MOBILE RADIO

MASTR Progress Line

150.8—174 MHz DUAL FRONT END MODEL 19D413462-G1

Maintenance Manual LBI-4106B
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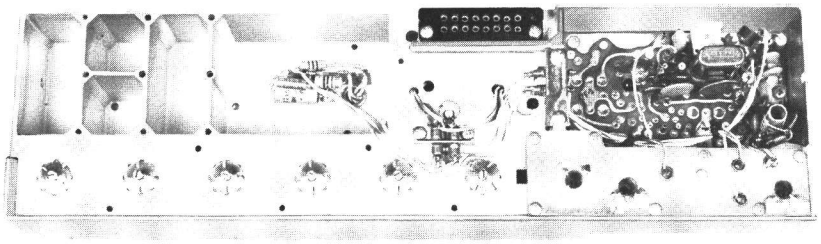
DF-8401



SPECIFICATIONS *

FREQUENCY RANGE	150.8-174 MHz		
SENSITIVITY (DFE & RECEIVER)	With Pre-Amp	Without Pre-Amp	With Noise Blanker
12-dB SINAD	0.35 mv	0.60 mv	0.35 mv
20-dB quieting	0.45 mv	0.85 mv	0.45 mv
INTERMODULATION (EIA)	-75 dB	-80 dB	-75 dB
INPUT POWER	.010 Amps at 10 volts		
FREQUENCY STABILITY			
Standard Oscillator	.0005% (-30°C to +60°C)		
ICOM	.0002% (-30°C to +60°C)		
TRANSISTORS	6		
DIMENSIONS (HxWxD)	2-1/4" x 11-3/4" x 4-3/8"		

OPTIONS

7232: 1-Freq. Transmit, 1-Freq. Receive

7233: 2-Freq. Transmit, 1-Freq. Receive

7285: 1-Freq. Transmit, 1-Freq. Receive with Pre-amp

7286: 2-Freq. Transmit, 1-Freq. Receive with Pre-amp

7287: Dual Front End with ICOM Oscillator

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

DUAL FRONT END 150.8-174 MHz

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with voltage or RF power; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

DESCRIPTION

DUAL FRONT END

General Electric Dual Front End Model 19D413462-G1 was designed for operation in the 150.8-174 megahertz band. The Dual Front End (DFE) is used with MASTR Progress Line Receivers to monitor two frequencies when the channel spacing is greater than 0.4% (±0.2%).

The DFE is of single-unit construction, completely housed in an aluminum casting for maximum shielding and rigidity. The standard unit consists of five helical resonators, 1st mixer, oscillator and two multiplier stages, and a high IF amplifier.

An optional RF pre-amplifier stage is available whenever an increase in sensitivity is required. The chassis is mounted in a housing on the rear of the mobile frame, adding approximately three inches to the overall length of the mobile unit. A block diagram of the DFE is shown in Figure 1.

ANTENNA SYSTEM

The Dual Front End and the receiver use a common antenna. A power splitter mounted on the front of the system frame provides approximately 20 dB separation for the two receive channels. Due to the isolation provided by the power splitter, cable lengths to the DFE and the receive are not critical.

In standard applications, the antenna connects to J901 on the front of the mobile unit. From J901, the antenna connects to the common terminal of the antenna relay (see Figure 2). The transmitter connects to the normally-open contact on the antenna relay, while the normally-closed contact is

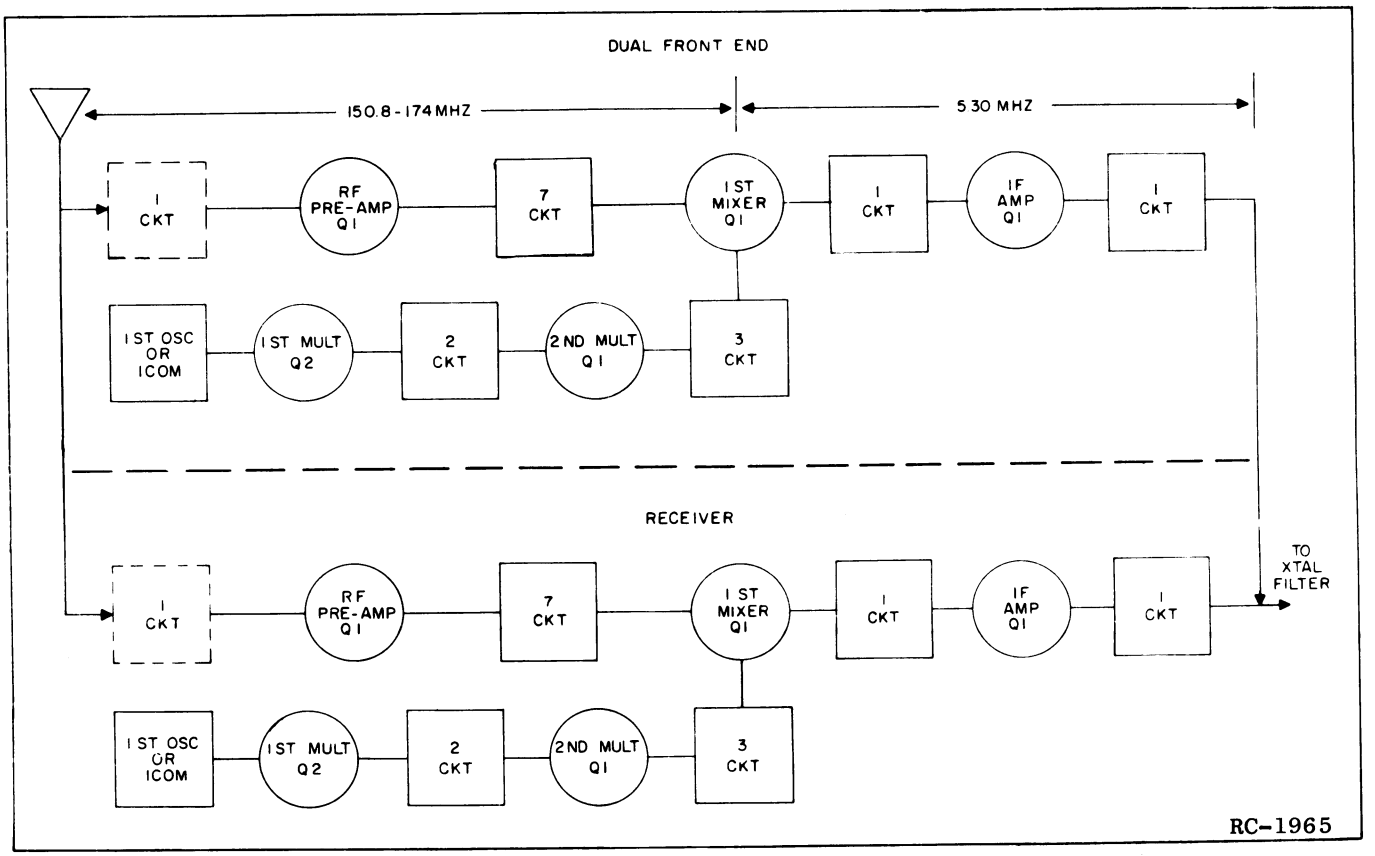


Figure 1 - Dual Front End Block Diagram

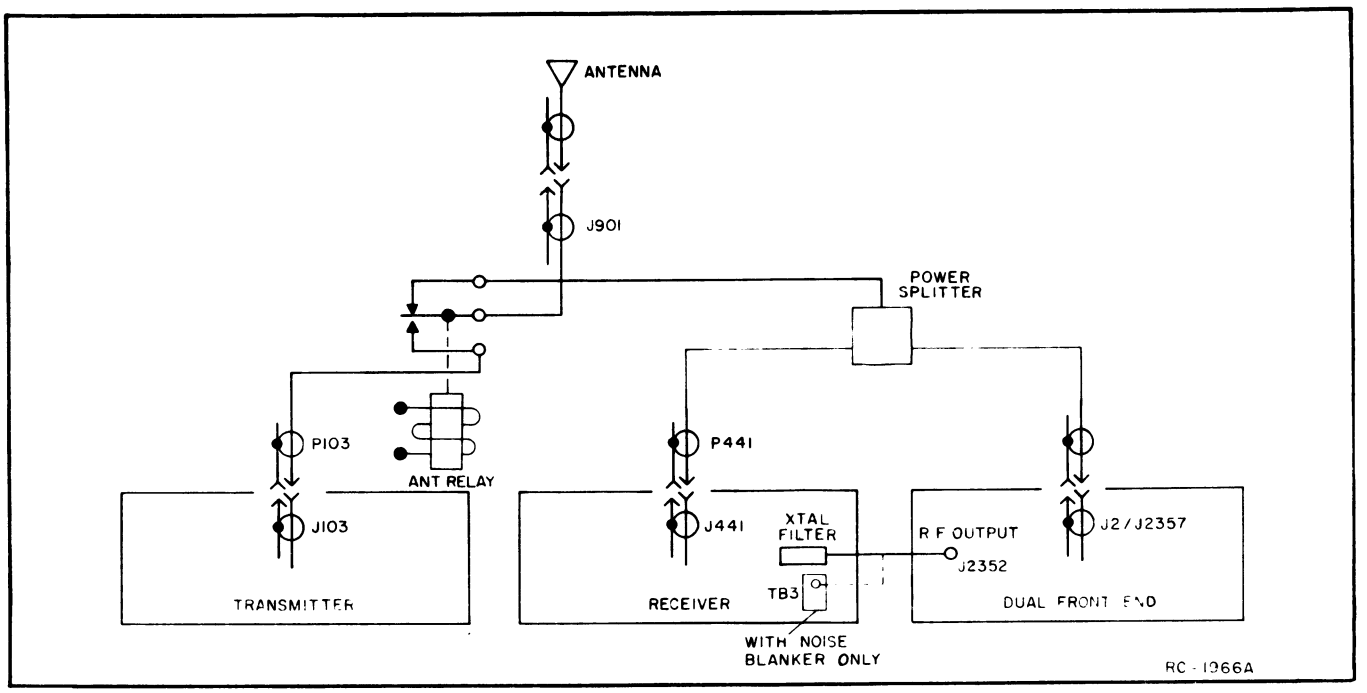


Figure 2 - Single Antenna Block Diagram

connected to input jack J3 on the power splitter.

One cable from the power splitter connects to the DFE input jack (J2/J2357), and the other cable connects to J441 on the receiver.

CIRCUIT ANALYSIS

DUAL FRONT END

The MASTR Progress Line Dual Front End is completely transistorized, using six silicon transistors. A regulated 10 volts is used for all stages of the Dual Front End.

Centralized metering jack J2351 is provided for use with GE Test Set Models 4EX3A10 and 4EX8K11 for ease of alignment and servicing. The Test Set meters the oscillator, multipliers, and the regulated 10 volts.

The regulated 10 volts, oscillator keying voltage, system negative, and ground connections are supplied by the four leads from receiver plug P443.

RF Preamplifier (A322)

Optional RF Preamplifier A322 consists of two tuned circuits and an RF Amplifier Q1.

The preamplifier uses a Field-Effect Transistor (FET) as the active device. The FET may be considered a semiconductor current path (or channel) whose resistance is varied by a voltage applied between the "gate" and "source" terminals. Lead identification for the FET is shown in Figure 3. The FET has voltage-controlled characteristics, and may be compared to a vacuum tube in operation (see Figure 3).

RF from the antenna is coupled through T2 to the "source" terminal of FET Q1. Q1 operates as a grounded-gate amplifier. This method of operation provides a low impedance input to the amplifier. The amplifier output is taken from the "drain" terminal and coupled through a tuned circuit (T4) to the input of five helical resonators.

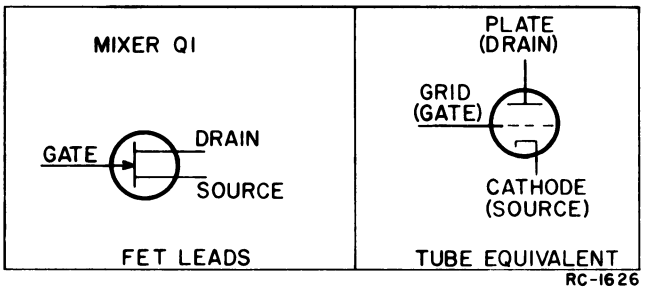


Figure 3 - FET Nomenclature

Helical Resonators

Five tuned helical resonators L2352 through L2360 provide the RF selectivity in the dual front end. An RF cable connects the RF signal from the antenna or the optional Pre-amp to a tap on L2352. The tap is positioned to provide the proper impedance match to the antenna. The output of L2360 is coupled through C3 to the 1st mixer assembly.

Standard Oscillator/Multiplier (A2358)

The standard 1st oscillator operates in a transistorized Colpitts oscillator circuit. The oscillator crystal operates in a fundamental mode at a frequency of approximately 13 to 18 megahertz. The crystal is cut to provide temperature compensation at the high end of the temperature range and is thermistor compensated at low temperatures. This provides ±.0005% frequency stability as soon as the power is applied -- without having to wait for crystal ovens to warm up.

Regulated 10 volts is supplied to the crystal circuit to forward bias diode CR1. Forward biasing the diode reduces its impedance, so that the crystal frequency is applied to the base of oscillator transistor Q1. Feedback for the oscillator is developed across C21. The oscillator output is coupled through C24 to the base of 1st multiplier Q2.

The output of the 1st multiplier (tripler Q2) is transformer-coupled (T2) to the 2nd multiplier assembly. The 1st multiplier is tuned to three times the crystal frequency, and is metered at centralized metering jack J2351-4 through metering network CR5, R5, R16 and C32.

Oscillator Multiplier With ICOM (A2362)

Oscillator/Multiplier Board A2362 uses ICOM Module Model 4EG26A11. The ICOM Module consists of a crystal-controlled Colpitts oscillator, a voltage regulator and a buffer output stage. The entire module (including crystal) is enclosed in a dust-proof aluminum can, with the ICOM frequency and the receiver operating frequency printed on the top. Access to the oscillator trimmer is obtained by prying off the plastic GE decal on the top of the can.

The oscillator frequency is temperature-compensated at both ends of the temperature range to provide instant frequency compensation, with a frequency stability of ±0.0002% without crystal ovens or warmers.

In the DFE, +10 volts for operating the ICOM is obtained through the frequency selector switch on the control unit. With the ICOM operating, diode CR1 is forward biased and the oscillator output is applied to 1st multiplier Q1.

The output of the 1st multiplier (tripler) is transformer-coupled (T2) to the 2nd multiplier assembly. The 1st multiplier tank is tuned to three times the crystal frequency, and is metered at centralized metering jack J442-4 through metering network CR5, R16, R5 and C33.

2nd Multiplier (A2354)

The 1st multiplier output is transformer coupled through T2 to the base of 2nd multiplier A2354-Q1. Following the 2nd multiplier are three resonant L-C circuits tuned to nine times the crystal frequency. The output is taken from a tap on L2362 and applied to the 1st mixer.

1st Mixer (A2352)

The 1st mixer uses a Field-Effect Transistor (FET) as the active device (Figure 2).

The FET has several advantages over a conventional transistor, including a high input impedance, high power gain, and an output that is relatively free of harmonics (los in intermodulation products).

In the 1st mixer, RF from the helical resonators is applied to the gate of Q1, and injection voltage from the 2nd multiplier is applied to the source. The mixer output is taken from the drain and applied to the output transformer. The transformer is tuned to the 5.3 MHz high IF frequency.

HI IF Amplifier (A2365)

A series-resonant circuit (L3 and C1) couples the mixer output to the emitter of high IF amplifier Q1. The transistor operates as a grounded-base amplifier which provides a low impedance for the mixer input. The amplifier output is coupled through transformer T1 to the crystal filter on standard receivers and to the level switch and IF gate on receiver with Noise Blanker.

RECEIVER MODIFICATIONS

The following modification is required in the MASTR mobile receiver whenever the receiver is used with a Dual Front End option.

1. In receivers without Noise Blankers:

   a. Replaced the 5.6K-ohm resistor across the input of Crystal Filter A316 with a 12K-ohm resistor (GE Part No. 3R77-P123K).

   b. Connected the center conductor of the DFE output cable to the filter input, and the shield to the ground lug on the filter.

2. In receiver with Noise Blankers, connected the center conductor of the DFE output cable to TB3-2 and the shield to TB3-1.

3. Removed the jumper from H1 to H2 on the 1st Oscillator/Multiplier board.

4. Connected the White-Yellow-Brown lead to J5 on the oscillator board.

5. Soldered the four leads from cable 19B204924-G1 to P443 as shown on the Outline Diagram (see Table of Contents).

6. Connected to RF cable from the Power Splitter to J441.

MAINTENANCE

DISASSEMBLY

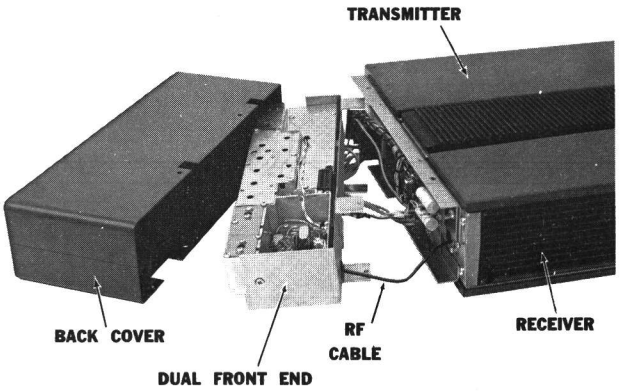


Figure 4 - Dual Front End Disassembly

To gain access to the DFE:

1. Pull locking handle down and pull radio out of mounting frame.

2. Remove the four screws holding back cover to system frame. Slide cover back and lift off (see Figure 13).

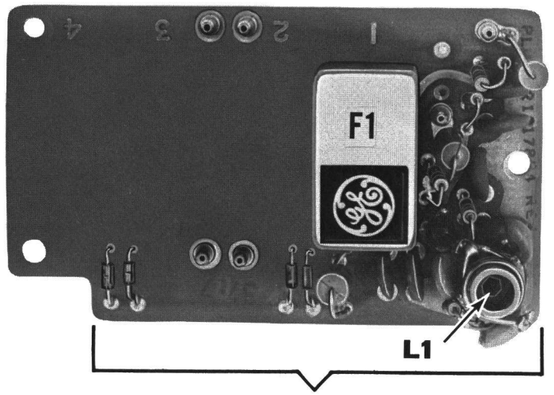
3. Remove four screws from angle brackets holding Dual Front End to the system frame.

4. Carefully swing Dual Front End chassis out for servicing.

TEST PROCEDURES

Dual Front End

SYMPTOM	CHECK
No Output	1. Connections to P443. 2. Cable from J2352 to receiver mixer board. 3. Antenna terminal connections. 4. Check 10-volt supply with GE test meter at Pin 13 on DFE centralized metering jack J2351.
Low Sensitivity	1. DFE alignment. 2. Cable and relay connections. 3. 1st Mixer voltages. 4. 1st Oscillator voltages. 5. HI IF Amplifier voltages.
Low Oscillator Reading	1. Oscillator alignment. 2. Voltage readings at 1st Oscillator. 3. Crystal Y1.



1st OSC./MULT. WITH ICOM

ICOM FREQUENCY ADJUSTMENT

Due to the high stability of the ICOM module, it is not recommended that zero discriminator be used as the indication for setting the oscillator frequency. Instead, measure the ICOM frequency as described in the following procedure.

EQUIPMENT REQUIRED:

1. Frequency Counter capable of measuring the 42 to 56.25 MHz frequency range. The counter should have an accuracy of 0.4 part-per-million (PPM).
2. Coaxial cable with test loop as shown in Figure 5.
3. Mercury thermometer.

PROCEDURE:

1. Check ICOM temperature by taping the mercury thermometer to the side of the ICOM.
2. Connect the coaxial cable to the frequency counter. Then place the 4-turn test loop over L1 on the 1st OSC/MULT board.
3. If the ICOM temperature is 80°F (±4°F) or 26.5°C (±2°C), the frequency indication on the counter should be 3 times the frequency stenciled on the ICOM case. Adjust the ICOM trimmer (if necessary) to obtain this frequency.
4. If the temperature is not within the 80°F (±4°F) or 26.5°C (±2°C) range, use the correction curves of Figure 6 for setting the ICOM frequency as follows:
   a. Check the color dot beneath the GE emblem and select the matching curve to determine the correction factor in parts-per-million (PPM).
   b. Multiply the frequency stanciled on the ICOM by 3 and then multiply this figure by the correction factor (from Figure 6) observing the sign (±) given to the correction factor.
   c. The frequency measured at L1 should be 3 times the ICOM frequency ± the correction factor. Adjust the ICOM trimmer (if required) to obtain this frequency.

EXAMPLE

ICOM Frequency	-	16.948,148 MHz
ICOM Color Dot	-	Green
Ambient Temperature	-	35°C (95°F)
Correction Factor	-	-1.15 PPM

Multiply ICOM Frequency by 3; (16.948,148 MHz x 3 = 50.844,444 MHz)

Multiply preceding figure by correction factor; (50.844 MHz x -1.15 PPM = -58.47 hertz (or -58 hertz)

Set the frequency measured at L1 for 50.844,386 MHz;

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50.844,444
-       58
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50.844,386
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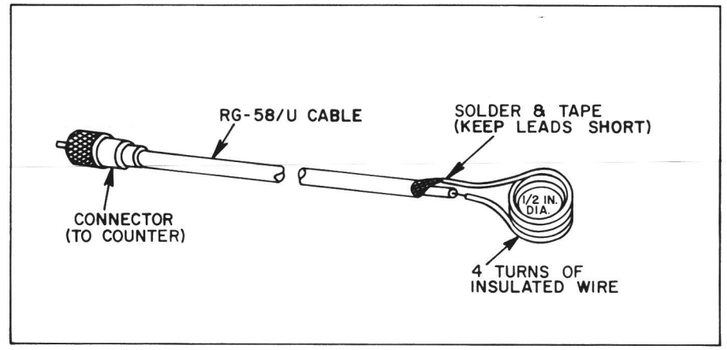


Figure 5 - Coaxial Cable and Test Loop

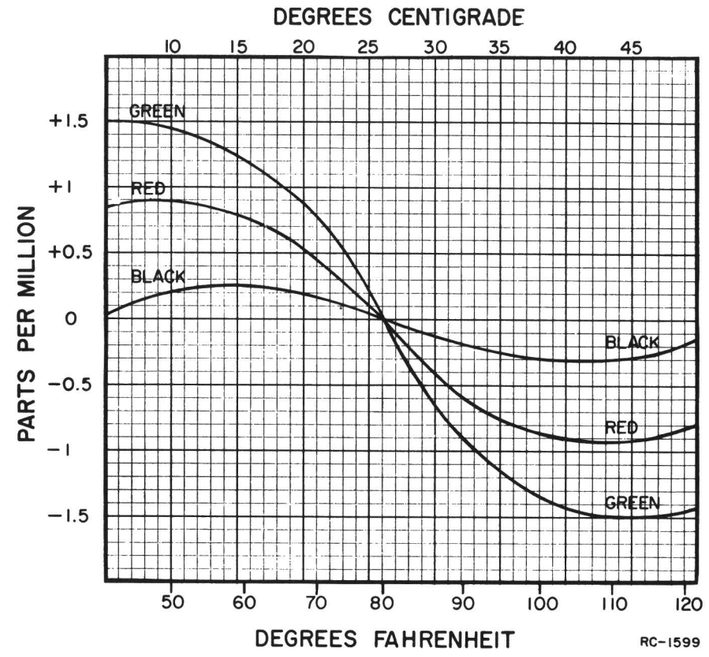


Figure 6 - ICOM Correction Curves

ADJUSTMENT PROCEDURE

ICOM ADJUSTMENT

DUAL FRONT END ALIGNMENT

Refer to Receiver MAINTENANCE MANUAL for Receiver IF Alignment Procedure.

EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A10 or 4EX8K11 (or a 20,000 ohm-per-volt multi meter).

2. Signal Generator (150.8-174 MHz range). Connect a one-inch piece of insulated wire no larger than .065-inch diameter to generator output probe.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Plug Test Set cable into metering jack J2351. With Test Set in position J, check for regulated +10 volts. If using multimeter, measure at metering jack J2351-13 and -16.

2. If using Multimeter for alignment, connect positive lead to J2351-16 (ground).

3. Set frequency selector switch on control unit to F2 position.

4. For a large change in frequency or a badly mis-aligned DFE, set crystal trimmer C9 on standard 1st Osc/Mult board to mid-capacity. Do not touch ICOM trimmer if using ICOM oscillator.

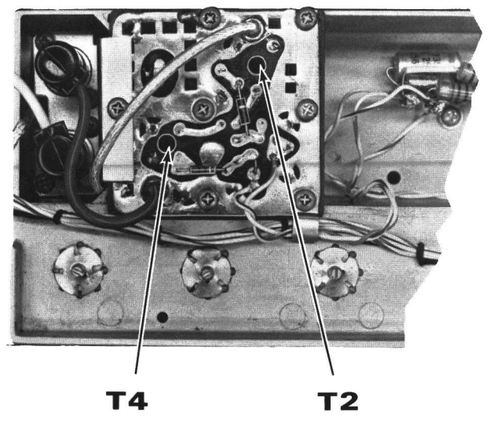
NOTE

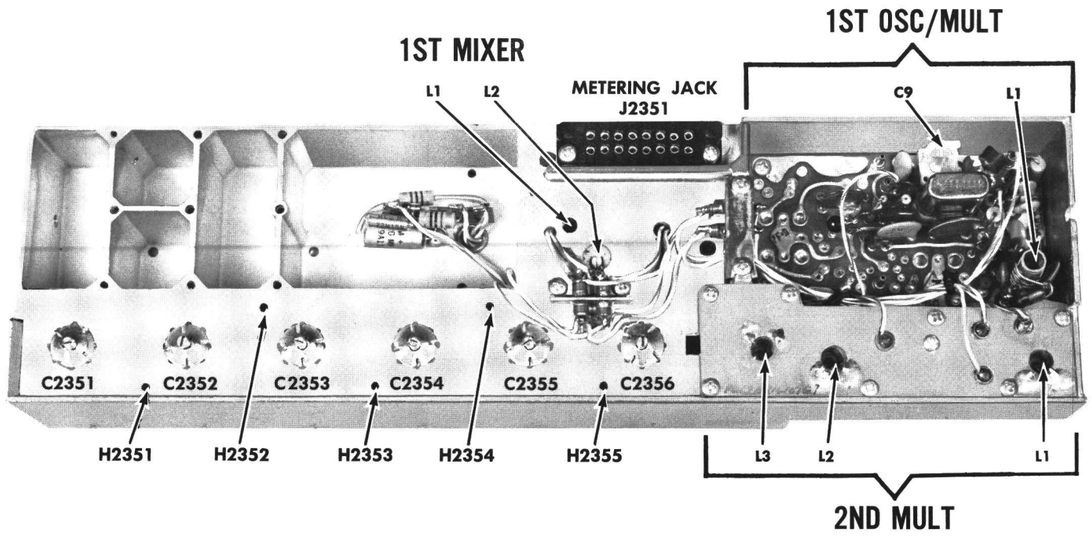
If Receiver and Dual Front End operating frequencies are less than 1 MHz apart, connect the signal generator directly into the Dual Front End antenna connector, not into the connector.

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set	METERING POSITION: Multimeter - at J2351	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR, MULTIPLIERS & 1ST MIXER		
1.	D (Mult 1 on DFE)	Pin 4	L1 (on 1st OSC/MULT), and L1 (on 2nd MULT)	See Procedure	Switch Test Set to Test 1 or 1-volt position. Tune L1 on 1st OSC/MULT for maximum meter reading. Then tune L1 on 2nd Mult for minimum meter reading.
2.	E (Mult 2 on DFE)	Pin 5	L1 (on 1st OSC/MULT), and L1, L2 and L3 (on 2nd MULT)	See Procedure	Tune L1 on 1st OSC/MULT and L1 and L2 on 2nd MULT for maximum meter reading. Then tune L3 for minimum meter reading.
3.	A (Disc on Receiver)	Pin 10		Zero	Connect Test Set plug to receiver metering jack J442. Insert signal generator probe into H2355 and adjust signal generator for discriminator zero.
4.	B (2nd IF Amp on Receiver)	Pin 2	L1 and L2 (on 1st Mixer)	Maximum	Apply an on-frequency signal as above. Tune L1 and L2 for maximum meter reading, keeping signal below saturation.
			RF CIRCUITS		
5.	B (2nd IF Amp on Receiver)	Pin 2	C2356, C2355, C2354, C2353 and C2352	Maximum	Apply an on-frequency signal into the holes as shown below. Insert probe into hole only deep enough to obtain a reading. Insert Probe Into: / Tune: 1. H2355 — C2356 2. H2354 — C2355 3. H2353 — C2354 4. H2352 — C2353 5. H2351 — C2352
6.	B (2nd IF Amp on Receiver)	Pin 2	C2351 thru C2356	See Procedure	Apply an on-frequency signal to the DFE antenna jack. On DFE's with Pre-amp, tune T2 and T4 for maximum meter reading. On all DFE's tune C2351 thru C2356 for maximum meter reading, keeping signal below saturation. Then return C2351 thru C2356 slightly for maximum quieting.
			FREQUENCY ADJUSTMENT (Standard Oscillator)		
7.	A (Disc on Receiver)	Pin 10	C9 (on 1st OSC/MULT)	Zero	Apply an on-frequency signal to the DFE antenna jack, and adjust C9 for zero discriminator reading.

PRE-AMP

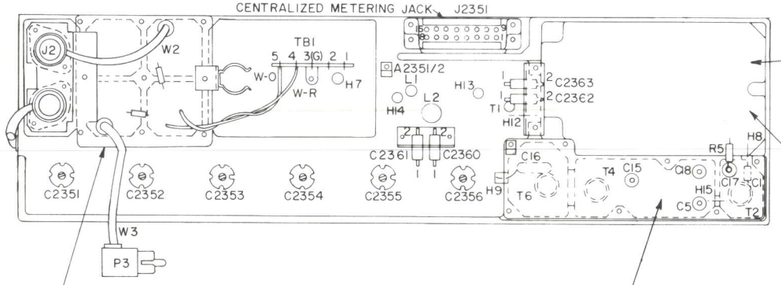




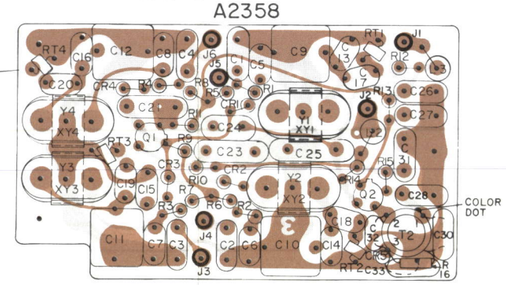
ALIGNMENT PROCEDURE

150.8—174 MHz, DUAL FRONT END
MODEL 19D413462-G1

TOP VIEW



IST OSCILLATOR/MULTIPLIER
A2358



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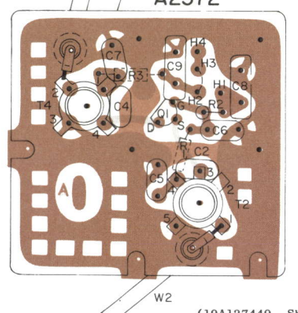
(19B204412, Sh. 2, Rev. 3)

PREAMP
A2372



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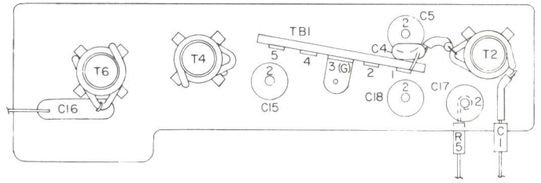
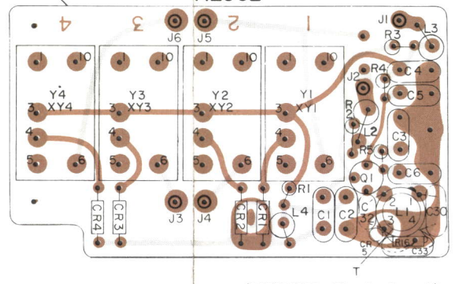
(19A127449, Sh. 2, Rev. 0)

2ND MULTIPLIER
A2354



IST OSC/MULT (WITH ICOM)
A2362



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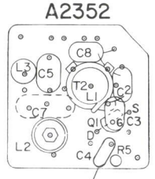
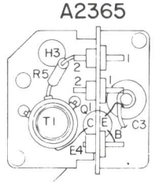
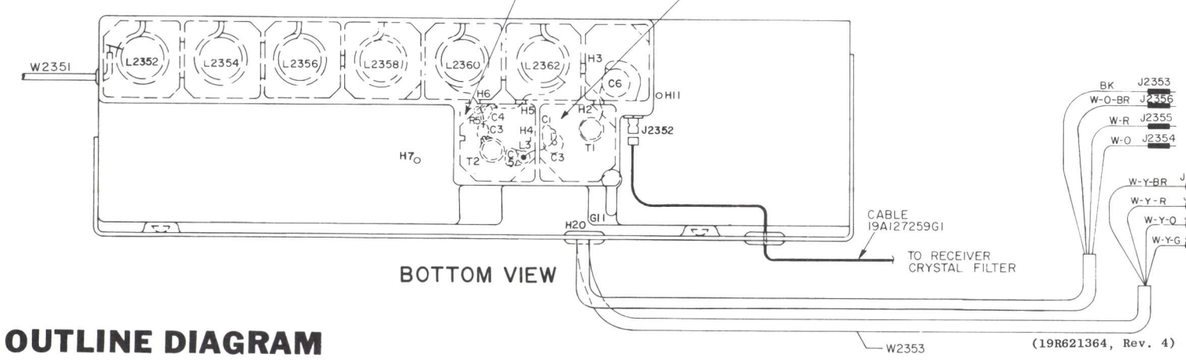
(19B216155, Sh. 2, Rev. 0)

IST MIXER
A2352



HI IF AMP
A2365





BOTTOM VIEW

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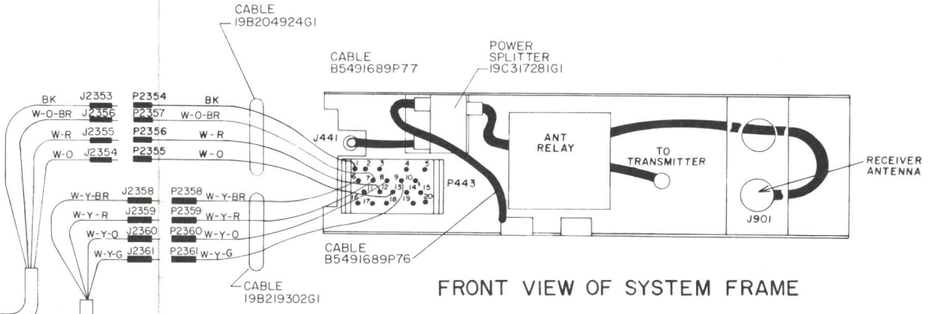
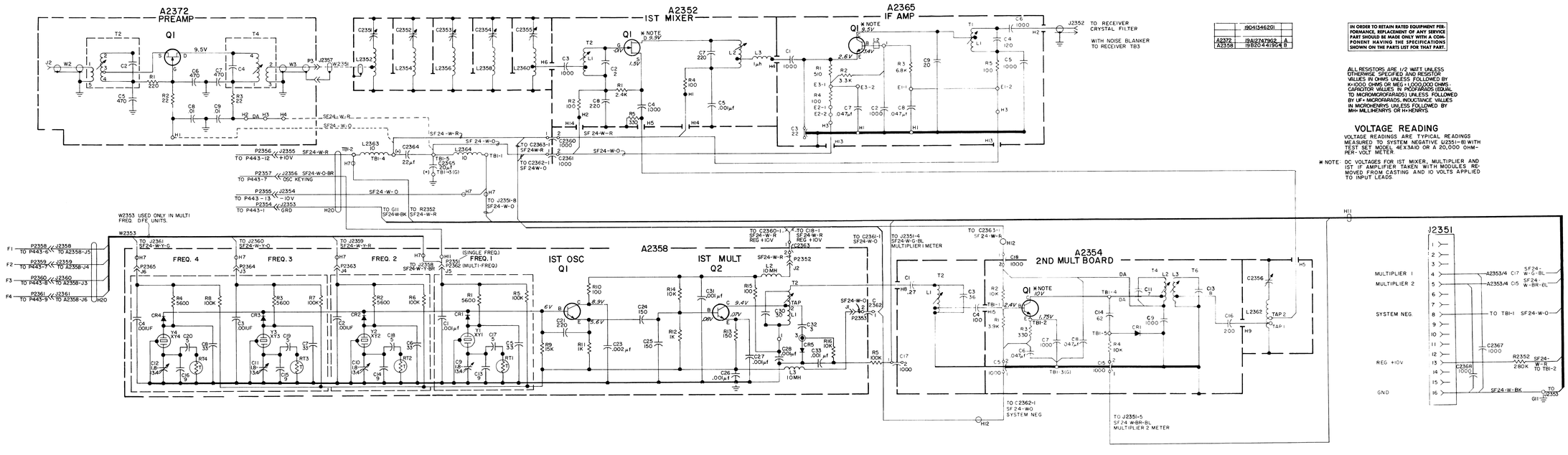


FRONT VIEW OF SYSTEM FRAME

OUTLINE DIAGRAM

150.8—174 MHz, DUAL FRONT END
MODEL 19D413462-G1



	804134620
A2372	19A12747903 A
A2358	19B20441904 B

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG =1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

VOLTAGE READING

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (J2351-8) WITH TEST SET MODEL 4EX3A10 OR A 20,000 OHM-PER-VOLT METER.

* NOTE: DC VOLTAGES FOR IST MIXER, MULTIPLIER AND IST IF AMPLIFIER TAKEN WITH MODULES REMOVED FROM CASTING AND IO VOLTS APPLIED TO INPUT LEADS.

(19B621318, Rev. 4)

SCHEMATIC DIAGRAM

150.8—174 MHz, DUAL FRONT END WITH STANDARD OSCILLATOR

PARTS LIST

LBI-4107B

150.8-174 MHz DUAL FRONT END
19D413462G1

SYMBOL	GE PART NO.	DESCRIPTION
A2372		RF PRE-AMPLIFIER 19C317051G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2		(Part of T2).
C4		(Part of T4).
C5 thru C7	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C8 and C9	19B209243P101	Polyester: 0.01 pf ±10%, 50 VDCW.
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - - -
J2		(Part of W2).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		(Part of W1).
P3		(Part of W3).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116154P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P221J	Composition: 220 ohms ±5%, 1/4 w.
R2 and R3	3R152P220J	Composition: 22 ohms ±5%, 1/4 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2		COIL ASSEMBLY 19B216479G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2*	5496218P640	Ceramic disc: 9.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM. Earlier than REV A:
	5496218P638	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
	5491798P5	Tuning slug.
T4		COIL ASSEMBLY 19B216478G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4	5496218P635	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
	5491798P5	Tuning slug.
		- - - - - - - - - - CABLES - - - - - - - - - -
W2	19B205634G2	Coaxial cable: approx 5 inches long. Includes (J1) connector.
W3	19A127476G1	Coaxial: approx 4 inches long. Includes (P3) connector.
A2352		FIRST MIXER 19B216077G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2		(Part of T2).
C3		(Part of T2).

SYMBOL	GE PART NO.	DESCRIPTION
C4	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C5	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C7	7480162P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C8	54962039149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of T2).
L2	19B216576G1	Coil.
L3	7488079P6	Choke, RF: 1 µh ±10%, 0.3 ohm DC res max; sim to Jeffers 4411-8K.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115593P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R2	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R4	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R5*	3R77P331K	Composition: 330 ohms ±10%, 1/2 w. Added by REV A.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2		COIL ASSEMBLY 19B216100G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	54962182P234	Ceramic disc: 3.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C3	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B216100P6	Coil. Includes tuning slug 5493185P5.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R6	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
A2354		SECOND MULTIPLIER 19B216107G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1		(Part of T2).
C3		(Part of T2).
C4		(Part of T2).
C5	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen Bradley Type FA5C.
C6	19B209243P105	Polyester: 0.047 pf ±10%, 50 VDCW.
C7	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C8	19B209243P105	Polyester: 0.047 pf ±10%, 50 VDCW.
C9		(Part of T4).
C11		(Part of T4).
C13		(Part of T6).
C14	5491601P16	Phenolic: 0.62 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C15	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen Bradley Type FA5C.
C16		(Part of T6).
C17 and C18	5493392P7	Ceramic, feed-thru: 1000 pf +100%-0%, 500 VDCW; sim to Allen Bradley Type FA5C.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of T2).
L2		(Part of T4).
L3		(Part of T6).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115330P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R2	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R3	3R152P331K	Composition: 330 ohms ±10%, 1/4 w.
R4	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R5	3R152P104K	Composition: 0.1 megohm ±10%, 1/4 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2		COIL ASSEMBLY 19B216097G2
J1 thru J6	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5491601P107	Phenolic: 0.27 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C3	5496218P252	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef -80 PPM.
C4	54962039134	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -3300 PPM.
	5491798P5	Tuning slug.
T4		COIL ASSEMBLY 19B216096G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C9	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C11	5496218P238	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A115250P1	Silicon.
	5491798P5	Tuning slug.
T6		COIL ASSEMBLY 19B216100G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C13	5496218P239	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C16	5496218P770	Ceramic disc: 200 pf ±5%, 500 VDCW, temp coef -750 PPM.
	5491798P5	Tuning slug.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1	7487424P7	Miniature, phen: 4 terminals.
A2358		FIRST OSCILLATOR 19B204419G4
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C5	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C9	5491271P106	Variable, subminiature: approx 2.1-12.7 pf 750 v peak; sim to EF Johnson 189-6-5.
C13	5496219P40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C17	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.

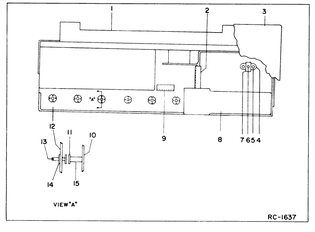
SYMBOL	GE PART NO.	DESCRIPTION
C21	5496219P771	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -750 PPM.
C23	5494481P114	Ceramic disc: 2000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C24	5490008P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C25	54962192467	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -220 PPM.
C26 thru C28	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C30		(Part of T2).
C31	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C32 and C33		(Part of T2).
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR5		(Part of T2).
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J6	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of T2).
L2 and L3	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res; sim to Jeffers 4421-7K.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A115330P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P563J	Composition: 5600 ohms ±5%, 1/4 w.
R9	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R10	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R11 and R12	3R152P103J	Composition: 1000 ohms ±5%, 1/4 w.
R13	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R14	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R15	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R16		(Part of T2).
R19	3R152P360J	Composition: 36 ohms ±5%, 1/4 w.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1	19B209284P5	Disc: 43 ohms nominal, color code green.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2		COIL ASSEMBLY 19B204421G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C30	5496218P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C32	5496218P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C33	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR5	19A115250P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121093P1	Coil. Includes tuning slug 5491798P5.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R16	3R152P103K 5491798P5	Composition: 10,000 ohms ±10%, 1/4 w. Tuning slug.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1		Refer to Mechanical Parts (MC-16371).
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
		When reordering give GE Part No. and specify exact freq needed.
		Crystal freq = (OF -5.30 MHz) ÷ 9.
Y1	19B206576P5	Quartz: freq range 16166.667 to 18744.444 KHz, temp range -30°C to +85°C. (150.8-174 MHz)
A2362		FIRST OSCILLATOR 19B216179G3
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C6	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C30		(Part of T2).
C32 and C33		(Part of T2).
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
CR5		(Part of T2).
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J6	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of T2).
L2 and L3	7488079P16	Choke, RF: 10 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L4	7488079P8	Choke, RF: 2.20 µh ±10%, 1 ohm DC res max; sim to Jeffers 4411-12K.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115330P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P272J	Composition: 2700 ohms ±5%, 1/4 w.
R2	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R3	3R152P100J	Composition: 1000 ohms ±5%, 1/4 w.
R4	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R5	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R16		(Part of T2).
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2		COIL ASSEMBLY 19B204421G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C30	5496218P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C32	5496218P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C33	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR5	19A115250P1	Silicon.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121093P1	Coil. Includes tuning slug 5491798P5.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R16	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1	19D213043G1 19D413071P1 19A115834P2	Socket assembly. Includes: Socket carry. Electrical contact.
		- - - - - - - - - - OSCILLATORS - - - - - - - - - -
Y1	19B209178P10	When reordering, specify ICOM frequency. ICOM frequency = (OF - 5.3 MHz) ÷ 9.
	19A115682P3	Tantalum: 22 pf ±20%, 15 VDCW; sim to Sprague Type 150D.
		Electrolytic: 20 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
Y1	4EG26A11	Integrated Circuit Oscillator Module (ICOM).
A2365	19D413070P1	Cap, decorative.
		HIGH IF AMPLIFIER 19B216109G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C2	5493392P107	Ceramic, feed-thru: 1000 pf +100%-0%, 500 VDCW; sim to Allen Bradley Type FA5C.
C3	5493392P108	Ceramic, stand-off: 22 pf ±10%, 500 VDCW; sim to Allen Bradley Type S5SA.
C4 thru C6		(Part of T1).
C7 and C8	19A116080P105	Polyester: 0.047 pf ±10%, 50 VDCW.
C9		(Part of T1).
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1 thru E3	4029309P1	Feed-thru: 750 VRMS max, 5.5 amps; sim to Bealectro FT-SM-27.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of T1).
L2*	19A116632P1	Core, toroidal; sim to Pyroferric P5-1288. Added by REV H.
Q1	19A115925P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R2	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R3	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R4	3R152P103K	Composition: 100 ohms ±10%, 1/4 w.
R5		(Part of T1).
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1		COIL ASSEMBLY 19B216103G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4	5496218P265	Ceramic disc: 120 pf ±5%, 500 VDCW, temp coef -80 PPM.
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C6	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C9	5496218P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.

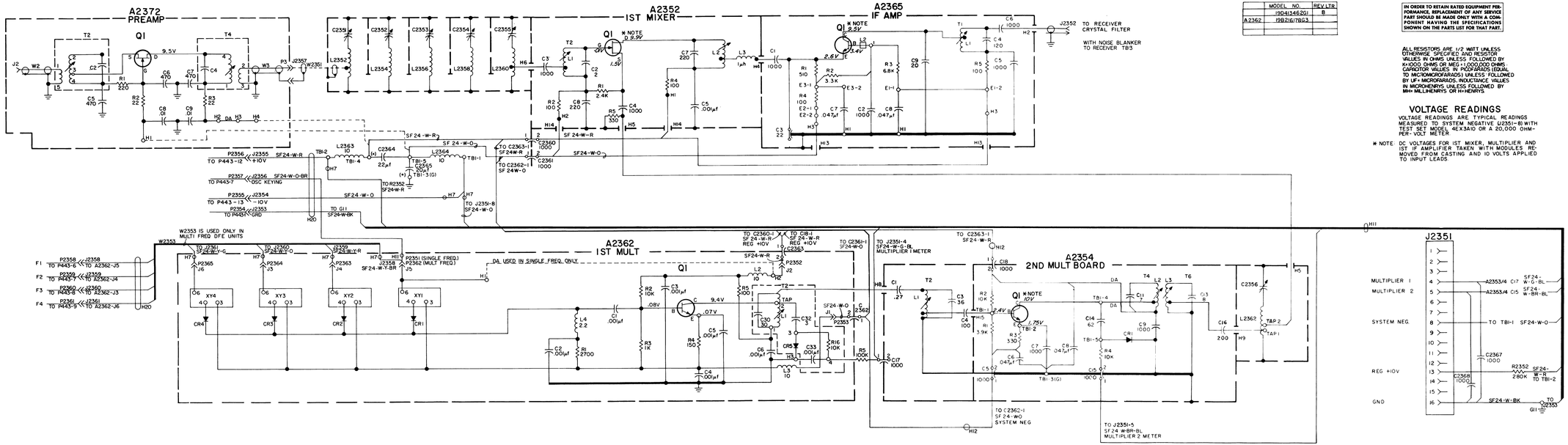
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R5	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
		CHASSIS AND RF CIRCUIT 19D413462G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2351 thru C2356		(See mechanical parts, MC-1637).
C2360 thru C2363	19B209135P1	Ceramic, feed-thru: 1000 pf +150%-0%, 500 VDCW.
C2364	5496367P10	Tantalum: 22 pf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2365	19A115682P3	Electrolytic: 20 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C2367 and C2368	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - -
J2351	19B205689G2	Connector: 18 contacts.
J2352	19A115465P1	Connector, coaxial; sim to Micon Electronics Type 1104.
J2353 thru J2356	7147199P1	Connector: male contact; sim to Winchester Electronics 21803.
J2357		(Part of W2351).
J2358 thru J2361		(Part of W2353).
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2352	19B216112G3	Coil.
L2354	19B216112G7	Coil.
L2356	19B216112G7	Coil.
L2358	19B216112G7	Coil.
L2360	19B216113G5	Coil.
L2362	19B216112G1	Coil.
L2363 and L2364	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res max; sim to Jeffers 4421-7K.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P2351 thru P2353	4029846P2	Contact, electrical; sim to Amp 42827-2.
P2362 thru P2365		(Part of W2353).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2352	19A116278P444	Metal film: 280,000 ohms ±2%, 1/2 w.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1	7487424P7	Miniature, phen: 4 terminals.
		- - - - - - - - - - CABLES - - - - - - - - - -
W2351	19B205634G1	Coaxial cable: approx 5 inches long. Includes (J2357) connector.
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - -
J2357	19B209122P3	Receptacle: coaxial; sim to Vendor Piece A-183.
W2353		4 FREQUENCY CABLE 19B215304G1
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - -
J2358 thru J2361	7147199P1	Connector: male contact; sim to Winchester Electronics 21803.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - PLUGS - - - - - - - - - -
P2362 thru P2365	4029846P2	Contact, electrical: sim to AMP 42827-2.
		RECEIVER MODIFICATION KIT 19A127682G2
	19B204924G1	Cable. (Connects to P443).
	19A127259G1	Cable. (Connects to FL1).
	19A115539P1	Tap screw. (Mounts dual front end to frame).
	4037914P2	Channel pad.
	3R152P123K	Resistor, Composition: 12,000 ohms ±10%, 1/4 w. (Hooks to input and ground on FL1).
		MECHANICAL PARTS (SEE MC-16373)
1	19C303649P1	Support. (Mounts cover).
2	19A121222P1	Angle support. (Used with C2362 and C2363).
3	19C303648G1	Cover.
4	4039307P1	Crystal socket. (Part of XY1).
5	19A115793P1	Electrical contact; sim to Methode 752V (PB). (Part of XY1).
6	19B209525P9	Rivet. (Part of XY1).
7	4033089P1	Clip, spring tension. (Part of XY1).
8	19B216072P1	Plate.
9	19A121221P1	Angle support. (Used with C2360 and C2361).
10	19B216070P1	RF plate. (Access to RF circuit).
11	4036765G2	(Not Used).
12	19C311659P1	RF Chassis.
13	4036765G4	Screw; 6-32. (Part of C2351-C2356).
14	7137988P8	Nut, stamped: thd size No. 6-32; sim to Palnut YOK3005. (Part of C2351-C2356).
15	4036899P4	(Not Used).



RC-1637

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



	MODEL NO.	REV LTR
	19041346261	B
A2362	19B216783	

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR HH=HENRYS.

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (J2351-8) WITH TEST SET MODEL 4EX3A10 OR A 20,000 OHM-PER-VOLT METER.

* NOTE: DC VOLTAGES FOR IST MIXER, MULTIPLIER AND IST IF AMPLIFIER TAKEN WITH MODULES REMOVED FROM CASTING AND 10 VOLTS APPLIED TO INPUT LEADS.

(19B621319, Rev. 4)

SCHEMATIC DIAGRAM

150.8—174 MHz, DUAL FRONT END WITH ICOM OSCILLATOR

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - RF Preamp A2373
To assure band-end tuning at 150.8 MHz. Changed C2 in transformer T2.

REV. A - Chassis and RF Circuit 19041346201
To improve stability of first Mixer. Deleted R2351. Added R5 to A2350.

REV. B - To prevent oscillations in High IF Amplifier. Added L2.

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number of component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

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MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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