

**MAINTENANCE MANUAL**

**440-470 MHz 25-WATT WIDEBAND TRANSMIT/RECEIVE BOARD 19D901003G14**

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**DESCRIPTION**

The 440-470 MHz wideband-synthesized transmit/receiver boards (Tx Rx) contain the receiver, exciter and power amplifier. The audio processor circuitry for the transmit (microphone) audio is included on the synthesizer/interconnect board. Transmit/receiver RF frequency injection (5-15 milliwatts) is provided by a common VCO on the synthesizer/interconnect board. The output of the VCO is tripled by the exciter to generate the transmit frequency and by the receiver to generate the correct Rx injection frequency for the receiver first mixer. A block diagram of the TRS board is shown in Figure 1.

The transmit/receiver board assembly is located on the bottom side of the radio and is provided in one group. The characteristics of this group are identified in the table below.

**CIRCUIT ANALYSIS**

**EXCITER**

The exciter consists of an amplifier, a tripler and final amplifier. The transmit/receiver component board is 19D8901043G2 and operates in the 440-470 MHz range. The exciter receives the Tx injection frequency from the synthesizer VCO (5 milliwatts minimum) and amplifies multiplies and amplifies it again to provide 60 milliwatts minimum drive to the power amplifier circuitry. In addition to these functions, the exciter contains the filters that determine the bandwidth and spurious characteristics (exclusive of harmonics) of the transmitter.

RF injection from the synthesizer/interconnect board is applied to the base

of Class A Ampl Q101 through J151, a 2 dB resistive pad, and an impedance matching network consisting of C101, C102 and L101. This network matches the base of Q101 to 50 ohms. The 2 dB attenuator pad (R101-R103) provides a constant load for the VCO output to maintain frequency stability when switching to or from the transmit or receive mode. 8.5V TX is applied to Class A Amplifier Q101 through a collector feed network consisting of L102, R106, and R107. Capacitors C104 and C105 provide decoupling for the 8.5V Tx supply. 8.5V Tx is used to control the supply voltage to Ampl 1 to assure that the exciter is turned on only in the transmit mode. Base bias is set by R104 and R105. 8.5V Tx also provides the bias voltage for final amplifier Q103.

The output of Q101 is direct coupled to tripler Q102 through C106 and C107. 8.5V CONT is supplied to the tripler through a collector feed network consisting of R111, L104 and L103. Decoupling is provided by C108 and C109. For tuning purposes the collector voltage may be metered at TP101. A matching network consisting of L103, C110, and R112-R114 match the output of the tripler to a two-pole helical filter, L105 and L106. The output of this filter is then matched by L107 and C111-C113 to a single stage broadbanded Class B amplifier Q103. Bias voltage is supplied by the 8.5V Tx source and is set by R115 and R116. Collector voltage is taken from the 8.5V CONT supply and applied to Q103 collector through collector feed network R117, C115, and L108. Capacitors C118 and C119 provide decoupling for the 8.5V CONT supply. For tuning purposes the collector voltage is measured at TP102. An impedance matching network consisting of C116, L109 and C117 match the collector Q103 to 50 ohms. The exciter provides 60 milliwatts to the power amplifier.

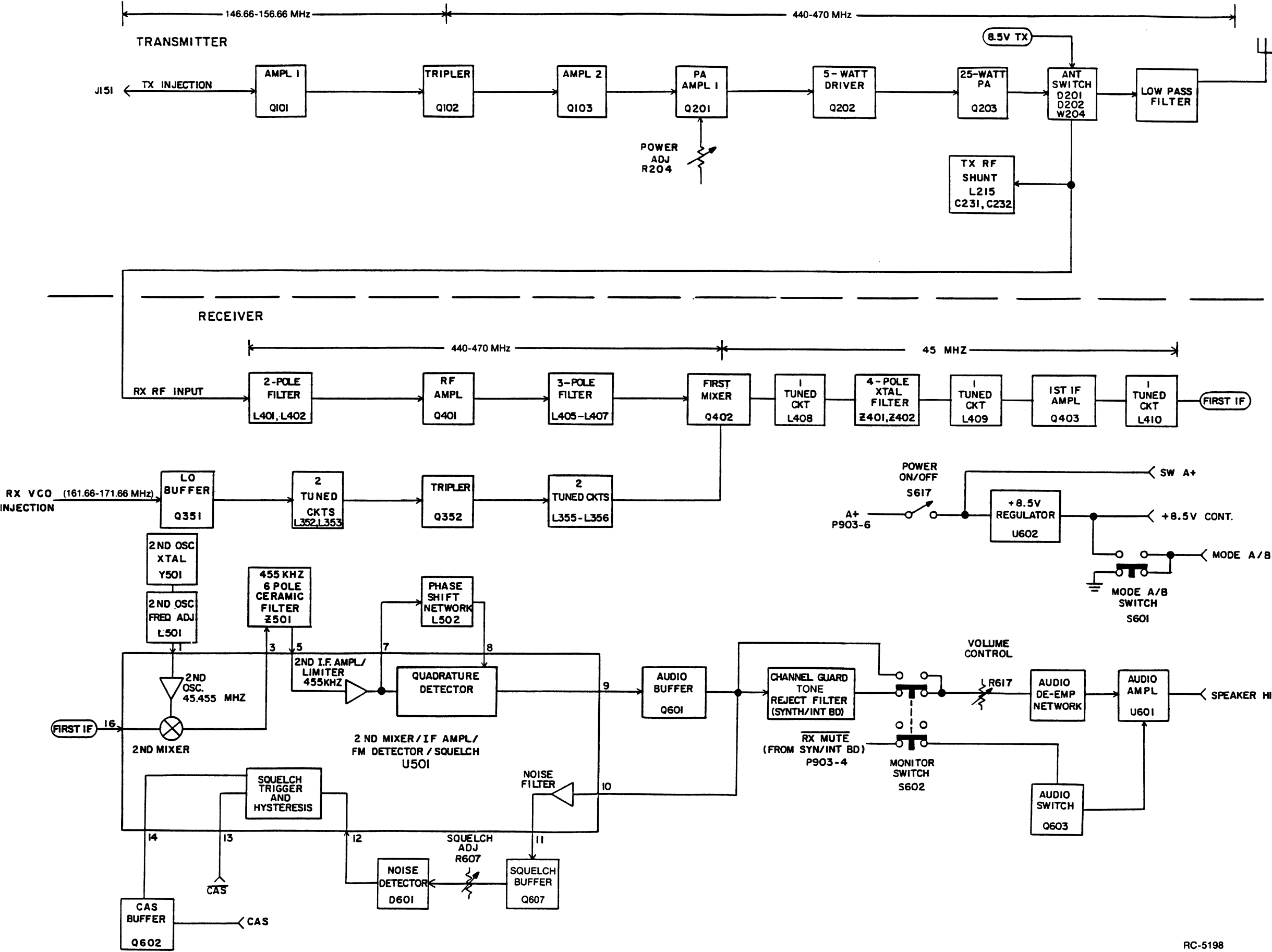


Figure 1 - TRS Board Block Diagram

## NOTE

There are 5 points in the exciter with an impedance of approximately 50 ohms. They are W101, W102, W104, W105, and W106. These points can conveniently be used to monitor or inject signals for troubleshooting and testing using 50 ohm sources and terminations.

## 25-WATT POWER AMPLIFIER

The broadband three stage power amplifier consists of amplifier Q201, driver Q202 and power amplifier Q203, and associated circuitry. The 60 milliwatt output of the exciter is amplified to provide 25 watts RF output from the radio. No tuning is required.

The 50 ohm output of the exciter is applied to the base of AMPL Q201 through an impedance matching network consisting of L201, C201-C203, and 50 ohm microstrip W201. L203, L204, C206, and C207 match the collector of Q201 to 50 ohms. W202, L205, C208 and C209 match the 50 ohms at W202 to the base of driver Q202. Collector voltage for Q201 is supplied through collector feed network R203-R205, L202, and C205.

The output power of the driver Q202 is coupled to the final power amplifier Q203 through impedance matching network consisting of W203, C212, C215, C220, and C221. The 25 watt output of Q203 is coupled to the antenna through and impedance matching network (C222-C225, C227, and L212), Tx/Rx switch (D201, D202) and the low pass filter to J601. The low pass filter consists of L214, C230, C229. W205 is a 50 ohm microstrip.

Collector voltage for Q202 and Q203 is provided by the A+ line through P251-3 and collector feed networks consisting of L207, L208, R207, and C210 for Q202 and L216, L211, C218 and C219 for Q203. Decoupling is provided by C211, C216, and C217.

Tx/Rx Antenna Switch

The antenna switch is controlled by 8.5V Tx (present when PTT is pressed) and connects either the PA output or receiver to the antenna. The antenna switch consists of diode D201 quarter wave stub W204, diode D202, C231, C232, and L215.

When the microphone is keyed, 8.5V Tx is applied to D201 through R210 and L213 forward biasing D201 and D202 and passing the PA output directly to the antenna through the low pass filter. At the same time the 1/4 wave stub W204 and

forward biased diode D202 presents an open circuit to the receiver preventing any possible damage to the receiver. C235 is a DC blocking capacitor.

In the receive mode D201 and D202 are turned off, the AC short is removed and the 1/4 wave stub now presents a 50 ohm impedance to the receiver, allowing the received RF to pass through the low pass filter to the receiver.

## RF POWER ADJUST

RF output power is set by adjusting the collector voltage to Q201. Collector voltage for Ampl Q201 is supplied by the 8.5V CONT source and set by RF Power Adjust control R204. R204 is set for rated output power.

## RECEIVER

The FM dual conversion, super-heterodyne receiver is designed for operation in the 440-470 MHz frequency range. A regulated 8.5 volts is provided to all receiver stages except for the audio PA IC, which operates from the switched A+ supply.

The receiver has intermediate frequencies of 45 MHz and 455 kHz. Adjacent channel selectivity is obtained by using two band-pass filters: a 45 MHz crystal filter and a 455 kHz ceramic filter.

All of the receiver circuitry except the synthesizer is mounted on the Tx/Rx board. The receiver consists of:

- Front End and Mixer
- 45 MHz 1st IF o 455 kHz 2nd IF and FM Detector
- Audio PA
- Squelch

## RECEIVER FRONT END

An RF signal from the antenna is coupled through the low pass filter, antenna switch, and two helical resonators (L401 and L402) to the base of RF amplifier Q401. The output of Q401 is coupled through three more helical resonators consisting of L405-L407 to the gate of 1st mixer Q402. Front end selectivity is provided by these five helical resonators.

## RECEIVER INJECTION

Receiver RF Injection (161.666 - 171.666 MHz) from the synthesizer VCO is applied to L.O. Buffer Q351 through J351. The input level at J351 will be between 5

and 15 milliwatts, 5 milliwatts minimum. R351-R353 and C351 match the source impedance of Q351 to the VCO output transmit/receive switching circuitry on the synthesizer/interconnect board.

The output of L.O. Buffer Q351 is coupled to the base of tripler Q352 through a two-pole LC filter L352, L353, and C352-C355. The LC filter will pass only those frequencies in the 149-185 MHz band, shunting all other frequencies to ground. Tripler Q352 multiplies the Rx injection frequency by 3 to provide a mixer injection frequency 45 MHz above the received RF frequency to First mixer Q402. The output of tripler Q352 is filtered by a two section helical filter consisting of L355 and L356. These filters are tuned to pass frequencies in the 447-555 MHz passband.

TP351 provides metering for the tripler Q352. The correct voltages with and without L.O. injection are shown on the Schematic Diagram.

#### 1st MIXER

The 1st mixer uses a FET (Q402) as the active device. The FET mixer provides a high input impedance, high power gain and an output relatively free of intermodulation products.

In the mixer stage, RF from the front end helical filter is applied to the gate of the mixer. Injection voltage from the multiplier stages is applied to the source of the mixer. The 45 MHz mixer 1st IF output signal is coupled from the drain of Q402 through an impedance matching network (L408 and C410-C411) to a 4-pole crystal filter consisting of Z401 and Z402.

#### 1st IF

The highly-selective crystal filters Z401 and Z402 provide the first portion of the receiver IF selectivity. The output of the filters is coupled through impedance matching network L409, C414, and R410 to the 1st IF amplifier Q403.

1st IF Amplifier Q403 is a dual-gate MOSFET transistor. The crystal filter output of Z402 is applied to Gate 1 of the amplifier, and the amplified signal is taken from the drain. The biasing on Gate 2 and the drain load determines the gain of the stage. The amplifier provides approximately 20 dB of IF gain. The output of Q403 is coupled through an impedance matching network, L410, C417, C418, and R415 that matches the amplifier output to the input of IC U501. Diodes D401 and D402 provide limiting for the 45 MHz IF signal (1.4 VPP) to prevent high level overload of U501.

#### 2nd IF and DETECTOR

U501 and associated circuitry consists of the 2nd oscillator/mixer, IF amplifier, FM detector, and squelch circuit. The 45 MHz IF input is applied to pin 16 of U501 and mixed with a 45.455 MHz frequency supplied by crystal oscillator Y501. L501 sets the frequency of Y501. High side injection is used. The output of the internal mixer is amplified and applied to a 6-pole ceramic filter, Z501, which provides the 455 kHz selectivity. The output of the 455 kHz filter is reapplied to U501-5. The 2nd IF signal is amplified and limited. L502 shifts the IF signal by 90° and reapplies it to the internal FM detector. The FM detector compares the shifted IF signal to the internal IF signal to recover the audio modulation.

#### AUDIO AND SQUELCH

The audio output of U501 is applied to the base of audio buffer Q601. The output of the audio buffer is applied to the Channel Guard Tone Reject filter on the synthesizer/interconnect board, the MONITOR switch, and to the squelch input U501-10.

#### Squelch Circuit

The squelch circuit senses the noise components contained in the FM detector audio output. The squelch input is applied to pin 10 of U501 from audio buffer Q601. Circuits internal to U501 provide filtering and apply received noise in the 6-8 kHz frequency band to squelch buffer Q607 and potentiometer R607 (squelch adjust). The output of the squelch adjust potentiometer is connected to the noise detector. The noise detector consists of R608, C606, C607, C621 and diode D601. As the noise increases in magnitude in a negative direction, negative spikes cause D601 to conduct and charge C607 and C621 to a DC level proportional to the noise power. The output of the noise detector is applied to the input of squelch trigger (U501-12). The squelch trigger has approximately 3 dB of hysteresis to prevent sudden noise level changes from effecting the squelch threshold setting. R634 provides temperature compensation for the Squelch Circuit. The outputs of squelch trigger are CAS and CAS. The CAS output is applied to Q602 to provide sufficient drive to operate an optional channel busy light or external relay control.

#### Audio Circuits

Detected audio from audio buffer Q601 is applied to the Channel Guard Tone Reject filter on the synthesizer/interconnect board and returned as

filtered volume squelch high through P903-7. Filtered audio is then applied through MONITOR switch S602 and VOLUME control R617 to the deemphasis network (R618 and C615) and audio amplifier U601. Switched A+ is applied to U601 through S617. The RX MUTE line is high when a message is received and accompanied by a correct Channel Guard Tone, keeping audio switch Q603 turned off. This enables audio amplifier U601 which provides up to 3 watts of audio output power into a 4 ohm speaker. The feedback loop consisting of R615, R616, and C611 determine the amplifier closed loop gain. R614 and C612 provide the high audio frequency roll-off above 6 kHz.

The audio amplifier is muted (switched off) when RX MUTE is low. When this occurs (no messages being received) audio switch Q603 is turned on, applying additional bias current to the reference input pin 2 of audio amplifier U601. This turns U601 off causing its output to be grounded.

#### Monitor

When the MONITOR switch is pressed, detected audio from audio buffer Q601 is applied directly to the audio amplifier through S602-5 and R617, bypassing the Channel Guard Tone Reject Filter. S602 also opens the RX MUTE line to Q603, causing it to be turned off and allowing

audio amplifier U601 to operate. The detected audio is amplified and applied to the speaker. Channel Guard Tones may be audible when present.

#### MODE A/B

Mode A/B Switch S601 provides the channel selection capability of the radio by controlling the 8.5V CONT line applied to the Mode A/B input of the microcomputer. The microcomputer input (P912-2) is grounded in Mode A or has 8.5 VDC cont. applied for Mode B.

In two frequency radios, the MODE A/B switch is provided. Channel selection (MODE A/B) is controlled by the MODE switch which toggles the MODE A/B input to the microcomputer. When MODE A is selected the input to the microcomputer is held low by the ground connection between S601-2 and 4. In MODE B, pull-up resistor R628 applies +8.5 VDC to the MODE A/B input through S601-5 and 6, holding it high and causing MODE B (second channel) to be selected.

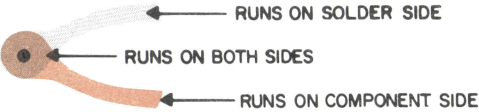
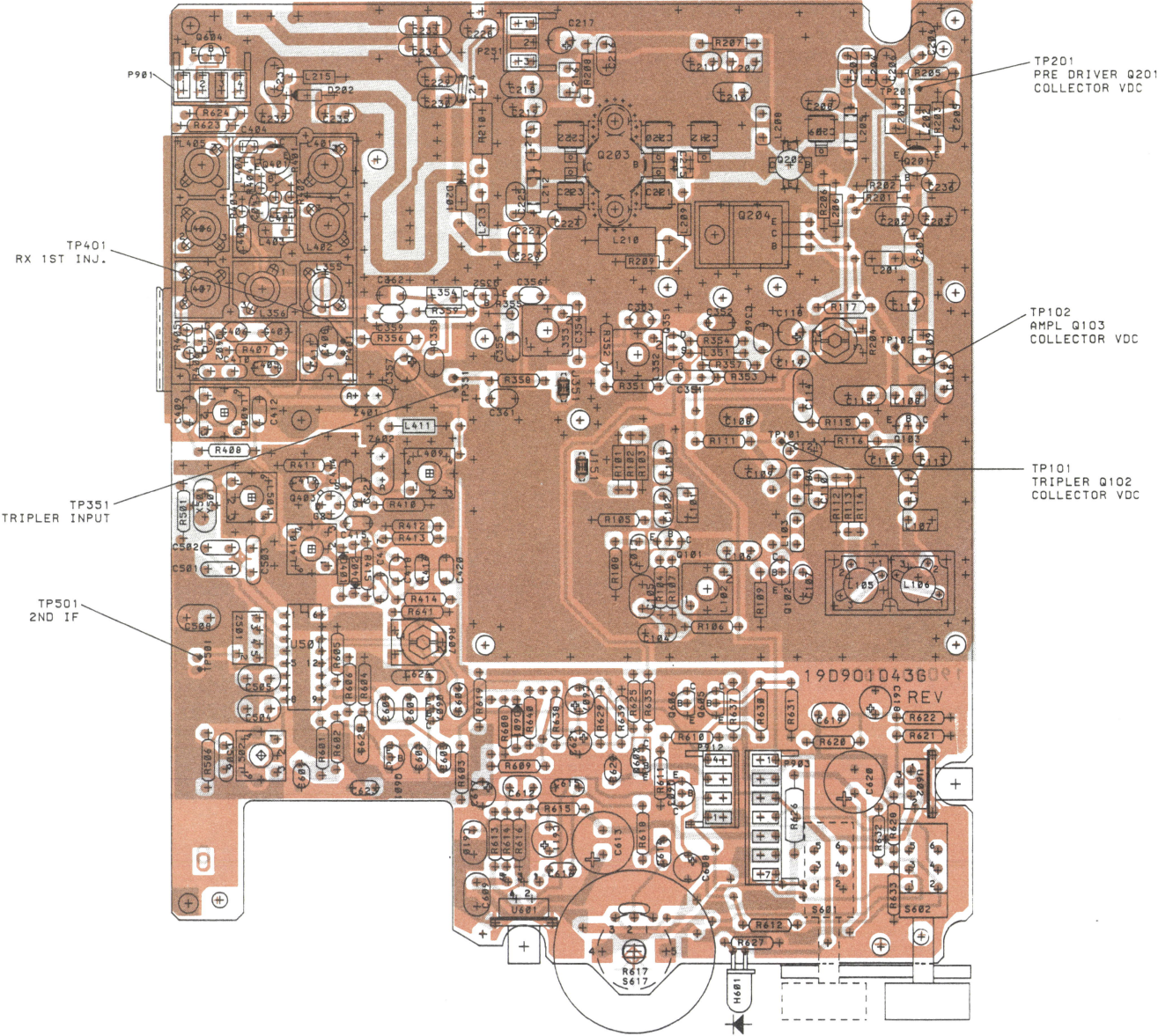
#### 8.5 VOLT REGULATOR

8.5 Volt regulator U602 receives switched A+ from S617 and P903-6 and provides 8.5 Volts regulated to the radio. Switched A+ is available from S617.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION  
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.







(19D901704, Rev. 2)  
(19A704793, Sh. 1 & 2, Rev. 0)  
(19A704793, Sh. 3 & 4, Rev. 0)

# OUTLINE DIAGRAM

440-470 MHz, 25 WATT WIDEBAND  
TRANSMIT/RECEIVE BOARD

TABLE OF CONTENTS

NOTES & CHARTS- - - - - SHEET  
- - - - - 1

TRANSMITTER- - - - - 2,2A

FUNCTION	CPNT SERIES
EXCITER	100
TX PWR AMP	200
TX 8.5V SWITCH	600

RECEIVER- - - - - 3

FUNCTION	CPNT SERIES
1ST LO INJECTION	350
RF/MIXER/1ST IF	400

RECEIVER/SYSTEM- - - - - 4

FUNCTION	CPNT SERIES
2ND IF	500
AUDIO/SQUELCH/SYSTEM	600

Δ COMPONENT IDENTIFICATION CHART			
PART	043G2 440-470 MHZ	043G5 470-512 MHZ	043G6 403-440 MHZ
C107	10P	8P	15P
C109	39P	36P	39P
C110	3P	3P	4P
C111	10P	7P	7P
C116	56P	56P	1n
C117	6P	6P	5P
C202	10P	10P	12P
C208	10P	10P	15P
C209	62P	51P	68P
C212	10P	10P	12P
C220	33P	30P	33P
C222	43P	39P	47P
C223	39P	39P	47P
C224	5P	6P	7P
C225	5P	6P	7P
C226	7P	7P	8P
C227	7P	7P	8P
C229	4P	4P	5P
C230	6P	6P	8P
C231	10P	8P	12P
C232	10P	8P	12P
C235	470P	20P	470P
C236	5P	5P	7P
C352	12P	6.8P	10P
C353	8.2P	6.8P	15P
C354	0.56P	0.56P	0.82P
C355	12P	8.2P	10P
C356	10P	8.2P	12P
C359	2.7P	5.6P	39P
C401	18P	18P	39P
C404	18P	3.9P	4.7P
C406	4.7P	10P	4.7P
C407	2.2P	2.2P	5.6P

NOTES:

- ① PART OF PWB.  
② VALUE OF R621 DEPENDS ON COLOR CODE OF U602.

U602 COLOR CODE	R621 VALUE
BROWN	OMIT R621
RED	270
ORANGE	100
YELLOW	47
GREEN	22
BLUE	6.8

- ③ SWITCH PRESENT ON 19D901003G14,G16,G18 & G20 ONLY.  
④ VOLTAGE READINGS:

ALL VOLTAGES ARE TYPICAL. VOLTAGES ARE MEASURED WITH A 20,000 OHM PER VOLT DC METER, REFERENCE TO A-, UNLESS OTHERWISE INDICATED.

SHEET 2,2A:  
ALL VOLTAGES ARE DC  
ALL VOLTAGES ARE IN THE TRANSMIT CONDITION.

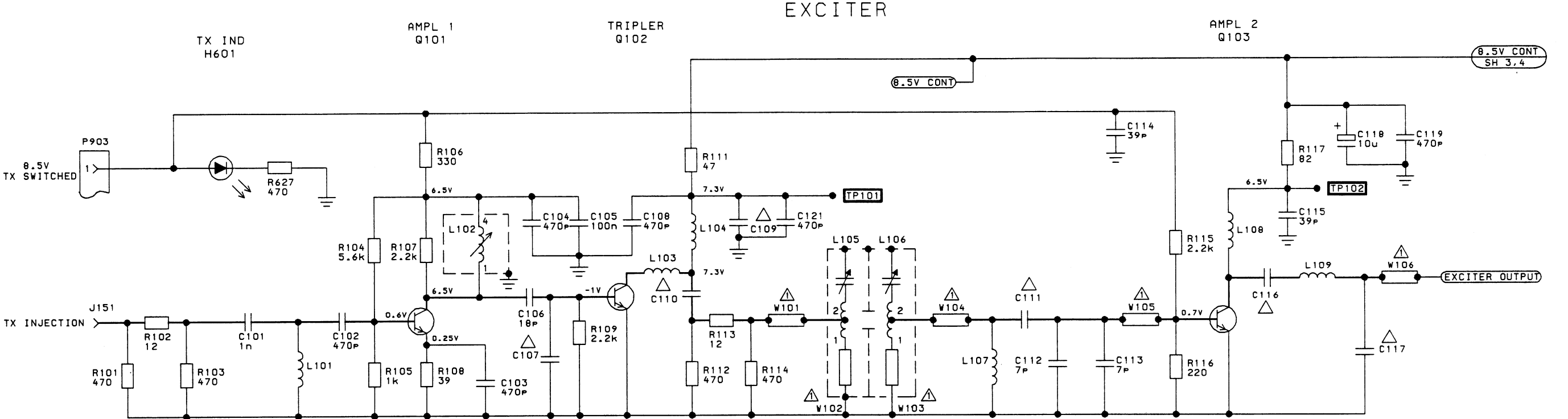
SHEET 3:  
RF VOLTAGES MEASURED WITH RF VOLTMETER  
W INJ - WITH L.O. INJECTION  
W/O INJ - WITHOUT L.O. INJECTION

SHEET 4:  
VOLTAGES AT U501 AND U601 ARE MEASURED WITH 1 M OHM DC VOLTMETER AND NO SIGNAL INPUT.  
S - SQUELCHED RECEIVER  
US - UNSQUELCHED RECEIVER

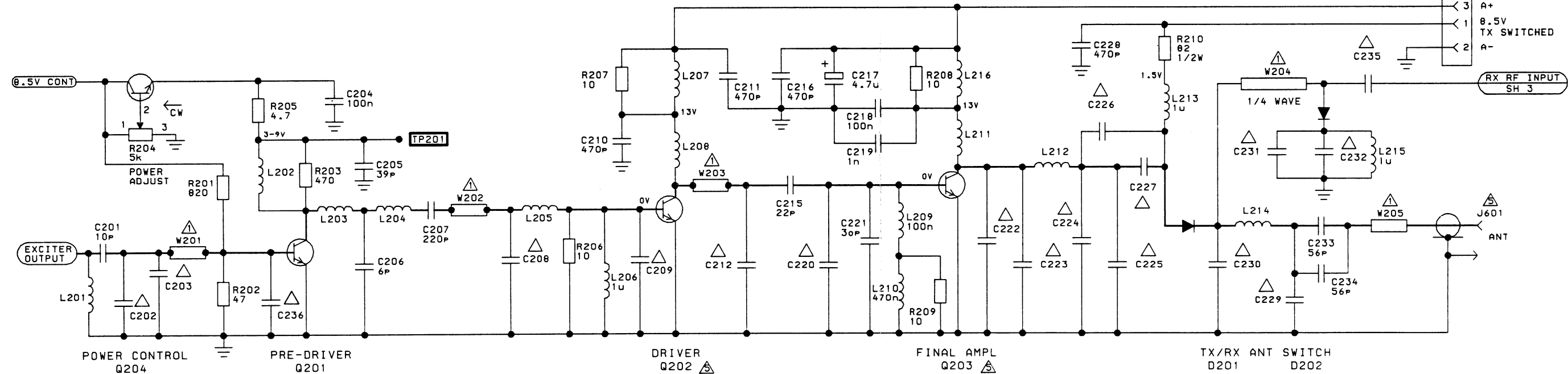
- ⑤ CALLED FOR AT HIGHER ASM.

ALL RESISTORS ARE 1/4 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 OR p.  
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR μ.

MODEL NO.	REV. LTR	FREQ RANGE	TX POWER
PL19D901043G2	A	440-470 MHZ	25W/5W
PL19D901003G13			25W
PL19D901003G14			25W
PL19D901003G15			5W
PL19D901003G16			5W
PL19D901043G5	A	470-512 MHZ	22W
PL19D901003G17			22W
PL19D901003G18			22W
PL19D901043G6	A	403-440 MHZ	25W
PL19D901003G19			25W
PL19D901003G20			25W

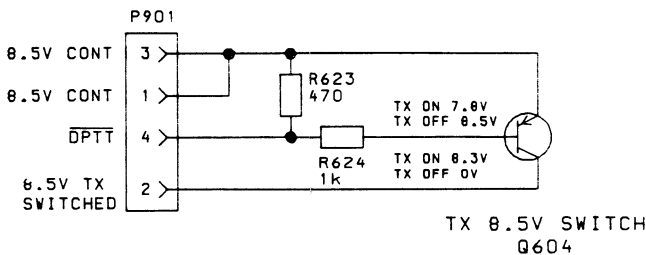


25 WATT TRANSMITTER POWER AMPLIFIER

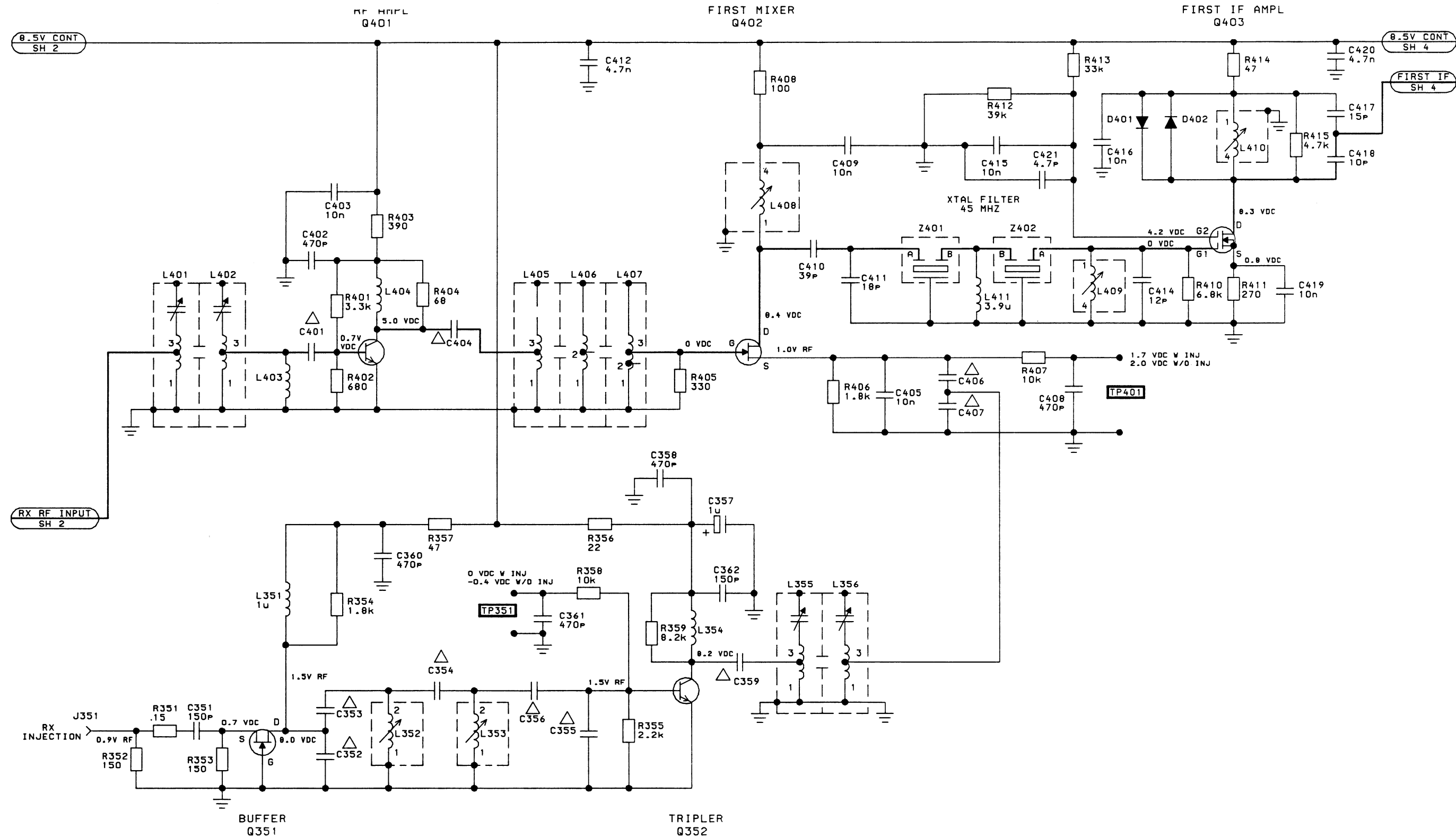


SCHEMATIC DIAGRAM

440-470 MHz  
WIDEBAND EXCITER/POWER AMPLIFIER



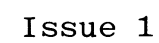




SCHEMATIC DIAGRAM

440-470 MHz WIDEBAND RECEIVER,  
FRONT END & FIRST MIXER/IF

(19D901701, Sh. 3, Rev. 1)





SYMBOL	GE PART NO.	DESCRIPTION	SYMBOL	GE PART NO.	DESCRIPTION	SYMBOL	GE PART NO.	DESCRIPTION	SYMBOL	GE PART NO.	DESCRIPTION
R410	H212CRP268C	Deposited carbon: 6.8K ohms ±5%, 1/4 w.	C604 and C605	T644ACP222J	Polyester: .0022 uF ±5%, 50 VDCW.	R618	H212CRP356C	Deposited carbon: 56K ohms ±5%, 1/4 w.		19C328587P1	Pushbutton. (S601 & S602).
R411	H212CRP127C	Deposited carbon: 270 ohms ±5%, 1/4 w.				R619	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.		NP280878P15	Nameplate. (MODE A, B - Used with S601).
R412	H212CRP339C	Deposited carbon: 39K ohms ±5%, 1/4 w.	C606	T644ACP322K	Polyester: .022 uF ±10%, 50 VDCW.	R620	H212CRP168C	Deposited carbon: 680 ohms ±5%, 1/4 w.		NP280878P17	Nameplate. (MONITOR - Used with S602).
R413	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.	C607 and C608	315A6047P225U	Tantalum: 2.2 uF ±20%, 35 VDCW.	R621A	H212CRP127C	Deposited carbon: 270 ohms ±5%, 1/4 w.		19A702381P508	Screw, thd. form: No. 3.5-0.6 x 8. (Secures A1).
R414	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.	C609 and C610	19A702250P113	Polyester: 0.1 uF ±10%, 50 VDCW.	R621B	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.		19A701886P1	Spring. (Used with L105, L106, L355, L356, L401, L402, L405-L407).
R415	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.				R621C	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.		19B232901P1	Support. (Used with U601 & U602).
TP401	19A703248P1	----- TEST POINTS -----	C611	315A6047P476M	Tantalum: 47 uF ±20%, 6.3 VDCW.	R621D	H212CRP022C	Deposited carbon: 22 ohms ±5%, 1/4 w.		19A700068P1	Insulator, bushing. (Used with U601 & U602).
		Contact, electrical.	C612	19A702250P112	Polyester: .068 uF ±10%, 50 VDCW; sim to NISSEI TYPE AMZ.	R621E	H212CRP968C	Deposited carbon: 6.8 ohms ±5%, 1/4 w.		19A700115P3	Insulator, plate. (Used with U601 & U602).
		----- NETWORKS -----	C613	19A701225P8	Electrolytic: 470 uF -10+75%, 16 VDCW; sim to Sprague 5002D477-0016DCIC.	R622	H212CRP056C	Deposited carbon: 56 ohms ±5%, 1/4 w.		19A701516P2	Insulator, plate. (Used with Z401 & Z402).
Z401	19A702166G2	Crystal pair, quartz: 45 MHz reference frequency	C614	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.	R624	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.		19B233285P1	Ground tab. (Located at L401-L407 casting).
Z402		Part of Z401.	C615	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.	R625	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.		19A701905P3	Tuning screw. (Used with L105, L106, L355, L356, L401, L402, L405-L407).
		RECEIVER - IF/DETECTOR	C616	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.	R626	19A700018P1	Deposited carbon: 1 ohm ±5%, 1/3 w.		19C851075P1	Knob. (R617).
		----- CAPACITORS -----	C617	19A703314P10	Electrolytic: 10 uF -10+50% tol, 50 VDCW; sim to Panasonic LS Series.	R627 and R628	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.		19A701743P1	Pad. (Located behind S602 knob).
C501	19A700235P16	Ceramic: 18 pF ±5%, 50 VDCW.	C618	19A703314P4	Electrolytic: 47 uF -10+50% tol, 16 VDCW; sim to Panasonic LS Series.	R629	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.		19D429946P4	Casting. (Located at L401 & L407).
C502 and C503	19A700235P15	Ceramic: 15 pF ±5%, 50 VDCW.	C619	19A702250P112	Polyester: .068 uF ±10%, 50 VDCW; sim to NISSEI TYPE AMZ.	R630	H212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.		19C850619G6	Casting. (Located at L105 & L106).
C504 and C505	19A702250P113	Polyester: 0.1 uF ±10%, 50 VDCW.	C620	19A701225P3	Electrolytic: 220 uF, -10+50%, 25 VDCW.	R631	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.		19A121175P46	Insulator, plate. (Located at L404).
C508	19A702250P113	Polyester: 0.1 uF ±10%, 50 VDCW.	C621	315A6047P334U	Tantalum: 0.33 uF ±20%, 35 VDCW.	R632	H212CRP312C	Deposited carbon: 12K ohms ±5%, 1/4 w.		19B801338P1	Shield, dust.
		----- COILS -----	C622	T644ACP210K	Polyester: .0010 uF ±10%, 50 VDCW.	R633	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.			
L501	19A703311P2	Coil, RF: sim to TOKO AMERICA KON-K6072BA.	C623	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.	R635	H212CRP115C	Deposited carbon: 150 ohms ±5%, 1/4 w.			
L502	19B801023P1	Coil, RF: 450 uH ±6%, sim to TOKO AMERICAN 124LN-A064HM.			----- DIODES -----	R637	H212CRP215C	Deposited carbon: 1.5K ohms ±5%, 1/4 w.			
		----- RESISTORS -----	D601	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.	R638	H212CRP439C	Deposited carbon: 0.39M ±5%, 1/4 w.			
R501	H212CRP182C	Deposited carbon: 820 ohms ±5%, 1/4 w.	H601	19A134354P1	Diode, optoelectronic: red; sim to Hew. Packard 5082-4655.	R639	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.			
R502	H212CRP318C	Deposited carbon: 18K ohms ±5%, 1/4 w.			----- INDICATORS -----	R640	H212CRP015C	Deposited carbon: 15 ohms ±5%, 1/4 w.			
R503 and R504	H212CRP218C	Deposited carbon: 1.8K ohms ±5%, 1/4 w.			----- TRANSISTORS -----	R641	H212CRP127C	Deposited carbon: 270 ohms ±5%, 1/4 w.			
R505	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.	Q601	19A700022P2	Silicon, PNP: sim to 2N3906.			----- SWITCHES -----			
R506	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.	Q602	19A700023P2	Silicon, NPN: sim to 2N3904.	S602	19B800563P8	Push: DPDT, contacts rated 15 mA at 130 VDC; sim to IEEE/SCHADOW F2U0A.			
		----- TEST POINTS -----	Q603	19A700022P2	Silicon, PNP: sim to 2N3906.			Part of R617.			
TP501	19A703248P1	Contact, electrical.	Q604	19A702504P2	Silicon, PNP; sim to 2N4403.	S617		----- INTEGRATED CIRCUITS -----			
		----- INTEGRATED CIRCUITS -----	Q605 and Q606	19A700023P2	Silicon, NPN: sim to 2N3904.	U601	19A701830P1	Linear, Audio AMPLIFIER; sim to TDA 2003.			
U501	19A704619P1	Linear: IF AMPLIFIER AND DETECTOR.			----- RESISTORS -----	U602	19A138414G1	Regulator: 8.5 V.			
		----- SOCKETS -----	R601	H212CRP282C	Deposited carbon: 8.2K ohms ±5%, 1/4 w.			SYSTEM INTERCONNECT			
X501	19A702742P1	Crystal socket. (Quantity 2).	R602	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.	P901	19A116659P15	Connector, printed wiring: 4 contacts rated at 5 amps; sim to Molex 09-52-3042.			
		----- CRYSTALS -----	R603	H212CRP215C	Deposited carbon: 1.5K ohms ±5%, 1/4 w.	P903	19A116659P83	Connector, printed wiring: 7 contacts rated at 5 amps; sim to Molex 09-52-3072 SPECIAL.			
Y501	19B233066G8	Crystal: freq range 45.455 MHz.	R604	H212CRP212C	Deposited carbon: 1.2K ohms ±5%, 1/4 w.	P912	19A116659P15	Connector, printed wiring: 4 contacts rated at 5 amps; sim to Molex 09-52-3042.			
		----- NETWORKS -----	R605	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.			----- TRANSISTORS -----			
Z501	19B801021P2	Bandpass filter: 455 kHz ±1.5; sim to Murata CFW-455E.	R606	H212CRP356C	Deposited carbon: 56K ohms ±5%, 1/4 w.	Q202	19A134164P2	Silicon, NPN; sim to Type 2N5945.			
		RECEIVER - AUDIO	R607	19B800784P105	Variable: 1K ohms ±20%, 350 VDCW, .5 w.	Q203	19A134239P2	Silicon, NPN.			
		----- CAPACITORS -----	R608	H212CRP368C	Deposited carbon: 68K ohms ±5%, 1/4 w.			----- SWITCHES -----			
C601 and C602	T644ACP210K	Polyester: .0010 uF ±10%, 50 VDCW.	R610	H212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w.	S601	19B800563P1	Push: DPDT, 1 station, alternate action; sim to IEEE/SCHADOW 51281 (F2UEE).			
C603	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.	R611 and R612	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.			----- MISCELLANEOUS -----			
			R613	H212CRP910C	Deposited carbon: 1 ohm ±5%, 1/4 w.		19A130465P1	Spacer, inner. (Used with Q202).			
			R614	H212CRP156C	Deposited carbon: 560 ohms ±5%, 1/4 w.		7142162P137	Nut, spacer: No. 8-32. (Used with Q202).			
			R615	H212CRP218C	Deposited carbon: 1.8K ohms ±5%, 1/4 w.		5492178P2	Washer, spring tension: sim to Wallace Barnes 375-20. (Used with Q202).			
			R616	H212CRP982C	Deposited carbon: 8.2 ohms ±5%, 1/4 w.						
			R617	19A703313P3	Variable: 10K ohms ±20%, .1 watt.						

ADDENDUM NO 1 TO LBI-31589A  
(PCN5)

This addendum provides neccessary information pertaining to a change in this publication.

To improve operation P901, P903, and P912 have been changed to gold plated contacts. New part numbers are:

P901 and P912: 19A116659P187  
P903: 19A116659P188

When changing boards, care should be taken to assure boards with gold contacts are not interchanged with boards having tin contacts.

