

MAINTENANCE MANUAL

**TRANSMITTER/RECEIVER BOARD
CMN-232A/B FOR MLSL161 & MLSL261**

NOTICE!

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations, or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

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DESCRIPTION

The Transmitter/Receiver Board CMN-232A/B (A801) for the MLSL161/261 Two-way mobile FM radio provides 60W RF power Transmitter and dual conversion superheterodyne receiver for operation in the 29.7-42 MHz and 42-50 MHz frequency ranges and mounts in back of the radio frame assembly as shown in Figure 1 – Transmitter/Receiver Location. The CMN-232A operates in the 29.7-42 MHz frequency range and CMN-232B operates in the 42-50 MHz frequency range.

CIRCUIT ANALYSIS

TRANSMITTER

The transmitter consists of an exciter circuit, a power amplifier circuit, a power control circuit, an antenna relay circuit, a low pass filter, and a transmitter switch circuit (refer to Figure 2 – Block Diagram).

Exciter

The exciter is a two stage RF amplifier consisting of an attenuator at the input, amplifier transistors TR101 and TR102, and a low pass filter on the output. The modulated RF signal from the System Control/Frequency Synthesizer Board is applied to the input of the attenuator circuit at P101. The attenuator circuit (R101 through

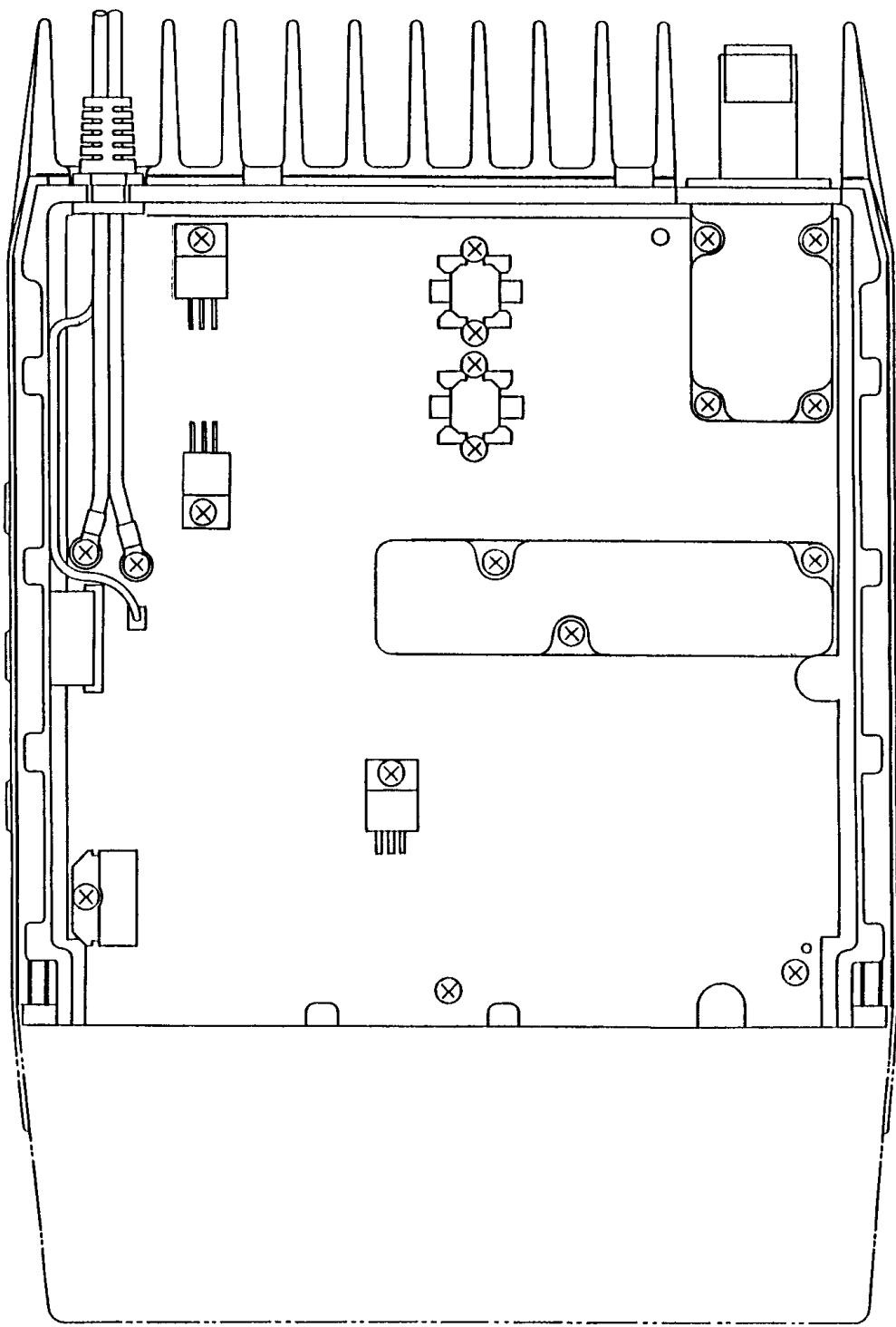
R103) provides approximately 2 dB attenuation to the RF signal before it is applied to the base circuit of transistor TR101 (Injection Amplifier). The RF input is amplified to provide 100 milliwatts drive to Pre-Driver transistor TR1 of the 60 Watt power amplifier circuit.

60 Watt PA

The exciter output is coupled through an attenuator pad (R1, R2, and R3), impedance matching transformer T1 and frequency compensator circuit capacitor C2 and resistor R4 to the base of Pre-Driver transistor TR1. Inductor L1, resistor R7, and diode CD1 set the bias voltage for TR1. Capacitor C3 and resistors R5 and R6 provide negative feedback to improve the stability of TR1. Collector voltage on TR1 is controlled by the Power Control Circuit and is applied through a decoupling network consisting of capacitors C5, C6, and C7.

The output of TR1 is coupled to the base of driver transistor TR2 through impedance matching transformer T2 and frequency compensator R9 and C55. Capacitor C8 provides impedance matching between T2 and the base of transistor TR2. Capacitor C9 and resistor R12 provide negative feedback and resistors R10 and R11 improve the stability of TR2.

Collector voltage to driver transistor TR2 is supplied through a decoupling network consisting of capacitors C11, C12, C13, and inductor L2.



RC-7864

Figure 1 – Transmitter/Receiver Location (Bottom View)

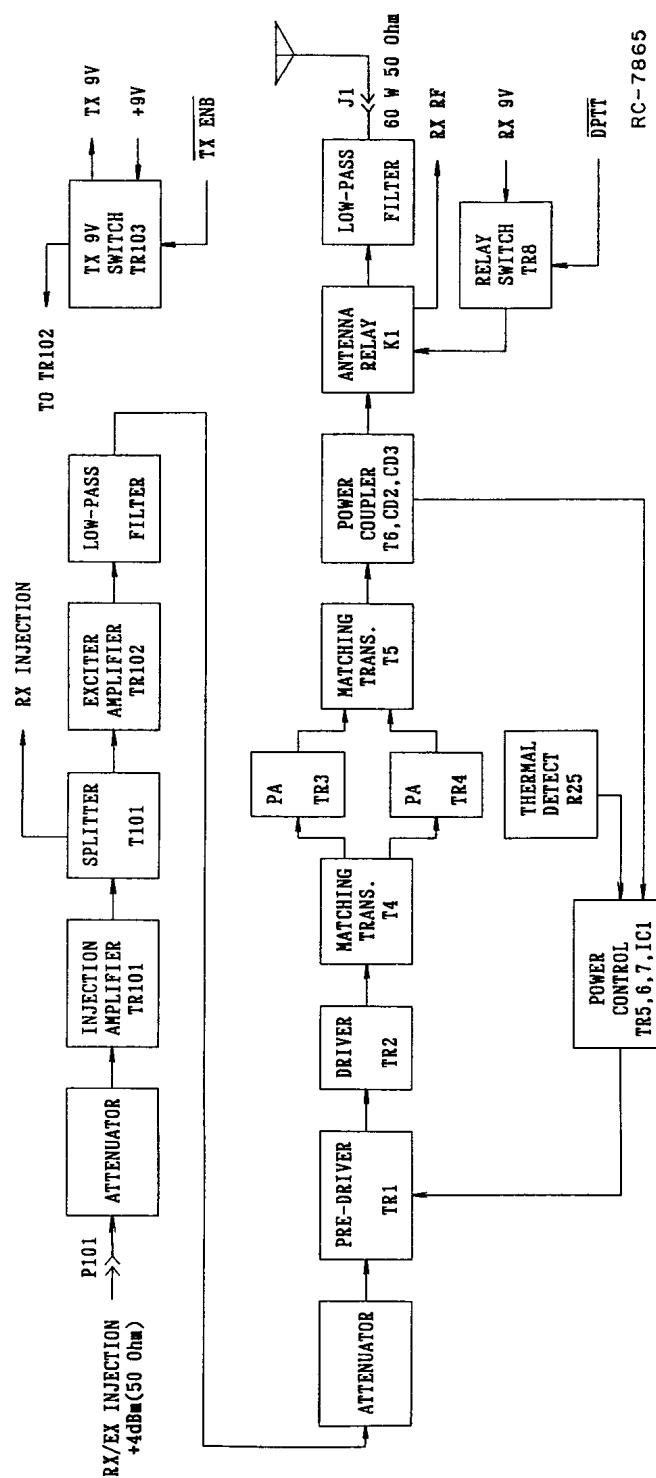


Figure 2 – Block Diagram

The RF output from TR2 passes through impedance matching transformer T3 and capacitor C10 (Note: This is a 50-ohm point and may be used for checking power levels). From transformer T3, RF passes through stabilizing resistor R13 to the input of transformer T4 that has a 4:1 turn ratio.

The final power amplifier circuit, consisting of transistors TR3 and TR4 and transformers T4 and T5, functions as a class-c push-pull power amplifier. Transformer T4 provides impedance matching and power splitting to the base circuits of TR3 and TR4. Capacitors C14 and C15 provide impedance matching to T4. Resistors R15 and R16 provide the base loading to TR3 and TR4. Capacitors C17 and C22 and resistors R14 and R17 provide negative feedback to improve the stability of TR3 and TR4. Transformer T5 provides impedance matching and power combining from the collector circuits of TR3 and TR4. Capacitors C18 and C23 provide impedance matching from the collector circuits.

Operating voltage for the power amplifier is supplied from the DC input through T5 and decoupling network consisting of capacitors C24, C25, C26, and inductor L3.

The output of the power amplifier passes through T5 to the low-pass filter network (LPF) consisting of capacitors C27, C28, C29, and inductor L5. (Note: This is a 50-ohm point and may be used for checking power levels.) The RF power passes through 50-ohm microstrips Z2 and Z3, directional coupler T6 and associated components, and transmit/receive relay K1 to the low-pass filter.

Antenna Relay

Antenna relay K1 is controlled by the delayed PTT (DPTT) output of the System Control/Synthesizer Board through J501. When the DPTT output goes low, antenna relay K1 picks up and couples the PA output through the low-pass filter to the antenna connector J1.

Automatic Power Control

The Automatic Power Control (APC) circuit protects the transmitter PA from damage due to excessive output power, reflected power or temperature by providing closed-loop RF power leveling and power turndown when it senses high VSWR load conditions. The output power control circuit allows the RF output power to be set at the rated output by POWER ADJ control RV1.

The APC circuitry consists of 9-volt switch /TRANSMIT ENABLE transistor TR103, power detect diode CD3, Thermal Detect transistor TR5, DC Amplifier IC1, DC Driver transistor TR7, and DC Pass transistor TR6.

Transistors TR6 and TR7, and IC1 serve as DC Amplifiers to supply voltage to the collector of TR1. The setting of variable resistor RV1 determines the voltage supplied to IC1-6. As the detected RF power increases, the voltage to IC1-6 increases, causing IC1 to pull current away from the base of TR7. This cuts back the drive to TR6 and, in turn, to TR7, which reduces voltage to the collector of TR1, decreasing the RF power output.

RF power is sensed by directional coupler T6 and its associated components. Forward power is sensed by diode CD3 and reflected power is sensed by diode CD2. Forward power is determined by the setting of RV1. Resistors R28 and R29 set the level of reflected RF power at which the control circuit reduces the RF output.

Thermal protection is provided by “posistor” R25 (PTH487A01BE222TS) and its associated components. A “posistor” is a thermistor-type device with a positive temperature coefficient. Posistor R25 is thermally connected to the body of power transistor TR4. As the temperature of TR4 increases above 90°C, the resistance of R25 increases and TR5 turns on. This lowers the voltage of IC1-5, which lowers the voltage at the collector of TR1, reducing the power output.

CAUTION

DO NOT operate the transmitter at levels higher than rated output. Operating at higher than rated output will shorten the life of the RF power transistors.

RECEIVER

A regulated 9.0 volts is provided to operate all receiver stages except the audio PA IC, which operates from the switched A+ (13.6 volts) supply.

The receiver has intermediate frequencies of 20.8 MHz and 455 kHz. Adjacent channel selectivity is obtained by using two band-pass filters: a 20.8 MHz crystal filter and a 455 kHz ceramic filter.

All of the receiver circuitry except the synthesizer and audio pre-amp is mounted on the Transmitter/Receiver board (refer to Figure 3 – Block Diagram). The receiver consists of:

- A Front End and First Mixer
- A 20.8 MHz First IF, a 455 kHz Second IF, and a FM Detector
- An Audio PA
- A Squelch Circuit

Receiver Front End

An RF signal from the antenna is coupled through the low-pass filter, ANTENNA SWITCH relay K1, and the RF band-pass filter to the input of RF amplifier TR401. The output of TR401 is coupled through RF low-pass filter to the input of first mixer CD451. Front end selectivity is provided by the RF band-pass filters.

Receiver Injection

The receiver RF injection frequency (50.5 MHz to 62.8 MHz/62.8 MHz to 70.8 MHz) from the synthesizer VCO is routed through RX/EX INJECTION connector P101 and applied to the first mixer CD451 via a low-pass filter. The input level at P101 will be between +1 dBm and +7 dBm.

First Mixer

The first mixer (CD451, T451, and T452) is a double-balanced diode mixer that converts an RF signal in the 29.7 MHz to 50 MHz frequency range to the first IF frequency of 20.8 MHz. In this mixer stage, RF from the receiver front end RF filter is applied to an input of the mixer. Injection voltage from the Synthesizer VCO is applied to another input of the mixer. The 20.8 MHz mixer first IF output signal is coupled from the output of the mixer through an impedance matching network (TR501 and L501) to a 4-pole crystal filter consisting of FL501-1 and FL501-2.

First IF

The highly-selective crystal filters FL501-1 and FL501-2 provide the first portion of the receiver's IF selectivity. The output to the filters is coupled through an impedance matching network consisting of inductor L505, capacitors C509 and C510, to the first IF amplifier transistor TR502. The amplifier provides approximately 20 dB of IF gain. The output of TR502 is coupled through impedance matching network inductor L510 to 2-pole crystal filter FL502 then coupled through impedance matching network inductor L512 to the input of second mixer IC502. The diode package CD501 provides limiting for the 20.8 MHz IF signal to prevent high level overload of IC502.

Second Mixer, Second IF, and FM Detector

IC module IC502 and associated circuitry provides the second oscillator, second mixer, second IF amplifier, and FM detector circuit. The 20.8 MHz IF input is applied to Pin 18 of IC502 and mixed with a 20.345 MHz frequency supplied by crystal oscillator X501. The output of the second mixer is coupled to 6-pole ceramic filter FL512, which provides the 455 kHz selectivity. The output of the 455 kHz ceramic filter is re-applied to

IC502-5. The second IF signal is amplified and limited. Inductor L513 shifts the signal by 90° and applies it to the internal FM detector circuit. The FM detector compares the shifted IF signal to the internal IF signal to recover the audio modulation. The audio output of IC502 is applied to the System Control/Frequency Synthesizer Board (A801) through the base of audio buffer transistor TR531.

Squelch Circuit

The squelch circuit senses the noise components contained in the FM detector audio output. The squelch input is applied to Pin 12 of IC502 from audio buffer transistor TR531. An internal circuit of IC502 provides filtering and applies received noise in the 6-8 kHz frequency band to the Squelch Adjust potentiometer RV531. The output of the squelch adjust potentiometer is connected to the noise detector. The noise detector consists of resistor R540, capacitor C537, and diode CD531. As the noise increases in magnitude in a negative direction, negative spikes cause CD531 to conduct and charge capacitors C537 and C538 to a DC level proportionate to the noise level. The output of the noise detector is applied to the input of a squelch trigger circuit consisting of transistors TR532 through TR535. The squelch trigger has approximately 3 dB of hysteresis to prevent sudden noise level changes from affecting the squelch threshold setting. Resistor R538 provides temperature compensation for the squelch circuit. The output of squelch trigger is the Carrier Activity Sensor (CAS). The CAS output is applied to the System Control/Frequency Synthesizer Board.

Audio Circuits

Received audio (RX IN) from the FM detector is applied to the input of the audio pre-amplifier IC601-A on System Control/Frequency Synthesizer Board (A801) (refer to Maintenance Manual LBI-38437). The audio is then applied through Tone Reject Filter HC601, audio gate IC603-C and pre-amplifier IC601-B to the Volume Control IC602. The audio output (VR OUT) from the Volume Control IC is applied through audio pre-amplifier IC601-D to the de-emphasis network, consisting of resistors R551 and R552 and capacitors C552 and C553 on the Transmitter/Receiver Board. This enables audio amplifier IC551 that provides up to 4 watts of audio output power to the 4-ohm speaker.

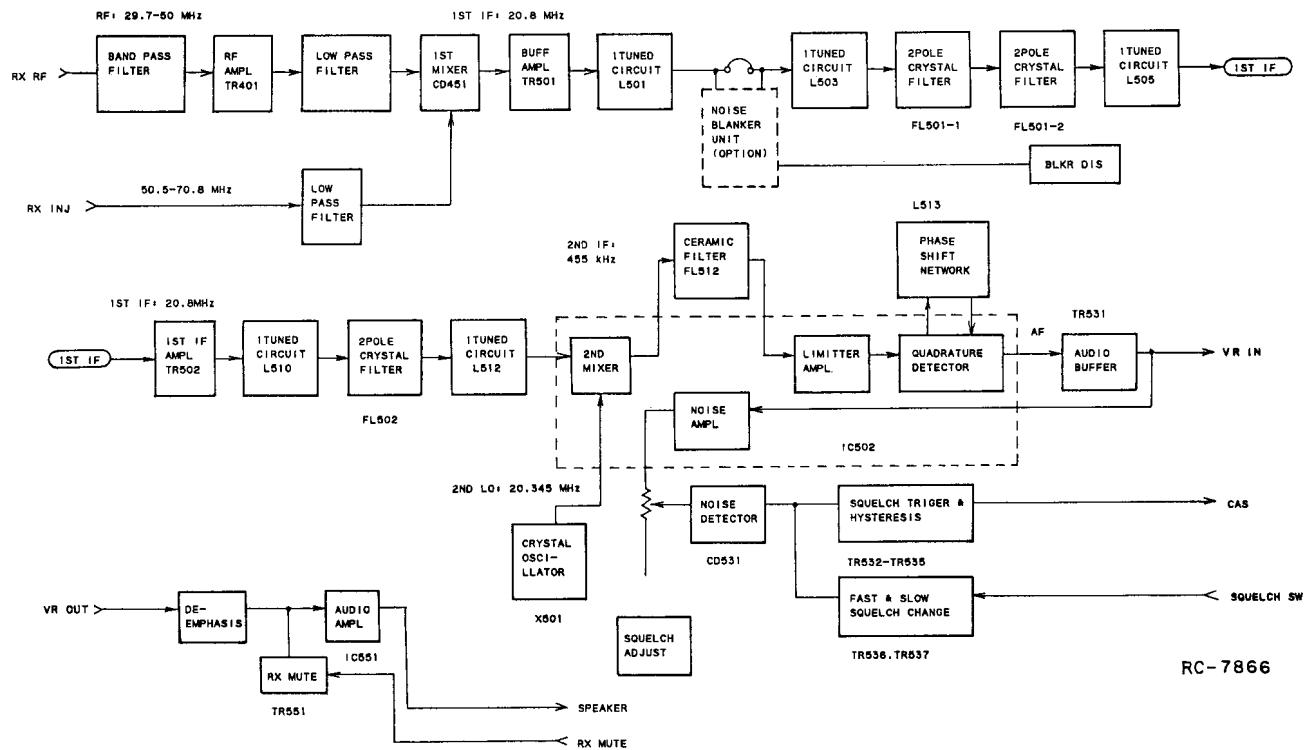
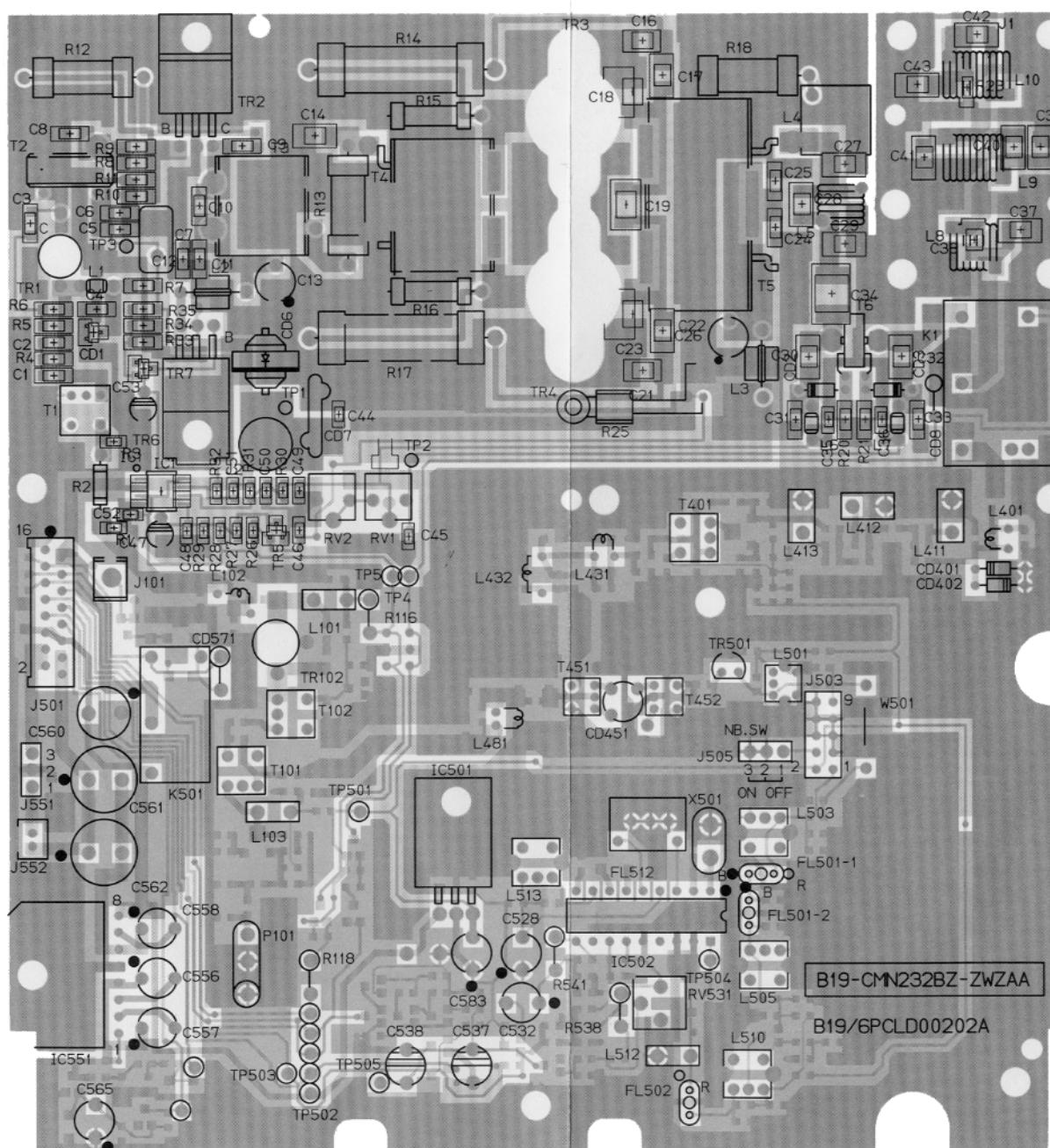
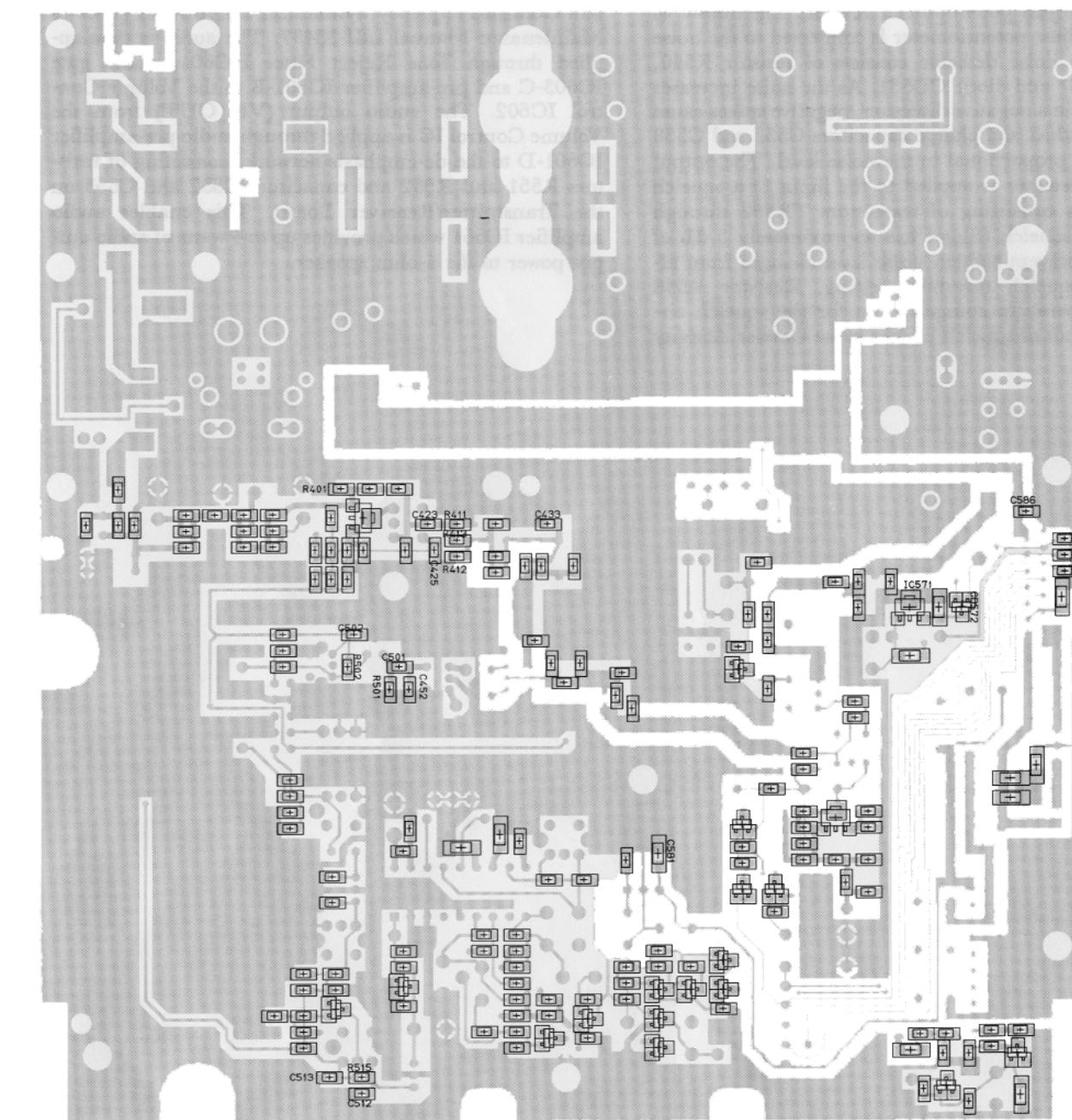


Figure 3 – Block Diagram

COMPONENT SIDE

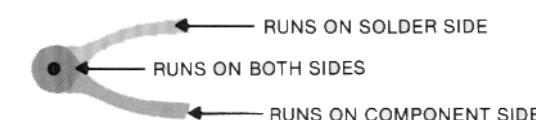


SOLDER SIDE

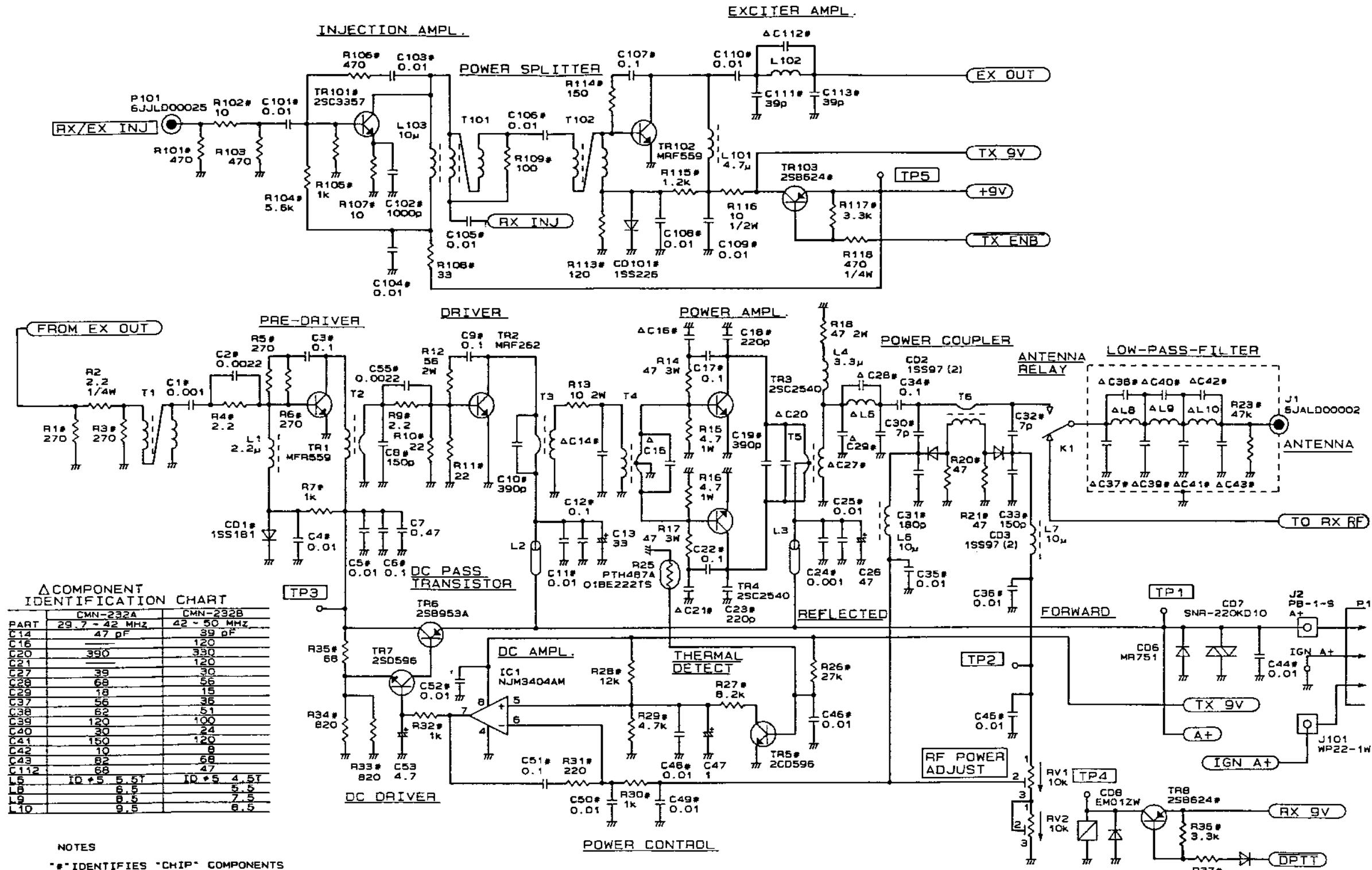


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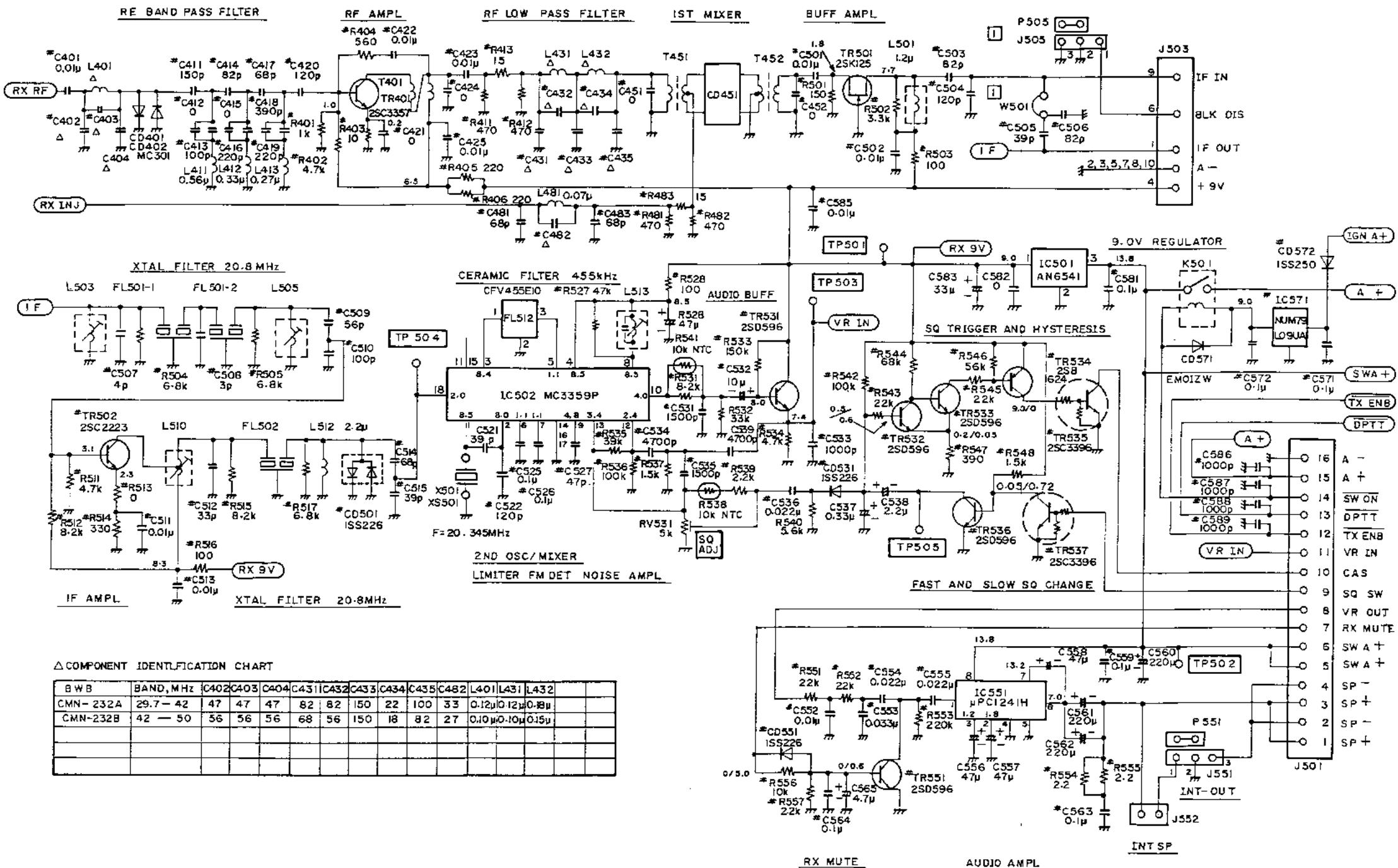
TRANSMITTER/RECEIVER BOARD



TRANSMITTER CMN-232-1

SCHEMATIC DIAGRAM

LBI-38436B



PARTS LIST

TRANSMITTER SECTION
MLS-II (LOW BAND)
CHN-232-1
ISSUE 2

SYMBOL	PART NO.	DESCRIPTION
		B19/CMMN-232A (29.7-42 MHz) B19/CMMN-232B (42-50 MHz)
C1	B19/5CAAD01267	- - - - - CAPACITORS - - - - - Ceramic: 1000 pF ±10%, 50 VDCW.
C2	B19/5CAAD00781	Ceramic: 2200 pF ±10%, 50 VDCW, Temp coef ±10%.
C3	B19/5CAAD01268	Ceramic: 0.1 uF +80-20%, 50 VDCW, Temp coef +30-80%.
C4 and C5	B19/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±10%.
C6	B19/5CAAD01268	Ceramic: 0.1 uF +80-20%, 50 VDCW, Temp coef +30-80%.
C7	B19/5CRAAA00838	Polyester: 0.47 pF ±5%, 500 VDCW, Temp coef ±15%.
C8	B19/5CAAD00870	Ceramic: 150 pF ±5%, 500 VDCW, Temp coef 0±60 PPM.
C9	B19/5CAAD01268	Ceramic: 0.1 uF ±80-20%, 50 VDCW, Temp coef +30-80%.
C10	B19/5CAAD00786	Ceramic: 390 pF ±5%, 50 VDCW, Temp coef ±15%.
C11	B19/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±10%.
C12	B19/5CAAD01268	Ceramic: 0.1 uF +80-20%, 50 VDCW, Temp coef +30-80%.
C13	B19/5CEAAA02283	Electrolytic: 33 uF ±20%, 25 VDCW.
C14	B19/5CRAAA03080	Ceramic: 47 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C14	B19/5CRAAA03100	Ceramic: 39 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C15	B19/5CMAB00139	Mica: 330 pF ±5%, 500 VDCW, Temp coef 0±60 PPM.
C16	B19/5CAAD03078	Ceramic: 120 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C17	B19/5CRAAA03083	Ceramic: 0.1 uF +80-20%, 50 VDCW.
C18	B19/5CRAAA03097	Ceramic: 220 pF ±5%, 500 VDCW, Temp coef 0±60 PPM.
C19	B19/5CMAB01469	Mica: 390 pF ±5%, 100 VDCW.
C20	B19/5CMAB00140	Mica: 390 pF ±5%, 500 VDCW. (Used in A).
C20	B19/5CMAB00139	Mica: 330 pF ±5%, 500 VDCW. (Used in B).
C21	B19/5CRAAA03078	Ceramic: 120 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C22	B19/5CRAAA03083	Ceramic: 0.1 uF +80-20%, 50 VDCW.
C23	B19/5CAAD03097	Ceramic: 220 pF ±5%, 500 VDCW, Temp coef 0±60 PPM.
C24	B19/5CAAD01267	Ceramic: 1000 pF ±10%, 50 VDCW.
C25	B19/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±10%.
C26	B19/5CEAAA01817	Electrolytic: 47 uF ±20%, 50 VDCW.
C27	B19/5CRAAA03100	Ceramic: 39 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C27	B19/5CRAAA03081	Ceramic: 30 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C28	B19/5CRAAA03090	Ceramic: 68 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C28	B19/5CRAAA03095	Ceramic: 56 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C29	B19/5CRAAA03085	Ceramic: 18 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C29	B19/5CRAAA03101	Ceramic: 15 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C30	B19/5CRAAA03102	Ceramic: 7 pF ±5%, 500 VDCW, Temp coef 0±60 PPM.
C31	B19/5CAAD01065	Ceramic: 180 pF ±5%, 50 VDCW, Temp coef 0±60 PPM.
C32	B19/5CAAD03102	Ceramic: 7 pF ±5%, 500 VDCW, Temp coef 0±60 PPM.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NO.	DESCRIPTION
C33	B19/5CAAD00870	Ceramic: 150 pF ±5%, 50 VDCW, Temp coef 0±60 PPM.
C34	B19/5CBAB02003	Ceramic: 0.01 uF ±5%, 50 VDCW, Temp coef 0±60 PPM.
C35 and C36	B19/5CAAD01385	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±10%.
C37	B19/5CAAA03095	Ceramic: 56 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C37	B19/5CRAAA03131	Ceramic: 36 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C38	B19/5CRAAA03259	Ceramic: 62 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C38	B19/5CRAAA03266	Ceramic: 51 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C39	B19/5CAAA03078	Ceramic: 120 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C39	B19/5CAAA03091	Ceramic: 100 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C40	B19/5CAAA03081	Ceramic: 30 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C40	B19/5CAAA03088	Ceramic: 24 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C41	B19/5CRAAA03260	Ceramic: 150 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C41	B19/5CRAAA03076	Ceramic: 120 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C42	B19/5CRAAA03094	Ceramic: 10 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C42	B19/5CRAAA03103	Ceramic: 8 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C43	B19/5CAAA03096	Ceramic: 82 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in A).
C43	B19/5CAAA03090	Ceramic: 68 pF ±5%, 500 VDCW, Temp coef 0±60 PPM. (Used in B).
C44 thru C46	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C47	B19/5CSAC00982	Tantalum: 1 uF ±10%, 35 VDCW.
C48 thru C50	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C51	B19/5CAAD01078	Ceramic: 0.1 uF ±80-20%, 50 VDCW, Temp coef ±30-80%.
C52	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C53	B19/5CSAC01409	Tantalum: 4.7 uF ±10%, 16 VDCW.
C55	B19/5CAAD00781	Ceramic: 2200 pF ±10%, 500 VDCW, Temp coef ±10%.
C101	B19/5CAAD01385	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±10%.
C102	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, Temp coef ±15%.
C103 thru C106	B19/5CAAD01385	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±10%.
C107	B19/5CAAD01078	Ceramic: 0.1 uF ±80-20%, 50 VDCW, Temp coef ±30-80%.
C108 thru C110	B19/5CAAD01385	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±10%.
C111	B19/5CAAD00955	Ceramic: 39 pF ±5%, 50 VDCW, Temp coef 0±30 PPM/C°.
C112	B19/5CAAD00947	Ceramic: 68 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C112	B19/5CAAD00854	Ceramic: 47 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C113	B19/5CAAD00955	Ceramic: 39 pF ±5%, 50 VDCW, Temp coef ±15%.
CD1	B19/5TXAD00356	Silicon, Fast Recovery (2 diode in cathode common): sim to TOSHIBA ISS181.
CD2 and CD3	B19/5TXAD00313	Silicon, Schottky Barrier: sim to NEC ISS97 (2).
CD6	B19/5TXAM00019	Silicon, Fwd current 3A, 200 PIV: sim to MOTOROLA MR751.
CD7	B19/5TZAA00104	Ceramic Varistor: sim to SANKEN, SNR-220KD10.

SYMBOL	PART NO.	DESCRIPTION
CD8	B19/5TXAN00068	Silicon: 2001A, sim to SANKEN EMOIZW.
CD9	B19/5TXAD00356	Silicon, Fast Recovery (2 diode in cathode common): sim to TOSHIBA ISS181.
CD101	B19/5TXAD00320	Silicon, Fast Recovery (2 diode in cathode common): sim to TOSHIBA ISS226.
I1	B19/5DAAN00202	- - - - - INTEGRATED CIRCUITS - - - - - Linear, Dual OP AMP: sim to NJRC NJM3404AM.
J1	B19/6JALD00002	- - - - - CONNECTORS - - - - - Connector.
J2	B19/5JTCW00060	Connector.
J101	B19/5JDAS00001	Connector.
K1	B19/5KLAD00057	- - - - - RELAYS - - - - - Relay: DC9V, drive current 39 mA. sim to ARG3909.
L1	B19/5LCAA00600	- - - - - COILS - - - - - Coil, RF 2.2 uH.
L2 and L3	B19/6LAFD01129	Coil, RF.
L4	B19/5LZNL00004	Coil, RF 3.3 uH.
L5	B19/5LZAV00033	Coil, RF. (Used in A).
L5	B19/5L2AV00038	Coil, RF. (Used in B).
L6	B19/5LCAA00695	Coil, RF 10 uH ±10%.
L7	B19/5LCAA00232	Coil, RF 10 uH ±10%.
L8	B19/5LZAV00034	Coil, RF. (Used in A).
L8	B19/5LZAV00033	Coil, RF. (Used in B).
L9	B19/5LZAV00035	Coil, RF. (Used in A).
L9	B19/5L2AV00039	Coil, RF. (Used in B).
L10	B19/5LZAV00036	Coil, RF. (Used in A).
L10	B19/5LZAV00035	Coil, RF. (Used in B).
L101	B19/5LCAA00510	Coil, RF.
L102	B19/5LZAV00037	Coil, RF.
L103	B19/5LCAA00232	Coil, RF.
P1	B19/6ZCLD00004A	- - - - - PLUGS - - - - - Power cable.
P101	B19/6JJLD15135	Connector, RF.
R1	B19/5RDAC02555	- - - - - RESISTORS - - - - - Metal film: 270 ohms ±5%, 200 VDCW, 1/10 w.
R2	B19/5RDAC01217	Metal film: 22 ohms ±5%, 200 VDCW, 1/4 w.
R3	B19/5RDAC02555	Metal film: 270 ohms ±5%, 200 VDCW, 1/10 w.
R4	B19/5RDAC02223	Metal film: 2.2 ohms ±5%, 100 VDCW, 1/8 w.
R5 and R6	B19/5RDAC02163	Metal film: 270 ohms ±5%, 100 VDCW, 1/8 w.
R7	B19/5RDAC02132	Metal film: 1K ohms ±5%, 100 VDCW, 1/8 w.
R9	B19/5RDAC02223	Metal film: 2.2 ohms ±5%, 100 VDCW, 1/10 w.
R10 and R11	B19/5RDAC02210	Metal film: 22 ohms ±5%, 100 VDCW, 1/8 w.
R12	B19/5REAG00080	Metal film: 56 ohms ±5%, 100 VDCW, 2 w.
R13	B19/5REAG00048	Metal film: 10 ohms ±5%, 350 VDCW, 2 w.
R14	B19/5REAG01464	Metal film: 47 ohms ±5%, 500 VDCW, 3 w.
R15 and R16	B19/5REAG00412	Metal film: 4.7 ohms ±5%, 100 VDCW, 1 w.
R17	B19/5REAG01464	Metal film: 47 ohms ±5%, 500 VDCW, 3 w.
R18	B19/5REAG00035	Metal film: 47 ohms ±5%, 500 VDCW, 2 w.
R20 and R21	B19/5RDAC02149	Metal film: 47 ohms ±5%, 200 VDCW, 1/8 w.

SYMBOL	PART NO.	DESCRIPTION

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PARTS LIST

LBI-38436B

PARTS LIST

RECEIVER SECTION
MLS
(LOW BAND)
CMN-232-2
ISSUE 1

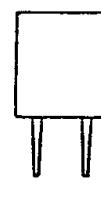
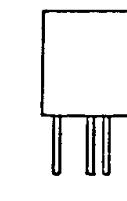
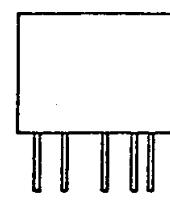
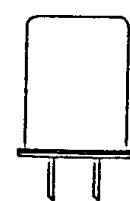
SYMBOL	PART NO.	DESCRIPTION
		B19/CMN-232A (29.7-42 MHz) B19/CMN-232B (42-50 MHz)
		- - - - - CAPACITORS - - - - -
C401	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C402	B19/5CAAD00854	Ceramic: 47 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C402	B19/5CAAD00969	Ceramic: 56 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C403	B19/5CAAD00854	Ceramic: 47 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C403	B19/5CAAD00969	Ceramic: 56 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C404	B19/5CAAD00854	Ceramic: 47 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C404	B19/5CAAD00969	Ceramic: 56 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C411	B19/5CAAD00958	Ceramic: 150 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C413	B19/5CAAD00839	Ceramic: 100 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C414	B19/5CAAD00960	Ceramic: 82 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C416	B19/5CAAD00954	Ceramic: 220 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C417	B19/5CAAD00947	Ceramic: 68 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C418	B19/5CAAD00974	Ceramic: 390 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C419	B19/5CAAD00954	Ceramic: 220 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C420	B19/5CAAD00970	Ceramic: 120 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C422 and C423	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C425	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C431	B19/5CAAD00960	Ceramic: 82 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C431	B19/5CAAD00947	Ceramic: 68 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C432	B19/5CAAD00960	Ceramic: 82 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C432	B19/5CAAD00969	Ceramic: 56 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C433	B19/5CAAD00958	Ceramic: 150 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C434	B19/5CAAD00840	Ceramic: 22 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C434	B19/5CAAD00963	Ceramic: 18 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C435	B19/5CAAD00839	Ceramic: 100 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C435	B19/5CAAD00960	Ceramic: 82 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C481	B19/5CAAD00947	Ceramic: 68 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C482	B19/5CAAD00948	Ceramic: 33 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A).
C482	B19/5CAAD00952	Ceramic: 27 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C483	B19/5CAAD00947	Ceramic: 68 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in B).
C501 and C502	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C503	B19/5CAAD00960	Ceramic: 82 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NO.	DESCRIPTION
C504	B19/5CAAD00970	Ceramic: 120 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C505	B19/5CAAD00955	Ceramic: 39 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C506	B19/5CAAD00960	Ceramic: 82 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C507	B19/5CAAD00961	Ceramic: 4 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM.
C508	B19/5CAAD00853	Ceramic: 3 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM.
C509	B19/5CAAD00969	Ceramic: 56 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C510	B19/5CAAD00839	Ceramic: 100 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C511	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C512	B19/5CAAD00948	Ceramic: 33 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C513	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C514	B19/5CAAD00947	Ceramic: 68 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C515	B19/5CAAD00955	Ceramic: 39 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C521	B19/5CAAD00955	Ceramic: 39 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C522	B19/5CAAD00970	Ceramic: 120 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C525 and C526	B19/5CAAD01237	Ceramic: 0.1 uF ±10%, 25 VDCW, Temp coef ±15%.
C527	B19/5CAAD01675	Ceramic: 47 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C528	B19/5CEAA01982	Electrolytic: 47 uF ±20%, 16 VDCW.
C531	B19/5CAAD01478	Ceramic: 1500 pF ±5%, 50 VDCW, Temp coef +350 -1000 PPM.
C532	B19/5CEAA01864	Electrolytic: 10 uF ±20%, 25 VDCW.
C533	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, Temp coef ±15%.
C534	B19/5CAAD00957	Ceramic: 4700 pF ±10%, 50 VDCW, Temp coef ±15%.
C535	B19/5CAAD01478	Ceramic: 1500 pF ±5%, 50 VDCW, Temp coef +350 -1000 PPM.
C536	B19/5CAAD01366	Ceramic: 0.022 uF ±10%, 50 VDCW, Temp coef ±15%.
C537	B19/5CSAC01151	Tantalum: 0.33 uF ±20%, 35 VDCW.
C538	B19/5CSAC01069	Tantalum: 2.2 uF ±20%, 35 VDCW.
C539	B19/5CAAD00957	Ceramic: 4700 pF ±10%, 50 VDCW, Temp coef ±15%.
C552	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C553	B19/5CAAD01595	Ceramic: 0.033 uF ±10%, 50 VDCW, Temp coef ±15%.
C554 and C555	B19/5CAAD01366	Ceramic: 0.022 uF ±10%, 50 VDCW, Temp coef ±15%.
C556 thru C558	B19/5CEAA01982	Electrolytic: 47 uF ±20%, 16 VDCW.
C559	B19/5CAAD01237	Ceramic: 0.1 uF ±10%, 25 VDCW, Temp coef ±15%.
C560	B19/5CEAA01844	Electrolytic: 220 uF ±20%, 25 VDCW.
C561 and C562	B19/5CEAA01657	Electrolytic: 220 uF ±20%, 16 VDCW.
C563 and C564	B19/5CAAD01237	Ceramic: 0.1 uF ±10%, 25 VDCW, Temp coef ±15%.
C565	B19/5CEAA02084	Electrolytic: 4.7 uF ±20%, 35 VDCW.
C571 and C572	B19/5CAAD01237	Ceramic: 0.1 uF ±10%, 25 VDCW, Temp coef ±15%.
C581	B19/5CAAD01237	Ceramic: 0.1 uF ±10%, 25 VDCW, Temp coef ±15%.
C583	B19/5CEAA02283	Electrolytic: 33 uF ±20%, 25 VDCW.
C585	B19/5CAAD00959	Ceramic: 0.01 uF ±10%, 50 VDCW, Temp coef ±15%.
C586 thru C589	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, Temp coef ±15%.
CD401 and CD402	B19/5TXAR00023	... - - - - - DIODES - - - - -
CD451	B19/5TXAA00334	Silicon: Schottky Barrier Diode Quad, sim to NEC ND487C1-3R.
CD501	B19/5TXAD00320	Silicon: Fast Recovery (2 diodes in series); sim to TOSHIBA ISS226.

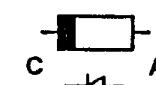
SYMBOL	PART NO.	DESCRIPTION
CD531	B19/5TXAD00320	Silicon: Fast Recovery (2 diodes in series); sim to TOSHIBA ISS226.
CD551	B19/5TXAD00320	Silicon: Fast Recovery (2 diodes in series); sim to TOSHIBA ISS226.
CD571	B19/5TXAN00068	Silicon: 200V 1A, sim to SANKEN EMO1Z.
CD572	B19/5TXAD00625	Silicon: Fast Recovery; sim to TOSHIBA ISS250.
FL501	B19/5XHAA00784	- - - - - FILTER- - - - -
FL502	B19/5XHAA00785	Crystal filter: 20.8 MHz 4 poles.
FL512	B19/5NRRA00144	Crystal filter: 455 KHz; sim to MURATA CFV455E10.
IC501	B19/5DAAR00021	- - - - - INTEGRATED CIRCUIT - - - - -
IC502	B19/5DDAS00074	Linear, Positive Voltage Regulator: sim to MATSUSHITA AN6541.
IC551	B19/5DAAA00245	Linear, Low Power Narrowband FM IF: sim to MOTOROLA MC3359P.
IC571	B19/5DAAN00483	Linear, Audio Amplifier: sim to NEC UPC1241H.
J501	B19/5JWBS00240	Connector, 16 pins: sim to HIROSE FH3-16S-1.25DS(G).
J503	B19/5JPAL00007	Connector, 10 pins.
J505	B19/5JTCA00137	Connector, 3 pins.
J551	B19/5JTCA00137	Connector, 3 pins.
J552	B19/5JWDAN00121	Connector, 2 pins.
P505	B19/5JDAN00012	Connector, 2 pins.
P551	B19/5JDAN00012	Connector, 2 pins.
K501	B19/5KLAC00112	- - - - - RELAYS - - - - -
L401	B19/6LALD10012	Relay: 9VDC, 3A; sim to TAKAMIZAWA JY9H-K.
L401	B19/6LALD10010	- - - - - COILS - - - - -
L401	B19/6LALD10010	Coil, RF. (Used in A).
L401	B19/6LALD10010	Coil, RF. (Used in B).
L431	B19/6LALD10012	Coil, RF. (Used in A).
L432	B19/6LALD10018	Coil, RF. (Used in A).
L432	B19/6LALD10015	Coil, RF. (Used in B).
L411	B19/5LAAA00061	Coil, RF 0.56 uH ±10%.
L412	B19/5LAAA00060	Coil, RF 0.33 uH ±10%.
L413	B19/5LAAA00063	Coil, RF 0.27 uH ±10%.
L481	B19/6LALD10007	Coil, RF 0.07 uH ±5%.
L501	B19/6LALD00034	Coil, RF.
L503	B19/6LALD00085	Coil, RF.
L505	B19/6LALD00085	Coil, RF.
L510	B19/6LALD00086	Coil, RF.
L512	B19/5LCAA00600	Coil, RF.
L513	B19/5LAL00004	Coil, RF.
R401	B19/5RDAC02446	- - - - - RESISTORS - - - - -
R402	B19/5RDAC02478	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R403	B19/5RDAC02450	Metal film: 4.7K ohms ±5%, 100 VDCW, 1/10 w.
R404	B19/5RDAC02552	Metal film: 10 ohms ±5%, 100 VDCW, 1/10 w.
R405 and R406	B19/5RDAC02469	Metal film: 560 ohms ±5%, 100 VDCW, 1/10 w.
R411 and R412	B19/5RDAC02471	Metal film: 470 ohms ±5%, 100 VDCW, 1/10 w.

SYMBOL	PART NO.	DESCRIPTION	SYMBOL	PART NO.	DESCRIPTION
R481 and R482	B19/5RDAC02471	Metal film: 470 ohms $\pm 5\%$, 100 VDCW, 1/10 w.	TR534	B19/5TBAB00055	Silicon, PNP: sim to NEC 2SB624 (BV3).
R483	B19/5RDAC02464	Metal film: 15 ohms $\pm 5\%$, 100 VDCW, 1/10 w.	TR535	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
R501	B19/5RDAC02468	Metal film: 150 ohms $\pm 5\%$, 100 VDCW, 1/10 w.	TR536	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596 (DV3).
R502	B19/5RDAC02462	Metal film: 3.3K ohms $\pm 5\%$, 100 VDCW, 1/10 w.	TR537	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
R503	B19/5RDAC02447	Metal film: 100 ohms $\pm 5\%$, 100 VDCW, 1/10 w.	TR551	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596 (DV3).
R504 and R505	B19/5RDAC02458	Metal film: 6.8K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			- - - - - WIRES - - - - -
R511	B19/5RDAC02478	Metal film: 4.7K ohms $\pm 5\%$, 100 VDCW, 1/10 w.	W501	B19/5ZCBJ00001	Jumper Wire.
R512	B19/5RDAC02479	Metal film: 8.2K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			- - - - - CRYSTALS - - - - -
R513	B19/5RDAC02581	Metal film: 0 ohms.	X501	B19/5XHAA00786	Crystal: F=20.345 MHz.
R514	B19/5RDAC02470	Metal film: 33 ohms $\pm 5\%$, 100 VDCW, 1/10 w.	XS501A and XS501B	B19/5ZJDF00001	Crystal Socket.
R515	B19/5RDAC02479	Metal film: 8.2K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R516	B19/5RDAC02447	Metal film: 100 ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R517	B19/5RDAC02458	Metal film: 6.8K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R527	B19/5RDAC02439	Metal film: 47K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R528	B19/5RDAC02447	Metal film: 100 ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R531	B19/5RDAC02479	Metal film: 8.2K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R532	B19/5RDAC02483	Metal film: 33 ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R533	B19/5RDAC02455	Metal film: 150K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R534	B19/5RDAC02478	Metal film: 4.7K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R535	B19/5RDAC02484	Metal film: 39K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R536	B19/5RDAC02449	Metal film: 100K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R537	B19/5RDAC02474	Metal film: 1.5K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R538	B19/5RZBX00002	Thermal: 10K ohms; sim to TDK NTCDS40203HG 103JC.			
R539	B19/5RDAC02451	Metal film: 2.2K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R540	B19/5RDAC02452	Metal film: 5.6K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R541	B19/5RZBX00002	Thermal: 10K ohms; sim to TDK NTCDS40203HG 103JC.			
R542	B19/5RDAC02449	Metal film: 100K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R543	B19/5RDAC02454	Metal film: 22K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R544	B19/5RDAC02485	Metal film: 68K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R545	B19/5RDAC02454	Metal film: 22K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R546	B19/5RDAC02444	Metal film: 56 ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R547	B19/5RDAC02491	Metal film: 390 ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R548	B19/5RDAC02474	Metal film: 1.5K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R551 and R552	B19/5RDAC02454	Metal film: 22K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R553	B19/5RDAC02453	Metal film: 220K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R554 and R555	B19/5RDAC02223	Metal film: 2.2 ohms $\pm 5\%$, 200 VDCW, 1/8 w.			
R556	B19/5RDAC02445	Metal film: 10K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
R557	B19/5RDAC02451	Metal film: 2.2K ohms $\pm 5\%$, 100 VDCW, 1/10 w.			
RV531	B19/5RVAB00277	Variable: 5K ohms $\pm 30\%$, 0.1 w.			
		- - - - - TRANSFORMERS - - - - -			
T401	B19/6LAFD01136	RF Transformer.			
T451 and T452	B19/6LHLD00005	RF Transformer.			
		- - - - - TRANSISTORS - - - - -			
TR401	B19/5TCAB00287	Silicon, NPN: sim to NEC 2SC3357.			
TR501	B19/5TKAH00006	N-Channel, field effect. (Junction Single Gate): sim to SONY 2SK125.			
TR502	B19/5TCAB00238	Silicon, NPN: sim to NEC 2SC2223(F14).			
TR531 and TR532	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596 (DV3).			
TR533	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596 (DV3).			

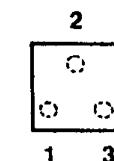


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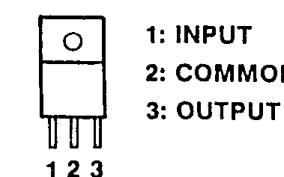
**LEAD IDENTIFICATION
FOR DIODES
(TOP VIEW)**



**LEAD IDENTIFICATION
FOR RV1, RV2, RV53I
(TOP VIEW)**



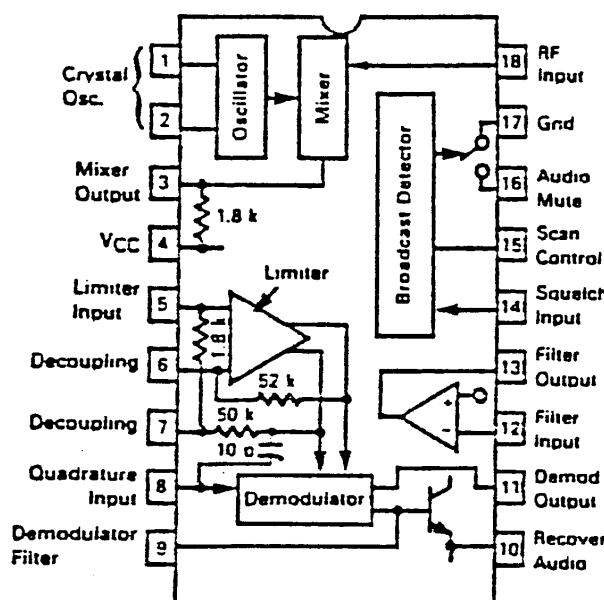
**LEAD IDENTIFICATION
FOR IC101, IC501
(TOP VIEW)**



RC-7719

RC-7720

RC-7716



RC- 7740

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