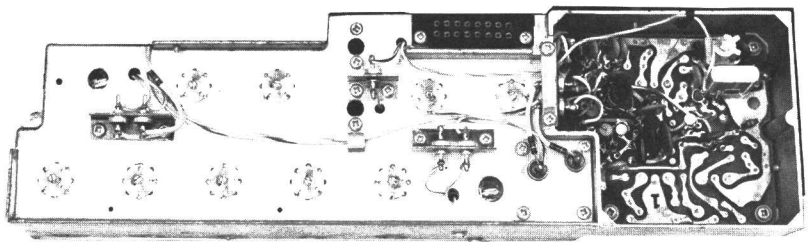
MOBILE RADIO

MASTR Progress Line

450-470 MHz DUAL FRONT END MODELS 19D413487-G1 & G2

Maintenance Manual LBI-4094
PF-8401



SPECIFICATIONS *

DUAL FRONT END 19D413487-G1:With Pre-Amp
DUAL FRONT END 19D413487-G2:Without Pre-Amp

FREQUENCY RANGE	450-470 MHz	
SENSITIVITY (DFE & RECEIVER)	With Pre-Amp	Without Pre-Amp
12-dB SINAD	0.35 mV	0.60 mV
20-dB Quieting	0.40 mV	0.70 mV
INTERMODULATION (EIA)	-70 dB	
INPUT POWER	.010 Amps at 10 volts	
FREQUENCY STABILITY		
Standard Oscillator	±.0005% (-30°C to +60°C)	
ICOM Oscillator	±.0002% (-30°C to +60°C)	
DIMENSIONS (HxWxD)	2-14" x 11-3/4" x 4-3/8"	

OPTIONS

7282	1-Freq. Transmit, 1-Freq. Receive
7262	2-Freq. Transmit, 1-Freq. Receive
7284	1-Freq. Transmit, 1-Freq. Receive with Pre-amp
7264	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 450-470 MHz

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

DESCRIPTION

DUAL FRONT END

General Electric Dual Front End Models 19D413487-G1 & G2 were designed for operation in the 450—470 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 three multiplier stages, and a high IF amplifier.

An optional RF 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 receiver 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 connected to input jack J3 on the power splitter.

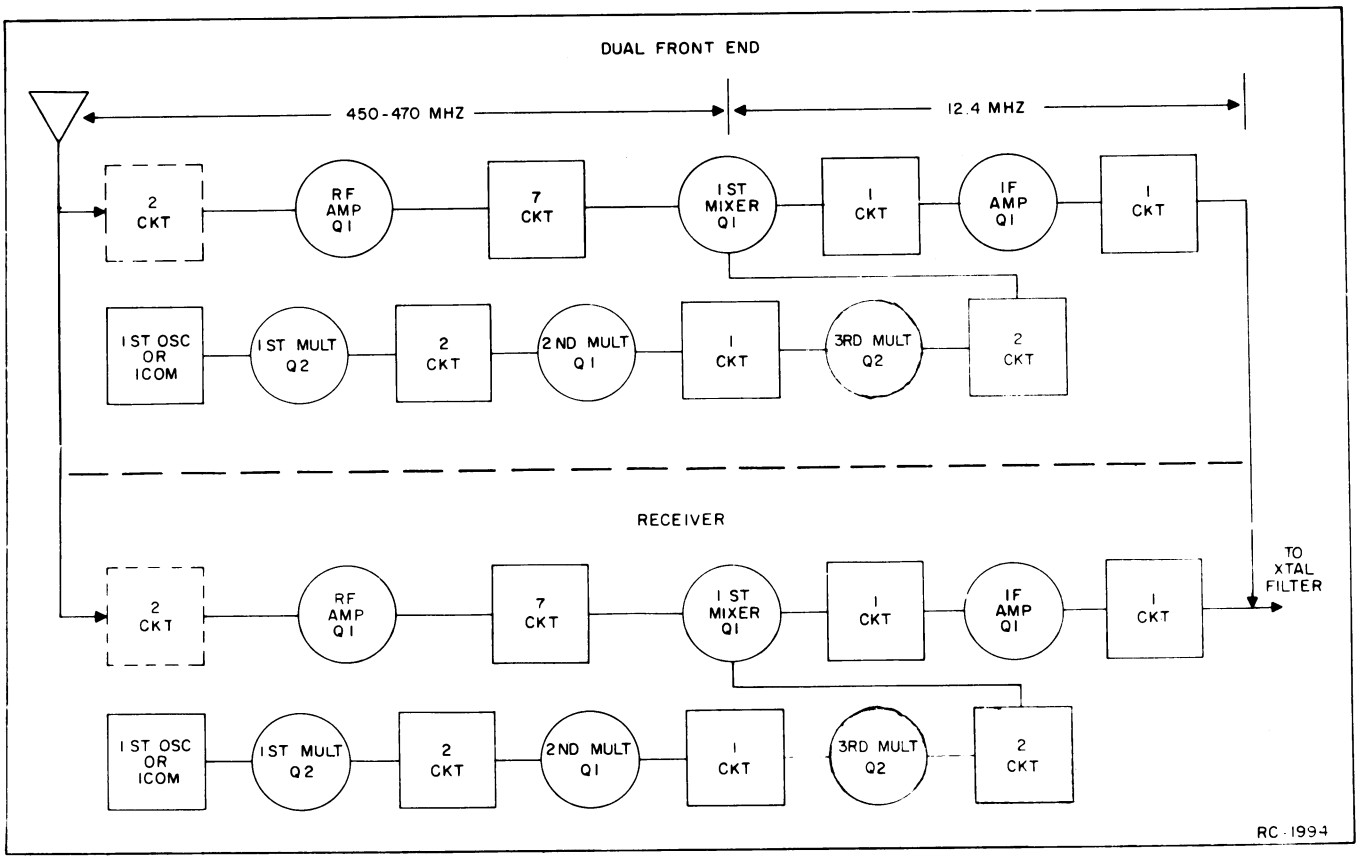


Figure 1 - Dual Front End Block Diagram

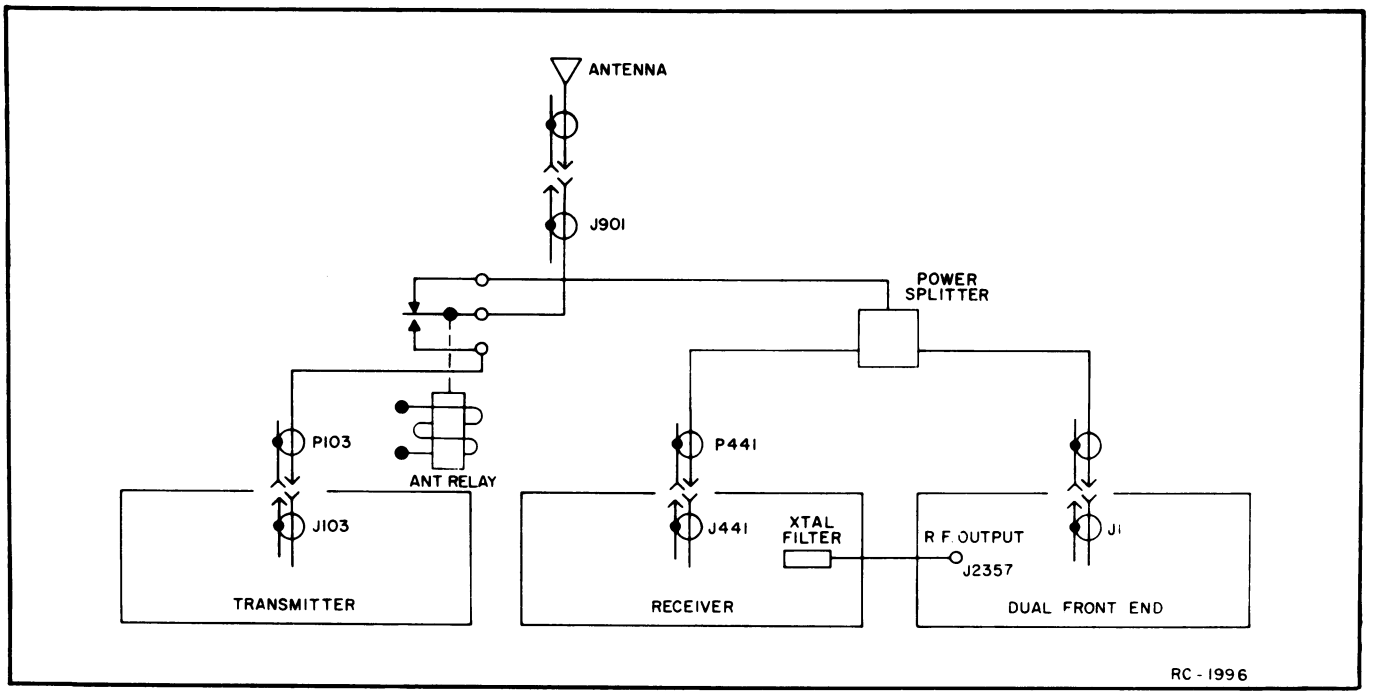


Figure 2 - Single Antenna Block Diagram

One cable from the power splitter connects to the DFE input jack J1, and the other cable connects to J441 on the receiver.

CIRCUIT ANALYSIS

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 J2352 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 AMPLIFIER A2352

RF Amplifier A2352 is used only in ultra-high sensitivity (UHS) Dual Front Ends and consists of two tuned helical resonators and an RF amplifier (Q1).

The RF Amplifier uses a Field-Effect Transistor (FET) as the active device. A 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 W2354 to a tap on L2353. The tap is positioned to provide the proper impedance match to the antenna. RF energy is coupled to L2354 through an opening in the shield wall, and then to the source terminal of FET Q1.

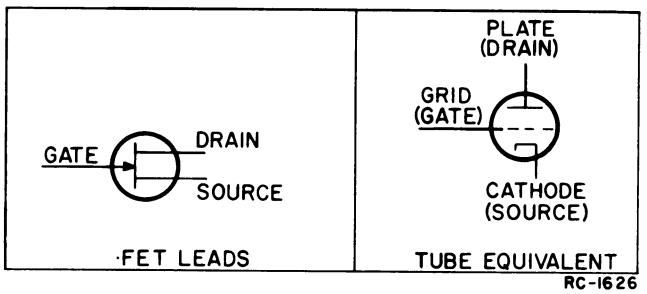


Figure 3 - FET Nomenclature

Q1 operates as a grounded-gate amplifier. This method of operation provides a low impedance input to the amplifier. The amplified output is taken from the drain terminal and coupled through a tuned circuit

(C7 and L3) to the input of five helical resonators.

HELICAL RESONATORS

In DFE's without the UHS option, the RF selectivity is provided by five tuned helical resonators L2360 through L2365. RF cable W2355 connects the RF signal from the antenna to a tap on L2360. The tap is positioned to provide the proper impedance match to the antenna. The output of L2365 is coupled through capacitor C1 to the 1st mixer assembly.

STANDARD OSCILLATOR/MULTIPLIER (A2359)

The standard 1st oscillator operates in a transistorized Colpitts oscillator circuit. The oscillator crystal operates in a fundamental mode at a frequency of approximately 16 to 19 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 C47. The oscillator output is coupled through C45 to the base of 1st multiplier Q2.

The 1st multiplier output is coupled through T8 to Multiplier Board A2355. T8 is tuned to four times the crystal frequency. The 1st multiplier stage is metered at J2352-4 through metering network C38, CR6, R17 and R18.

OSCILLATOR MULTIPLIER WITH ICOM (A2375)

Oscillator/Multiplier Board A2375 uses ICOM Module Model 4EG26A10. The ICOM Module consists of a crystal-controlled Colpitts oscillator, a voltage regulated 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 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 1st multiplier output is coupled through T1 to multiplier board A2355. T2 is tuned to four times the ICOM frequency. The 1st multiplier stage is metered at J2352-4 through metering network C4, CR5, R5 and R6.

CAUTION

All ICOM modules are individually compensated at the factory, and cannot be repaired in the field. Any attempt to remove the ICOM cover will void the warranty.

MULTIPLIER BOARD (A2355)

Following the oscillator board are two multiplier stages. A2355-Q1 operates as a tripler, and Q2 operates as a doubler. Q2 is metered at J2351-1 across metering resistor R6.

The output of Q2 is coupled through two helical resonator circuits to the source terminal of the 1st mixer. The helical resonators are tuned to six times the 1st multiplier output for a total multiplication of 24 times the crystal frequency.

1ST MIXER (A2353)

The 1st Mixer uses a Field-Effect Transistor (FET) as the active device (Figure 3). The FET mixer has several advantages over a conventional transistor mixer, including a high input impedance and an output that is relatively free of harmonics (low in intermodulation products).

RF from the helical resonators is applied to the gate of Q1, and injection voltage from the multiplier is applied to the source. The mixer output is taken from the drain with the output tuned to the 12.4 MHz high IF frequency.

HI IF AMPLIFIER (A2362)

A series-resonant circuit (A2353-L2 and -C3) couples the mixer output to the emitter of the high IF amplifier A2362. The transistor is connected as a grounded-base amplifier which provides a low impedance for the mixer output. The amplifier output is coupled through transformer T1 to the crystal filter.

RECEIVER MODIFICATIONS

The MASTR mobile receiver when used with a Dual Front End option has been

modified in the following manner.

1. Replaced the 3.3K-ohm resistor across the input of Crystal Filter A422 with a 10K-ohm resistor (GE Part No. 3R77-P103K).

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

3. Connected the White-Orange-Brown lead to J5 on the oscillator board.

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

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

MAINTENANCE

DISASSEMBLY

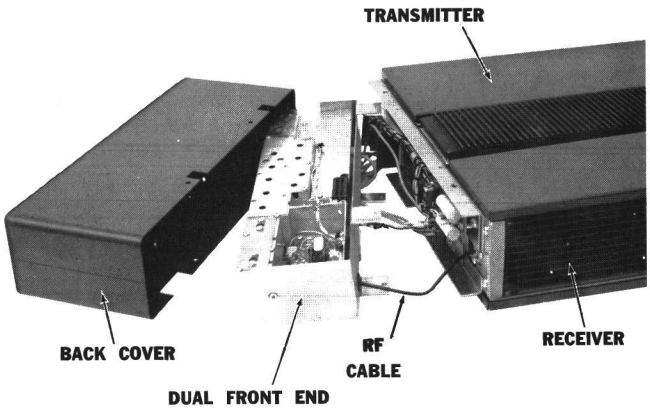


Figure 4 - Dual Front End Assembly

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 4).

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

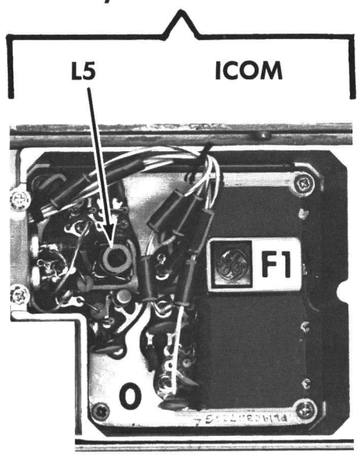
4. Carefully swing Dual Front End chassis out for servicing.

TEST PROCEDURES

Dual Front End

SYMPTOM	CHECK
No Output	1. Connections to P443. 2. Cable from J2357 to receiver crystal filter. 3. Antenna terminal connections. 4. Check 10-volt supply with GE test meter at Pin 13 on DFE centralized metering jack J2352.
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



ADJUSTMENT PROCEDURE

ICOM ADJUSTMENT
OSCILLATOR BOARD 19C311726-G3

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 70-80 MHz frequency range. (The counter should have an accuracy of 0.4 part-per-million.)
2. Coaxial cable with test loop as described in Figure 5.
3. Mercury thermometer.

PROCEDURE:

1. Check the ICOM temperature by taping the mercury thermometer to the side of the ICOM.
2. Connect the frequency counter to L5 (on the 1st Osc/Mult) using the 4-turn test loop and cable shown in Figure 5.
3. If the ICOM temperature is 80°F (±4°F) or 26.5°C (±2°C), the frequency indication on the counter should be 4 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 stenciled on the ICOM by 4 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 L5 should be 4 times the ICOM frequency ± the correction factor. Adjust the ICOM trimmer (if required) to obtain this frequency.

FOR EXAMPLE

ICOM Frequency - 18.233333 MHz
ICOM Color Dot - Green
Ambient Temperature - 35°C (95°F)
Correction Factor -1.15 PPM
(From Figure 6)

Multiply ICOM Frequency by 4;
(18.233333 MHz x 4 = 72.933332 MHz)

Multiply preceding figure by correction factor;
(72.933 MHz x -1.15 PPM = 83.87 hertz
(or -84 hertz)

Set the frequency measured at L5 for
72.933248 MHz;

72.933332 MHz
- .000084 MHz
72.933248 MHz

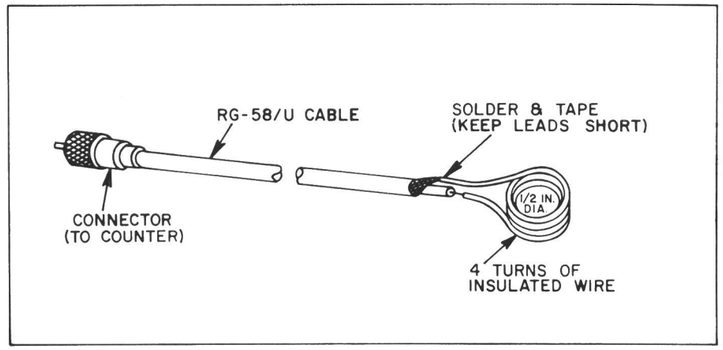


Figure 5 - Coaxial Cable and Test Loop

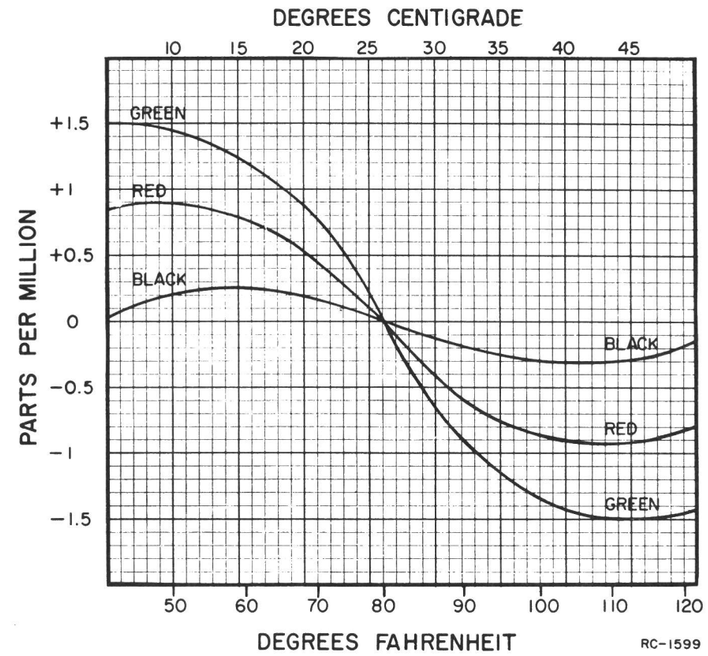


Figure 6 - ICOM Correction Curves

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 (450-470 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 J2352. With Test Set in position J, check for regulated +10 volts. If using multimeter, measure at metering jack J2352-13 and -16.

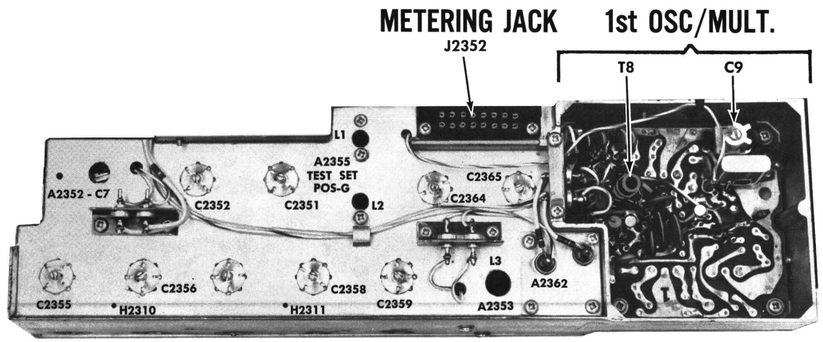
2. If using Multimeter for alignment, connect positive lead to J2352-16 (ground).

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.



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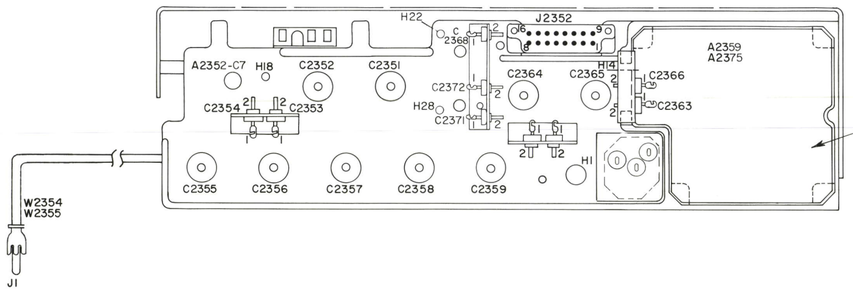
ALIGNMENT PROCEDURE

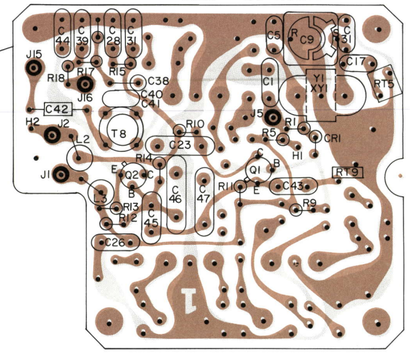
STEP	METERING POSITION: GE Test Set	METERING POSITION: Multimeter Minus at J2352	TUNING CONTROL	METER READING	PROCEDURE
		OSCILLATOR AND MULTIPLIERS AND 1ST MIXER			
1	D (MULT-1 on DFE)	Pin 4	T8 (on 1st OSC/MULT)	Maximum	Tune T8 for maximum meter reading.
2	D (MULT-1 on DFE)	Pin 4	L1 (on MULT Bd)	Minimum	Tune L1 for minimum meter reading.
3	G (MULT-2 on DFE)	Pin 1	T8 (on 1st OSC/MULT) L1 and L2 (on MULT Bd)	Maximum	Tune T8, L1 and L2 for maximum meter reading. If two peaks occur, use the peak that occurs with the slug nearest the top of the coil form.
4	G (MULT-2 on DFE)	Pin 1	C2364	Minimum	Tune C2364 for a small dip in in meter reading.
5	A (DISC on Receiver)	Pin 10		Zero	Connect Test Set plug to receiver metering jack J442. Insert signal generator probe into H2311 and adjust signal generator for discriminator zero.
6	B (2nd IF Amp on Receiver)	Pin 2	T4, C2364 and C2365	Maximum	Tune T4, C2364 and C2365 for maximum meter reading.
7	B (2nd IF Amp on Receiver)	Pin 2	L3 (on 1st Mixer)	Maximum	Apply an on-frequency signal as above. Tune L3 for maximum meter reading, keeping signal below saturation. If two peaks occur, use the peak that occurs with the slug nearest the bottom of the coil form.
		RF CIRCUITS			
8	B (2nd IF Amp on Receiver)	Pin 2	A2353—L3, C2359, C2358, C2357, & C2356	Maximum	Apply an on-frequency signal into holes as shown below. Insert probe into hole only deep enough to obtain a reading. Insert Probe In: — Tune: 1. H2311 — A2353-L3, C2359 and C2358 2. H2310 — C2356, C2357 and C2358
9	B (2nd IF Amp on Receiver)	Pin 2	C2355, C2356, C2357, C2358, C2359 and A2353-L3	See Procedure	For standard models, apply an on-frequency signal to the antenna jack (J1) and tune C2355 for maximum meter reading. Then retune C2356 thru C2359 and A2353-L3 for best sensitivity.
10	B (2nd IF Amp on Receiver)	Pin 2	C2351, C2352, A2352-C7, C2355 thru C2359 and A2353-L3	See Procedure	For models with UHS, apply an on-frequency signal to the antenna jack (J1) and tune C2351, C2352 and A2352-C7 for maximum meter reading. Then retune C2351, C2352, A2352-C7, C2355 thru C2359, and A2353-L3 for best sensitivity.
		FREQUENCY ADJUSTMENT			
11	A (DISC 2nd IF Amp on Receiver)	Pin 10	C9 (on 1st OSC/MULT)	Zero	Apply a 10 μV or greater on-frequency signal to the antenna jack, and adjust C9 for zero discriminator reading.

TOP VIEW



IST OSCILLATOR/MULTIPLIER

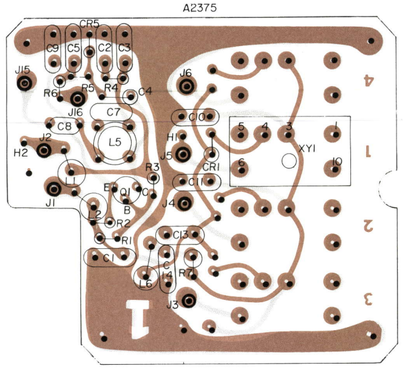
A2359 450-470MHZ



(19B204934, Sh. 1, Rev. 1)
(19B204934, Sh. 2, Rev. 1)

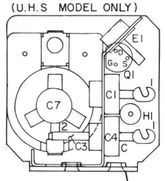
IST OSCILLATOR/MULTIPLIER (WITH ICOM)

A2375

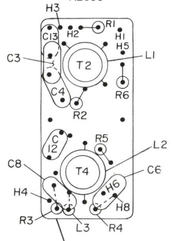


(19B216041, Sh. 1, Rev. 2)
(19B216041, Sh. 2, Rev. 2)

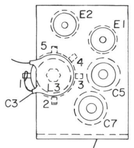
RF AMPLIFIER
A2352
(U.H.S MODEL ONLY)



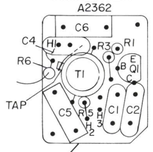
MULTIPLIER
A2355



IST MIXER
A2353

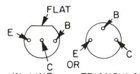


HI IF AMPLIFIER
A2362

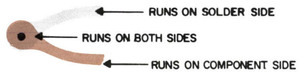


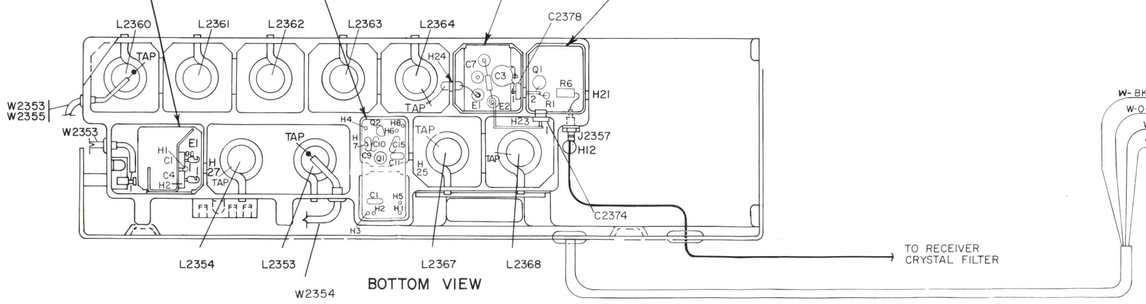
FET LEAD IDENTIFICATION FOR Q1 OF A2352 & A2353

TRANSISTOR LEAD IDENTIFICATION



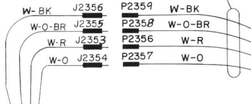
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

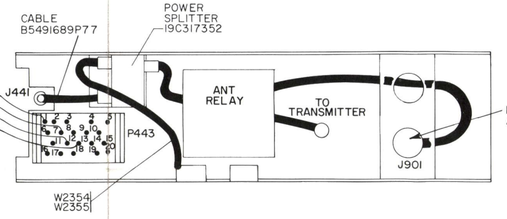




BOTTOM VIEW

CABLE 19B204924G1



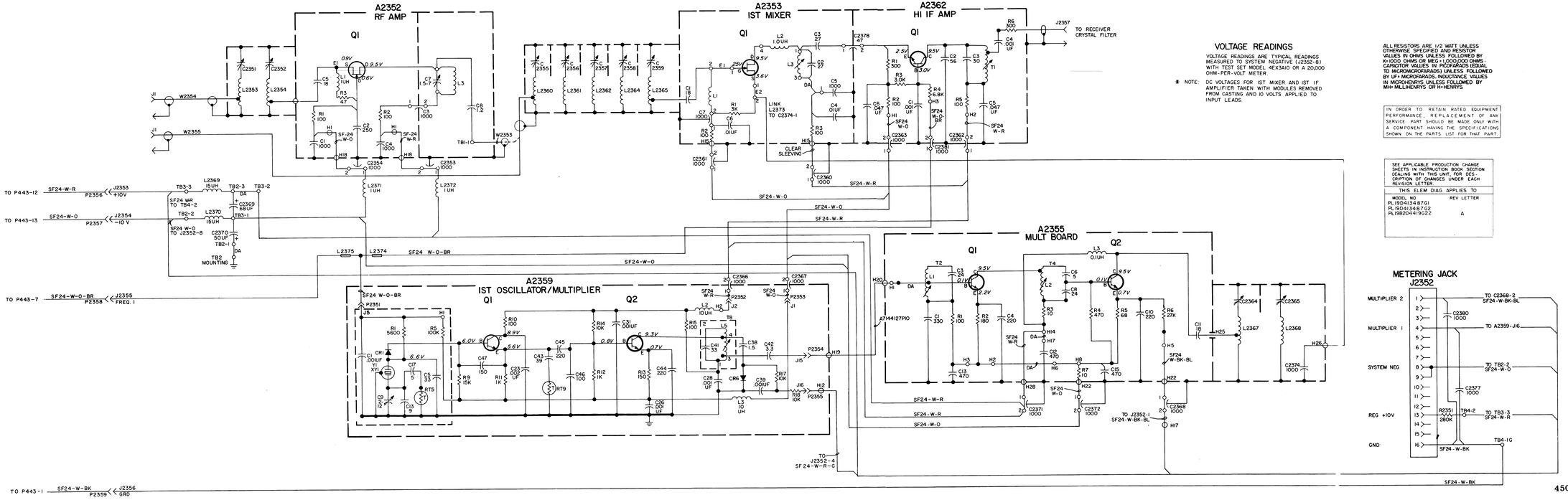


FRONT VIEW OF SYSTEM FRAME

(19R621385, Rev. 0)

OUTLINE DIAGRAM

450—470 MHz, DUAL FRONT END
19D413487-G1 & G2



VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (J2352-8) WITH TEST SET MODEL 4EX3A10 OR A 20,000 OHM-PER-VOLT METER.

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

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.

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.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL19D413487G1	
PL19D413487G2	
PL19B204419G2	A

(198621337, Rev. 4)

(DF-8401)

SCHEMATIC DIAGRAM

450—470 MHz, DUAL FRONT END WITH STANDARD OSCILLATOR
19D413487-G1 & G2

PARTS LIST

LBI-4133A

MAST® PROGRESS LINE
450-470 MHz DUAL FRONT END
19D413487G1-G2

SYMBOL	GE PART NO.	DESCRIPTION
A2352		RF AMPLIFIER 19C311975G2
		---------- CAPACITORS ----------
C1	5493392P107	Ceramic, stand-off: .001 pf +100%-0%, 500 VDCW; sim to Allen-Bradley Type 585D.
C2	7484398P3	Silver mica: 330 pf ±10%, 500 VDCW; sim to Underwood Type J18F.
C3	5493392P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C4	5493392P107	Ceramic, stand-off: .001 pf +100%-0%, 500 VDCW; sim to Allen-Bradley Type 585D.
C5	5496218P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C6	5491601P122	Phenolic: 1.2 pf ±5%, 500 VDCW.
		---------- TERMINALS ----------
E1	19B209055P1	Terminal, feed thru; sim to Electrical Industries ARAS-40W-ER.
		---------- INDUCTORS ----------
L1	19B209420P1	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4415-1.
L3	19A137439P2	Coil.
		---------- TRANSISTORS ----------
Q1	19A116154P1	N Channel, field effect.
		---------- RESISTORS ----------
R1 and R2	3R152P100K	Composition: 100 ohms ±10%, 1/4 w.
R3	3R152P470K	Composition: 47 ohms ±10%, 1/4 w.
A2353		FIRST MIXER ASSEMBLY 19C311976G1
		---------- CAPACITORS ----------
C1	5496218P312	Ceramic disc: 18 pf ±10%, 500 VDCW, temp coef -150 PPM.
C2		(Part of L3).
C3	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C4	19B209243P1	Polyester: 0.01 pf ±20%, 50 VDCW.
C5	5493392P107	Ceramic, stand-off: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type 585D.
C6	19B209243P1	Polyester: 0.01 pf ±20%, 50 VDCW.
C7	5493392P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
		---------- TERMINALS ----------
E1 and E2	19B209055P6	Terminal, feed-thru.
		---------- INDUCTORS ----------
L1	19A127430G1	Choke.
L2		(Part of L3).

SYMBOL	GE PART NO.	DESCRIPTION
L3	19B216440G1	Coil assembly, includes:
C2	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
L2	19B209420P113	Coil, RF: 1 µh ±10%, 0.74 ohms DC res max; sim to Jeffers 4425-6R.
	5491784P6	Tuning slug.
		---------- TRANSISTORS ----------
Q1	19A116154P1	N Channel, field effect.
		---------- RESISTORS ----------
R1	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R2 and R3	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
A2355		COMPONENT BOARD 19B216360G2
		---------- CAPACITORS ----------
C1	5494481P106	Ceramic disc: 330 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C3		(Part of T2).
C4	5496372P149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C6		(Part of T4).
C8		(Part of T4).
C10	5496372P149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C11	5496218P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C12	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C13	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C15	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		---------- INDUCTORS ----------
L1		(Part of T2).
L2		(Part of T4).
L3	19B209430P1	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-12.
		---------- TRANSISTORS ----------
Q1	19A116301P1	Silicon, NPN.
Q2	19A115691P1	Silicon, NPN.
		---------- RESISTORS ----------
R1	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R2	3R152P181J	Composition: 180 ohms ±5%, 1/4 w.
R3	3R152P100K	Composition: 10 ohms ±10%, 1/4 w.
R4	3R152P471K	Composition: 470 ohms ±10%, 1/4 w.
R5	3R152P680J	Composition: 68 ohms ±5%, 1/4 w.
R6	3R152P273K	Composition: 27,000 ohms ±10%, 1/4 w.
R7	3R152P100K	Composition: 10 ohms ±10%, 1/4 w.
		---------- TRANSFORMERS ----------
T2		COIL ASSEMBLY 19B216373G2
		---------- CAPACITORS ----------
C3	5496218P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
		---------- INDUCTORS ----------
L4	19B209420P1	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-1.
	5491784P7	Tuning slug.

SYMBOL	GE PART NO.	DESCRIPTION
T4		COIL ASSEMBLY 19B216374G2
		---------- CAPACITORS ----------
C6	5496218P437	Ceramic disc: 6 pf ±5%, 500 VDCW, temp coef -220 PPM.
C8	5496218P749	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef +750 PPM.
		---------- INDUCTORS ----------
L2	19B216374P5	Coil.
	5491784P7	Tuning slug.
A2359		FIRST OSCILLATOR ASSEMBLY 19B204419G22
		---------- CAPACITORS ----------
C1	5494481P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C5	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef +750 PPM.
C9	5491371P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
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.
C23	5494481P114	Ceramic disc: .002 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C26	5494481P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C28	5494481P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C31	5494481P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C38	5491601P123	Phenolic: 1.5 pf ±5%, 500 VDCW.
C39	5494481P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C41		(Part of T8).
C42	5491601P130	Phenolic: 3.3 pf ±5%, 500 VDCW.
C43	5496219P53	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef 0 PPM.
C44	5490008P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-10.
C45	5490008P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C46	5496219P563	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -330 PPM.
C47	5496219P767	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -750 PPM.
		---------- DIODES AND RECTIFIERS ----------
CR6	19A115250P1	Silicon.
		---------- JACKS AND RECEPTACLES ----------
J1 thru J6	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J15 and J16	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		---------- INDUCTORS ----------
L2 and L3	7488079P16	Choke, RF: 10 µh ±10% ind at 640 ma, 0.6 ohm DC res; sim to Jeffers 4421-7K.
L5		(Part of T8).
		---------- TRANSISTORS ----------
Q1 and Q2	19A115330P1	Silicon, NPN.

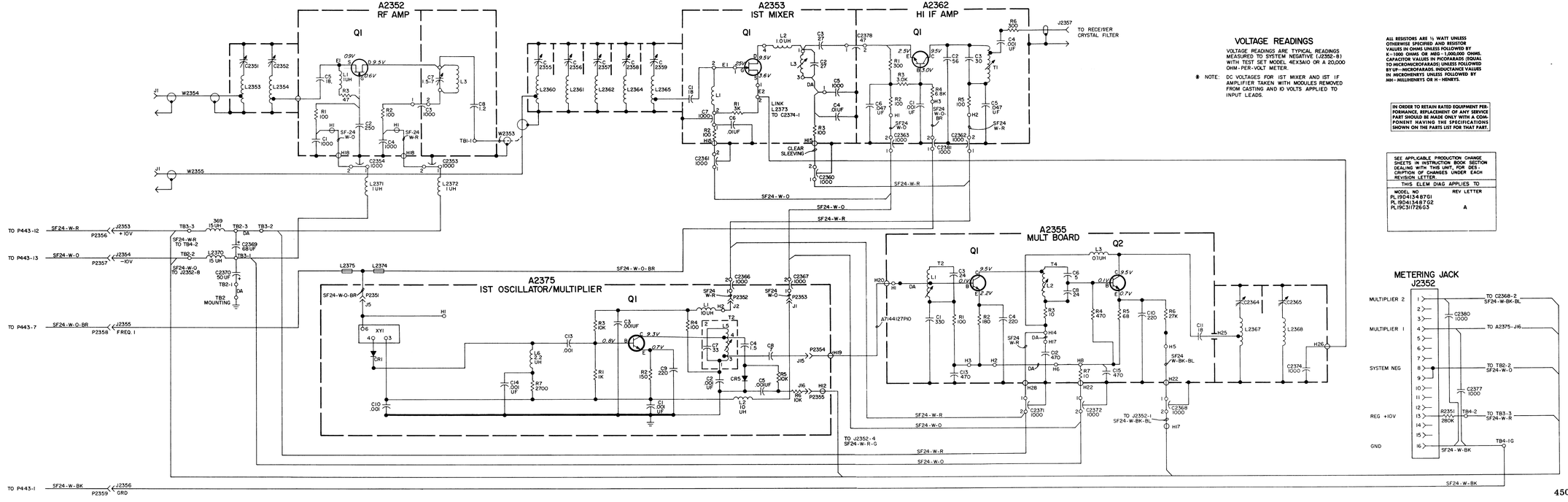
SYMBOL	GE PART NO.	DESCRIPTION
		---------- RESISTORS ----------
R1	3R152P562J	Composition: 5600 ohms ±5%, 1/4 w.
R9	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R10	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R11 and R12	3R152P103J	Composition: 1000 ohms ±5%, 1/4 w.
R13	3R152P151J	Composition: 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.
R17 and R18	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R20	3R152P370K	Composition: 37 ohms ±10%, 1/4 w.
		---------- THERMISTORS ----------
RT5	19B209284P7	Disc: 62 ohms res nominal at 25°C, color code violet.
RT9	19B209284P8	Disc: 845 ohms res nominal at 25°C, color code gray.
		---------- TRANSFORMERS ----------
T8		COIL ASSEMBLY 19B204850G2
		---------- CAPACITORS ----------
C41	5496218P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
		---------- INDUCTORS ----------
L5	19A127128P1	Coil.
	5491784P7	Tuning slug.
		---------- SOCKETS ----------
XY1		Refer to Mechanical Parts.
		---------- CRYSTALS ----------
		When reordering give GE Part No. and specify exact freq needed.
		Crystal freq = (OF -12.4 MHz) ÷ 24.
Y1	19B206576P7	Quartz: freq range 17925.001 to 20685.000 KHz, temp range -30°C to +85°C. (450-470 MHz)
A2362		IF AMPLIFIER ASSEMBLY 19B216356G1
		---------- CAPACITORS ----------
C1	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5490008P21	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C3	5496218P650	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -470 PPM.
C4	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C5 and C6	19B209243P5	Polyester: 0.047 pf ±20%, 50 VDCW.
		---------- TRANSISTORS ----------
Q1	19A116201P1	Silicon, NPN.
		---------- RESISTORS ----------
R1	3R152P301J	Composition: 300 ohms ±5%, 1/4 w.
R2	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R3	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R4	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R5	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R6	3R152P301J	Composition: 300 ohms ±5%, 1/4 w.
		---------- TRANSFORMERS ----------
T1	19B216372G1	Coil assembly. includes tuning slug 5491784P7.
A2375		OSCILLATOR/MULTIPLIER BOARD 19C311726G3
		---------- CAPACITORS ----------
C1 thru C3	5494481P112	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C4	5491601P123	Phenolic: 1.5 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C5	5494481P112	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C7		Part of T2.
C8	5496219P238	Ceramic disc: 7 pf ±5%, 500 VDCW; temp coef -80 PPM.
C9	5490008P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C10 and C11	5494481P112	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C13 and C14	5494481P112	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
		---------- DIODES AND RECTIFIERS ----------
CR1	19A115250P1	Silicon.
CR5	19A115250P1	Silicon.
		---------- JACKS AND RECEPTACLES ----------
J1 thru J6	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J15 and J16	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		---------- INDUCTORS ----------
L1 and L2	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res max; sim to Jeffers 4421-7.
L5		Part of T2.
L6	7488079P25	Choke, RF: 2.90 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4413-8.
		---------- TRANSISTORS ----------
Q1	19A115330P1	Silicon, NPN.
		---------- RESISTORS ----------
R1	3R152P103J	Composition: 1000 ohms ±5%, 1/4 w.
R2	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R3	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R5 and R6	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R7	3R77P372K	Composition: 3700 ohms ±10%, 1/2 w.
T2		---------- TRANSFORMERS ----------
		COIL ASSEMBLY 19B204850G22
		---------- CAPACITORS ----------
C41	5496218P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
		---------- INDUCTORS ----------
L5	19A121728P1	Coil.
	5491784P7	Tuning slug.
		---------- SOCKETS ----------
XY1	19B216043G1	Socket, 6 contacts, (ICOM).
		OSCILLATORS
		When reordering specify ICOM Frequency. ICOM Freq = Operating Freq -12.8 MHz ÷ 24.
Y1	4EQ26A10	Integrated Circuit Oscillator Module (ICOM).
	19D413070P1	Cap, decorative.
		---------- CAPACITORS ----------
C2351 and C2352		See Miscellaneous.
C2353 thru C2354	5493392P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C2355 thru C2359		See Miscellaneous.
C2360 thru C2363	5493392P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C2364 and C2365		See Miscellaneous.
C2366 thru C2368	5493392P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C2369	5496267P11	Tantalum: 68 pf ±20%, 15 VDCW; sim to Sprague Type 150D.
C2370	19A115680P4	Electrolytic: 50 pf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C2371 and J6	5493392P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
J15 and J16	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		---------- INDUCTORS ----------
L1 and L2	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res max; sim to Jeffers 4421-7.
L5		Part of T2.
L6	7488079P25	Choke, RF: 2.90 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4413-8.
		---------- TRANSISTORS ----------
Q1	19A115330P1	Silicon, NPN.
		---------- RESISTORS ----------
R1	3R152P103J	Composition: 1000 ohms ±5%, 1/4 w.
R2	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R3	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R5 and R6	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R7	3R77P372K	Composition: 3700 ohms ±10%, 1/2 w.
T2		---------- TRANSFORMERS ----------
		COIL ASSEMBLY 19B204850G22
		---------- CAPACITORS ----------
C41	5496218P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
		---------- INDUCTORS ----------
L2371 and L2372	7488079P6	Choke, RF: 1.0 µh ±10%, 0.30 ohms DC res; sim to Jeffers 4411-8K.
L2373	19A127433P1	Coil.
		---------- PLUGS ----------
P2351 thru P2355	4029840P2	Contact, electrical: sim to Amp 42827-2.
		---------- RESISTORS ----------
R2351	5495948P444	Deposited carbon: 0.28 megohm ±1%, 1/2 w; sim to Texas Instrument CD1/2M.
		---------- TERMINAL BOARDS ----------
TB1	7487424P2	Miniature, phen: 1 terminal.
TB2 and TB3	7487424P24	Miniature, phen: 3 terminals.
TB4	7487424P23	Miniature, phen: 1 terminal.
		---------- CABLES ----------
W2353	19B209044P13	RF: approx 12 inches; sim to Amphenol 421-105.
W2354	19A122563G1	RF: approx 27 inches.
W2355	19A122563G2	RF: approx 21 inches.
		---------- MISCELLANEOUS ----------
	19B204913P1	Shield. (Used with TB4).
	19B204946P1	Plate, aluminum. (Located over RF Circuit).
	19A121723P1	Support. (Used with C2366 and C2367).
	19A127372P1	Support. (Used with C2368, C2371, and C2372).
	19A127726P1	Support. (Used with C2360 and C2361).
	7142152P109	Spacer. (Located between chassis and RF casting at W2353).
	19C311172P1	Crystal socket. (Part of XY1).
	19A115793P1	Contact, electrical: sim to Malco 2700. (Part of XY1).
	19B800552P9	Rivet, brass: .06 dia. (Part of XY1).
	4033088P1	Clip, spring tension. (Part of XY1).
	19C300648G1	Rear Cover, Dual Front End.
	7117825P1	Washer, spring tension. (Part of C2351, C2352, C2355-C2359, C2364, and C2365).
	4036765G5	Screw. (Part of C2351, C2352, C2355-C2359, C2364, and C2365).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (J2352-8) WITH TEST SET MODEL 4EX3A10 OR A 20,000 OHM-PER-VOLT METER.

* NOTE: DC VOLTAGES FOR 1ST MIXER AND 1ST IF AMPLIFIER TAKEN WITH MODULES REMOVED FROM CASTING AND 10 VOLTS APPLIED TO INPUT LEADS.

ALL RESISTORS ARE ½ WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

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.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL19041348701	
PL19041348702	
PL19C311726G3	A

(198621328, Rev. 2)

SCHEMATIC DIAGRAM

450—470 MHz, DUAL FRONT END
WITH ICOM OSCILLATOR
19D413487-G1 & G2

Issue 1

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 furhter 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

LBI-4094

DF-8401

Progress Is Our Most Important Product

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MOBILE RADIO DEPARTMENT LYNCHBURG, VIRGINIA 24502

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