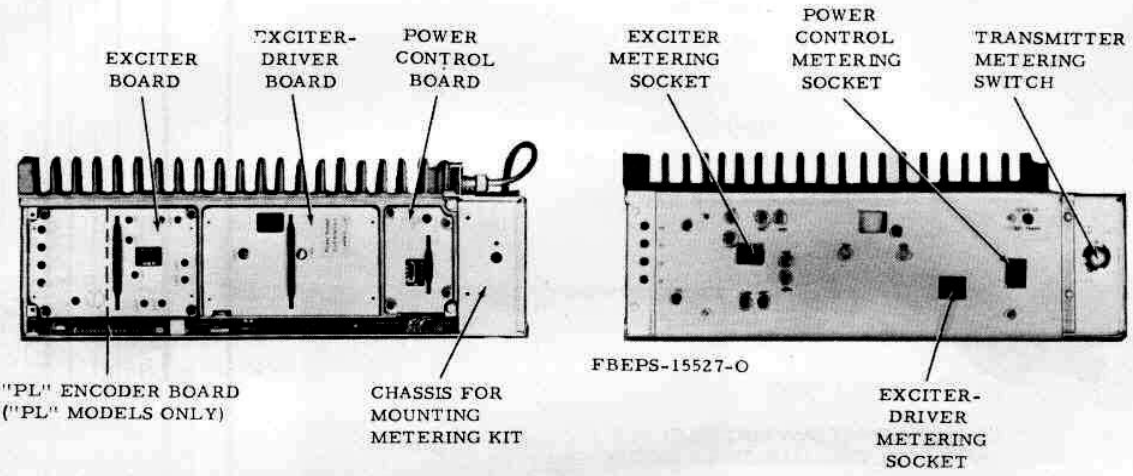
TRANSMITTER INTRODUCTION



The transmitters described in this instruction manual are used in the Motorola "Micor" base and repeater (RT) stations. The transmitters provide 250- or 375-Watts of rf power and can be operated continuously with no off time required, except as dictated by established operating procedures. The transmitters consist of two separate assemblies; an exciter-driver and a high power amplifier, each occupying a separate shelf within the station. A model breakdown is shown in the model charts included within this section. The transmitter interconnections to other items within the station are shown on the station intercabling diagram and rf cabling diagram contained within the Installation section of this instruction manual. Complete descriptive information, as well as thorough servicing information, is contained within the separate instruction sections provided in this instruction manual for each major item that comprises the transmitter's model complement. A consolidated transmitter alignment procedure is provided in the Maintenance section of this instruction manual.

MOTOROLA INC. Communications Division
ENGINEERING PUBLICATIONS 1301 E. ALGONQUIN ROAD SCHAUMBURG, ILLINOIS 60172

MOTOROLA

EXCITER

MODEL CHART

FOR

136-174 MHz

"MICOR" UPRIGHT BASE RADIO

AND REPEATER STATIONS

CODE:

[X] = ONE ITEM INCLUDED

* = CONSISTS OF ITEMS LISTED IN THE CONTINUOUS DUTY DRIVER-AMPLIFIER MODEL CHART.

MODEL	DESCRIPTION	ITEM	*TLD1951A	*TLD1952A	*TLD1953A	TLD5100A	TLD5321A	TLD5322A	TLN4729B	TLN5169A	TLN5230A	TKN6569A
		DESCRIPTION	DRIVER-AMPLIFIER 136-150.8 MHz	DRIVER-AMPLIFIER 150.8-162 MHz	DRIVER-AMPLIFIER 162-174 MHz	POWER CONTROL BOARD	EXCITER CIRCUIT BOARD 132-150.8 MHz	EXCITER CIRCUIT BOARD 150.8-174 MHz	TRANSMITTER INTERFACE BOARD	TRANSMITTER METERING SWITCH AND CABLE	TRANSMITTER HARDWARE KIT	TRANSMITTER RF CABLE KIT
TLD1941B	136-150.8 MHz		X			X	X		X	X	X	X
TLD1942B	150.8-160 MHz			X		X		X	X	X	X	X
TLD1943B	160-174 MHz				X	X		X	X	X	X	X

MOTOROLA

EXCITER

MODEL CHART

FOR

136-174 MHz

"MICOR" UPRIGHT BASE RADIO

AND REPEATER STATIONS

(EARLIER VERSION)

CODE:

[X] = ONE ITEM INCLUDED

[*] = CONSISTS OF ITEMS LISTED IN THE CONTINUOUS DUTY DRIVER-AMPLIFIER MODEL CHART.

MODEL	DESCRIPTION	*TLD1951A	*TLD1942A	*TLD1953A	TLD5100A	TLD8731A	TLD8732A	TLN4729A	TLN5169A	TLN5587A	TKN6569A
	ITEM	DRIVER-AMPLIFIER 136-150.8 MHz	DRIVER-AMPLIFIER 150.8-162 MHz	DRIVER-AMPLIFIER 162-174 MHz	POWER CONTROL BOARD	EXCITER CIRCUIT BOARD 132-150.8 MHz	EXCITER CIRCUIT BOARD 150.8-174 MHz	TRANSMITTER INTERFACE BOARD	TRANSMITTER METERING SWITCH AND CABLE	TRANSMITTER HARDWARE KIT	TRANSMITTER RF CABLE KIT
TLD1941A	136-150.8 MHz	X			X	X		X	X	X	X
TLD1942A	150.8-160 MHz		X		X		X	X	X	X	X
TLD1943A	160-174 MHz			X	X		X	X	X	X	X

NEPS-15528-A

MOTOROLA

CONTINUOUS DUTY

DRIVER AMPLIFIER

MODEL CHART

136-174 MHz

CODE:

☒ = ONE ITEM INCLUDED

ITEM	DESCRIPTION	TLD1951A 136-150.8 MHz	TLD1952A 150.8-162 MHz	TLD1953A 162-174 MHz
TFD6101A	HARMONIC FILTER KIT 132-150.8 MHz	X		
TFD6102A	HARMONIC FILTER KIT 150.8-174 MHz		X	X
TFD6111A	EXCITER FILTER KIT 132-150.8 MHz	X		
TFD6112A	EXCITER FILTER KIT 150.8-174 MHz		X	X
TLD5091A	DRIVER AMPLIFIER 136-150.8 MHz	X		
TLD5092A	DRIVER AMPLIFIER 150.8-162 MHz		X	
TLD5093A	DRIVER AMPLIFIER 162-174 MHz			X
TLN5074A	TERMINAL BRACKET	X	X	X
TLN5741A	TRANSMITTER CHASSIS AND HEAT SINK	X	X	X

NEPS-15529-O

MODEL	FREQUENCY
TLD5321A	132-150.8 MHz
TLD5322A	150.8-174 MHz

TECHNICAL CHARACTERISTICS

	MODEL TLD5321A	MODEL TLD5322A
FREQUENCY	132-150.8 MHz	150.8-174 MHz
NUMBER OF CHANNELS	1 to 4	
MAXIMUM FREQUENCY SEPARATION	±750 kHz	
OSCILLATOR FREQUENCY	11-14.5 MHz	
FREQUENCY MULTIPLICATION	12 times	
OUTPUT POWER	400 milliwatts	
OUTPUT IMPEDANCE	50 ohms	
MODULATOR TYPE	Direct FM	
DEVIATION	±5 kHz, adjustable instantaneous deviation limiting	
AUDIO RESPONSE	6 dB/octave pre-emphasis 300 to 3000 Hz	
AUDIO SENSITIVITY	165 millivolts for ±3.0 kHz deviation	
AUDIO DISTORTION	Less than 3% at ±3.0 kHz deviation from 300 to 3000 Hz	
POWER REQUIREMENTS	Regulated +9.6 volts dc @150 mA +13.6 volts dc @100 mA	
CONSTRUCTION METERING	Fully solid-state Five test points critical to operation and alignment are accessible at a metering receptacle which permits testing with an optional built-in station meter, Motorola portable test set, or 0-50 uA microammeter with 2,000 ohms series resistance.	

1. DESCRIPTION

1.1 Models TLN5321A and TLN5322A Exciter provides the low power excitation for an FM transmitter. Up to four plug-in channel elements, one for each transmitter operating frequency, are used to develop a direct FM carrier signal of at least 400 milliwatts.

1.2 The exciter is directly frequency-modulated for crystal-controlled frequency operation in the 132-174 MHz range. It consists of a symmetrical clipper and splatter filter, emitter follower, channel element(s) (voltage controlled crystal oscillator), buffer amplifier, tripler, first doubler, second doubler, and output amplifier. The fundamental crystal frequency is multiplied by twelve to provide the final output frequency.

1.3 When the exciter is used in "Private-Line" stations, a "Private-Line" encoder circuit

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board is plugged directly into the mating pins of the exciter; and one jumper (JU402) is removed from the exciter; no interconnecting wires are used. The exciter board also includes additional pins that permit the board to be used with certain types of optional equipment. These pins are designated P403 on the exciter schematic diagram.

2. FUNCTIONAL OPERATION

Refer to the exciter block diagram and the exciter schematic diagram included in this section.

2.1 DEVIATION LIMITING CIRCUIT

2.1.1 Microphone output audio is applied to the symmetrical clipper and splatter filter. This circuit, together with amplifier U401, provides pre-emphasis, amplification, and limiting of the microphone audio. Microphone audio is then applied to emitter follower Q401 (together with "PL" code) through IDC control to the channel elements.

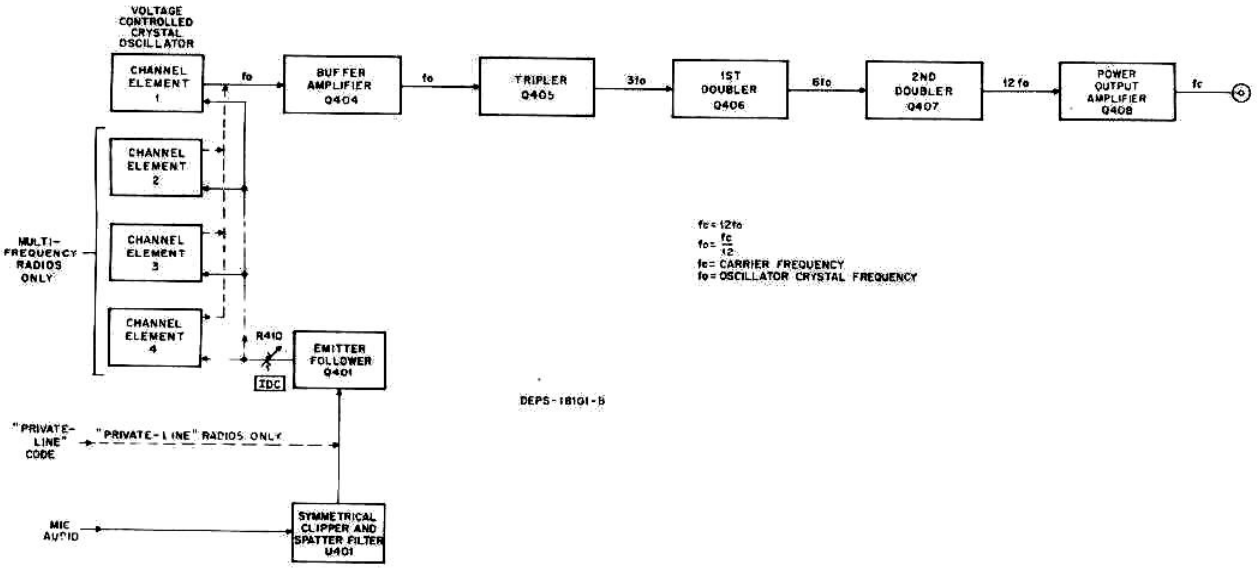
2.1.2 The output of the emitter follower is developed across IDC potentiometer R410. This audio signal can be monitored at pin 1 of the exciter metering receptacle. The potentiometer adjusts the maximum level of audio coupled to the oscillator-modulator, thus setting the amount of deviation.

2.1.3 In "Private-Line" radios, a low amplitude "Private-Line" code is continuously injected into the oscillator-modulator from the "Private-Line" encoder. This code range will produce 0.5 to 1.0 kHz deviation.

2.2 MODULATOR-OSCILLATOR STAGE (CHANNEL ELEMENT)

2.2.1 The combination modulator-oscillator stage (channel element) produces a low-power crystal frequency signal modulator at an audio rate. This signal is multiplied twelve times and amplified in following stages to produce the carrier signal. The channel element consists of a parallel combination varactor and warping capacitor connected in series with a crystal. A change in capacitance seen at the crystal terminals will cause the crystal to vary its resonant frequency in proportion to the capacitance change. The audio voltage from the audio and IDC circuitry is applied to the varactor to cause a change in capacitance; this variation in turn causes the frequency to change at the same audio rate.

2.2.2 Channel elements are highly stable crystal-controlled oscillators. They use unheated crystals in an oscillator circuit that is temperature compensated over the entire temperature range of -30°C to +60°C (-22°F to +140°F). A variable warp capacitor in the base



Exciter Block Diagram

of each channel element is accessible through a hole in the exciter circuit board for fine frequency adjustment. Each channel element is a factory sealed, plug-in module which provides a train of stable frequency positive pulses.

2.2.3 The exciter accepts up to four channel elements - one channel element is required for each frequency. Only one frequency may be selected at a time, but transmission is possible on as many as four separate frequencies. A power input of +9.6 volts is applied to the channel element(s) continuously while the station is turned ON. Channel element output is developed only when a switched ground generated by the local or remote control unit is present. In single-frequency receivers, this switched ground is applied to a specific channel element as determined by the frequency selector switch associated with the station. An indication of the channel element output is available at pin 2 of the metering socket. This allows channel element operation to be easily checked with optional built-in station metering or with a Motorola Portable test set.

NOTE

If the station is equipped with a time-out timer module and the timer times out, keyed A- is removed from the modulator-oscillator(s) and the entire transmitter is shut down.

2.3 BUFFER AMPLIFIER

The buffer amplifier, Q404, is biased to operate as a Class A amplifier and provides reserve gain to isolate the modulator-oscillator from the succeeding stages.

2.4 MULTIPLIERS AND EXCITER POWER AMPLIFIER

2.4.1 The multipliers develop an output signal that is 12 times the channel element frequency and a final power amplifier gives power gain and matches the output impedance to 50 ohms.

2.4.2 The buffer amplifier output is developed across two parallel resonant tank circuits at the channel element frequency. Tripler Q405 operates as a Class C amplifier with its parallel resonant output tuned to the third harmonic of its input. Thus the output of the tripler is three times the channel element frequency. A meter connected at pin 3 of the metering receptacle measures the average dc base current which is proportional to input signal strength.

2.4.3 The first doubler circuit operates very similar to the tripler except its output is tuned to the second harmonic of its input and its drive is metered at pin 4. The output of the doubler is six times the channel element frequency.

2.4.4 The second doubler circuit also operates similar to the tripler with its output tuned to the second harmonic of its input. The drive to the second doubler is metered on pin 5 of the metering receptacle. The output signal is 12 times the channel element frequency and is the carrier frequency of the transmitter.

2.4.5 The exciter power amplifier also operates as a Class C amplifier. The amplifier provides at least 400 milliwatts of frequency modulated signal at the carrier frequency to the power amplifier section of the transmitter.

3. MAINTENANCE

3.1 METERING

The exciter is equipped with a metering receptacle which allows five major test points to be measured. The output of the exciter (input to the power amplifier) can be measured by using the metering receptacle on the power amplifier. With the portable test set connected to the metering receptacles, or by using the built-in station metering kit (if so equipped), readings may be made at each of the major test points in the circuit by merely rotating a selector switch. A failure in almost any portion of the exciter will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

NOTE

The exciter board must be installed in the transmitter for testing to provide the necessary power, ground, control and signal connections. The circuit board should always be secured in place with all mounting screws for operation and testing to provide good rf ground to all stages of the exciter. The exciter may be tested while installed in the station--usually the preferred method. However, if desired, it can be bench tested in a "Micor" mobile radio, except that the time-out timer is inoperative.

TYPICAL EXCITER METER READINGS

SELECTOR SWITCH POSITION	REFERENCE SWITCH POSITION (TEST SET ONLY)	READING	CIRCUIT METERED	IF LOW, THE DEFECTIVE CIRCUIT IS
1	A	2 (no mod) 6 (1 V rms @ 1 kHz exciter board pins 1 & 12)	Audio output of IDC circuit.	IDC circuit
2	A	25	Channel element output.	Channel element
3	A	38	Tripler input	Modulator or Tripler
4	A	22	1st doubler input	Tripler or 1st doubler
5	A	25	2nd doubler input	1st doubler or 2nd doubler

3.1.1 Built-In Station Metering

Step 1. The output of the exciter must be terminated into its normal point, the bandpass filter. The output of the power amplifier must be terminated in a 50-ohm dummy load or an antenna.

Step 2. Turn station ON.

Step 3. Set selector switch to position 1. Key the transmitter and whistle into the microphone long enough to observe the meter reading.

Step 4. Set selector switch to positions 2, 3, 4, and 5 respectively, keying the transmitter and observing the meter readings for each position (whistling not required). On multi-frequency stations, repeat the readings for each exciter frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows in the "Performance Tests" paragraph.

3.1.2 Portable Test Set

Step 1. Connect the 20-pin plug of the test set adapter cable to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

Step 2. Connect the red "control" plug of the adapter cable to the control receptacle on the local or remote control circuit board. Connect the white "metering" plug of the adapter cable to the metering receptacle on the exciter circuit board.

Step 3. Set function selector switch to the XMTR position.

Step 4. Set oscillator and meter reversing switch to OFF position.

Step 5. Set 1 V-100 mV switch on the adapter cable to the 100 mV position (TEK-37). On the later version adapter cable (TEK-37A), the switch is omitted and the unit operates at 100 mV sensitivity.

Step 6. Set the REF A-B switch on the adapter cable to position A.

Step 7. The output of the exciter must be terminated into its normal point, the bandpass filter. The output of the power amplifier must be terminated in a 50-ohm dummy load or an antenna.

Step 8. Turn station ON.

Step 9. Connect a microphone to the microphone receptacle on the portable test set or to the local or remote control board.

Step 10. Set selector switch to position 1. Key the transmitter and whistle into the microphone long enough to observe the meter reading.

Step 11. Set selector switch to positions 2, 3, 4, and 5 respectively, keying the transmitter with the XMTR ON pushbutton on the test set or the push-to-talk switch on the microphone and observing the meter reading for each position. On multi-frequency stations, repeat the readings for each exciter frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows in the "Performance Tests" paragraph.

Step 12. Move the "metering" plug to the power amplifier metering receptacle and observe the meter readings for selector switch position 1. The reference A-B switch must be set to the B position and the meter reversing switch to METER REV.

Each time maintenance is performed on the exciter, the readings should be compared

with the previous set of readings. Any degradation of performance will quickly be noted.

3.2 PERFORMANCE TESTS

The performance tests may be used for troubleshooting to isolate the point of abnormal performance. They may also be used after repair and alignment to assure that the exciter meets all specifications before it is returned to service.

3.2.1 Power Output Test

Step 1. Connect the equipment as connected for Metering (paragraph 3.1), except connect the test set "metering" plug to the power amplifier metering receptacle.

Step 2. Set selector switch to position 1. This checks the input to the power amplifier (output of the exciter). A meter reading of at least 20 uA equals an rf signal level of 400 milliwatts.

Step 3. On multi-frequency stations of ±750 kHz separation, repeat the test for each exciter frequency. Select the frequency to be tested by the frequency selector switch associated with the station. The test set meter should indicate at least 20 uA for each frequency.

3.2.2 Frequency Test

Step 1. Terminate the transmitter in an antenna and measure the radiated signal with a Motorola digital frequency meter and deviation monitor or other highly accurate frequency measuring device (±.00005% or better).

NOTE

When high stability channel elements are used, carrier frequency must be within .0002%.

Step 2. Key the transmitter to produce an unmodulated carrier signal. In "Private-Line" tone-coded stations disable the "Private-Line" encoder by unplugging the "Vibrasender" resonant reed. In "Digital Private-Line" stations, disable the code by shorting together the two "code disable" pins on the PL encoder board.

NOTE

Do not use the push-to-talk switch on the microphone. Background noise will modulate the signal.

Step 3. Read the transmitter output frequency. On multi-frequency stations, repeat the test for each frequency.

Step 4. If adjustment is required, set the "warp" capacitor on the associated channel element for the assigned frequency output. For best accuracy, the radio set should be brought to room temperature (+70° to 75°F) and the test equipment thoroughly warmed up. This brings the channel element to the center of its temperature compensation range.

3.2.3 Deviation Test

Step 1. Terminate the transmitter output in an antenna and measure the radiated signal with a deviation meter.

Step 2. In "Private-Line" tone-coded squelch stations, re-insert the "Vibrasender" resonant reed if it was removed in the previous test. In "Digital Private-Line" stations, remove the code disable short. Key the transmitter with only "Private-Line" code modulation. The deviation meter should indicate 0.5 to 1 kHz.

Step 3. Connect an audio oscillator output to exciter board pins 1 (Gnd) and 12 (Audio High). Adjust the audio oscillator to 1000 Hz and 1 volt as measured on an AC voltmeter. The deviation meter should indicate ±5 kHz deviation.

Step 4. Adjust the audio oscillator over the entire 300 to 3000 Hz range, keeping the audio level at approximately 1 volt. The deviation meter should never exceed ±5 kHz nor drop below ±2.5 kHz.

3.2.4 Audio Sensitivity Test

Step 1. After completion of the Deviation Test, reduce the output of the audio oscillator to 130 millivolts at 1000 Hz.

Step 2. The deviation meter should indicate approximately ±3.0 kHz. Meter position 1 may be noted at this time for future reference. Future audio sensitivity checks may then be made by comparing the meter 1 reading with the reference value.

3.3 TROUBLESHOOTING

3.3.1 If there are no test set indications at one or more of the metered points, check the dc input voltages to the exciter circuit board.

P402-11 & 13	+9.6 volts in respect to chassis
P402-6	Keyed A- (approximately -13.6 volts in respect to A+, pin 7).

3.3.2 If test set indications localize the trouble to a specific stage or two, measure the dc input voltages to the suspected stages. Refer to the schematic diagram for the normal voltages.

NOTE

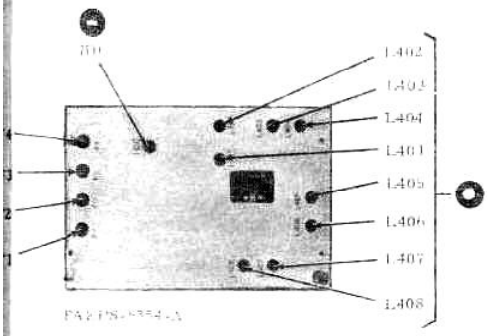
In "Private-Line" stations, the transmitter cannot be keyed if the PL encoder is removed unless a jumper (JU402) is connected from pin 8 to pin 10 of the exciter to complete the keying circuit. This jumper is permanently connected in exciters for non-"Private-Line" operation.

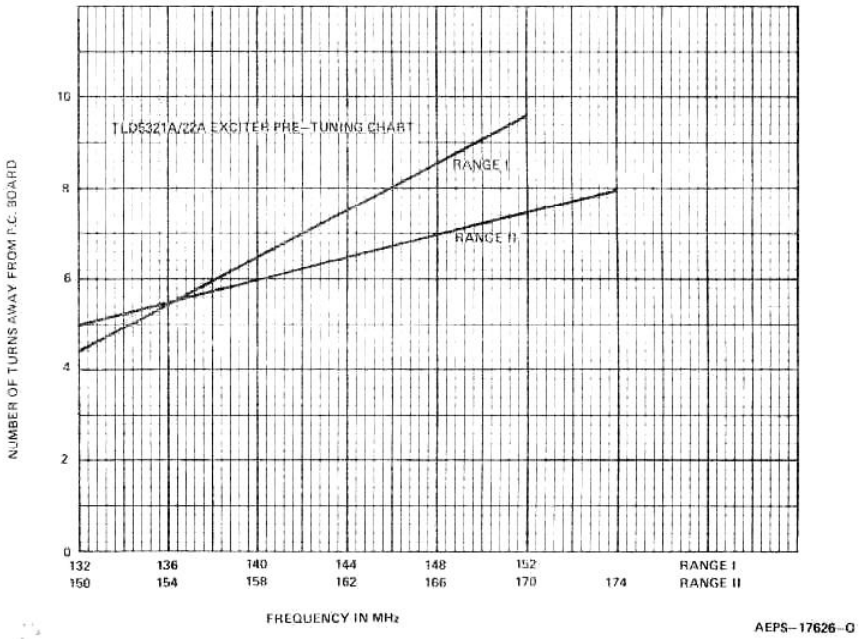
ALIGNMENT PROCEDURE

STEP	ADJUST	METERING PLUG LOCATION	SELECTOR SWITCH POSITION	METER REV. SWITCH AND REF A-B SWITCH (SEE NOTE)	STAGE AND PROCEDURE
1					SET UP - Key the transmitter with the XMTR ON pushubtton on the portable test set.
2	POWER SET				OUTPUT - Turn the POWER SET control fully counterclockwise. Unkey the transmitter.
3	FRE-QUENCY SWITCH	EXCITER	2	OFF REF A	CHANNEL ELEMENT - Select the desired frequency on multi-frequency stations. Key the transmitter. The test set meter 2 should indicate at least 10 uA.
4	ALL EXCITER COILS	EXCITER	5	OFF REF A	PRE-ALIGNMENT - If the exciter is completely untuned and shows no meter 5 readings, set cores of tuning coils L401 to L406 to the top of their coil forms (away from circuit board). Set cores of L407 and L408 per the exciter pre-tuning chart. If a meter 5 reading is available proceed to step 7.
5	L401	EXCITER	2	OFF REF A	BUFFER OUTPUT - Tune L401 for minimum meter reading.
6	L401, L402	EXCITER	3	OFF REF A	BUFFER OUTPUT - Tune L402 and then L401 for peak meter reading.
7	L403	EXCITER	3	OFF REF A	TRIPLER OUTPUT - Tune L403 for minimum meter reading.
8	L403, L404	EXCITER	4	OFF REF A	TRIPLER OUTPUT - Tune L404 and then L403 for peak meter reading.
9	L405	EXCITER	4	OFF REF A	FIRST DOUBLER OUTPUT - Tune L405 for minimum meter reading.
10	L405, L406	EXCITER	5	OFF REF A	SECOND DOUBLER OUTPUT - Tune L406, and then L405 for peak meter reading.
11	L407 L408	EXCITER	5	OFF REF A	EXCITER OUTPUT - Tune L407 then L408 for peak meter reading.
12	L407, L408	PA	1	METER REV REF A	EXCITER OUTPUT - Move the metering plug to the PA. Tune L408 and then L407 for peak meter reading.
13					Repeat steps 6, 8 and 10.
14					Align the power amplifier.

METERING NOTE

Alignment may be performed using a Motorola S1056B thru S1059B Portable Test Set or optional built-in station metering. The OSC. & METER REV. SWITCH column refers to portable test set usage -- polarity is automatically reversed as required when built-in station metering is used. All meter readings are based on a two-thousand ohm (2000_{Ω}) equivalent series resistance in the meter. Therefore, meters not having a two-thousand ohm series resistance must have their readings corrected.





OSCILLATOR FREQUENCY ADJUSTMENT

1. Key the transmitter with no modulation (key the transmitter with the XMTR ON pushbutton on the portable test set rather than with the microphone). On "Private-Line" stations, unplug the "Vibrasender" resonant reed from the PL tone generator. On "Digital Private-Line" stations short together the code disable pins on the "Digital Private-Line" encoder board.
2. Adjust the channel element warp capacitor for the selected channel to the exact desired frequency. On single-frequency models, adjust the F1 channel element warp capacitor. On multi-frequency models, adjust the warp capacitor which corresponds to the frequency selector switch setting; repeat for each frequency.

"IDC" ADJUSTMENT PROCEDURES

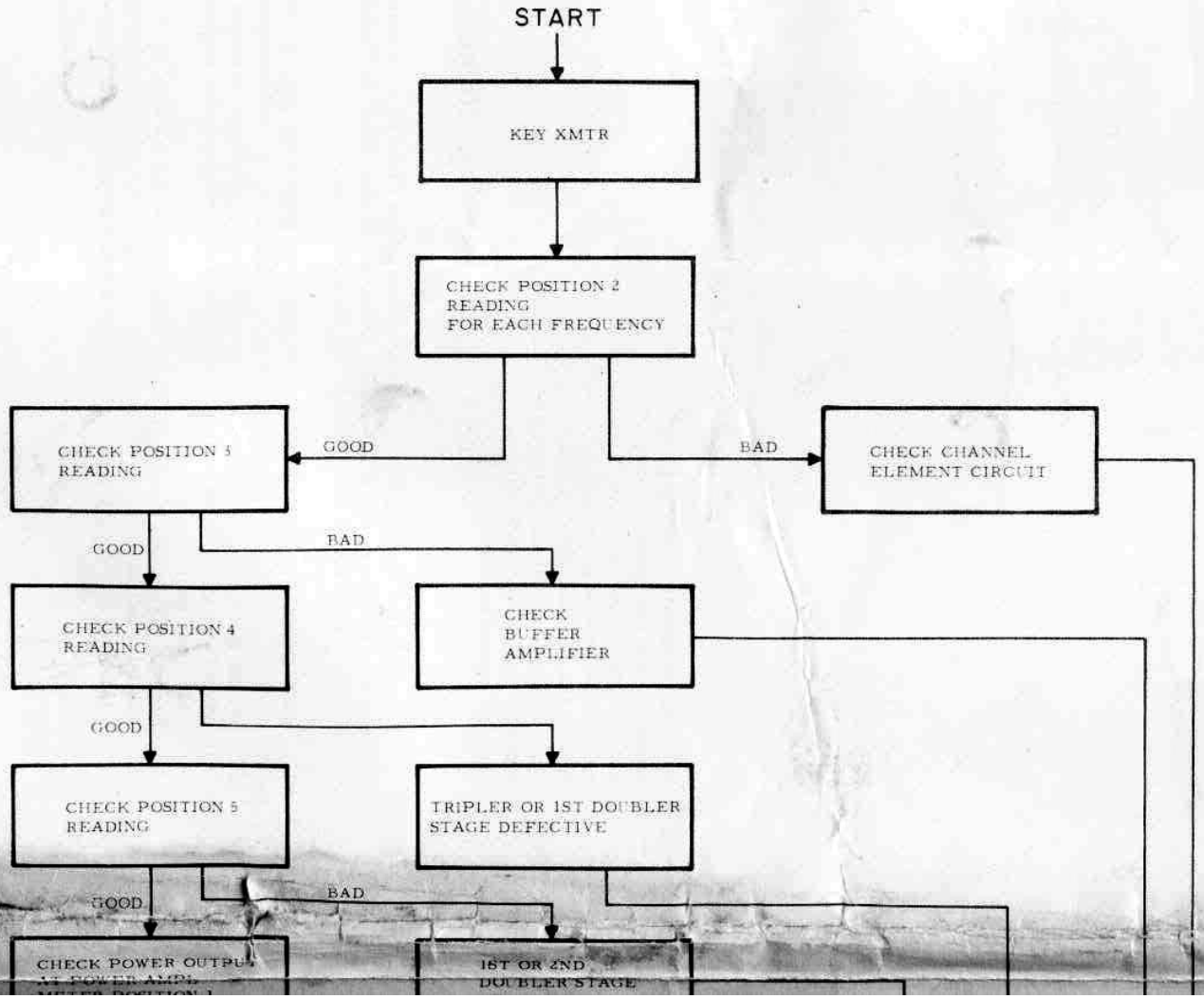
NOTE

For "Digital Private-Line" stations, deviation must be measured with a Motorola R-1200 Series Service Monitor with RTC-4000A Deviation Meter Plug-In Module that has been modified for frequency response of less than 1 Hz, or equivalent.

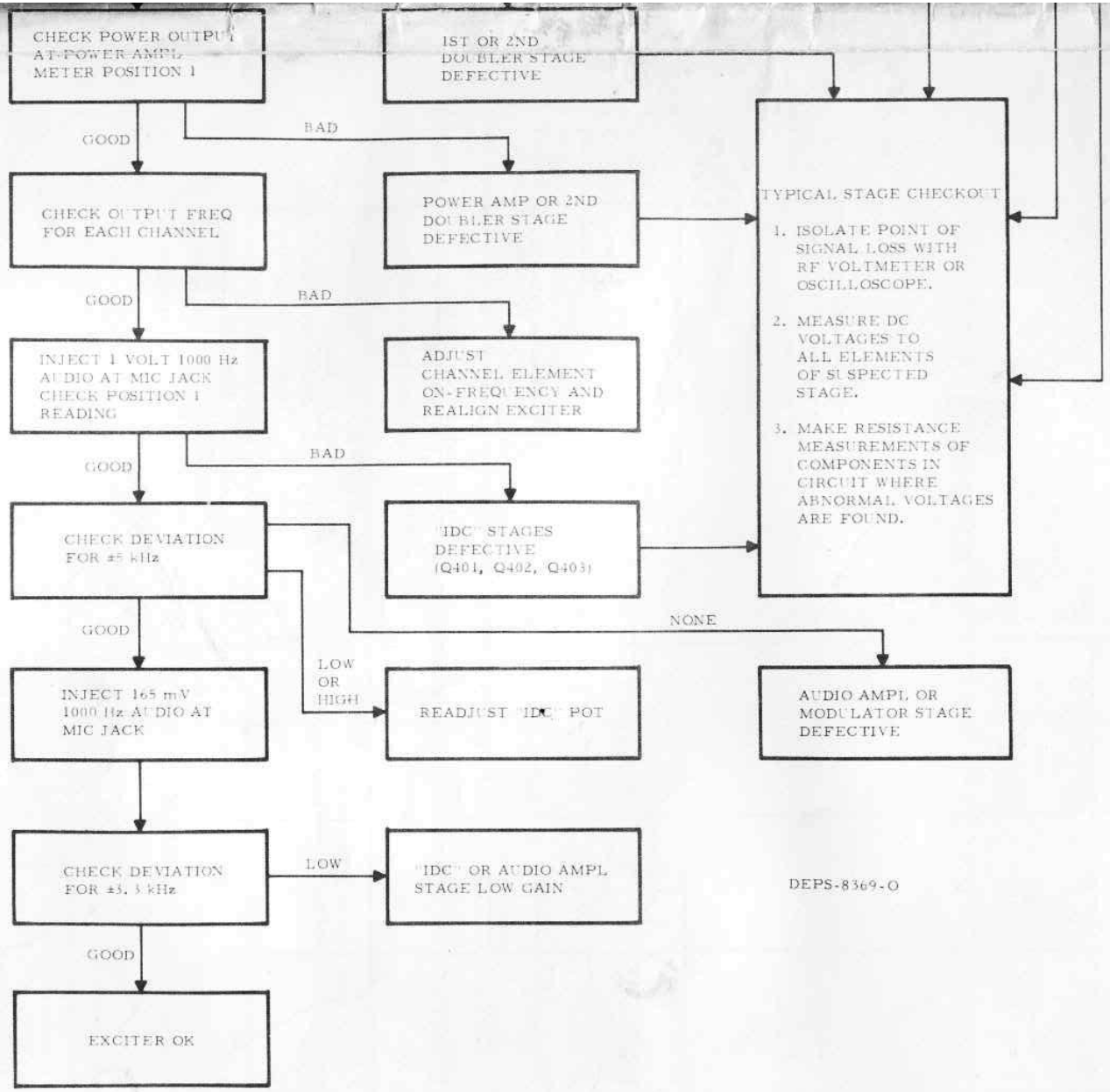
1. Each channel element must be "warped" on frequency before setting "IDC". Connect the audio oscillator to the exciter input (pins 1, Gnd, and 12, Audio High).
2. Set the audio oscillator to 1000 Hz and 1 volt. On tone "Private-Line" models, replace the "Vibrasender" resonant reed. On "Digital Private-Line" models, remove the short from the code disable pins.
3. Key the transmitter and adjust the IDC control for ±5 kHz deviation.
4. Reduce the tone oscillator output to .25 volt. Essentially full deviation should still be indicated. Less than full deviation may indicate a weak audio stage.

NOTE

CHECK POSITION READINGS WITH A MOTOROLA S–1056A THRU S–1059A PORTABLE TEST SET, OPTIONAL BUILT–IN–STATION METERING, OR EQUIVALENT.



DOTING CHART



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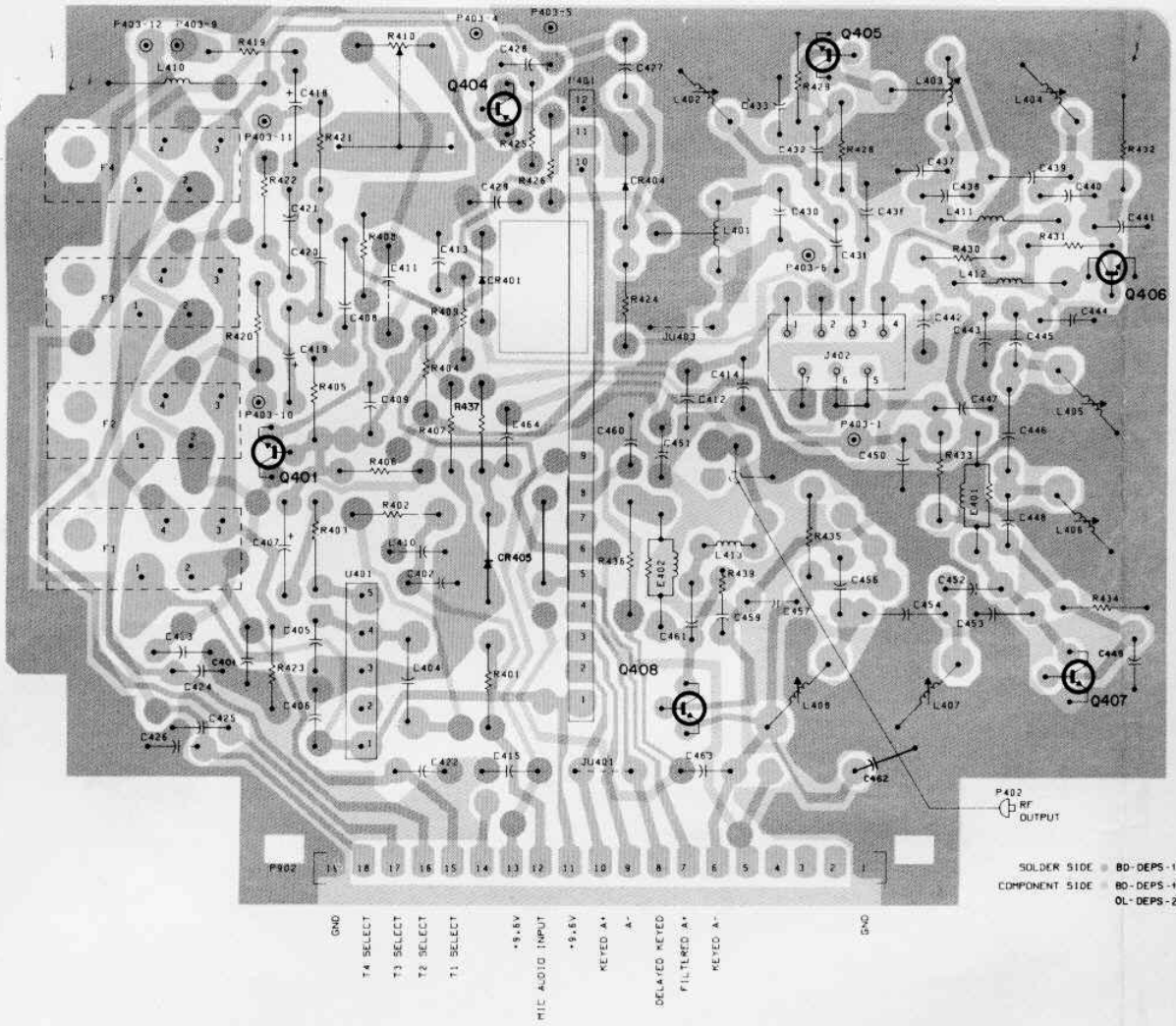
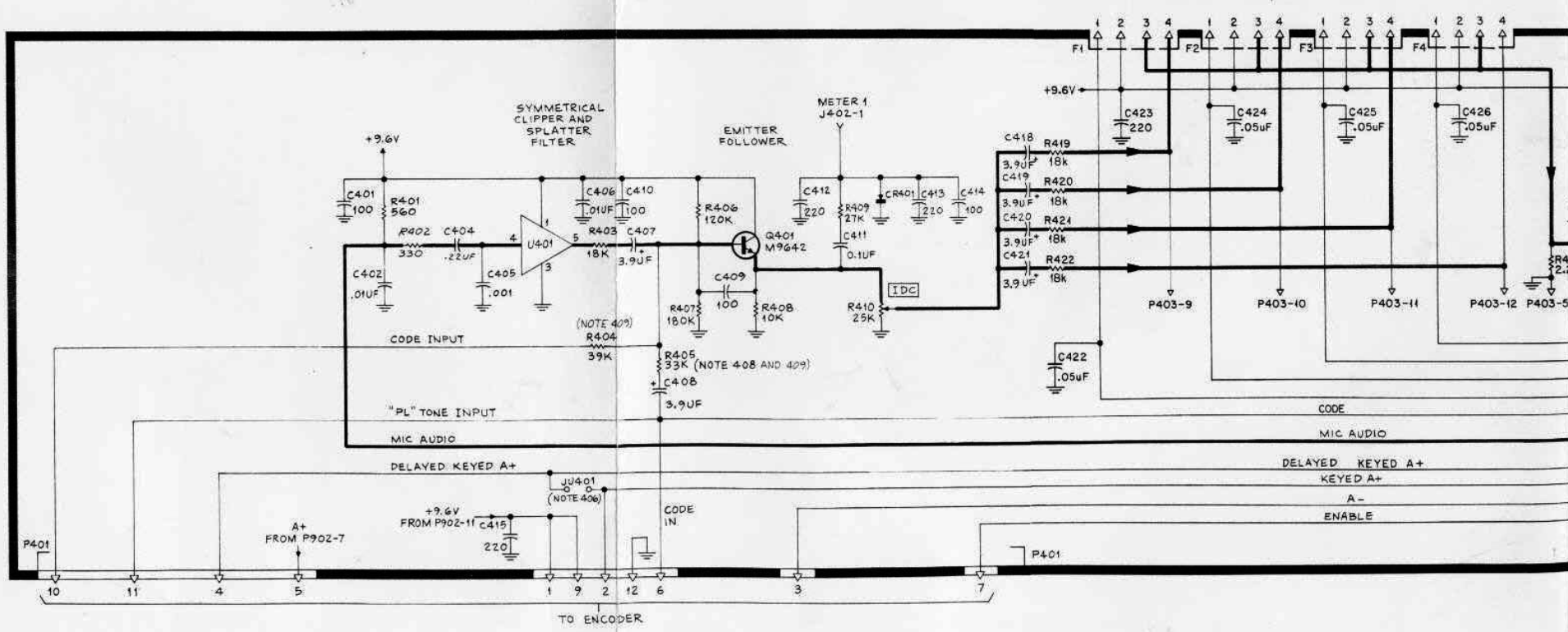
SHOWN FROM SOLDER SIDE



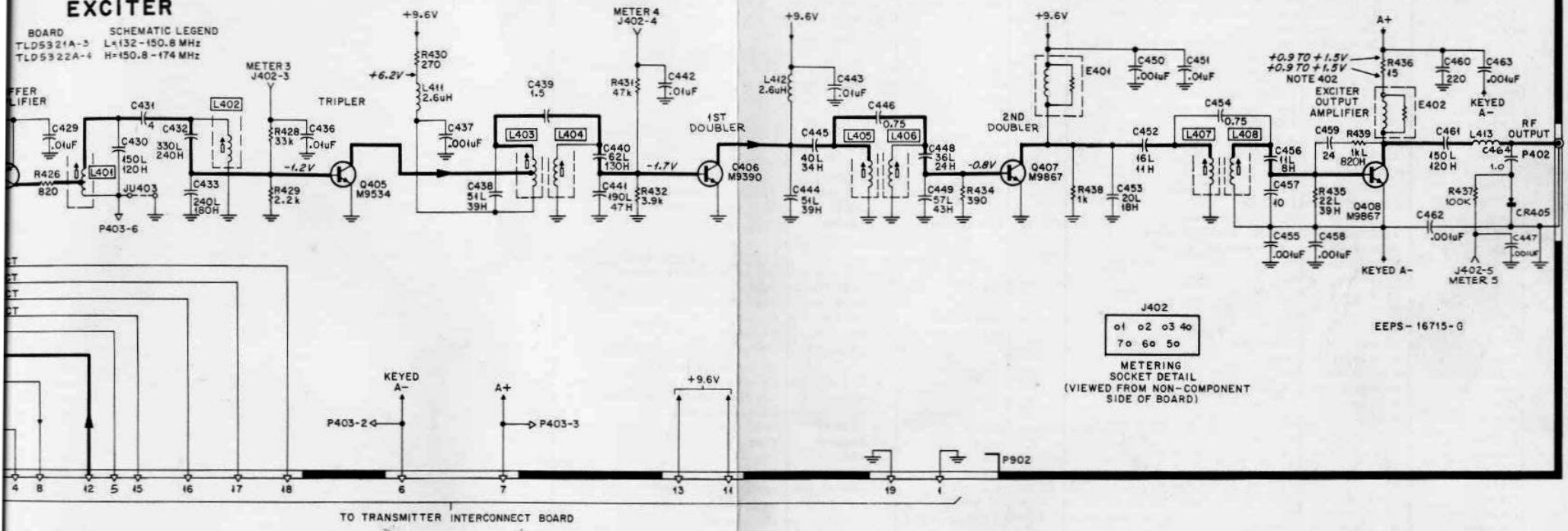
SOLDER SIDE BD-DEPS-16779-0
COMPONENT SIDE BD-DEPS-16780-0
OL-DEPS-23719-0


SYMMETRICAL CLIPPER AND SPLATTER FILTER
EMITTER FOLLOWER
METER 1 J402-1
+9.6V
C401 100
R401 560
R402 330
C404 .22UF
C402 .01UF
C405 .001
U401
C406 .01UF
C410 100
R403 18K
C407 3.9UF
R406 120K
C409 100
R407 180K
R408 10K
Q401 M9642
C412 220
R409 27K
CR401
C413 220
C414 100
C411 0.1UF
R410 25K
IDC
C418 3.9UF
R419 18k
C419 3.9UF
R420 18k
C420 3.9UF
R421 18k
C421 3.9UF
R422 18k
C422 .05uF
C423 220
C424 .05uF
C425 .05uF
C426 .05uF
F1
F2
F3
F4
P403-9
P403-10
P403-11
P403-12
CODE INPUT
(NOTE 409)
R404 39K
R405 33K (NOTE 408 AND 409)
C408 3.9UF
"PL" TONE INPUT
MIC AUDIO
DELAYED KEYED A+
JU401 (NOTE 406)
+9.6V FROM P902-11
C415 220
A+ FROM P902-7
CODE IN
CODE
MIC AUDIO
DELAYED KEYED A+
KEYED A+
A-
ENABLE
P401
P401
10
11
4
5
1
9
2
12
6
3
7
TO ENCODER

EXCITER

BOARD
TLD5321A-3
TLD5322A-4

SCHEMATIC LEGEND
L=132-150.8 MHz
H=150.8-174 MHz



TO TRANSMITTER INTERCONNECT BOARD

J402

o1	o2	o3	4o
7o	6o	5o	

METERING SOCKET DETAIL
(VIEWED FROM NON-COMPONENT SIDE OF BOARD)

EEPS-16715-G

NOTES:

401. TRANSMITTER FREQUENCY CALCULATION:
$fo = \frac{fc}{12}$ $fc = fo\,12$
WHERE:
fo=CHANNEL ELEMENT FREQUENCY
fc=CARRIER FREQUENCY
402. VOLTAGE MEASURED ACROSS R436.
403. HIGH IMPEDANCE TRANSISTORIZED VOLTMETERS (11 MEGOHM) NOT RECOMMENDED.
404. UNLESS OTHERWISE STATED, VOLTAGES MEASURED IN RESPECT TO CHASSIS GROUND.
405. UNLESS OTHERWISE STATED CAPACITOR VALUES ARE IN PICOFARADS.
406. JU401 REMOVED IN "PRIVATE-LINE" RADIOS.
407. R401 REMOVED IN REMOTE CONTROL STATIONS.
408. WHEN CODE INPUTS ARE APPLIED VIA P401-10, R405 MUST BE REMOVED FROM THE CIRCUIT.
409. R404 AND R405 ARE FACTORY SELECTED SO THAT PRIVATE LINE DEVIATION FALLS BETWEEN 500HZ AND 1000HZ LIMITS.

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

TLD5320A Series Exciter Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-16953-F
8/29/77-UP

PARTS LIST

LEGEND

L = 132-150.8 MHz
H = 150.8-174 MHz

TLD5321A, AV Exciter (132-150.8 MHz)
TLD5322A, AV Exciter (150.8-174 MHz) PL-3268-D

This parts list covers **four** models of the high band Exciter Board. Where differences exist a letter suffix L or H is added to the reference symbol to show the applicable unit.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; 500 V unless otherwise stated
C401	21-831125	100 ±10%; 300 V
C402	21-82428B59	.01 uF +80-20%; 200 V
C403		NOT USED
C404	8-82905G11	.22 uF ±10%; 50 V
C405	21-83596E13	.001 uF ±10%; 100 V
C406	21-82428B59	.01 uF +80-20%; 200 V
C407, 408	23-84762H08	3.9 uF ±20%; 15 V
C409, 410	21-831125	100 ±10%; 300 V
C411	21-82372C03	0.1 uF +80-20%; 25 V
C412, 413	21-83596E10	220 ±20%
C414, 415	21-831125	100 ±10%; 300 V
C416, 417		NOT USED
C418 thru 421	23-84762H08	3.9 uF ±20%; 15 V
C422	21-82372C04	.05 uF +80-20%; 25 V
C423	21-83596E10	220 ±20%
C424, 425, 426	21-82372C04	.05 uF +80-20%; 25 V
C427	21-83406D51	3 ±0.25 pF
C428	21-82133G06	27; 500 V
C429	21-82428B59	.01 uF +80-20%; 200 V
C430L	21-84494B07	150
C430H	21-84494B06	120
C431	21-83406D54	4 ±0.25 pF
C432L	21-84494B16	330
C432H	21-84494B13	240
C433L	21-84494B13	240
C433H	21-84494B46	180 ±3%
C434, 435		NOT USED
C436	21-82428B59	.01 uF +80-20%; 200 V
C437	21-83596E13	.001 uF ±10%; 100 V
C438L	21-84494B01	51
C438H	21-84494B24	39
C439	21-861453	1.5 ±10%
C440L	21-852322	62
C440H	21-861601	130 ±3%
C441L	21-84494B10	190
C441H	21-868681	47
C442, 443	21-82428B59	.01 uF +80-20%; 200 V
C444L	21-84493B27	51; 200 V
C444H	21-84494B24	39
C445L	21-83406D91	40
C445H	21-84494B30	34
C446	21-82450B06	0.75 ±10%
C447	21-83596E13	.001 uF ±10%; 100 V
C448L	21-83406D92	36
C448H	21-83406D56	24
C449L	21-84493B31	57; 200 V
C449H	21-84494B28	43
C450	21-83596E13	.001 uF ±10%; 100 V
C451	21-82428B59	.01 uF +80-20%; 200 V
C452L	21-83406D93	16
C452H	21-83406D90	11
C453L	21-83406D81	20
C453H	21-83406D55	18
C454	21-82450B06	0.75 ±10%
C455	21-83596E13	.001 uF ±10%; 100 V
C456L	21-83406D90	11
C456H	21-83406D70	8 ±0.5 pF
C457	21-83406D89	10 ±0.5 pF
C458	21-83596E13	.001 uF ±10%; 100 V
C459	21-840365	24; NP0
C460	21-83596E10	220 ±20%
C461L	21-84494B07	150
C461H	21-84494B06	120
C462, 463	21-83596E13	.001 uF ±10%; 100 V
C464	21-82355B62	1.0
C465	21-82428B59	.01 uF +80-20%; 200 V
CR401	48-863030	DIODE: (SEE NOTE) germanium
CR402, 403		NOT USED
CR404, 405	48-82139G01	germanium
		COIL, rf:
E401	24-84392B06	40 turns on 820 ohm resistor
E402L	24-84392B13	15 turns on 560 ohm resistor
E402H	24-84392B05	9 turns on 560 ohm resistor
		CONNECTOR, receptacle:
J401		NOT USED
J402	9-84207B01	7 contacts
		COIL, rf:
L401	24-84389B02	18-2/3 turns; coded Black
L402	24-84389B01	18-1/2 turns; coded Yellow
L403	24-84389B06	8-2/3 turns; coded Green
L404	24-84389B05	8-1/2 turns; coded Red
L405, 406	24-84972A09	6-1/2 turns; coded Yellow
L407, 408	24-84972A11	3-1/2 turns; coded Green
L409		NOT USED
L410	24-80900A61	0.62 mH
L411, 412	24-82835G08	2.6 uH; coded Red-Blue-Gold
L413	24-84923C01	1-1/2 turns
		CONNECTOR, plug:
P401		part of printed circuit board
P402	28-84282D01	phono
P403, 902		part of printed circuit board
		TRANSISTOR: (SEE NOTE)
Q401	48-869642	NPN; type M9642
Q402, 403		NOT USED
Q404	48-869571	PNP; type M9571
Q405	48-869534	NPN; type M9534
Q406	48-869390	NPN; type M9390
Q407, 408	48-869867	NPN; type M9867
		RESISTOR, fixed: ±10%; 1/4 W unless otherwise stated
R401	6-124C43	560
R402	6-124A37	330 ±5%
R403	6-124A79	18k ±5%
R404	6-124A87 or	39k ±5%
	6-124A89	47k ±5% (factory selected for DPL models only)
R405	6-124A85 or	33k ±5%
	6-124A89	47k ±5% (factory selected for PL models only)
R406	6-124A99	120k ±5%
R407	6-124B04	180k ±5%
R408	6-124C73	10k
R409	6-124C83	27k
R410	18-83083G24	variable: 25k ±30%
R411 thru 418		NOT USED
R419 thru 422	6-124A79	18k ±5%
R423	6-124C57	2.2k
R424	6-124C85	33k
R425	6-124C51	1.2k
R426	6-124C47	820
R427		NOT USED
R428	6-124C85	33k
R429	6-124C57	2.2k
R430	6-124C35	270
R431	6-124C89	47k
R432	6-124C63	3.9k
R433		NOT USED
R434	6-124C39	390
R435L	6-124C09	22
R435H	6-124C15	39
R436	6-125C05	15; 1/2 W
R437	6-124C97	100k
R438	6-124C49	1k
R439L	6-124C49	1k
R439H	6-124C41	470
		SYMMETRICAL CLIPPER AND SPLATTER FILTER:
U401	1-80763B05	potted unit

NOTE:

PTION

)TE)

hm resistor
hm resistor
m resistor
eceptacle:

led Black
led Yellow
ed Green
ed Red
ed Yellow
ed Green

d-Blue-Gold

ug:
rcuit board

rcuit board

EE NOTE)

: ±10%; 1/4 W
stated

selected for
)

selected for

%

CLIPPER AND
ER:

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
NON-REFERENCED ITEMS		
	14-861196	INSULATOR, transistor; 2 req'd. (used with Q407 & Q408)
	26-83379H01	HEAT SINK (used with Q408)
	26-84598A01	SHIELD, coil; 4 req'd. (used with L405 thru L408)
	26-84598A02	SHIELD, coil; 4 req'd. (used with L401 thru L404)
	42-84284B01	RETAINER; 4 req'd.
	3-138162	SCREW, tapping: Phillips round hd., 4-40 x 3/8"; 4 req'd. (used for mounting Retainers)
	55-84300B01	HANDLE
	30-83794C01	CABLE, coaxial; 6" req'd. (used with P402)
	29-84028H01	TERMINAL, pin; 19 req'd.
	29-84028H02	TERMINAL, pin; 12 req'd.
	29-855943	TERMINAL, pin; 16 req'd.
	39-10184A10	CONTACT, terminal; 10 req'd.

NOTE: For optimum performance, replacement diodes and transistors must be ordered by Motorola part numbers.

REVISIONS

PEPS-16953-F

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLD5321A-1	R424	From 6-124C89, 47k To 6-124C85, 33k	Meter 2 J402-2
	R428	From 6-124C87, 39k To 6-124C85, 33k	
	R431	From 6-124C93, 68k To 6-124C89, 47k	Meter 4 J402-4
TLD5321A-2 TLD5322A-2	R428	From 6-124C85, 33k To 6-124C87, 39k	Meter 2 J402-2
TLD5321A-3 TLD5322A-3	C439	From 21-864518, 1 pF To 21-861453, 1.5 pF	Meter 4 J402-4
	C440H	From 21-83406D87, 43 pF To 21-861601, 130 pF	
	C441H	From 21-84494B46, 180 pF To 21-868681, 47 pF	
TLD5322A-4	R439H	From 6-124C41, 470 To 6-124C47, 820	Q408 Collector