

SECTION I
GENERAL DESCRIPTION

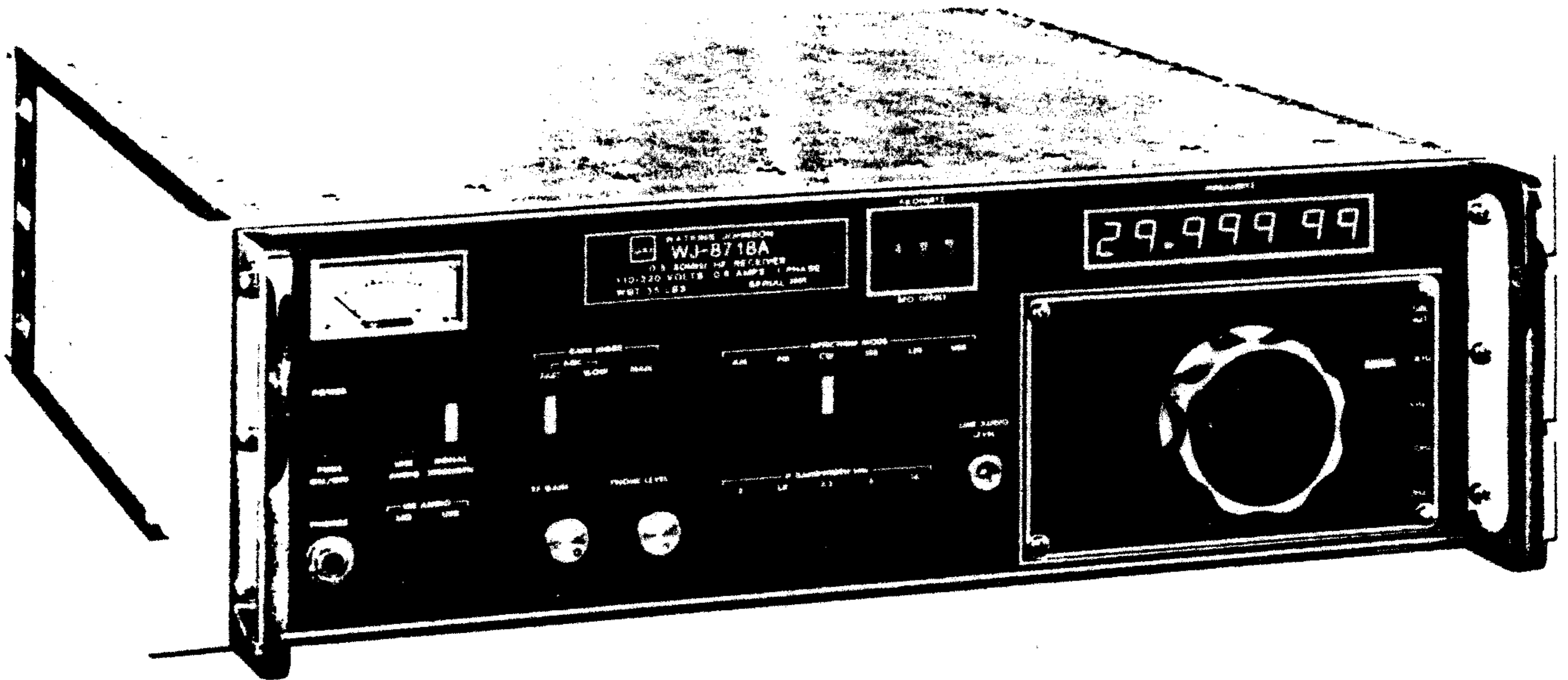


Figure 1-1. WJ-8718 Series HF Receiver

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-8718 Series HF Receiver (Figure 1-1) detects AM, FM, CW, USB, LSB, and ISB signals emissions over the frequency range of 5 kHz to 29.99999 MHz. Receiver functions may be controlled manually through the front panel, or remotely through the rear panel remote input connector. In the manual mode, operating parameters are selected by depressing appropriate pushbutton/indicators. The depressed button indicates the operators selection by a brightly colored display behind the transparent front surface. Seven digits composed of light emitting diodes (LED's) indicate the tuned frequency to a resolution of 10 Hz. The large tuning knob and four tuning rate pushbuttons provide frequency tuning capability. A tuning disable pushbutton locks the receiver to a specific frequency, thereby preventing accidental frequency changes. The remote control mode is enabled by one of two methods: depressing the TUNING DISABLE pushbutton, or a control change activated by the remote device. A jumper wire on the Manual Tuning Up/Down Counter card determines the method employed. In the remote mode, the receiver responds to parallel input data, consisting of frequency and bandwidth information, and is compatible with buffered CMOS levels.

Pushbutton-selectable parameters in addition to the operating modes are IF Bandwidths, Gain Mode and Meter Select. Selectable IF bandwidths of 0.3 kHz, 1.0 kHz, 3.2 kHz, 6 kHz, and 16 kHz operate in conjunction with the AM, FM, or CW detection modes. When the ISB, LSB, or USB detection modes are chosen, IF bandwidth selection is ineffective due to the automatic override by the detection mode control. RF gain is controlled manually or by Fast or Slow AGC. A dual-purpose meter indicates Signal Strength or Line Audio level.

Internal frequency tuning circuitry of the receiver includes the 1st, 2nd, and 3rd LO and BFO Synthesizers. The phase lock loop frequency synthesizers determine tuned frequency to a resolution of 10 Hz. The synthesized BFO tunes ± 8.9 kHz from 455 kHz in 100 Hz and 1 kHz steps. A non-volatile memory stores the tuned frequency for a minimum of 48 hours after power interruption (i.e., power failure or manually turning power off).

Rear panel features include BNC connectors for a 50 Ω RF input, a 455 kHz IF output and a 1 MHz reference input/output selected by a related slide switch. Two five-lug terminal boards provide audio outputs that include: a 600 Ω floating center-tapped ISB output (for the lower sideband), a single-ended phone output, a center-tapped line audio output and an FM/CW/SSB detector output for monitoring. Line voltage selection for high and low voltage conditions may be accomplished in a few seconds by inserting the printed circuit (PC) wafer in one of four positions in the line cord assembly.

Maintenance operations are straightforward due to clean mechanical packaging and placement of nearly all components on plug-in circuit boards. These circuit boards mount on motherboards which have all pins accessible from the bottom of the receiver. Removing the top cover exposes the assemblies, which may be unplugged from their sockets or freed from the main chassis by quick disconnect plugs. The dc power supplies are thermal and short circuit protected, requiring no adjustments, and are easily replaced. A printed circuit wafer, accessible on the rear panel, enables matching the power transformer to line voltages of 110 Vac ($\pm 15\%$) and 220 Vac ($\pm 15\%$).

1.2 MECHANICAL CHARACTERISTICS

The receiver mounts in a standard 19-inch equipment rack, occupies 5.25 inches of vertical space, and extends 19.6 inches into the rack. The main chassis, front, rear, top, and internal compartment panels are constructed of aluminum. Side panels are cast aluminum, the front panel is a 0.19-inch thick aluminum plate, and the rear panel, main deck, and internal partitions are stamped aluminum. The side panels, top and bottom covers are perforated allowing flow-through ventilation. All operating controls and indicators are on the front panel, while all input and output cables are connected to the rear panel (except for the phone jack). This package meets the radiation specification of MIL-STD-461A.

The front panel is overlaid with a black bezel etched with control markings. All pushbuttons are mounted on a printed circuit card positioned behind the front panel, and extend through cutouts in the front panel. The remaining controls and line audio/signal strength meter are mounted directly on the front panel. The tuned frequency numeric display is mounted on a card positioned behind a cutout in the front panel, over which a polarized filter is installed. The audio phones jack, RF gain control and phone level controls are also mounted on the front panel. The WJ-8718A Line Audio control is also mounted on the front panel.

The rear panel mounts all input, output, and accessories, except for the phones jack. BNC connectors are supplied for the RF input, IF output and 1 MHz reference input/output. The INT/EXT clock switch for selecting internal or external timebase reference is located next to the 1 MHz reference input/output. Two terminal blocks supply an output for Line Audio, Phone Audio, ISB Audio, and FM Audio. Two fuseholders are found on the rear panel. The circular fuseholder holds the alternate line voltage fuse, while the rectangular fuseholder has the additional functions of line filter, voltage selection and ac line cord receptacle. Also on the rear panel are +15 V, -15 V, and +5 V heat sinked regulators, and 37-pin female connectors for remote control. The WJ-8718 and 8718-9 Line Audio controls are also mounted on the rear panel.

Loosening 34 quarter-turn fasteners allows the top cover to be lifted from the receiver exposing four main compartments. A power distribution circuit, input converter and optional preselector mount in one compartment and three synthesizer boards mount in another. The IF modules and the digital control circuits are in separate compartments for mechanical support and shielding purposes.

Removing the bottom cover via 34 quarter-turn fasteners, exposes three motherboards that mount a total of 27 modules and the components mounted on the front panel. All connections to the motherboards are push-on plugs so replacement of a motherboard consists of removing less than 10 screws and the plugs.

1.3 EQUIPMENT SUPPLIED

The equipment supplied consists of the receiver and a detachable line cord.

1.4

EQUIPMENT REQUIRED BUT NOT SUPPLIED

Select equipment from the following general classifications to obtain full use of the receiver.

- Antenna, 50 Ω
- Audio monitoring equipment such as the following: (for monitoring ISB signals, two units will be required except for headphones, which monitors both sidebands.)
 - a) Speaker panel, 600 Ω
 - b) Stereo headphones, 600 Ω
 - c) Tape recorder
- Wideband tape recorder for 455 kHz IF amplifier predetection output.
- IF-to-tape converter for 455 kHz-to-video signal conversion.
- Remote Input Interface - for receivers utilizing remote control operation. Refer to the **Installation Section** of this manual for definitions of the input lines.

1.5

OPTIONAL EQUIPMENT

The following optional equipment is available for use with the WJ-8718 Series HF Receiver. For additional information concerning these options and others, contact Watkins-Johnson Company, Gaithersburg, Maryland, or your Watkins-Johnson representative.

- | | |
|---|--------------|
| ● 10 Hz BFO Synthesizer | WJ-8718/B10 |
| ● Built-in Test Equipment | WJ-8718/BITE |
| ● Command Input | WJ-8718/COM |
| ● Carrier Operated Relay | WJ-8718/COR |
| ● Dual Diversity Combiner | WJ-8718/DDC |
| ● Frequency Extender | WJ-8718/FE |
| ● Frequency Shift Keying | WJ-8718/FSK |
| ● Green LED Frequency Display | WJ-8718/GRN |
| ● Low Level Audio | WJ-8718/LLA |
| ● Microprocessor Front Panel | WJ-8718/MFP |
| ● Monitor Output | WJ-8718/MON |
| ● Sub-Octave Preselector | WJ-8718/PRE |
| ● Independent Sideband (ISB) (WJ-8718 only) | WJ-8718/ISB |

GENERAL DESCRIPTION

WJ-8718 SERIES HF RECEIVER

- Red LED Frequency Display
- Signal Monitor Output
- 1 Hz Tuning
- RS-232 Interface (Talk/Listen)
- IEEE-488 Bus Interface (Talk/Listen)

WJ-8718/RED

WJ-8718/SMO

WJ-8718/1 Hz

WJ-8718/232

WJ-8718/488-2

Table 1-1. Type WJ-8718 Series HF Receiver, Specifications

Tuning Range	5 kHz to 29.99999 MHz.
Detection Modes	Standard: AM, FM, CW.
Optional: LSB, USB, ISB.	
Frequency Display	7 digit, LED's.
Frequency Resolution/Readout	10 Hz.
Frequency Stability	6×10^{-8} per day, 2×10^{-6} per year.
Input Impedance	50 Ω , unbalanced, nominal.
Antenna Input Protection	The antenna input withstands the effects of RF power to +15 dBm and static build-up.
IF Bandwidths (3 dB)	Standard: 0.3, 1, 3.2, 6, and 16 kHz.
IF Shape Factor	IF BW 60 dB: 3 dB, Typical
	0.3 kHz 7.0:1
	1 kHz 4.5:1
	3.2 kHz 2.5:1
	6 kHz 2.3:1
	16 kHz 2.0:1
Sensitivity	(0.2-30 MHz, see CW Sensitivity for extended frequency range)
AM Sensitivity	
(6 kHz IF Bandwidth)	A 1.7 μ V signal 50% AM modulated at a 400 Hz rate produces at least a 10 dB (S+N)/N ratio at the audio output.
FM Sensitivity	
(16 kHz IF Bandwidth)	A 2.5 μ V signal FM modulated at a 400 Hz rate to a 4.8 kHz peak deviation produces at least a 17 dB (S+N)/N ratio at the audio output.
CW Sensitivity	
(0.3 kHz IF Bandwidth)	
200 kHz-30 MHz	A 0.4 μ V signal produces a 16 dB (S+N)/N ratio at the audio output.
50 kHz-200 kHz	A 0.63 μ V signal produces a 16 dB (S+N)/N ratio at the audio output.
15 kHz-50 kHz	A 1.4 μ V signal produces a 16 dB (S+N)/N ratio at the audio output.
5 kHz-15 kHz	A 63 μ V signal produces a 16 dB (S+N)/N ratio, typically at the audio output.
ISB, (USB, LSB) Sensitivity	
(3 kHz SSB Bandwidth)	A 0.56 μ V signal produces a 10 dB (S+N)/N ratio at the audio output.
Gain Control Modes	Manual, Fast AGC, Slow AGC.
AGC and Manual Range	100 dB, minimum.
AGC Threshold	3.0 μ V, typical.
AGC Attack Time	15 ms, maximum.
AGC Release Time	Fast AGC: 25 ms, maximum. Slow AGC: 4 sec, maximum.

Table 1-1. Type WJ-8718 Series HF Receiver, Specifications (Continued)

Audio Outputs:	
ISB Output	100 mW, maximum across 600 Ω .
Line Audio	1 W minimum, across 600 Ω for an input signal of 3 μ V, 30% AM modulated at a 400 Hz ratio.
Headphone Output*	30 mW, minimum, for an input signal of 3 μ V, 30% AM modulated at a 400 Hz rate.
Audio Distortion	Less than 5% at rated audio output.
Audio Frequency Response	± 1.5 dB from 100 Hz to 8 kHz, 1 kHz reference frequency.
Final IF Output	20 mV, minimum, into 50 Ω for input signals greater than 3.0 μ V.
Frequency Control	Manual or Remote options.
Synthesizer Lock-Up Time	3 ms, typical; 10 ms, maximum.
Synthesized BFO	455 kHz ± 8.9 kHz in 100 Hz steps.
IF Rejection	Greater than 90 dB.
Image Rejection	Greater than 90 dB.
Intermodulation Distortion:	
3rd Order Input Intercept Point	+20 dBm, minimum for signals separated by 30 kHz, (performance may degrade below 3 MHz).
Unwanted Sideband Rejection	50 dB at 350 Hz into unwanted sideband.
Reciprocal Mixing	With a desired signal of 25 μ V in the 3.2 kHz IF bandwidth, the desired signal-to-noise ratio is greater than 20 dB, when an undesired signal 70 dB higher in amplitude and 30 kHz removed in frequency is present.
Cross Modulation	With a desired signal of 10 μ V an undesired signal 70 dB higher, 30% AM modulated produces less than 10% cross modulation for frequency separation of greater than 50 kHz in the 1 kHz IF bandwidth.
Antenna Conducted Oscillator Radiation	-87 dBm, maximum.
Signal Meter	Indicates carrier level or line audio level.
Operating Temperature Range	0 $^{\circ}$ C to 50 $^{\circ}$ C.
Power Consumption	0.6 A at 115 Vac, approximately.
Power Requirements	110/220 Vac $\pm 15\%$ 48-420 Hz.
Power Interrupt	With Manual Control Module option, storage of frequency data automatically occur. Upon restoration of power, the receiver returns to the previously tuned frequency.

Table 1-1. Type WJ-8718 Series HF Receiver, Specification (Continued)

Size	5.25 inches high, 19 inches wide and 19.4 inches deep.
Weight	35 pounds (15.75 kilograms), approximately.

* **Note:** The stereo headphone output provides 30 mW for each output on on stereo phone plug. Refer to **Figure 1-2**.

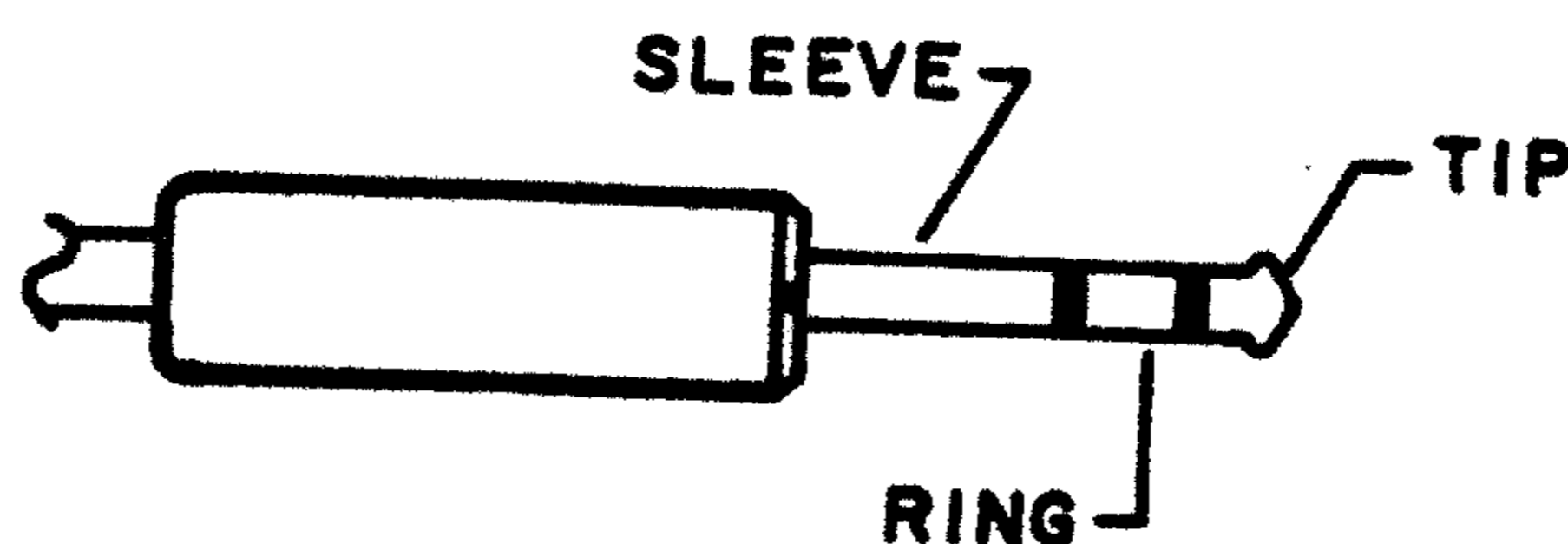


Figure 1-2. Tip-Ring-Sleeve Plug Outline Drawing.