MAINTENANCE MANUAL
RECEIVER BOARD CMA-256A/B
FOR
MLSL160 & MLSL260
TWO-WAY MOBILE RADIO COMBINATIONS

TABLE OF CONTENTS

DESCRIPTION

The MLS FM dual conversion, superheterodyne receiver board (CMA-256A/B) is designed for operation in the 29.7 MHz to 42 MHz and 42 MHz to 50 MHz frequency ranges. This board mounts in the front and bottom of the radio frame assembly as shown in Figure 1. The CMA-256A board operates in the 29.7 MHz to 42 MHz frequency range and the CMA-256B board operates in the 42 MHz to 50 MHz frequency range.

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

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, audio preamp and audio PA are mounted on the receiver (RX) board (refer to Figure 2 - Block Diagram). The receiver consists of:

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

CIRCUIT ANALYSIS

Receiver Front End

An RF signal from the antenna is coupled through the low pass filter, ANTENNA SWITCH relay K1 and RF band pass filter FL401 to the input of RF amplifier HC401. The output of HC401 is coupled through RF band pass filter FL402 to the input of first mixer HC402. The receiver front end selectivity is provided by the RF band pass filters.

Receiver Injection

The receiver board RF injection frequency (50.5 MHz to 62.8 MHz/62.8 MHz to 70.8 MHz) from the synthesizer VCO is applied to amplifier HC403 through RX INJECTION connector J402. The input level at J402 is between 0.5 and 1.0 milliwatts, 0.65 milliwatts minimum. The output of amplifier HC403 is filtered by injection filter FL404. This filter is tuned to pass frequencies in the 50.5 MHz to 70.8 MHz band pass range.

First Mixer

First mixer HC402 is a double balanced diode mixer that converts a 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 FL402 is applied to an input of the mixer at HC402, Pin 8. Injection voltage from the amplifier stages is applied to another input of the mixer at Pin 1. The 20.8

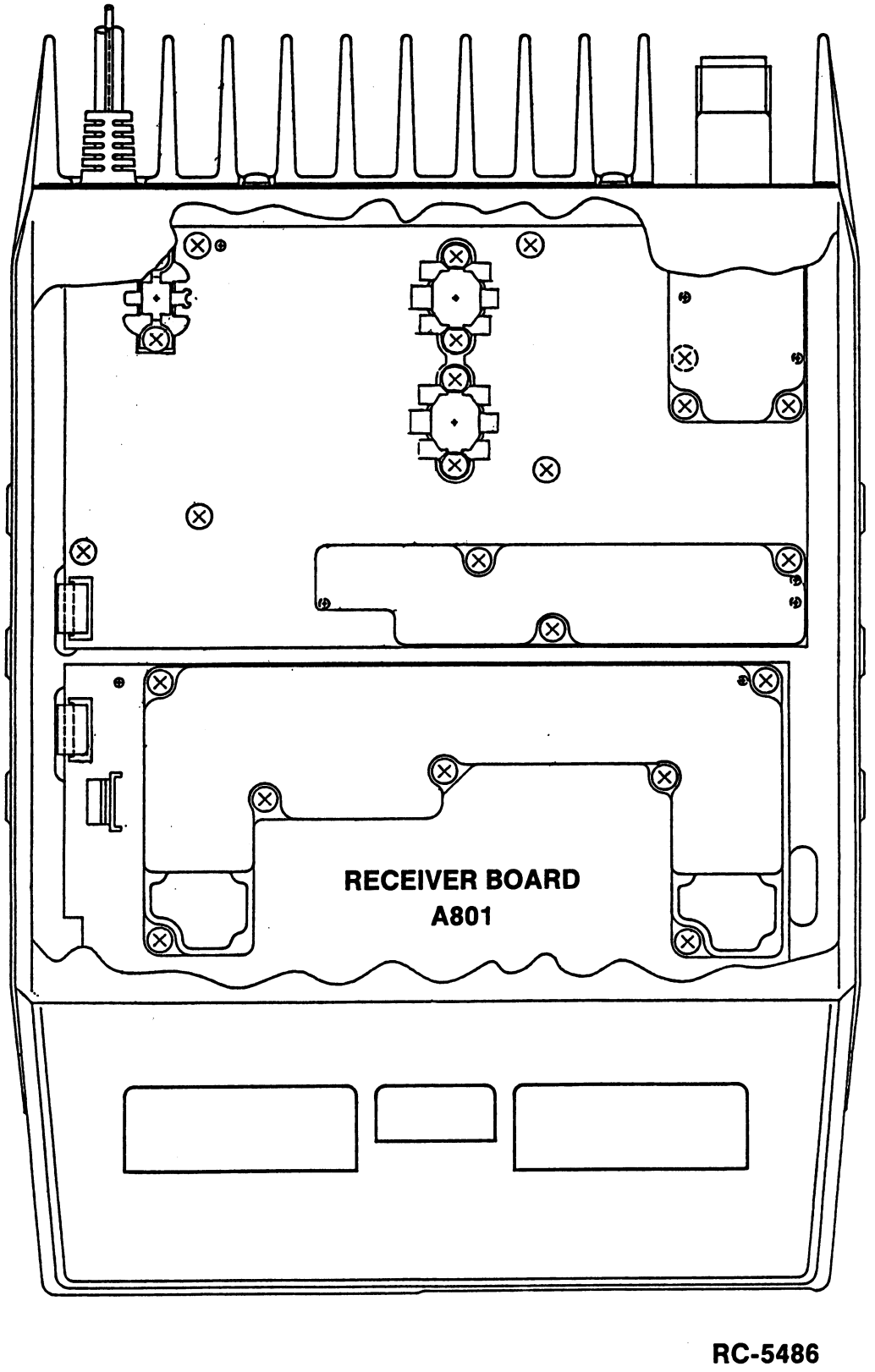

Figure 1 - Receiver Location (Bottom View)

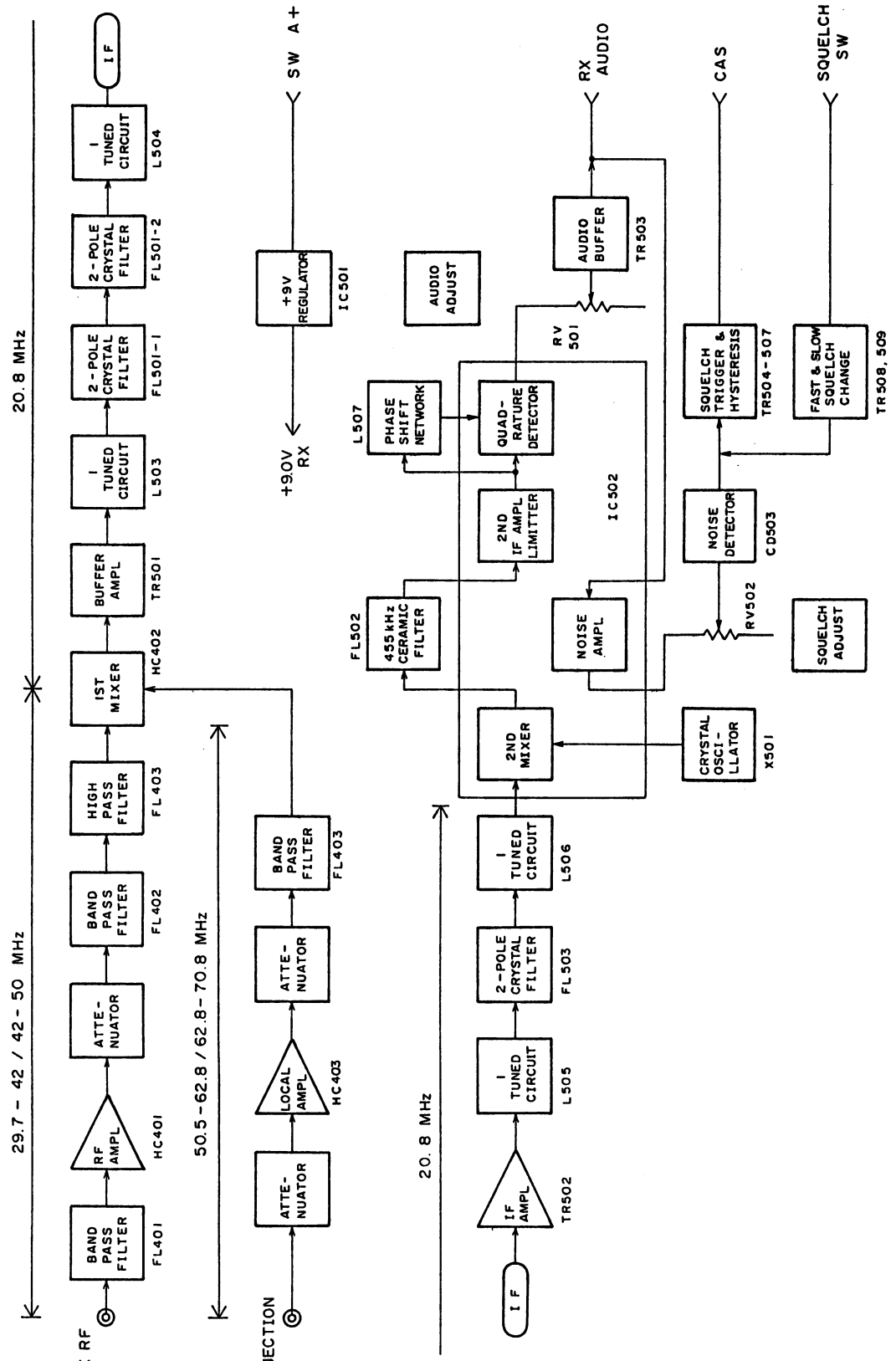

Figure 2 - Block Diagram

MHz first IF output signal is coupled from the output of HC402 at Pin 5 through an impedance matching network consisting of transistor TR501 and inductor L503 to a 4-pole crystal filter consisting of FL501-1 and FL501-2.

First IF

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 L504, capacitors C506 and C507, and 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 L505 to 2-pole crystal filter FL503 then coupled through impedance matching network inductor L506 to the input of second mixer IC502. 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 HC502 and associated circuitry provide the second oscillator, second mixer, second IF amplifier and FM detector circuit. The 20.8 MHz IF input is applied to Pin 18 of HC502 and mixed with a 20.8 MHz frequency supplied by crystal oscillator X501. The output of the second mixer is coupled to 6-pole ceramic filter FL052, 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 L507 shifts the IF 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 TR503.

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 TR503. An internal circuit of IC502 provides filtering and applies received noise in the 6-8 KHz frequency band to Squelch Adjust potentiometer RV502. The output of the squelch adjust potentiometer is connected to the noise detector. The noise detector consists of resistor R527, capacitor C531 and diode CD501. As the noise increases in magnitude in a negative direction, negative spikes cause CD501 to conduct and charge capacitors C535 and C536 to a DC level proportional to the noise level. The output of the noise detector is applied to the input of a squelch trigger circuit consisting of transistors TR504 through TR507. The squelch trigger has approximately 3 dB of hysteresis to prevent sudden noise level changes from affecting the squelch threshold setting. Resistor R526 provides temperature compensation for the squelch circuit. The output of the squelch trigger is the Carrier Activated Switch (CAS) signal. The CAS output is applied to the System Control/Frequency Synthesizer Board.

Audio Circuits

Received audio (RX AUDIO) from the FM detector is applied to the input of audio pre-amplifier IC601-A on System Control/Frequency Synthesizer Board A801 (refer to Maintenance Manual LBI-31794). The audio is then applied through Tone Reject Filter HC601, audio gate IC604-C and pre-amplifier IC601-C to Volume Control IC602. The audio output from the Volume Control IC is applied through audio pre-amplifier IC601-C to the de-emphasis network, consisting of resistors R628 and R618 and capacitors C609 and C605. This enables audio amplifier IC603 which provides up to 4 watts of audio output power input to a 4-ohm speaker.

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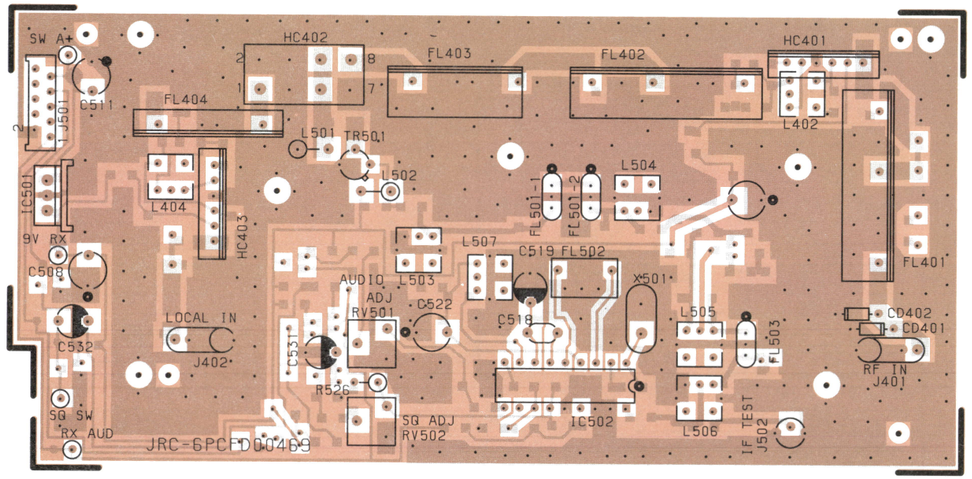
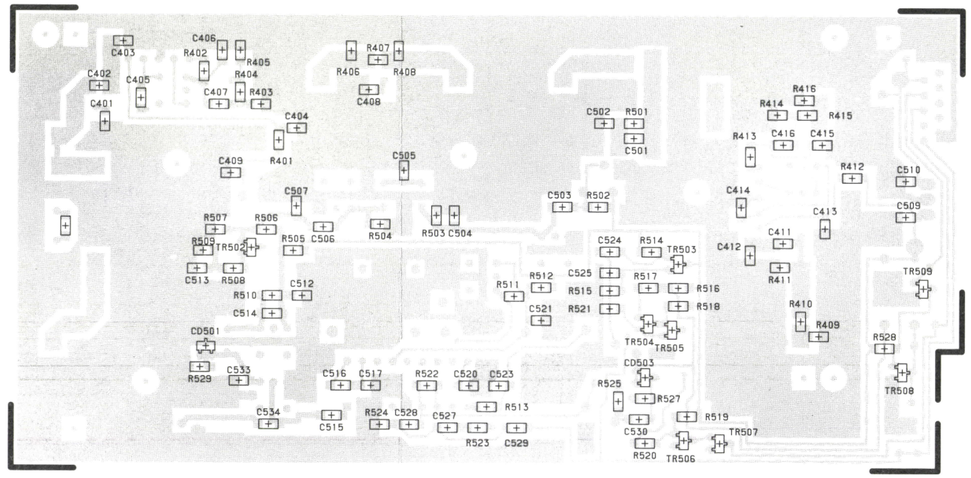
COMPONENT SIDE



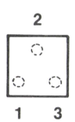
SOLDER SIDE



(JRC-PCFD00469)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

LEAD IDENTIFICATION FOR RV501 (TOP VIEW)

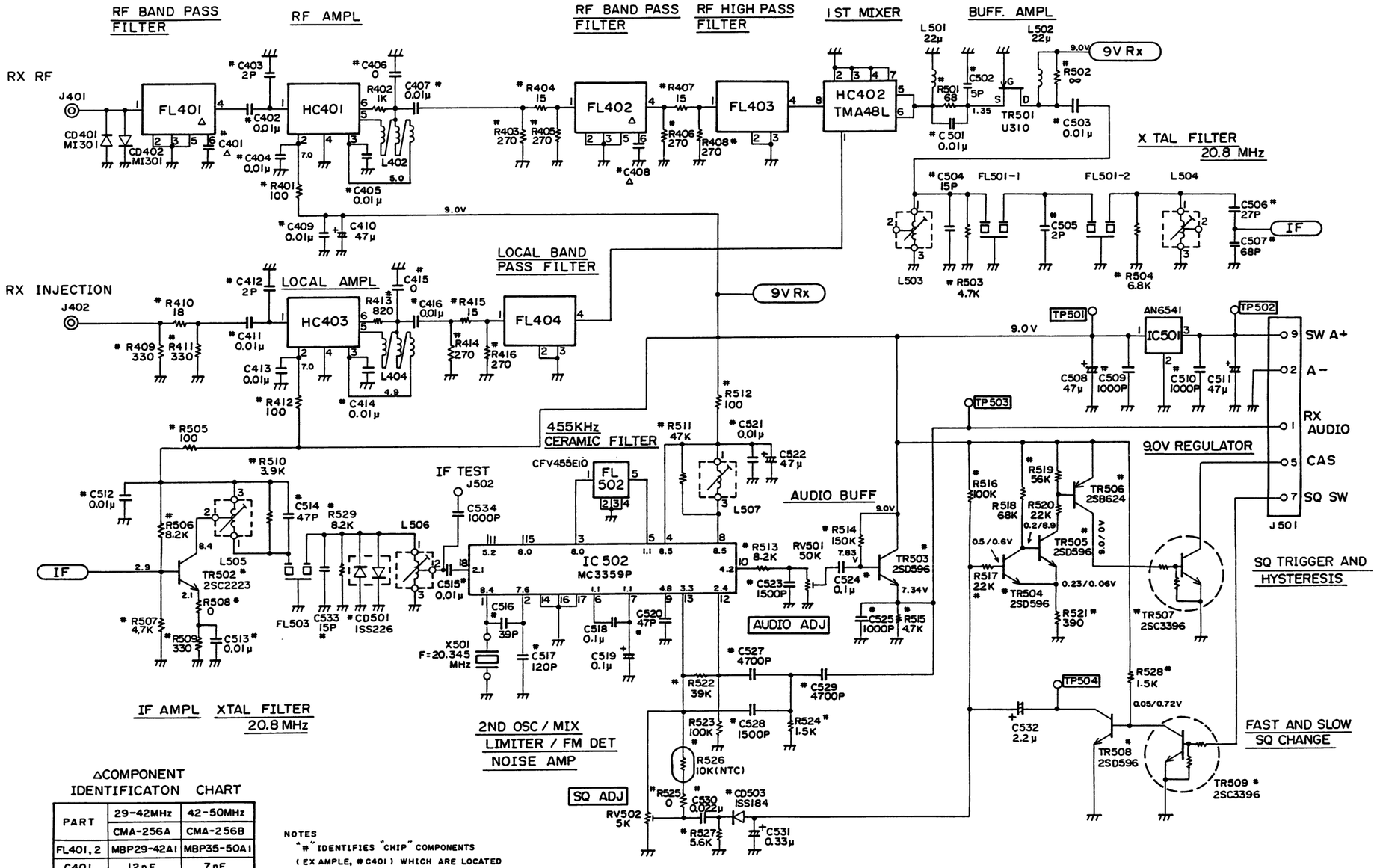


RC-5442

OUTLINE DIAGRAM

29.7-42 MHz &
42-50 MHz
Receiver Board
DDOO-CMA-256A/B

Issue 1



△COMPONENT IDENTIFICATON CHART

PART	29-42MHz	42-50MHz
	CMA-256A	CMA-256B
FL401,2	MBP29-42A1	MBP35-50A1
C401	12pF	7pF
C408	12pF	7pF

NOTES
"*" IDENTIFIES "CHIP" COMPONENTS (EX AMPLE, *C401) WHICH ARE LOCATED ON THE COMPONENT SIDE OF THE BOARD.

ALL RESISTORS ARE 1/8 WATT UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER K OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER μ, n ORp.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR μ.

SCHEMATIC DIAGRAM

29.7-42 MHz
42-50 MHz
DD00-CMA-256

PARTS LIST

RECEIVER BOARD
CMA-256A/B

ISSUE 1

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C401	JRC/5CAAD00784	Ceramic: 12 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM. (Used in A).
C401	JRC/5CAAD00977	Ceramic: 7 pF ±0.5 pF, 50 VDCW, temp coef 0 ±60 PPM. (Used in B).
C402	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C403	JRC/5CAAD00798	Ceramic: 2 pF ±0.25 pF, 50 VDCW, temp coef 0 ±60 PPM.
C404 and C405	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C407	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C408	JRC/5CAAD00784	Ceramic: 12 pF ±5%, 50 VDCW, temp coef 0 ±d60 PPM. (Used in A).
C408	JRC/5CAAD00977	Ceramic: 7 pF ±0.5 pF, 50 VDCW, temp coef 0 ±60 PPM. (Used in B).
C409	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C410	JRC/5CEAA01816	Electrolytic: 47 uF ±20%, 25 VDCW.
C411	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C412	JRC/5CAAD00798	Ceramic: 2 pF ±0.25 pF, 50 VDCW, temp coef 0 ±60 PPM.
C413 and C414	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C416	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C501	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C502	JRC/5CAAD00800	Ceramic: 5 pF ±0.25 pF, 50 VDCW, temp coef ±10%.
C503	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C504	JRC/5CAAD00787	Ceramic: 15 pF ±5%, 50 VDCW, temp coef ±60 PPM.
C505	JRC/5CAAD00798	Ceramic: 2 pF ±0.25 pF, 50 VDCW, temp coef 0 ±60 PPM.
C506	JRC/5CAAD00793	Ceramic: 27 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM.
C507	JRC/5CAAD00929	Ceramic: 68 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM.
C508	JRC/5CEAA01816	Electrolytic: 47 uF ±20%, 25 VDCW.
C509 and C510	JRC/5CAAD00782	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef +350 -1000 PPM.
C511	JRC/5CEAA01816	Electrolytic: 47 uF ±20%, 25 VDCW.
C512 and C513	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C514	JRC/5CAAD00864	Ceramic: 47 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM.
C515	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C516	JRC/5CAAD00875	Ceramic: 39 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM.
C517	JRC/5CAAD00931	Ceramic: 120 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM.
C518	JRC/5CBAB00462	Ceramic: 0.1 uF ±20%, 50 VDCW.
C519	JRC/5CSAC01068	Tantalum: 0.1 uF ±20%, 35 VDCW.
C520	JRC/5CAAD00864	Ceramic: 47 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM.
C521	JRC/5CAAD00789	Ceramic: 0.01 uF ±10%, 50 VDCW, temp coef ±10%.
C522	JRC/5CEAA01816	Electrolytic: 47 uF ±20%, 25 VDCW.
C523	JRC/5CAAD00791	Ceramic: 1500 pF ±5%, 50 VDCW, temp coef +350 -1000 PPM.
C524	JRC/5CAAD01056	Ceramic: 0.1 uF +80% -20%, 50 VDCW, temp coef +30 -80%.
C525	JRC/5CAAD00782	Ceramic: 1000 pF ±5%, 50 VDCW, temp coef +350 -1000 PPM.
C527	JRC/5CAAD00783	Ceramic: 4700 pF ±10%, 50 VDCW, temp coef ±10%.
C528	JRC/5CAAD00791	Ceramic: 1500 pF ±5%, 50 VDCW, temp coef +350 -1000 PPM.
C529	JRC/5CAAD00783	Ceramic: 4700 pF ±10%, 50 VDCW, temp coef ±10%.
C530	JRC/5CAAD01109	Ceramic: 0.022 uF ±10%, 50 VDCW, temp coef ±10%.
C531	JRC/5CSAC01151	Tantalum: 0.33 uF ±20%, 35 VDCW.
C532	JRC/5CSAC01069	Tantalum: 2.2 uF ±20%, 35 VDCW.
C533	JRC/5CAAD00787	Ceramic: 15 pF ±5%, 50 VDCW, temp coef 0 ±60 PPM.
C534	JRC/5CAAD00878	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef 0 ±60 PPM.
		- - - - - - - - - - DIODES - - - - - - - - - -
CD401 and CD402	JRC/5TXAR00004	Silicon, RF switching: sim to MITUSBISHI MI301.
CD501	JRC/5TXAD00320	Silicon, fast recovery (2 diode in series): sim to TOSHIBA 1SS226.
CD502	JRC/5TXAD00290	Silicon, fast recovery (2 diode in cathode common): sim to TOSHIBA 1SS184.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL401	JRC/5NLAT00030	Dielectric RF filter: B.P.F. 29-42 MHz; sim to SOSHIN MBP29-42A1. (Used in A).
FL401	JRC/5NLAT00027	Dielectric RF filter: B.P.F. 35-50 MHz; sim to SOSHIN MBP35-50A1. (Used in B).
FL402	JRC/5NLAT00030	Dielectric RF filter: B.P.F. 29-42 MHz; sim to SOSHIN MBP29-42A1. (Used in A).
FL402	JRC/5NLAT00027	Dielectric RF filter: B.P.F. 35-50 MHz; sim to SOSHIN MBP35-50A1. (Used in B).
FL403	JRC/5NLAT00028	Dielectric RF filter: H.P.F. 29 MHz; sim to SOSHIN MHP29A1.
FL404	JRC/5NBAG00017	Dielectric RF filter: B.P.F. 60 MHz; sim to SOSHIN MBP60A1.
FL501	JRC/5XHAA00837	Crystal filter: 20.8 MHz; XPJ14-2.
FL502	JRC/5NRAA00144	Ceramic filter: 455 kHz; sim to MURATA CFV455E10.
FL503	JRC/5XHAA00838	Crystal filter: 20.8 MHz; XPJ14-5.
		- - - - - - - - - - HYBRIDS CIRCUITS - - - - - - -
HC401	JRC/5DHBE00005	Linear, RF Amplifier: sim to SOSHIN AMP-2.
HC402	JRC/5DHAV00004	Linear, DBM: sim to TOKO TMA48L.
HC403	JRC/5DHBE00005	Linear, RF Amplifier: sim to SOSHIN AMP-2.
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - -
IC501	JRC/5DAAR00021	Linear, positive voltage regulator: sim to MATSUSHITA AN6541.
IC502	JRC/5DDAS00074	Linear, IF Amplifier & Detector: sim to MOTOROLA MC3359P.
		- - - - - - - - - - - JACKS - - - - - - - - - - -
J401 and J402	JRC/5JWCL00045	Connector RF: sim to TAIKO TMP-J01X-A2.
J501	JRC/5JWBS00178	Connector: 10 pins; sim to HIROSE FH3-10S-1.25DSA(G).
J502	JRC/5JWCL00047	Connector RF: sim to TAIKO TMP-J01X-V1.
		- - - - - - - - - - - COILS - - - - - - - - - - -
L402 and L404	JRC/6LAFD01136	Coil RF: sim to MIDORI 6LAFD01136.
L501 and L502	JRC/5LCAC00281	Choke coil: 22 uH ±10%.
L503 and L504	JRC/6LAFD01207	Coil RF: sim to MIDORI 6LAFD01207.
L505	JRC/6LAFD01212	Coil RF: sim to MIDORI 6LAFD01212.
L506	JRC/6LAFD01207	Coil RF: sim to MIDORI 6LAFD01207.
L507	JRC/6LAFD00877	Coil RF: sim to MIDORI 6LAFD00877.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R401	JRC/5RDAC02137	Metal film: 100 ohms ±5%, 200 VDCW, 1/8 W.
R402	JRC/5RDAC02132	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 W.
R403	JRC/5RDAC02163	Metal film: 270 ohms ±5%, 200 VDCW, 1/8 W.
R404	JRC/5RDAC02161	Metal film: 15 ohms ±5%, 200 VDCW, 1/8 W.
R405 and R406	JRC/5RDAC02163	Metal film: 270 ohms ±5%, 200 VDCW, 1/8 W.
R407	JRC/5RDAC02161	Metal film: 15 ohms ±5%, 200 VDCW, 1/8 W.
R408	JRC/5RDAC02163	Metal film: 270 ohms ±5%, 200 VDCW, 1/8 W.
R409	JRC/5RDAC02140	Metal film: 330 ohms ±5%, 200 VDCW, 1/8 W.
R410	JRC/5RDAC02146	Metal film: 18 ohms ±5%, 200 VDCW, 1/8 W.
R411	JRC/5RDAC02140	Metal film: 330 ohms ±5%, 200 VDCW, 1/8 W.
R412	JRC/5RDAC02137	Metal film: 100 ohms ±5%, 200 VDCW, 1/8 W.
R413	JRC/5RDAC02142	Metal film: 820 ohms ±5%, 200 VDCW, 1/8 W.
R414	JRC/5RDAC02163	Metal film: 270 ohms ±5%, 200 VDCW, 1/8 W.
R415	JRC/5RDAC02161	Metal film: 15 ohms ±5%, 200 VDCW, 1/8 W.
R416	JRC/5RDAC02163	Metal film: 270 ohms ±5%, 200 VDCW, 1/8 W.
R501	JRC/5RDAC02127	Metal film: 68 ohms ±5%, 200 VDCW, 1/8 W.
R503	JRC/5RDAC02152	Metal film: 4.2K ohms ±5%, 200 VDCW, 1/8 W.
R504	JRC/5RDAC02157	Metal film: 6.8K ohms ±5%, 200 VDCW, 1/8 W.
R505	JRC/5RDAC02137	Metal film: 100 ohms ±5%, 200 VDCW, 1/8 W.
R506	JRC/5RDAC02158	Metal film: 8.2K ohms ±5%, 200 VDCW, 1/8 W.
R507	JRC/5RDAC02152	Metal film: 4.7K ohms ±5%, 200 VDCW, 1/8 W.
R508	JRC/5RDAC02380	Metal film: 0 ohm, 1/8 W.
R509	JRC/5RDAC02140	Metal film: 330 ohms ±5%, 200 VDCW, 1/8 W.
R510	JRC/5RDAC02435	Metal film: 3.9K ohms ±5%, 200 VDCW, 1/8 W.
R511	JRC/5RDAC02134	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 W.
R512	JRC/5RDAC02137	Metal film: 100 ohms ±5%, 200 VDCW, 1/8 W.
R513	JRC/5RDAC02158	Metal film: 8.2K ohms ±5%, 200 VDCW, 1/8 W.
R514	JRC/5RDAC02129	Metal film: 150K ohms ±5%, 200 VDCW, 1/8 W.
R515	JRC/5RDAC02152	Metal film: 4.7K ohms ±5%, 200 VDCW, 1/8 W.
R516	JRC/5RDAC02138	Metal film: 100K ohms ±5%, 200 VDCW, 1/8 W.
R517	JRC/5RDAC02148	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 W.
R518	JRC/5RDAC02176	Metal film: 68K ohms ±5%, 200 VDCW, 1/8 W.
R519	JRC/5RDAC02231	Metal film: 56K ohms ±5%, 200 VDCW, 1/8 W.
R520	JRC/5RDAC02148	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 W.
R521	JRC/5RDAC02443	Metal film: 390 ohms ±5%, 200 VDCW, 1/8 W.
R522	JRC/5RDAC02374	Metal film: 39K ohms ±5%, 200 VDCW, 1/8 W.
R523	JRC/5RDAC02138	Metal film: 100K ohms ±5%, 200 VDCW, 1/8 W.
R524	JRC/5RDAC01233	Metal film: 1.5K ohms ±5%, 200 VDCW, 1/8 W.
R525	JRC/5RDAC02380	Metal film: 0 ohm, 1/8 W.
R526	JRC/5RZBX00002	Thermal: 10K ohms ±3%; sim to TDK NTCDS40203HG 103JC.
R527	JRC/5RDAC02154	Metal film: 5.6K ohms ±5%, 200 VDCW, 1/8 W.
R528	JRC/5RDAC02133	Metal film: 1.5K ohms ±5%, 200 VDCW, 1/8 W.
R529	JRC/5RDAC02158	Metal film: 8.2K ohms ±5%, 200 VDCW, 1/8 W.
RV501	JRC/5RVAB00317	Variable: 50K ohms ±30%, 0.1 W.
RV502	JRC/5RVAB00277	Variable: 5K ohms ±30%, 0.1 W.

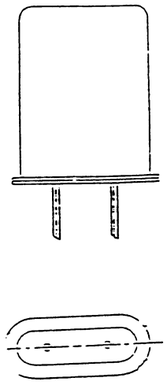
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
TR501	JRC/5TKAG00007	Field effect (Single Gate): sim to SILICONIX U310.
TR502	JRC/5TCAB01107	Silicon, NPN: sim to NEC 2SC2223.
TR503 thru TR505	JRC/5TDAB00054	Silicon, NPN: sim to NEC 2SD596 (DV3).
TR506	JRC/5TBAB00055	Silicon, PNP: sim to NEC 2SB624 (BV3).
TR507	JRC/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
TR508	JRC/5TDAB00054	Silicon, NPN: sim to NEC 2SD596 (DV3).
TR509	JRC/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
X501	JRC/5XHAA00839	Quartz crystal: 20.345 MHz, XPJ-14-3.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XS501-A and XS501-B	JRC/5ZJDF00001	Crystal socket: sim to HAKUTO 75315-001.

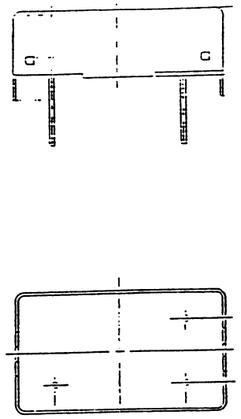
IC DATA

OSCILLATORS

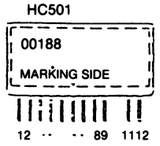
X501



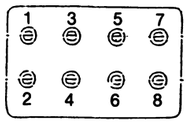
XU201



HC501



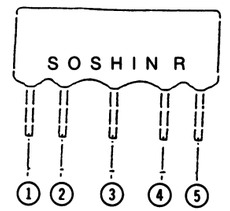
HC402



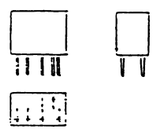
FILTERS

FL403

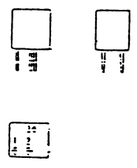
FL401-FL403



FL502



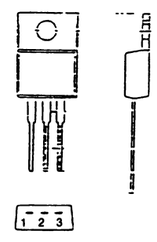
FL503



Input
Gnd
Output

9-VOLT REGULATOR

IC501



1 = Input
2 = Common
2 = Output

RC-5421

PARTS LIST CHANGES

The prefix of Service Parts replacement part numbers listed in the various Parts Lists included in this maintenance manual have been changed from "JRC/" to "B19/". All other characters remain the same as displayed. When this manual is next reprinted, all replacement parts lists will show only the "B19/" prefix.

When ordering replacement parts listed in this manual from the GE Mobile Communications Service Parts Operation, please use only the "B19/" prefix. The "B19/" prefix will be the only one shown in any future SERVICE PARTS PRICE LIST.