

KENWOOD

Listen to the Future

Distinctive Performance

TS-590S

HF/50 MHz ALL MODE TRANSCEIVER





Uncover the Hidden

The TS-590S marks a bold new chapter in Kenwood's proud history of manufacturing high-performance transceivers. Featuring a narrow-band Roofing Filter the TS-590S significantly reduces interference from unwanted signals, which results in excellent RX performance revealing signals that would be hidden to lesser rigs. With IF AGC based on advanced DSP technology, Kenwood has essentially redefined HF performance.

Built to satisfy the most demanding DX'er, this high-performance HF transceiver takes Amateur Radio to the next level continuing the Kenwood tradition of operating ease and rugged reliability.

- Best dynamic range in its class versus off-frequency interference
- 500 Hz / 2.7 kHz Roofing Filters
- 32-bit floating point DSP
- 100 W heavy-duty design
- Automatic antenna tuner
- USB port for PC connectivity



Superb RX Performance: Excellent Dynamic Range Even with Powerful Off-frequency Interference!

Thanks to a narrow-band Roofing Filter and dedicated 1st Mixer, this new transceiver offers the best dynamic range in its class to handle adjacent unwanted signals.

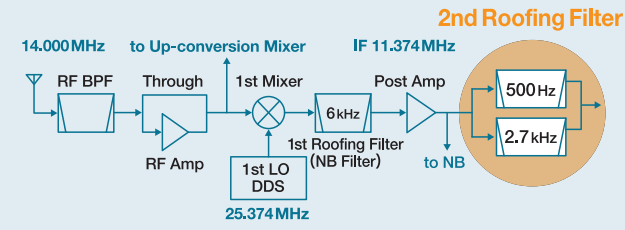
Powerful 500 Hz/2.7 kHz Roofing Filter

On 15, 20, 40, 80 or 160 meters, the TS-590S employs down conversion* for the first IF (11.374 MHz). Having the 1st Roofing Filter (6 kHz BW) directly after the Mixer enhances the noise blanker's ability to deal with adjacent off-frequency signals. What really determines RX performance is the 2nd Roofing Filter, after the post amplifier. The TS-590S comes equipped with a 500 Hz and 2.7 kHz BW 6-pole MCF. This results in superb dynamic range when adjacent signals are present, performance that was not previously possible using up conversion. So even when an interfering signal approaches the target frequency, a virtually flat dynamic range is maintained. Even with strong adjacent interference, you can capture a clear signal.

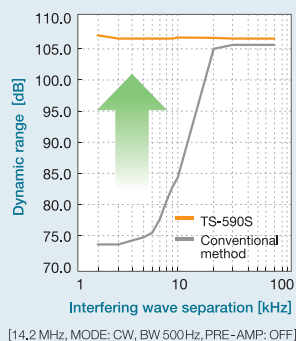


*For 1.8/3.5/7/14/21 MHz Amateur bands, when receiving in CW/FSK/SSB modes down conversion is selected automatically if the final passband is 2.7 kHz or less.

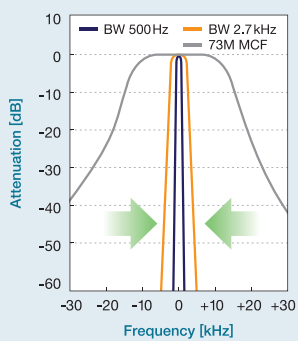
Block diagram: Down conversion



Comparison: Dynamic range characteristics



Comparison: MCF bandpass characteristics

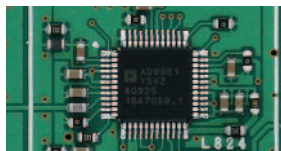


DDS offers superb Carrier to Noise ratio characteristics, significantly cutting noise generated by adjacent unwanted signals.

For the 1st local oscillator frequency, instead of employing conventional PLL/VCO, the output of a DDS (Direct Digital Synthesizer) is supplied directly to the following Mixer. When down conversion is active, the oscillator frequency is lower than it is with up conversion, so the output boasts even better C/N (Carrier to Noise ratio) characteristics and a desirable level of reciprocal mixing.

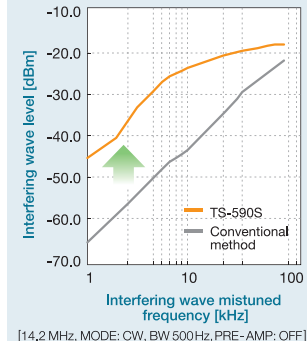
Reciprocal Mixing

To measure the level of reciprocal mixing, an off-channel signal is mixed with the output of a signal generator, which is then varied until the unwanted signal can be detected as noise. The higher the figure, the less noise will be generated by adjacent interference, allowing undisturbed reception.



AD9951 from Analog Devices, Inc

Comparison: C/N characteristics



Wide Range of Features Thanks to 32-bit Floating-point DSP

In addition to basic functions such as AGC, digital IF filters, detection and demodulation, a wide range of features including noise reduction and IF notch are all implemented with the latest algorithms.

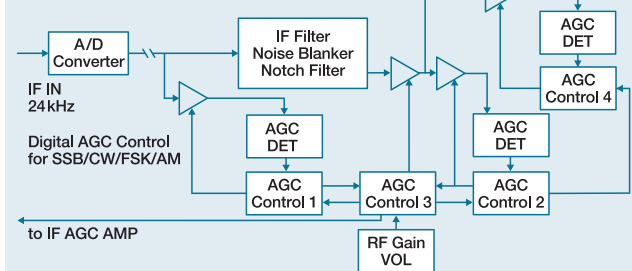
Advanced AGC with digital signal processing from the IF stage onward

The TS-590S employs DSP from the IF stage onward. Kenwood was the first to offer DSP-based IF AGC in an Amateur radio (TS-870) and this DSP technology has been further enhanced for the TS-590S, resulting in the development of a unique approach to IF AGC. It is possible to apply level-optimized AGC even for signals that slip between the Roofing Filter and the final IF passband. You can be confident of optimum operation at all times, without having to think about the Roofing Filter bandwidth. Gain control performance has been greatly improved for the target signal in the final IF passband (RX band). This results in in-band IMD (intermodulation distortion) characteristics on a par with those of top-of-the-line transceivers. You can enjoy superb RX with next-generation Kenwood sound.



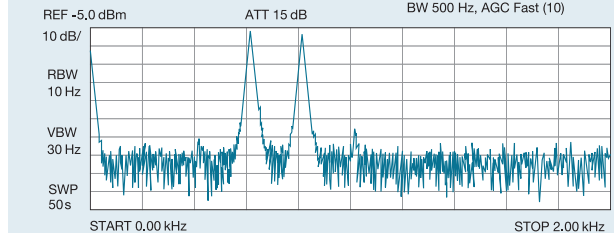
Texas Instruments TMS320C6726B

Block diagram: IF AGC control



RX in Band IMD characteristics

Input two signals equivalent to S9; 14.2 MHz, CW, Pre-amp OFF, BW 500 Hz, AGC Fast (10)

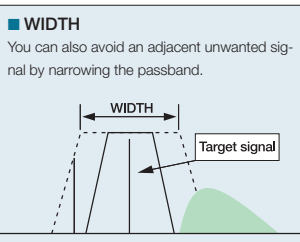
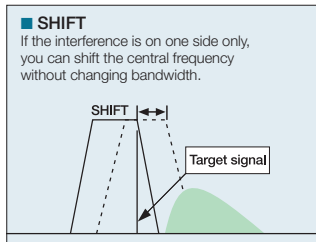
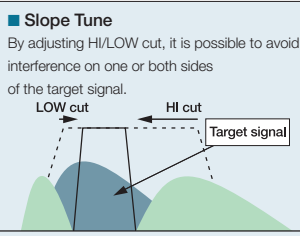




Extensive interference/noise removal features

Adjustable IF filter passband

By adjusting the DSP filter passband, you can tailor interference removal to suit your needs. This provides slope tuning in SSB/AM/FM modes, and bandwidth width/shift control for CW/FSK/SSB-DATA communications.



Options and defaults for each mode (default settings in bold)

SSB mode

LOW CUT: 0, 50, 100, 200, **300**, 400, 500, 600, 700, 800, 900, 1000 Hz
HI CUT : 1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.4, **2.6**, 2.8, 3.0, 3.4, 4.0, 5.0 kHz

CW mode

WIDTH : 50, 80, 100, 150, 200, 250, 300, 400, **500**, 600, 1000, 1500, 2000, 2500 Hz
SHIFT : 300 Hz to 1 kHz (50 Hz steps)

SSB-DATA mode

WIDTH : 50, 80, 100, 150, 200, 250, 300, 400, 500, 600, 1000, 1500, 2000, **2500** Hz
SHIFT : 1000, 1100, 1200, 1300, 1400, **1500**, 1600, 1700, 1800, 1900, 2000, 2100, 2210 Hz

AM mode (AF filter for LOW cut)

LOW CUT: 0, **100**, 200, 300 Hz
HI CUT : 2.5, 3.0, 4.0, **5.0** kHz

FSK mode

WIDTH : 250, **500**, 1000, 1500 Hz

FM mode (AF filter)

LOW CUT: 0, 50, 100, 200, **300**, 400, 500, 600, 700, 800, 900, 1000 Hz
HI CUT : 1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.4, **2.6**, 2.8, 3.0, 3.4, 4.0, 5.0 kHz

Simple IF filter A/B switching

You can, for example, set Filter A for a wide passband, and Filter B for a narrow passband. When searching for a particular station during CW operations you can then use the Filter A, switching to the narrower Filter B once communications are initiated. In this way, you can easily switch between 2 preset DSP filters as needed.

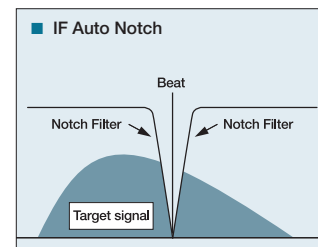


IF auto-notch* & manual notch**

Automatic and manual notch are both implemented at the IF stage. By removing a powerful interfering signal with a notch filter, you can capture a weak target signal. With the IF auto-notch, notch frequency automatically tracks the beat frequency. The notch filter has such sharp characteristics that it is not possible to adjust it manually. Manual notch, however, offers not only manual adjustment of the notch frequency, but also the choice of either normal or wide attenuation to suit the type of interference being encountered.

*Available only in SSB mode.

**Available in SSB/CW/FSK modes.



Analog & Digital noise blanking (NB1 / NB2)

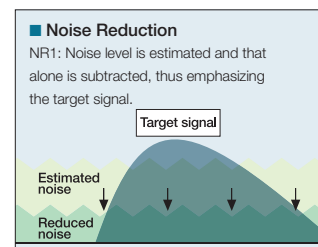
In addition to the analog noise blanker (NB1), which has a proven track record for eliminating weak noise, this transceiver is equipped with a newly developed digital noise blanker (NB2). Just pick the blanker which is more effective for the type of noise encountered and the RX conditions. NB1 offers stable noise suppression independent of RX bandwidth because, during down conversion, the noise that has passed through the 1st Roofing Filter (NB filter) is fed to the NB circuit. The NB2 employs a newly developed envelope tracking method, making it effective against noise that defies tracking by an analog noise blanker.

DSP noise reduction (NR1 / NR2)

In addition to conventional NR1 and NR2, NR1 now employs a newly developed spectral-subtraction approach that is specially designed to remove noise in speech modes. The optimum noise reduction method is applied for each RX mode.

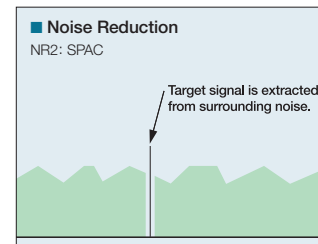
NR1

Spectral-subtraction noise reduction has been developed with a focus on improving speech clarity for weak SSB signals. Thanks to this advanced technology, which makes use of the processing power of the 32-bit floating-point DSP, you can capture a target signal that is swamped by noise, without suffering any loss in quality. For the non-speech modes (CW/FSK), a line enhancer offers tried and true noise reduction. Whichever method is used, the degree of attenuation can be adjusted smoothly.



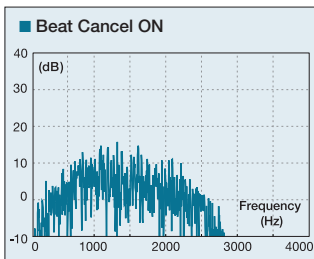
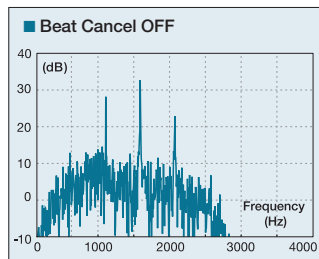
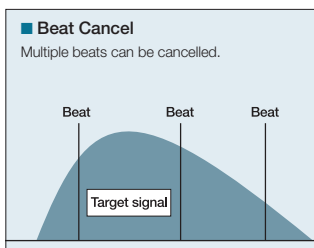
NR2 (SPAC)

Kenwood's original NR2 is SPAC-based noise reduction that extracts a periodic signal. SPAC is ideal for CW operations as it can suppress noise at the same frequency as the target signal. You can adjust correlation time in 2 ms increments from 2 ms to 20 ms (10 steps). NR2 is not available for FM.



■ Beat cancel (BC1 / BC2)

Whereas IF auto notch is effective against a single, powerful beat, the beat cancel feature comes into its own when there are multiple, relatively weak beats. Choose BC1 to remove weak and/or continuous beat interference, and BC2 to handle intermittent beat, like that of a CW signal. Since this can be used in conjunction with IF auto notch, even more effective beat cancellation is possible. (SSB/AM/FM only)



High-reliability TX Section for a High-quality Signal

Kenwood's attention to detail is evident in both TX and RX performance.

Stable operation guaranteed. Designed for high reliability.

■ 100 W heavy-duty design

The cooling system features a pair of 60 x 60 mm fans, the same size as on the previous model. Having two fans provides sufficient air flow at low rpm, ensuring quiet operation. Meticulous attention has been paid not only to the fans and motors but also to the size and shape of the intake/exhaust vents as a comprehensive approach to noise reduction. The aluminum die-cast chassis is combined with a large heat sink to enhance heat dissipation efficiency, minimizing the rise in temperature in the final section during continuous TX sessions. This heavy-duty design is capable of withstanding long hours of operation under grueling conditions typical of contests or DXpeditions.



■ Built-in automatic antenna tuner (compatible with 5 MHz band)

The preset-type automatic antenna tuner enables quick band changing and can even operate when the TS-590S is receiving. When the TX frequency changes, the preset data (stored separately for each antenna band) is loaded into the antenna tuner circuit to ensure that optimum matching is rapidly achieved without having to retune.



■ Optional TCXO

The TCXO (temperature compensated crystal oscillator), which is available as an option, ensures superb frequency stability (± 0.5 ppm) throughout a wide temperature range, from -10°C to $+50^{\circ}\text{C}$.

■ Drive output (including 135 kHz band)

The DRV terminal provides external access to the TX drive output (approx. 0 dBm). This is not just handy when a transverter is attached: the main antenna terminal cannot be used for transmission on the 135 kHz band, but this DRV terminal fills that need. Convenience is further enhanced when combined with the dedicated RX antenna terminal.

Note: A separate license for the 2200 meter band may be required.

■ Speech processor (SSB/AM/FM)

The speech processor enhances the clarity of messages for the receiving station by raising average TX power. And as well as adjusting compression level, you can switch between soft and hard modes.

■ Adjustable TX filter (SSB/AM)

The TX filter passband is switchable. Since the high-pass and low-pass cut-off frequencies can be switched independently, you can have fine control over filter operation.

■ TX equalizer (SSB/AM/FM)

The equalizer offers flat (default), high boost (2 types), Formant pass (to minimize extraneous sounds), bass boost (2 types), conventional and user settings (using the ARCP-590). It is possible to adjust frequency characteristics to suit the voice quality and microphone characteristics on the transmitting end.

■ TX monitor

This outputs the TX audio via the speaker allowing you to check your own sound quality.

■ Other TX features

- VOX function (adjustable gain, selectable delay time)
- Adjustable TX power output
- Adjustable MIC gain
- Adjustable CAR level

Extensive CW Support

■ CW auto tune

With just the press of a button, you can automatically zero in on a target frequency for CW reception. During RIT operations, it will also tune in to the RIT frequency.

■ 2 key terminals on rear panel

Thanks to both an electronic keyer (built-in) paddle terminal and a separate one for an external keyer, PC keying is possible even when a paddle is connected.

■ Other CW features

Support for full break-in and semi break-in (semi break-in delay time: 50 ms~1000 ms) • Memory keyer (max. 4-channel message memory) • Pitch control (300~1000 Hz) • Side tone monitor with 10-step volume control • Electronic keyer (selectable key speed, squeeze A/B modes) • Microphone paddle mode • CW reverse mode • CW auto transmit (in SSB mode, a simple key-press will switch automatically to CW)



Superior Ease of Operation Plus More Enjoyable TX/RX Performance

The user-friendly man-machine interface means you can count on impeccable operation – under the grueling conditions of a contest or a DXpedition.

Numerous functions to assure easy operation

User-friendly menus, outstanding operating ease

The TS-590S menus offer intuitive access to numerous additional features. The combination of menu and arrow keys makes operation intuitive. Also, the menu mode is visible in the main area, while the sub area scrolls through the relevant guidance information.



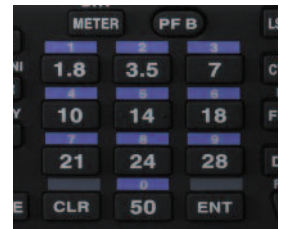
Large display with 2-color LED backlight

The large display ensures outstanding visibility under all conditions. And you can select amber or green for the LED backlight.



Direct frequency entry, direct band selection

The keypad is used for Amateur band direct key access. There are 3 memories for each band, so you can quickly call up the frequencies you usually use. Also, the buttons – laid out to optimize ease of operation – provide responsive feedback.



USB connectivity for PC control

Thanks to the addition of a USB port, the TS-590S can be hooked up to a PC with a USB cable, enabling PC control of the transceiver plus TX/RX audio connectivity.

Note: Because of the theoretical latency of USB audio, it cannot be used for applications that are affected by a time lag.

Remote control of the TS-590S using a computer

Using the ARCP-590 radio control program, it is possible to access virtually all functions from a computer. This makes it easy for you to change settings and manage memory channels.



*You can download related freeware from the Kenwood website after purchasing the TS-590S.

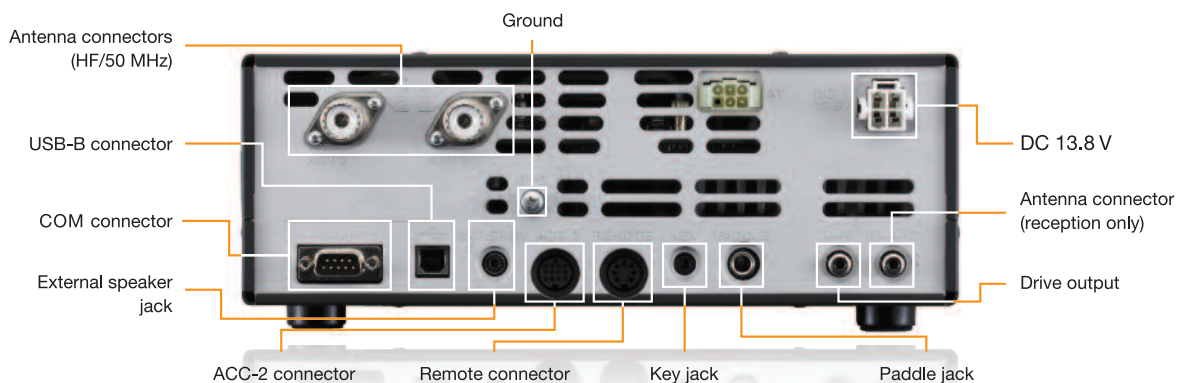
Voice guide & storage unit (option)

The VGS-1 voice guide and storage unit can serve two important roles: vocal confirmation (in English or Japanese) of frequency, key operation, settings, etc., and recording/playback of messages received by the transceiver.



Voice memory: max. 4 channels
 (recording time: 30 secs. each for CH1 & CH2, 15 secs. each for CH3 & CH4)
 Constant RX recording: 30 secs. (1 channel)

External Connectors



OFF beep

In addition to conventional audio confirmation of operation, a different beep sounds when a feature or mode is off, allowing clear differentiation.

Programmable function keys (PF A, PF B)

The TS-590S features 2 programmable function keys. You are free to select frequently used functions for assigning to these keys.



Memory/Scan functions

Easy-to-use memory

The Memory Name function enables clear identification for up to 110 memory channels (including specified ranges). Also, the memory scroll function can be used to check memory channel data without changing operating frequency. Other features include a Quick Memory function for storing frequencies on the fly (max.10 channels),* memory channel copy, single channel memory clear, memory lockout, memory shift, and the ability to change memory channel data/frequency temporarily.

*3, 5 or 10 channels can be selected.

Multiple scan functions

Included among the many scan functions are program scan, memory scan, group scan, subtone scan and CTCSS scan. And a program slow scan automatically reduces the scanning speed around any frequency of special interest.

Other features

RX

- RX equalize • ATT, pre-amp
- Adjustable RF gain, adjustable AF gain, selectable SQL level

FSK

- Basic RTTY settings (keying polarity, shift width, high/low tones, reverse mode)

FM

- FM Wide/Narrow switching for TX/RX • Repeater subtone
- FM signaling (CTCSS, cross-tone)

DATA

- Independent SSB-DATA/FM-DATA modes
- Choice of IF filters for PSK31/AFSK operations • Variable ANO/ANI level
- Selectable DATA modulation line (ACC2/USB) • DATA VOX

Accessory connectors

- ACC2 connector for packet operations
- Remote connector compatible with linear amp control (built-in vacuum tube linear amp control relay, selectable TX attack delay)

External connectivity

- Kenwood Sky Command® II support (when connected to TH-D7A*/TM-D710A/TH-D72A**)
- Packet cluster tune (when connected to TM-D710A/TH-D72A**)
- Cross-band repeater functions (when connected to TM-D710A/TM-V71A)

Others

- Emergency contact frequency paging
- TX tuning for external antenna tuner
- Power-on message

Note: A message of up to 8 alphanumeric characters can be input for display when the power is switched on.

- Split data transfer using COM port
- Firmware updates
- Adjustable long-keypress timing

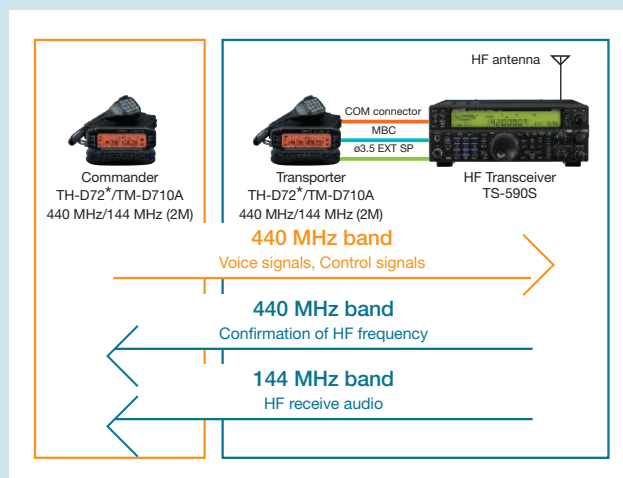
Kenwood Sky Command® II

The Kenwood Sky Command® System (KSS) effectively puts an HF transceiver in your hand, allowing you to relax in your backyard while controlling the TS-590S in your shack. Or you could be sitting at a baseball game while operating the HF transceiver safely installed in your car. Kenwood Sky Command® II has the added convenience of LCD confirmation of HF frequency.

It's not just freedom you'll enjoy: KSS is simple and intuitive, yet amazingly powerful. Once the Transporter (TH-D72* or TM-D710A) has been wired to your TS-590S HF transceiver, all you need to is the second handheld (the Commander). The Commander transmits control signals to the Transporter, which also relays your voice to the HF radio. In return, HF signals are transmitted back to the Commander. This system allows you to transmit and receive HF signals, set frequencies, switch memory channels, and much more — all from your handheld transceiver.




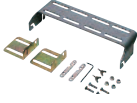












Kenwood Sky Command® II enables full-duplex operation, adding some extra features that further enhance functionality. For example, you can confirm HF frequency visually on the LCD panel of the Commander. Control is effected via TNC (AX.25), and now even more HF functions are accessible: XIT, mode switching (USB, FM, etc.), split-frequency operations on/off, memory shift, and frequency step selection. In addition, once every 10 minutes, the Transporter will send out its pre-programmed call sign via CW.

**Kenwood Sky Command® II uses a pair of TH-D72* and/or TM-D710A transceivers.



- The operator controls the TS-590S HF transceiver from the portable Commander TH-D72** or TM-D710A.
- Voice is transmitted from the command unit on the 440MHz band.
- Control signals are sent from the command unit on the 440MHz band.
- The received HF signal is re-transmitted by the Transporter TH-D72* or TM-D710A on the 2M band.
- The operator can confirm the HF frequency on the LCD of the commander.

Options

MC-90 Deluxe Desktop Microphone 	MC-43 Hand Microphone 	PG-20 DC Cable (7 metres) 	MB-430 Mobile Bracket 	SP-23 External Speaker 	ARCP-590 Radio Control Program  <small>(available free for downloading from the Kenwood website)</small>
MC-60A Desktop Microphone 	HS-6 Headphones 	SO-3 TCXO 	PS-60 Heavy-duty Power Supply (22.5A) 		ARHP-590 Radio Host Program  <small>(available free for downloading from the Kenwood website)</small>
MC-47 Hand Microphone 	HS-5 Headphones 	LF-30A Low-pass Filter (50 MHz band is not supported) 	SP-50B Mobile Speaker 	VGS-1 Voice Guide & Storage Unit 	

Not all accessories may be available. Please contact dealers for details.

Main Specifications

TS-590S	
General	
Frequency Range TX RX	180,80,60,40,30,20,17,15,12,10, 6 meter bands 0.13 ~ 30 MHz, 50 ~ 54 MHz (VFO: Continuous 30 kHz ~ 60 MHz)
Mode	J3E(SSB), A1A(CW), A3E(AM), F3E(FM), F1B(FSK)
Frequency Stabilities	±5ppm (±0.5ppm with SO-3), -10° C ~ +50° C
Antenna Impedance	50 Ω
Antenna Tunable Range	16.7 ~ 150 Ω
Supply Voltage	13.8 V DC ±15%
Current Drain	
TX	20.5A or less
RX (No signal)	1.5A or less
Operating Temperature	14°F ~ 122°F (-10° C ~ +50° C)
Dimensions Without projections (W x H x D) With projections	10.63 x 3.78 x 11.46 in (270 x 96 x 291 mm) 11.02 x 4.21 x 13.19 in (280 x 107 x 335 mm)
Weight (Net)	16.31 lbs
Transmitter	
Output Power	Max 100 W, Min 5 W AM: Max 25 W / Min 5 W
Modulation	
SSB	Balanced modulation
FM	Reactance modulation
AM	Low-power modulation
Maximum Frequency Deviation (FM)	Less than ±5kHz (Wide) Less than ±2.5kHz (Narrow)
Spurious Response	HF: Less than -50dB 50MHz: Less than -60dB
Carrier Suppression	More than 50dB
Unwanted Sideband Suppression	More than 50dB
Transmit Frequency Response	-6dB: 400Hz ~ 2,600Hz
Microphone Impedance	600 Ω
XIT Variable Range	±9.999kHz
Receiver	
Circuitry	Double or Triple Superheterodyne* ¹ Triple Superheterodyne* ²
Intermediate Frequency	
1st IF	11.374MHz 73.095 MHz
2nd IF	24kHz 10.695 MHz
3rd IF	- 24 kHz (except FM) 455 kHz (FM)

*1 In 1.8 / 3.5 / 7 / 14 / 21 MHz Amateur band, IF band width 2.7 kHz or less (SSB, CW, FSK)

*2 Except in 1.8 / 3.5 / 7 / 14 / 21 MHz Amateur band, IF band width 2.7 kHz or less (SSB, CW, FSK)

TS-590S	
Receiver (Continued)	
Sensitivity SSB/CW/FSK (S/N 10dB)	Less than 0.5µV (0.13-0.522MHz) Less than 4µV (0.522 - 1.705MHz) Less than 0.2µV (1.705 - 24.5MHz) Less than 0.13µV (24.5 - 30MHz) Less than 0.13µV (50 - 54MHz)
AM (S/N 10dB)	Less than 6.3µV (0.13-0.522MHz) Less than 31.6µV (0.522 - 1.705MHz) Less than 2µV (1.705 - 24.5MHz) Less than 1.3µV (24.5 - 30MHz) Less than 1.3µV (50 - 54MHz)
FM (12dB SINAD)	Less than 0.22µV (28 - 30MHz) Less than 0.22µV (50 - 54MHz)
Squelch Sensitivity SSB/CW/FSK/AM	Less than 5.6µV (0.13 - 0.522MHz) Less than 18µV (0.522 - 1.705MHz) Less than 1.8µV (1.705 - 30MHz) Less than 1.1µV (50 - 54MHz)
FM	Less than 0.2µV (28-30MHz) Less than 0.2µV (50-54MHz)
Image Rejection Ratio	More than 70 dB
IF Rejection Ratio	More than 70 dB
Selectivity	
SSB	More than 2.2kHz (-6dB) Less than 4.4kHz (-60dB)
CW/FSK	More than 500Hz (-6dB) Less than 1.2kHz (-60dB)
AM	More than 6 kHz (-6dB) Less than 12kHz (-50dB)
FM	More than 12kHz (-6dB) Less than 25kHz (-50dB)
RIT Variable Range	±9.999kHz
Notch Filter Attenuation	
Auto	More than 60dB
Manual	More than 70dB
Beat Cancel Attenuation	More than 40dB
Audio Output Power	More than 1.5W (8 Ω)
Audio Output Impedance	8 Ω

These specifications are guaranteed for Amateur Bands only.
Sky Command® is a registered trademark of Kenwood Corporation in the U.S.

Kenwood follows a policy of continuous advancement in development.
For this reason, specifications may be changed without notice.

Listen to the Future

Kenwood has always connected with people through sound. Now we want to expand the world of sound in ways that only Kenwood can, listening to our customers and to the pulse of the coming age as we head toward a future of shared discovery, inspiration and enjoyment.

Kenwood U.S.A. Corporation
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024

Order Administration/Distribution
P.O. BOX 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745

