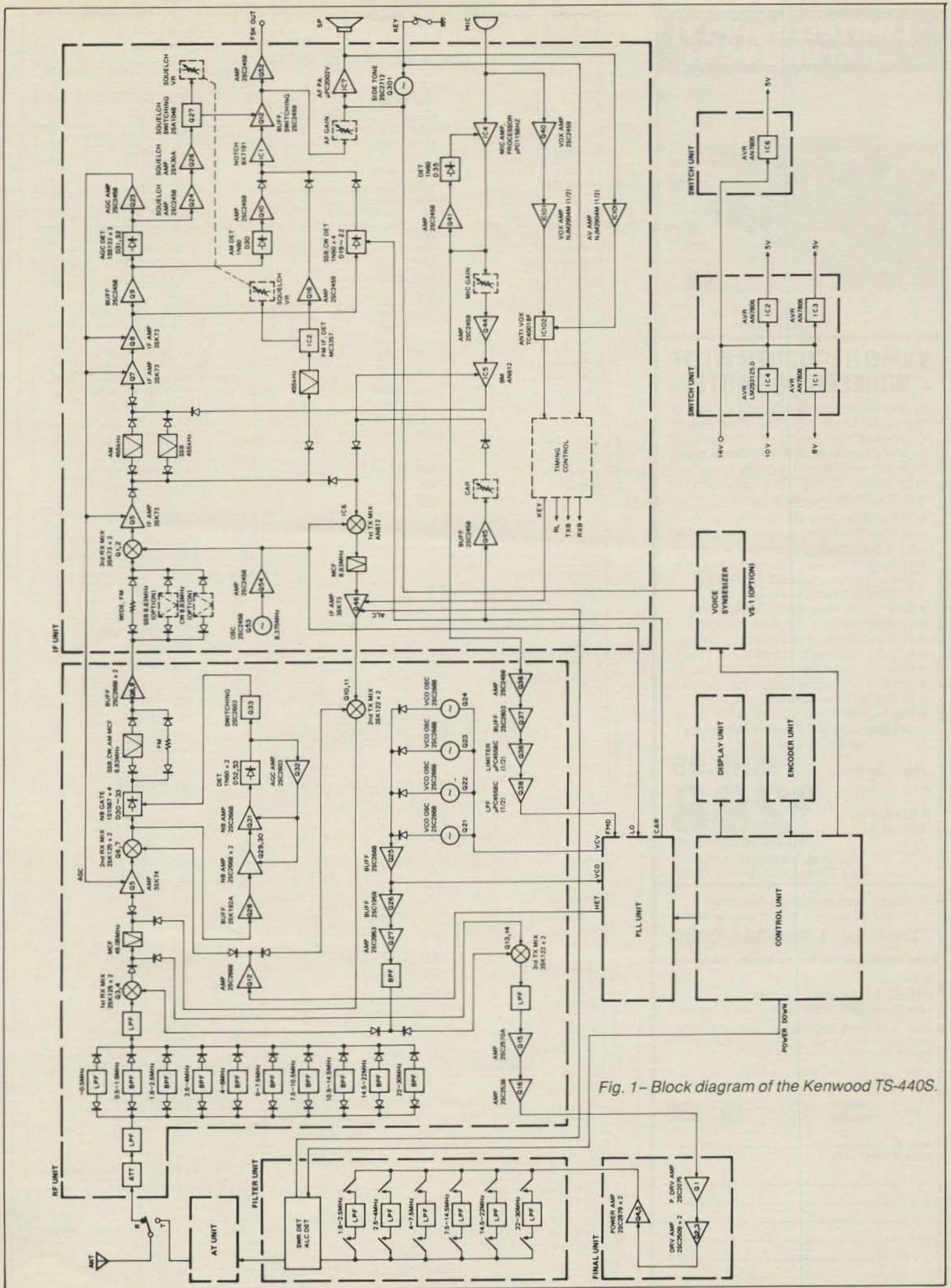


Fig. 1-Block diagram of the Kenwood TS-440S.

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Specifications		Model	TS-440S		
General	Mode		LSB (A3J), USB (A3J), CW (A1), AM (A3), FM (F3), FSK (F1)		
	Antenna impedance	With AT unit	20 to 150 ohms (Transmit only)		
		Without AT unit	50 ohms		
	Power requirement		12 to 16 VDC (13.8 VDC reference)		
	Grounding		Negative		
	Current drain	Receive mode with no input signal		1.9 A	
		Transmit mode		20 A	
	Operating temperature		-10 to +50°C (+14 to +122°F)		
	Dimensions () includes projection.	Wide		270 (279) mm	
		High		96 (108) mm	
	Deep		313 (335) mm		
Weight	With AT unit		7.3 kg (16.1 lbs)		
	Without AT unit		6.3 kg (13.9 lbs)		
Transmitter	Frequency range	160 m band	1.8 to 2.0 MHz		
		80 m band	3.5 to 4.0 MHz		
		40 m band	7.0 to 7.3 MHz		
		30 m band	10.1 to 10.15 MHz		
		20 m band	14.0 to 14.35 MHz		
		17 m band	18.068 to 18.168 MHz		
		15 m band	21.0 to 21.45 MHz		
	12 m band	24.89 to 24.99 MHz			
	10 m band	28.0 to 29.7 MHz			
	Input power	LSB, USB, CW, FM, FSK		200 W PEP	
AM			110 W PEP		
Modulation	LSB, USB		Balanced modulation		
	FM		Reactance modulation		
	AM		Low level modulation		
Spurious radiation (CW)			Less than -40 dB		
Carrier suppression			More than 40 dB (with 1.5 kHz reference)		
Unwanted sideband suppression			More than 50 dB (with 1.5 kHz reference)		
Third order distortion			More than 26 dB below one of two tones		
Maximum frequency deviation (FM)			±5 kHz		
Frequency response (-6 dB)			400 to 2600 Hz		
Microphone impedance			500 ohms to 50 kΩ		
Receiver	Circuitry		Triple conversion superheterodyne		
	Frequency range		100 kHz to 30 MHz		
	Intermediate frequency		1st: 45.05 MHz, 2nd: 8.83 MHz, 3rd: 455 kHz		
	Sensitivity	LSB, USB, CW, FSK (at 10 dB S/N)	100 to 150 kHz	Less than 2.5 μV	
			150 to 500 kHz	Less than 1 μV	
			500 kHz to 1.6 MHz	Less than 4 μV	
			1.6 to 30 MHz	Less than 0.25 μV	
			AM (at 10 dB S/N)	100 to 150 kHz	Less than 25 μV
				150 to 500 kHz	Less than 13 μV
		500 kHz to 1.6 MHz		Less than 40 μV	
1.6 to 30 MHz		Less than 2.5 μV			
FM (at 12 dB SINAD)		1.6 to 30 MHz		Less than 0.7 μV	
Selectivity		LSB, USB, CW, FSK	-6 dB	2.2 kHz	
			-60 dB	4.4 kHz	
	AM	-6 dB	6 kHz		
		-50 dB	18 kHz		
FM	-6 dB	12 kHz			
	-50 dB	25 kHz			
Image ratio	100 kHz to 1.6 MHz		More than 50 dB		
	1.6 to 30 MHz		More than 70 dB		
IF rejection	100 kHz to 1.6 MHz		More than 50 dB		
	1.6 to 30 MHz		More than 70 dB		
IF SHIFT variable range			More than ±0.9 kHz		
RIT/XIT variable range			More than ±1 kHz		
NOTCH filter attenuation			More than 20 dB (at 1.5 kHz)		
Squelch sensitivity	LSB, USB, CW, AM, FSK	100 to 150 kHz	Less than 20 μV		
		150 to 500 kHz	Less than 10 μV		
		500 kHz to 1.6 MHz	Less than 20 μV		
		1.6 to 30 MHz	Less than 2 μV		
	FM	1.6 to 30 MHz	Less than 0.32 μV		
Output			1.5 W across 8 ohms load (10% distortion)		
Output load impedance			4 to 16 ohms (both ext. speaker and phones)		
Frequency control	Frequency accuracy (at RIT/XIT off)		Less than ±1 × 10 ⁻⁵		
	Frequency stability (at RIT/XIT off)		Less than ±1 × 10 ⁻⁵ (-10 to +50°C)		

Table I- Kenwood TS-440S specifications.

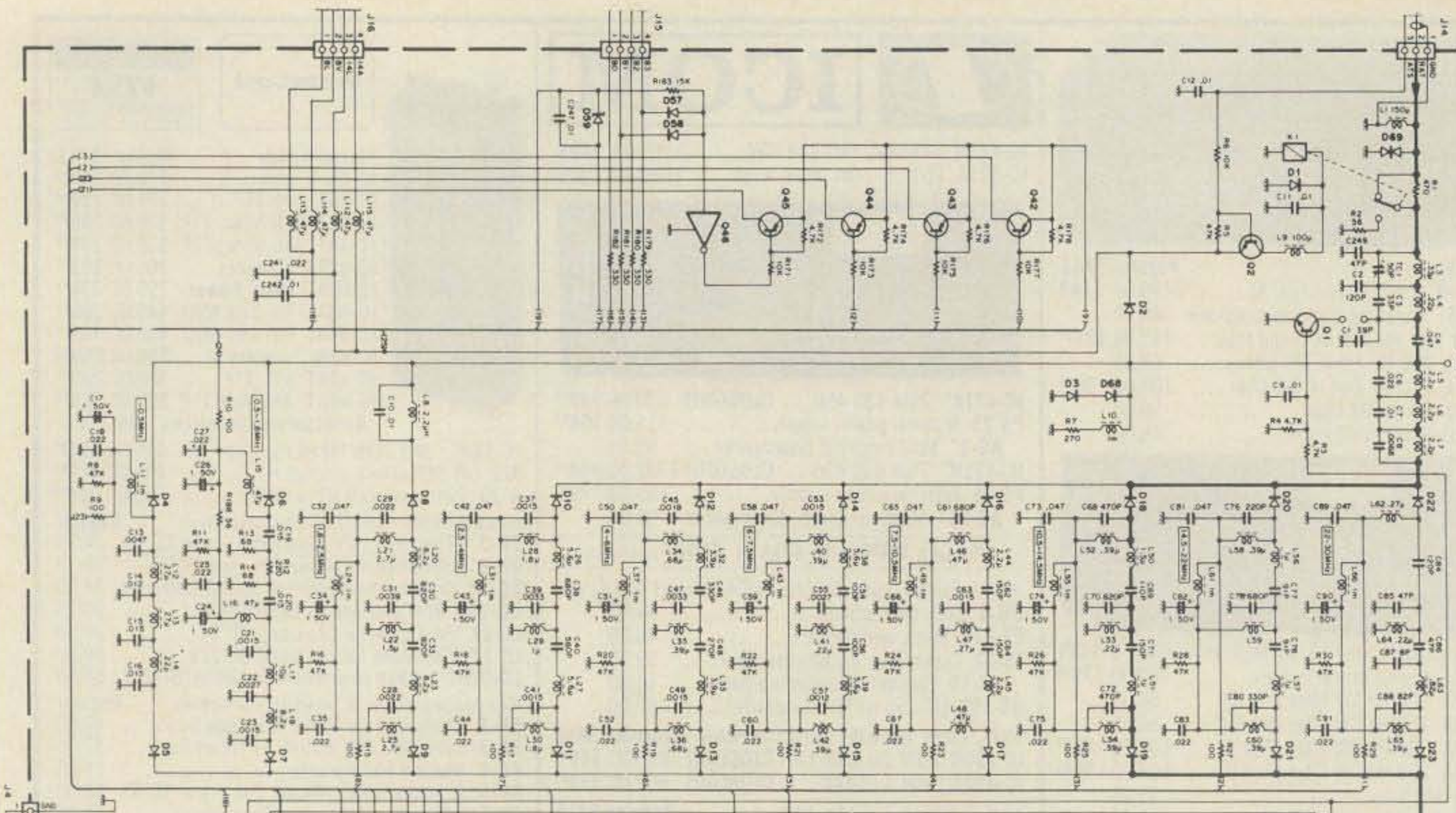


Fig. 2—Part of the "front end" of the TS-440S. Antenna input is at J14 (upper left). Note the extensive use of input filtering, the use of balanced mixers and the lack of an RF amplifier stage.

they or a dealer replace the battery. Once it is replaced, however, reset of the microprocessor is extremely simple using only front panel switches. One then only has to enter whatever frequencies into memory again one wants to store.

A Few Circuits of Interest

Fig. 2 shows part of the RF Unit block and the "front-end" of the TS-440S. It's quite an interesting "front-end" with extensive fixed low-pass filtering, switchable high-pass filters and the use of double-balanced mixers. Follow the heavy line signal input starting at J14. Fig. 3 shows the Final Unit or RF power amplifier.

Fig. 4 shows the optional antenna tuner unit. Again, this is a new design as compared to the automatic tuner in the TS-940S (probably made necessary by space restraints in the TS-440S). The circuitry is still that of a "T" network tuner, although the actual tuner RF components (lower left) are almost lost in the detail of the control circuitry. M1 and M2 (upper right) actually turn VC1 and VC2.

A Look Inside

The photographs give an interior glimpse of the transceiver. If I was awed looking at the exterior of the unit, I was doubly impressed when looking inside it. It's a small gem of fine construction. There is plenty of shielding, and the basic frame looks like it can take the rugged type of usage associated with mobile op-

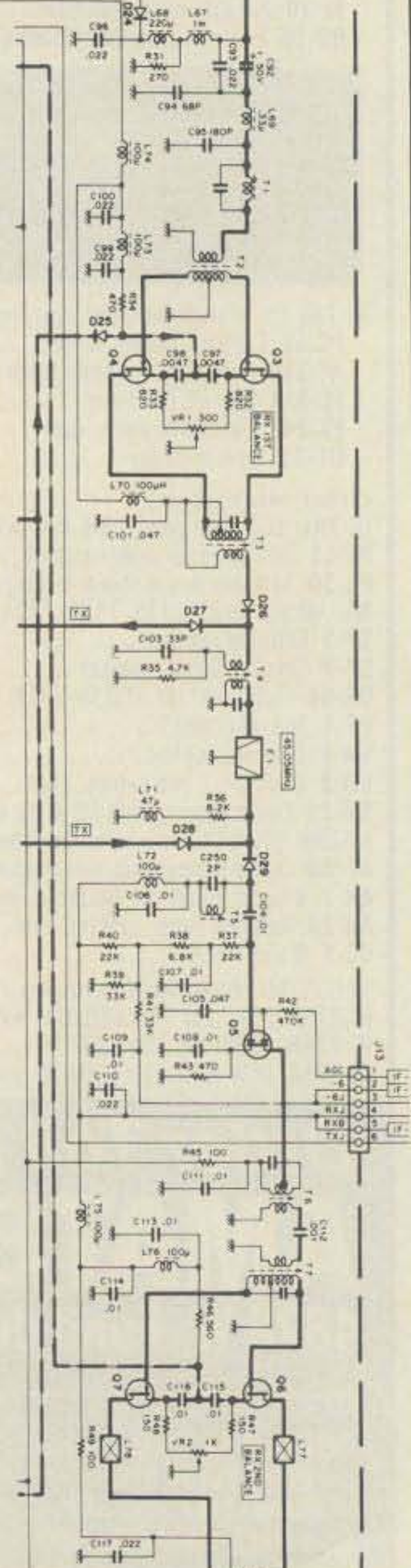
eration. Plenty of connectors are used throughout. There shouldn't be any problem in getting at any PC board, although it's hardly a playground for inexperienced technicians.

The size of the heatsink is impressive. Also, the location of the internal fan is unique in that it is located fairly well inside the transceiver. Externally, the finish is excellent. All of the various knobs and switches are well proportioned. The VOX controls are screwdriver adjustable and located on the rear panel. Only one switch is located on the top cover area, and it controls the selection for VOX on/off in the phone modes and the selection for semi- or full break-in in the CW mode.

Measurements

The TS-440S is conservatively specified. The power output, using a PS-50 power supply, was *at least* 100 watts on all bands. Using the PS-50 supply the transceiver was tested key-down for over an hour without any decrease in power output! The power output can be varied continuously by a "carrier control" on all modes except SSB.

The latter may present a small problem when using a linear amplifier which does not have an ALC feedback connection to the TS-440S. It's true that one can reduce the microphone gain on the TS-440S to reduce the PEP output drive to a linear, but then one also loses the compression



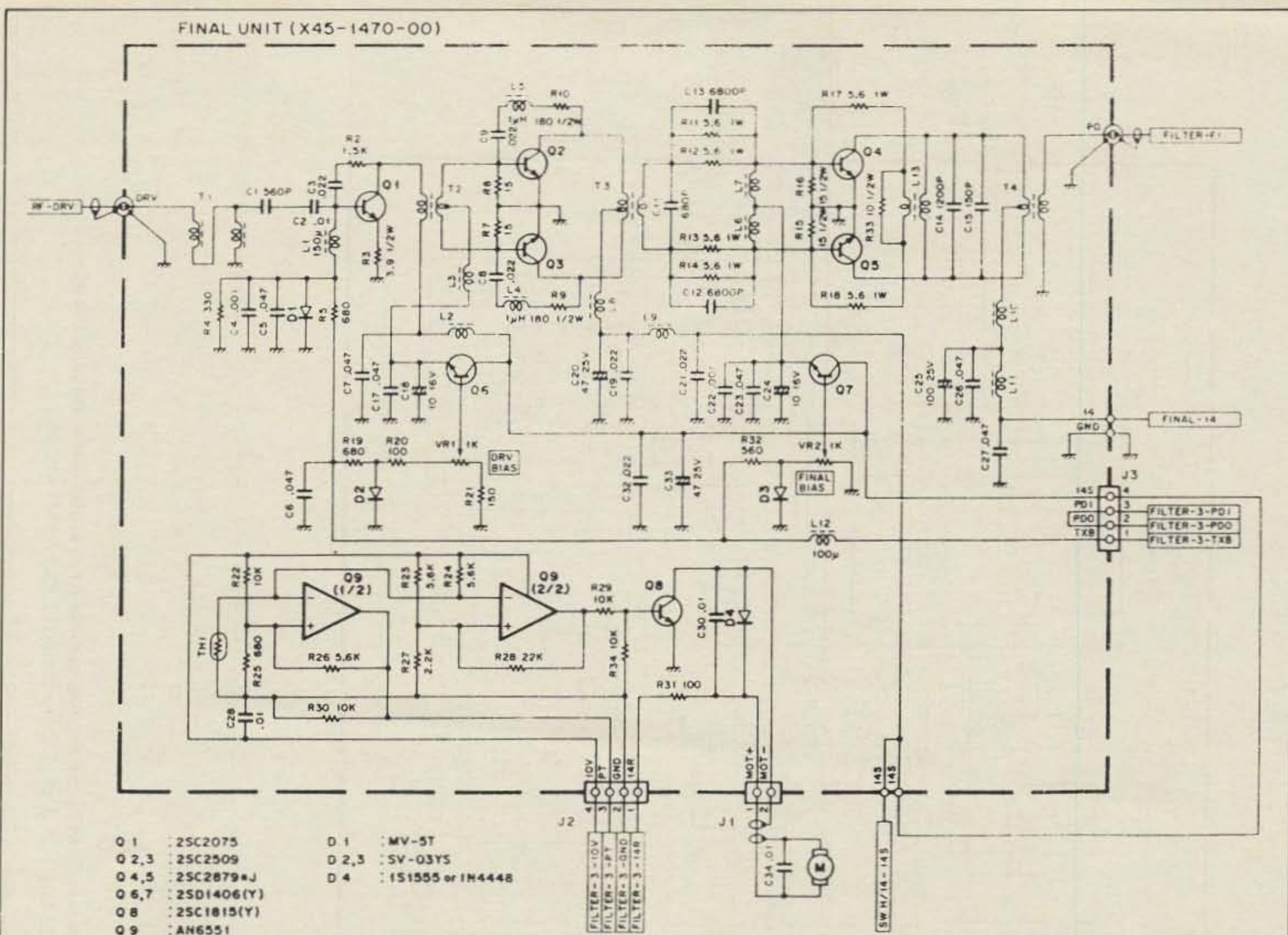


Fig. 3- TS-440S final amplifier stage. The fan is thermally controlled by the heat sink temperature. Various external circuits provide protection for the final amplifier in case of high SWR.

effect of the ALC loop within the transceiver. Third order IMD products were about -30 dB which is a bit better than specified and perfectly acceptable.

The AT-440 automatic antenna tuner was tested with simulated resistive loads representing SWR's of up to 1:4 and it performed perfectly on all bands (80-10 meters). Tune-up time was rarely more than 10 seconds. Although the TS-440S covers 160 meters, the AT-440S only extends down to 80 meters. An external tuner may be needed on 160 meters. On the other hand, if the TS-440S is modified for HF MARS coverage, the AT-440 operates anywhere in the 3.5-29.9 MHz range. Harmonic and spurious outputs were at least -50 to -70 dB down referenced to full carrier output level.

The TS-440S provides exceptional "receive" performance. It has a clean, quiet background noise aspect to it. This direct mixing system does produce results. Minimum discernable sensitivity was a hair over 0.03 uV (-137 dBm), and that combined with a blocking sensitivity of -33 dBm made the blocking dynamic range come out to -104 dBm (500 Hz bandwidth,

QSLs BY

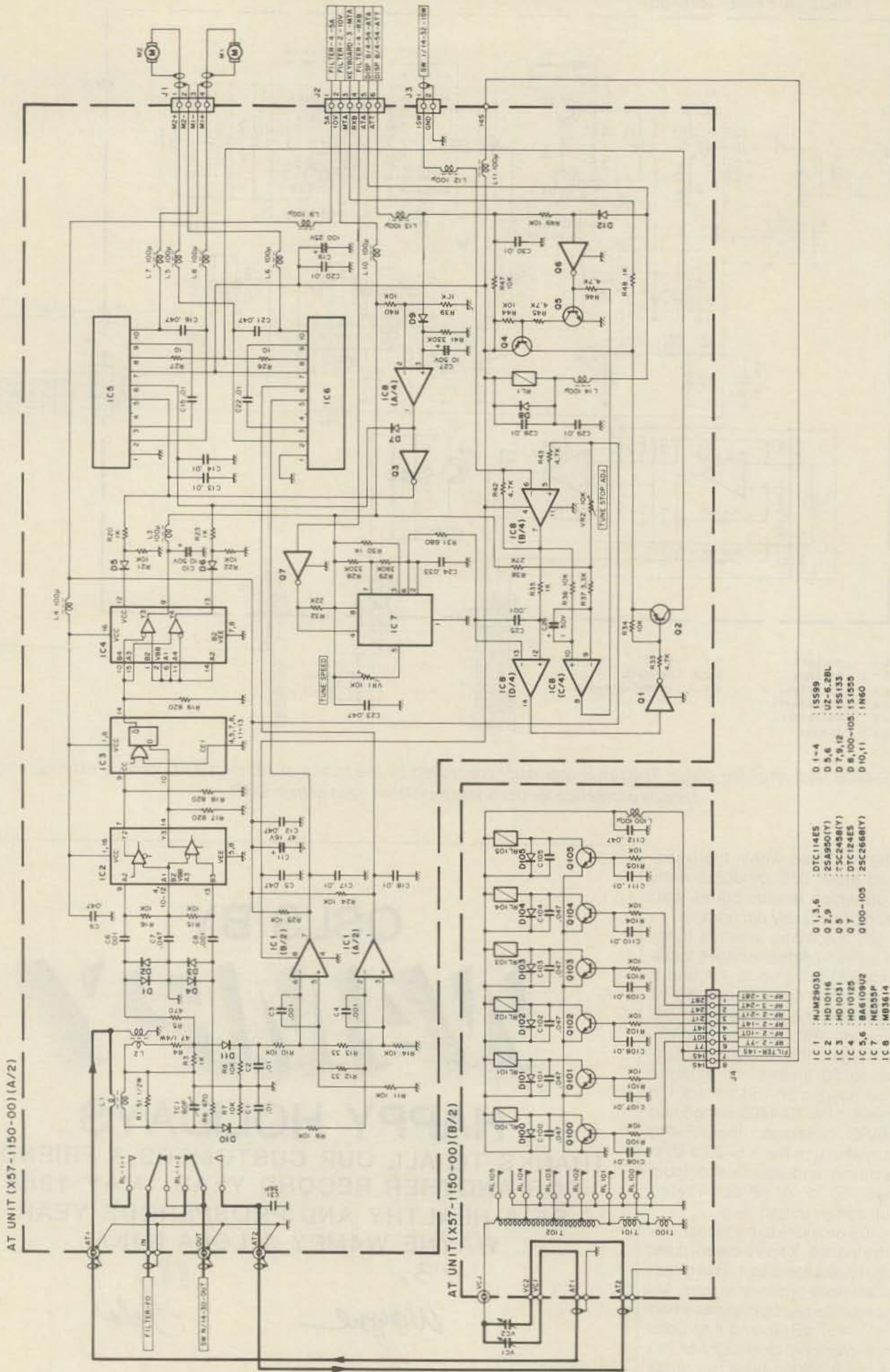
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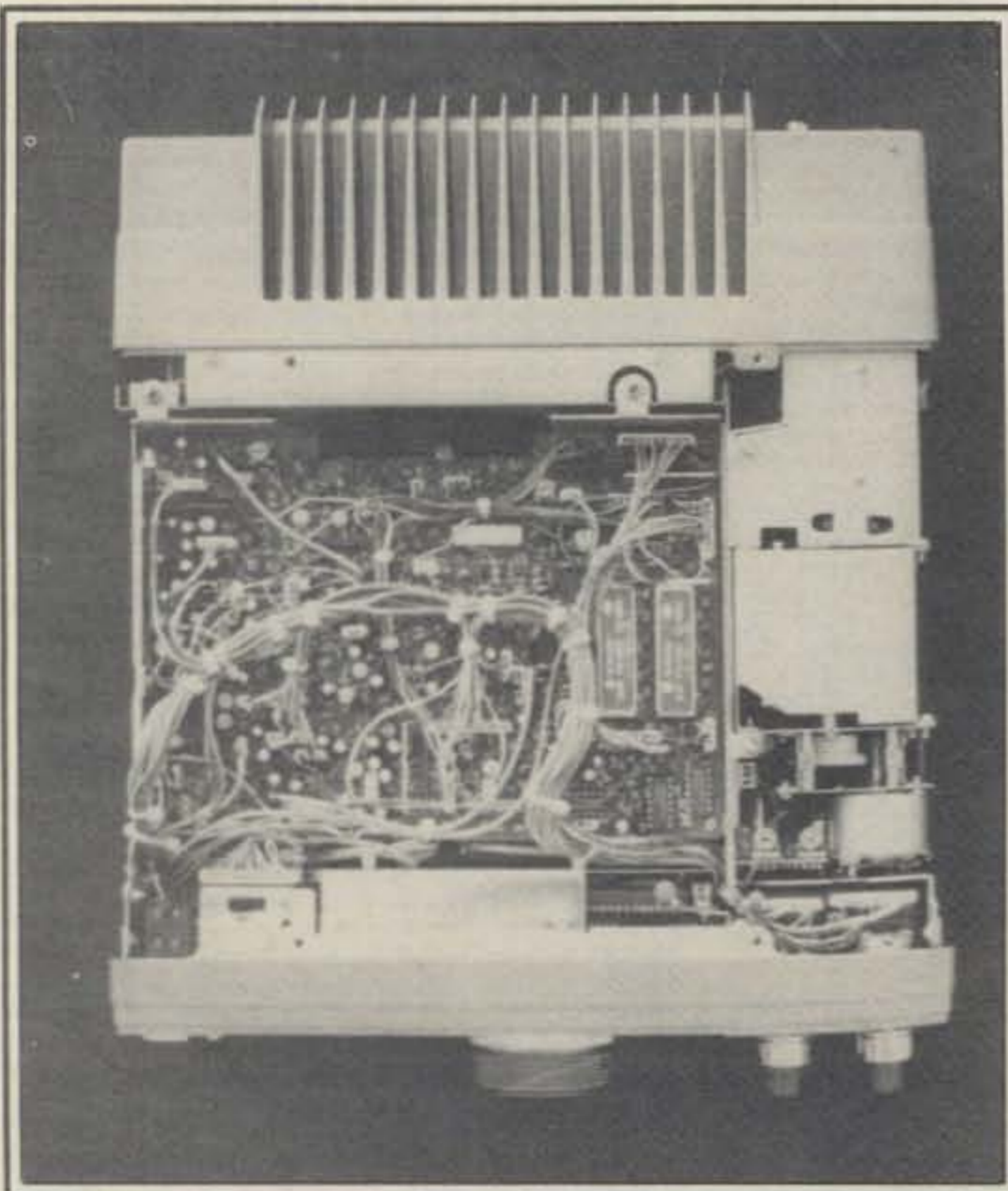
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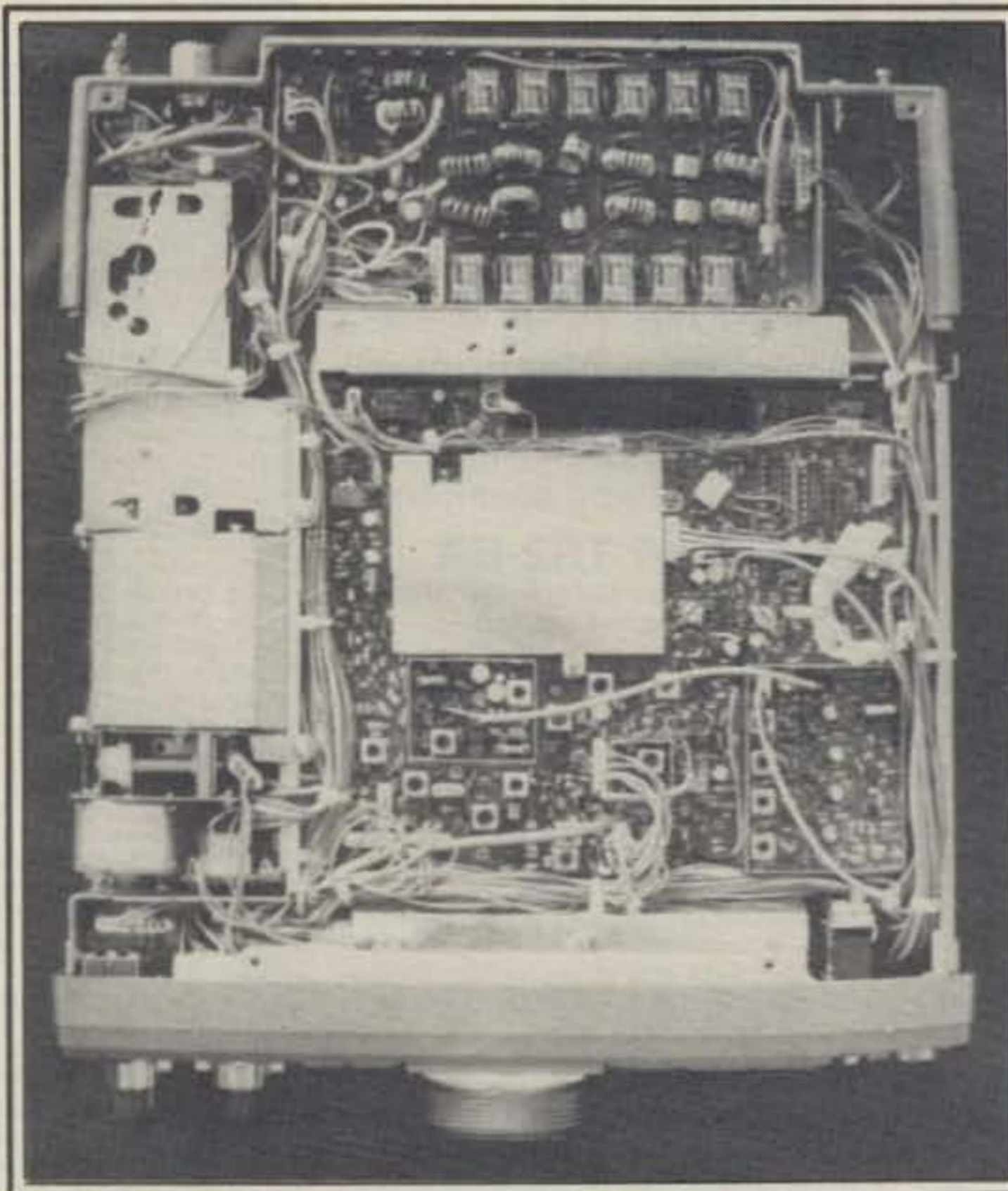


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|---------|------------|-----------|--------------|--------------|------------|
| IC 1 | : NJM2903D | Q 1, 3, 6 | : DTC114E5 | D 1-4 | : 1S599 |
| IC 2 | : HD10116 | Q 2, 9 | : 2SA950(Y) | D 5, 6 | : UZ-6.2BL |
| IC 3 | : HD10131 | Q 5 | : 2SC2458(Y) | D 7, 9, 12 | : 1S5133 |
| IC 4 | : HD10125 | Q 7 | : DTC124E5 | D 8, 100-105 | : 1S1555 |
| IC 5, 6 | : BA6109U2 | Q 100-105 | : 2SC2668(Y) | D 10, 11 | : 1N60 |
| IC 7 | : NE555P | | | | |
| IC 8 | : MB3614 | | | | |

Fig. 4—Optional antenna tuner diagram. This unit fits inside the TS-440S. SWR sensing circuitry is at the upper left, and the actual RF components are at the lower left. Capacitors VC1 and VC2 are turned by motors M1 and M2.



Looking inside the top of the transceiver one can see two optional filters installed on the right side of the large PC board. One motor for the very compact automatic antenna tuner is in the lower right. The main cooling fan is located inside just before the power amplifier compartment and the massive heat sink.



Looking at the bottom inside of the TS-440S one can see another motor (lower left) for the antenna tuner and most of the tuner's housing. Another large PC board in the middle contains various RF, AF, and frequency generation functions. The relays and coils in the upper portion of the photograph are associated with the low-pass filtering assembly following the power amplifier. The construction is first-rate in every sense.

20 kHz signal spacing on 20 meters).

The third order intercept point is an excellent +14 - 15 dB. Not all of the sensitivity/frequency range specifications were checked but spot checks indicate that most are as claimed. Tuning rate is 10 kHz per revolution in the SSB, CW and FSK modes and increases to 50 kHz/revolution in the AM and FM modes. Frequency readout is to 100 Hz, but a simple

internal modification (cutting a wire) will extend the readout another digit to 10 Hz. The RIT and XIT offsets, when used, are displayed separately.

Filter specifications measured as claimed. Table I lists the specifications for the standard filters, while Table II lists the specifications for the available optional filters. A final pleasant surprise, when I had the TS-440S on a test bench,

was to discover that the "S" meter provides realistic readings! S9 is just a shade under 50 uV and S1 represents 0.6 uV (measurements on 20 meters).

Next month W4FA finishes his review of the TS-440S with his impressions of how well it measures up to its promises. He also looks at the matching PS-50 heavy duty power supply.

CQ

■ YK-88C CW FILTER

Center frequency	: 8,830.7 kHz
Passband width	: 500 Hz (-6 dB)
Attenuation bandwidth	: 1.5 kHz (-60 dB)
Guaranteed attenuation	: More than 80 dB

■ YK-88CN CW NARROW FILTER

Center frequency	: 8,830.7 kHz
Passband width	: 270 Hz (-6 dB)
Attenuation bandwidth	: 1.1 kHz (-60 dB)
Guaranteed attenuation	: More than 80 dB

■ YK-88SN SSB NARROW FILTER

Center frequency	: 8,830.0 kHz
Passband width	: 1.8 kHz (-6 dB)
Attenuation bandwidth	: 3.3 kHz (-60 dB)
Guaranteed attenuation	: More than 80 dB

■ YK-88S SSB FILTER

Center frequency	: 8,830.0 kHz
Passband width	: 2.4 kHz (-6 dB)
Attenuation bandwidth	: 4.2 kHz (-60 dB)
Guaranteed attenuation	: More than 80 dB

Table II- Specifications for the optional filters.

CQ REVIEWS:

The Kenwood TS-440S Transceiver Part II

BY JOHN J. SCHULTZ*, W4FA/SV0DX

Last month W4FA looked at the technical side of the Kenwood TS-440S. This time he takes you through the performance and operation of the unit in the shack.

—K2EEK

Setting the TS-440S into operation for a basic mode like SSB or CW is simplicity itself. Plug in the supplied microphone (or CW key) along with ground, power supply, and antenna connections, and you can start enjoying the rig. For AFSK, you have to make the suitable FSK in/out connections. With a linear amplifier, you have to make the usual interconnections, paying particular attention to an ALC feedback connection, as previously mentioned. Computer interface will be mentioned later.

Fig. 5 shows the front panel of the TS-440S. As with many of the advanced transceivers available these days, I sug-

gest that you just appreciate the basic operating functions available first. Then slowly advance to the point where you can take advantage of all the features contained in a transceiver.

In the case of the TS-440S the basic controls are all intuitively obvious— analog controls for AF/RF gain, microphone, and carrier level, and switches for mode selection, meter functions, selectivity, band up/down, etc.

The only "basic" control that might deserve a bit of mention is the selectivity switch. In the "AUTO" position, it means that the transceiver uses the internal IF filter suitable for the mode selected. In other switch positions, it means that you select which IF filter should be used. Table III summarizes the possibilities.

If the optional antenna tuner is installed, the "AUTO/THRU" switch is set at "THRU." When tune-up is desired, the "AT/TUNE-OFF" switch is set to "TUNE." The "ATTUNE" LED below the digital display will light and then extinguish when tuning is complete. The "AT/TUNE-OFF" switch is then returned to its "OFF" posi-

tion. No further action is necessary before transmitting, and the mode and send/receive switches need not be touched regardless of the mode in use. The meter switch may be placed in the "SWR" position to verify that the automatic tuner has done its job, but this is not necessary. Normally, the meter switch would be left in its "ALC" or "PWR" position. In the latter it functions as a peak reading output power indicator.

Progressing a simple step beyond the very basic controls, there are the obvious controls and switches for RIT/XIT, squelch, notch on/off, notch tuning, IF shift tuning, AGC fast/slow, "F.LOCK" (tuning knob inactive), noise blanker on/off, attenuator on/off, and manual send/receive.

The band up/down switches select through the various amateur bands, unless the "1 MHz" switch is depressed, in which case the up/down switches move the frequency band in 1 MHz steps from the last selected amateur band frequency.

The six switches under the "FUNCTION" heading mainly involve the built-in dual VFOs. VFO A and B can be independ-

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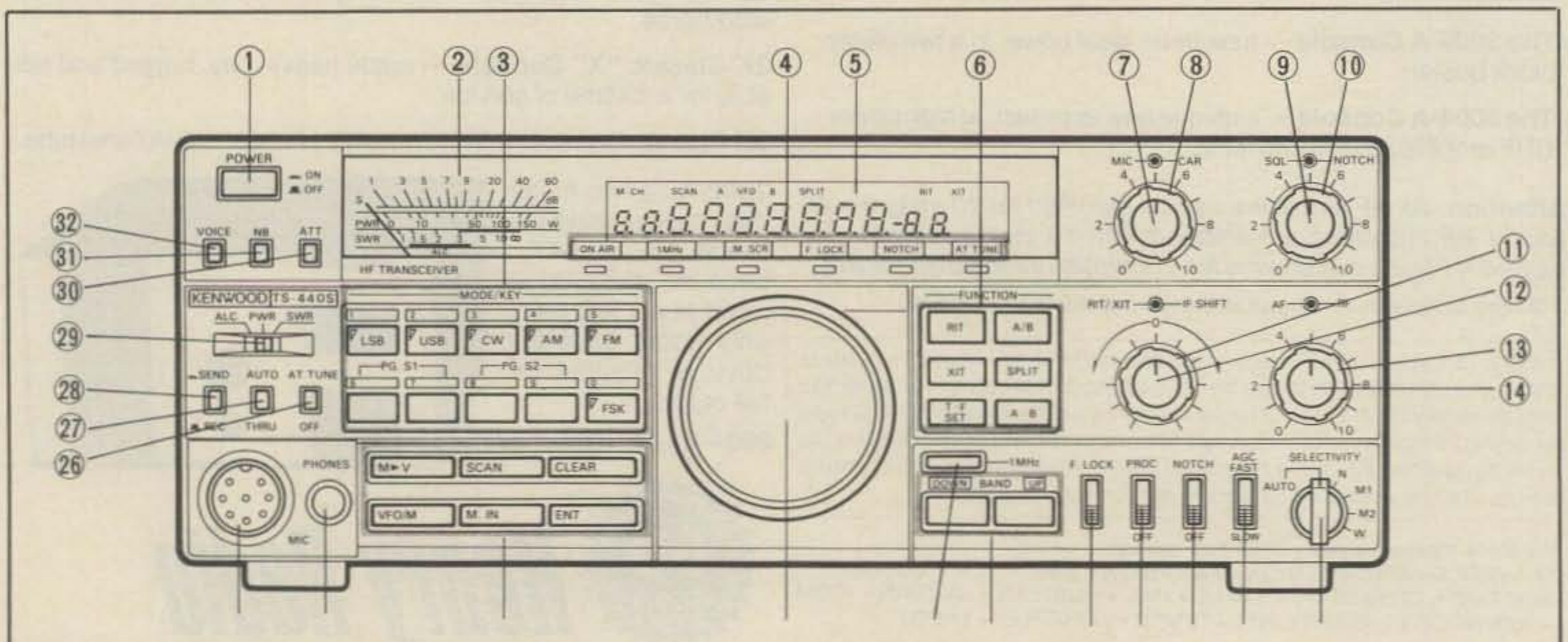


Fig. 5— Front-panel layout. Packed with controls, the TS-440S front panel is neatly arranged for easy day-to-day operation.

AUTO MODE

MODE	Without optional filter (): -6 dB bandwidth	
SSB	8.83 MHz	+ 455 kHz (2.2 kHz)
CW	8.83 MHz	+ 455 kHz (2.2 kHz)
AM	8.83 MHz	+ 455 kHz (6.0 kHz)
FSK	8.83 MHz	+ 455 kHz (2.2 kHz)

MODE	With optional filter (YK-88C/88CN/88S/88CN) (): -6 dB bandwidth	
SSB	8.83 MHz (2.4 kHz or 1.8 kHz)*	+ 455 kHz (2.2 kHz)
CW	8.83 MHz (500 Hz or 270 Hz)*	+ 455 kHz (2.2 kHz)
AM	8.83 MHz	+ 455 kHz (6.0 kHz)
FSK	8.83 MHz (500 Hz or 270 Hz)*	+ 455 kHz (2.2 kHz)

* Can be selected by changing the jumper line connection in the IF unit

MANUAL MODE

POSITION	Without optional filter (): -6 dB bandwidth	
N	No output signal	
M ₁	No output signal	
M ₂	8.83 MHz	+ 455 kHz (2.2 kHz)
W	8.83 MHz	+ 455 kHz (6.0 kHz)

POSITION	With optional filter (): -6 dB bandwidth	
N	8.83 MHz (500 Hz or 270 Hz)	+ 455 kHz (2.2 kHz)
M ₁	8.83 MHz (2.4 kHz or 1.8 kHz)	+ 455 kHz (2.2 kHz)
M ₂	8.83 MHz	+ 455 kHz (2.2 kHz)
W	8.83 MHz	+ 455 kHz (6.0 kHz)

Table III- IF selectivity options using Auto or Manual modes.

ently selected for frequency and mode, equalized, and used for split-mode and/or cross-band frequency operation. Their operation is quite simple, and it's just like having available two completely independent VFOs in every sense. Only one restriction applies. On CW semi or full break-in, the TS-440S VFOs cannot be used for cross-band operation. Full break-in is only possible within the same band. For the great majority of users, these restrictions are minor.

The set of switches under the "Mode/Key" block heading really unlocks the tremendous frequency control possibilities built into the TS-440S, and yet, the functions are not difficult to use. For simple direct keyboard entry of a frequency (using either VFO A or B) the "ENT" switch is depressed followed by the numeric switches, but trailing zeros don't have to be entered. For instance, if you are using VFO A on a 14 MHz frequency and want to check an approximate 3.8 MHz frequency, you use the sequence "ENT-3-8-ENT" to have the VFO switch to 3.800.0 MHz. You can, of course, enter the exact frequency down to 10 Hz if desired.

The TS-440S has 100 memory channels all fully usable using only the front-panel controls! To get a frequency into memory, it has to be transferred from one of the VFOs. To use a frequency in memory, the information regarding it has to go to one of the VFOs. The transfer of information is not at all complicated, but you do have to get used to a set routine regarding the use of the front-panel controls. A scroll feature is provided whereby you can review what is stored in the memory channels without affecting the operating mode. Ten of the memory channels (90 through 99) can store separate transmit and receive frequencies.

A further unique feature is that data

can be transferred between memory channels. So any time you want to re-group, say, net frequencies or shortwave BC frequencies, you do it without having to re-enter all of the frequencies. Various scan modes are available whereby you can scan through all of the memory channels or only through selected memory channel limits.

Operating Notes

After a few months of using the TS-440S in both fixed and mobile installations, I would simply say that the TS-440S is a distinctly pleasant rig to operate. It has tremendous capabilities, but it is very easy to learn to operate it.

The receive section in the unit is definitely superior. It's sensitive yet "holds together" under the most crowded band conditions. The quality of the built-in speaker is excellent—a bit of a rarity. "Feel" of the tuning knob is very smooth, and it has an adjustable torque feature, which you can adjust by rotating a back rim on the tuning knob. The noise blanker is quite effective for ignition-type noise but not adjustable for other types of noise.

Optional CW and narrow SSB filters performed very well. I would say the 500 Hz CW filter is a "must" if you do any real CW operating. The narrow SSB filter definitely helps when the bands are crowded, but I don't regard it as a "must" if you need to hold back on spending money. On the other hand, the only negative point I could find is that there is no LED to indicate that the attenuator switch has been turned on. For one reason or other, I once used the attenuator and then spent a considerable amount of time wondering why the bands sounded so dead!

I (you) need 100 memory channels? I really don't know. So far I've only managed to program about 40 channels, but I suspect that number will double in a year

or so. At any rate, it is nice to have such a great amount of memory capability available.

The optional antenna tuner performed perfectly and is extremely easy to operate. It will not match random-wire antennas, because it was not designed to do so. It operates perfectly for what it is intended to do—namely, to bring the SWR down to a 1:1 match when a beam, mobile whip, or dipole is used off of its resonant frequency but within the band for which it is dimensioned. The average tuning time was less than 10 seconds.

I received very good audio reports on transmit using the hand microphone supplied with the TS-440S. For fixed station usage, however, I preferred the Kenwood MC-85 microphone. It has a touch more audio "punch." Those who do extensive mobile operation might want to look into the MC-55 microphone. It's an electret type on a long gooseneck and can be permanently mounted in a vehicle.

The speech processor in the TS-440S is effective and does not produce any noticeable distortion. I left it switched on continuously. The TS-440S has CW sidetone but no audio monitoring on SSB. QSK operation was perfect, at least into the 20 wpm region, which is the best I can manage to do. The cooling fan within the transceiver is extremely quiet.

Power Supply

I used the TS-440S extensively with the PS-50 power supply. The PS-50 is a relatively small (about half the size of the TS-440S), but very potent unit. It has all sorts of regulation, contains a built-in cooling fan, and can deliver 20 amperes "key-down" continuously for at least one hour! It should more than satisfy the needs of any RTTY or SSTV user. I would really recommend it to anyone who might use a TS-440S in a fixed station setup, simply

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1500W

MODEL PT2500A LINEAR AMPLIFIER

The Barker & Williamson PT2500A Linear Amplifier is a completely self-contained table-top unit designed for continuous SSB, CW, RTTY, AM or ATV operation. Intended for coverage of all amateur bands between 1.8 MHz and 21 MHz, it can be readily modified for frequencies outside the amateur bands for commercial or military application. Two type 3-500z glass envelope triodes provide reliability and rapid turn-on time.

FEATURES INCLUDE:

- Full 1500 watt output
- Pi-network input for maximum drive
- Pressurized plenum cooling system
- DC antenna relay for hum-free operation
- Illuminated SWR and power meters
- Vernier tuning for accurate settings
- Pi-L output for greater harmonic attenuation

Ruggedly constructed of proven design, this amplifier reflects the manufacturer's critical attention to details—such as the silver-plated tank coil for maximum efficiency. Cathode zener fuse and internal/external cooling are among the protective and safety devices employed. Input and output impedances are 50 ohms.

Dimensions: 17" wide x 19" deep x 8 1/2" high
Weight: 80 lbs. (shipped in 3 cartons to meet UPS requirements)

Price: **\$2175.00** FOB factory. Price includes one year limited warranty.

Call or write factory for complete specifications.



1500W

MODEL VS1500A ANTENNA COUPLER

The Barker & Williamson VS1500A antenna coupler is designed to match virtually any receiver, transmitter or transceiver in the 160 to 10 meter range (1.8 to 30 MHz) with up to 1500 watts RF power to almost any antenna, including dipoles, inverted vees, verticals, mobile whips, beams, random wire and others, fed by coax cable, balanced lines or a single wire. A 1:4 balun is built in for connection to balanced lines.

FEATURES INCLUDE:

- Series parallel capacitor connection for greater harmonic attenuation.
- In-circuit wattmeter for continuous monitoring.
- Vernier tuning for easy adjustment.

Front panel switching allows rapid selection of antennas, or to an external dummy load, or permits bypassing the tuner.

Dimension (Approx.): 11" wide x 13" deep x 6" high

Weight: 6 1/2 lbs.

Price: **\$499.00** FOB Factory. Fully warranted for one year.



Please send all reader inquiries directly.



BIGGER AND BETTER

By popular demand, we are extending our end-of-year sale* of genuine top-rated 8-pole FOX TANGO filters for Kenwood, Yaesu, Drake, Heath, and Collins indefinitely. Buy at discounts of 10%, 20%, and even 30% or more at a time when these Japanese-made units should be getting more expensive. Our secret? Fine products, low overhead, high sales volume. Filters are our prime speciality!

We are not just bragging when we say FOX TANGO filters are top-rated. We are proud that they have been favorably rated twice in impartial QST Product Reviews, selected for use in a major construction article in the ARRL Handbook, praised in two major articles in 73 magazine, and recommended for contesters in Radiosporting magazine. Reprints of all articles are available. Convince yourself! Use your next ten QSOs to learn what hams think about FOX TANGO: its products, its reputation. Since no rig is better than its filters, why risk disappointment with unproven imitations?

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PETER DAHL CO. HAS Conversion Kits



With a 516F2 Solid State Conversion kit from the Peter Dahl Co., your power supply will run cooler and have full protection against line transients. For only **\$19.95** you get solid state replacements for the 5U4 and 5R4 tubes, a silicon diode to replace the selenium bias rectifier, meter protection and a selenium line transient suppressor.

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CIRCLE 59 ON READER SERVICE CARD

- Programming and recall of VFO A and VFO B frequency
- MR (Memory Recall) and M.IN (Memory Input)
- Microphone UP/DOWN frequency control disable
- Control of the F.LOCK switch
- Memory channel selection
- MODE selection
- Control of RIT/XIT
- Selection of RIT/XIT frequency
- Scan operation
- Review of transceiver status

Table IV—Control possibilities if the TS-440S is interfaced to a PC using the optional interface kit (IC-10).

because the power supply is such a rugged unit. Besides powering the TS-440S, the supply does have accessory terminals for other gear such as a low-power 2 meter transceiver. The TS-440S itself has no direct provisions for use with transverters.

Computer Interface

An optional computer interface kit (IC-10) will allow many functions in the TS-440S to be controlled from a PC. Table IV lists the possibilities. The interface kit really consists of just two ICs that must be placed into sockets already provided in the TS-440S. The wiring interface to a PC is via a 13-pin "DIN"-type connector on the rear of the TS-440S (a 13-pin plug is supplied with the transceiver).

Manual

The instruction manual supplied with the TS-440S rates very high marks for being both complete and clear. It covers everything from basic installation of the TS-440S to operating the unit to installing various options to basic trouble-shooting. A very generous amount of illustrations is used, and the manual includes a full set of schematic and block diagrams but no PC board layouts. A service manual with such diagrams is available from Kenwood for a nominal cost. I would strongly recommend the purchase of the service manual at the time of purchase of the TS-440S.

Summary

The TS-440S is a delightful rig to operate straight from its smooth tuning "feel" to its very efficient automatic antenna tuner. Its compact size makes it very attractive for mobile/portable operation. However, it should also prove to be a very satisfactory home station rig for amateurs who desire just about every feature possible in a state-of-the-art transceiver while staying under the \$1K price line. Where is 4D0P? I just worked him using the TS-440S barefoot on 15 meters, and he gave me a 59 report!

