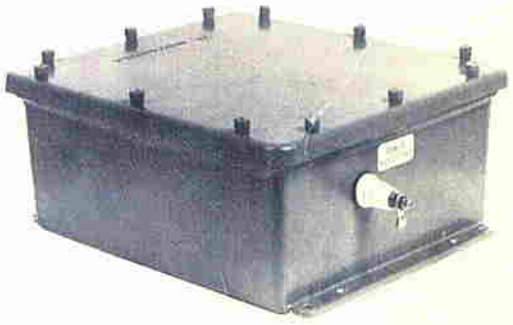
MOTOROLA

MOTOROLA HF-SSB
Automatic Antenna Tuners
2-18 MHz, 2-30 MHz

Models T1959B, T1961B, T1962B, F2259A, F2260A

LIGHT/COMPACT

Models F2261A, F2262A



HEAVY DUTY

Service Manual

68P02926G25-O

MOTOROLA INC.
Communications
Sector

MOTOROLA HF-SSB
Automatic Antenna Tuners
2-18 MHz, 2-30 MHz

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technical writing services
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TLA1132B Antenna Base Tuner
TKN8123A Cable Kit (17 feet)
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TLA1152B Antenna Marine Tuner

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*Cable kit TKN8120B (30 feet) or TKN8121B (100 feet) must be ordered.

KIT BREAKDOWNS

TLA1132B Antenna Base Tuner
TLA1102A Antenna Tuner
FBN5507A Packing

TLA1152B Antenna Marine Tuner
TLA1102A Antenna Tuner
FBN5507A Packing

TLA1102A Antenna Tuner
TLA6102A RF Board
THN6410A Housing

TLA1162B Antenna Marine Tuner
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FLN1667A Antenna Tuner
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ACCESSORIES

TKN8120B Cable Kit, 30 feet
TKN8121B Cable Kit, 100 feet

Mobile Light Compact

Specifications

Models	T1959B	F2260A
Frequency range	2-18 MHz	2-30 MHz
Antenna length	8-16 feet (up to 60 feet)	8-16 feet (up to 60 feet)
Lead-in length from antenna to tuner	1 foot (mobile installation)	1 foot (mobile installation)
Cabling	Model TKN8123A, supplied with the tuner	
Ground lead	1" wide copper strap. Length 1 foot or less between tuner and ground system.	
Power requirements	12 V dc at 1.4 A maximum	
Power handling capability	125 W PEP maximum	
Tuning time	One second typical, 2.5 seconds maximum	
Housing	Weather-resistant housing with all stainless-steel hardware. All connections are made externally without removing the cover.	
Ground system requirements	Requires suitable low-resistance ground connection to steel hull or sufficient ground plane.	
Dimensions, H x W x L	14.2" x 3.6" x 9" (36 cm x 9.1 cm x 22.9 cm)	
Weight	5.5 lbs (2.5 kg)	
Accessories	Model TKN8119A Mobile Antenna Matching Harness (supplied with tuner)	

Marine Light Compact

Specifications

Models	T1961B	F2259A	T1962B
Frequency range	2-18 MHz	2-30 MHz	2-9 MHz
Antenna length	23-60 feet	23-60 feet	23-foot whip
Lead-in length from antenna to tuner	No restriction as long as length of lead-in and antenna is less than 60 feet.		3 feet maximum
Cabling	100' maximum. Requires field-assembled and supplied 3-conductor cable (#18 gauge minimum), and coaxial cable and connectors. All control-cable connectors are provided with the radio.		
Ground lead	1" wide copper strap. Length 5' or less between tuner and ground system.		
Power requirements	12 V dc at 1.4 A maximum		
Power handling capability	150 W PEP maximum		
Tuning time	One second typical, 2.5 seconds maximum		
Housing	Weather-resistant housing with all stainless steel hardware. All connections are made externally without removing the cover.		
Ground system requirements	Requires suitable low-resistance ground connection to steel hull or sufficient ground plane.		
Dimensions, H x W x L	14.2" x 3.6" x 9" (36 cm x 9.1 cm x 22.9 cm)		
Weight	5.5 lbs (2.5 kg)		
Accessories (one required for land applications)	Model TKN8120B, 30-foot cable kit Model TKN8121B, 100-foot cable kit		

Heavy Duty Marine/Land-Base Station

Specifications

Models	F2261A	F2262A
Frequency range	2-18 MHz	2-30 MHz
Antenna length	23-60 feet	23-60 feet
Lead-in length from antenna to tuner	No length restriction as long as total length of lead-in and antenna is less than 60 feet	
Cabling	100' maximum. Requires field-assembled and supplied 3-conductor cable (#18 gauge minimum), and coaxial cable and connectors. All control cable connectors are provided with the radio.	
Ground lead	1" wide copper strap. Length 5' or less between tuner and ground system.	
Power requirements	12 V dc at 1.4 A maximum	
Power handling capability	150 W PEP maximum	
Tuning time	One second typical, 2.5 seconds maximum	
Housing	Heavy-duty fiberglass housing per NEMA 4X standards.	
Ground system requirements	Requires suitable low-resistance ground connection to sufficient ground plane.	
Dimensions, H x W x L	6.7" x 13.3" x 15.4" (17 cm x 34 cm x 39 cm)	
Weight	12.1 lbs (5.5 kgs)	
Accessories (one required for land applications)	Model TKN8120B 30-foot cable kit Model TKN8121B 100-foot cable kit	

FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar equipment. The information it contains is current as of the printing date. Subsequent engineering changes are described in supplementary Instruction Manual Revisions (IMRs) issued as needed. The applicable schematic diagram is updated and the changes are described in a revision column printed either on the diagram or next to the corresponding parts list.

2. SERVICE

The Motorola National Service Organization offers one of the finest nation-wide installation and maintenance programs available to communications equipment users. This organization comprises approximately 900 Motorola Service Stations located throughout the United States. Each Service Station is independently owned and operated, is staffed by one or more trained, FCC-licensed technicians, and is specially selected and authorized by Motorola.

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National Service Manager
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

3. MODEL AND KIT IDENTIFICATION

Every Motorola product is specific identified by an overall model number prir on the nameplate. In addition, the assemb and kits comprising the product usually h kit model numbers stamped on them.

4. REPLACEMENT PARTS ORDERING

Motorola maintains a **factory parts ce** and several **area parts centers** loc throughout the United States. These fa ties are equipped to process parts ord identify part numbers, and otherwise assis the maintenance and repair of Moto Communications Group products. addresses of these parts centers are liste the following page.

Orders for crystals, channel eleme active filters, PROMs, code plugs, and r nant reeds should be sent directly to **factory parts center.** Orders for all o parts and for instruction manuals shoul sent to the nearest **area parts center.**

All orders for replacement parts or eq ment information should include the c plete identification number. This requ ment applies to all components, kits chassis. If the component part number is known, the order should include the nun of the chassis or kit which uses it, an description of the desired component suf ient to identify it.

Orders for crystals and channel elem should specify the crystal or channel elen type number, crystal and carrier frequenc and the model number of the chassis u the part.

Orders for active filters, PROMs, c plugs, and "Vibrasender" and "Vibraspon resonant reeds, should specify type nun and frequency, and should identify the c er/operator of the communications sys utilizing these items.

5. ADDRESSES

5.1 AREA PARTS CENTERS

5.1.1 U.S. Orders

Western Area Parts
1170 Chess Drive, Foster City
San Mateo, California 94404
Telephone: 415-349-3111
TWX: 910-375-3877

Midwest Area Parts
1313 E. Algonquin Road
Schaumburg, Illinois 60196
Telephone: 312-576-7322
TWX: 910-693-0869

Midatlantic Area Parts
7230 Parkway Drive
Hanover, Maryland 20176
Telephone: 301-796-8600
TWX: 710-862-1941

East Central Area Parts
12995 Snow Road
Parma, Ohio 44130
Telephone: 216-267-2210
TWX: 810-421-8845

Eastern Area Parts
85 Harristown Road
Glen Rock, New Jersey 07452
Telephone: 201-447-4000
TWX: 710-988-5602

Pacific Southwestern Area Parts
P.O. Box 85036
San Diego, California 92138
Telephone: 714-578-2222
TWX: 910-335-1634

Gulf States Area Parts
8550 Katy Freeway, Suite 128
Houston, Texas 77024
Telephone: 713-932-8955

Southwestern Area Parts
P.O. Box 34290
3320 Belt Line Road
Dallas, Texas 75234
Telephone: 214-241-2151
TWX: 910-860-5505

Southeastern Area Parts
P.O. Box 368
Decatur, Georgia 30031
Telephone: 504-981-9800
TWX: 810-766-0876

5.1.2 Canadian Orders

Motorola Ltd.
National Parts Department
3125 Steeles Avenue East
Willowdale, Ontario M2H 2H6
Telephone: 416-499-1441
TWX: 610-492-2713
Telex: 065-25191

5.1.3 All Other Countries

Motorola, Inc., or
Motorola Americas, Inc.
International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196
U.S.A.
Telephone: 312-576-6492
TWX: 910-693-0869
Telex: 722443 or 722424
Cable: MOTOL PARTS

5.2 FACTORY PARTS CENTER

5.2.1 Mail Orders

Motorola, Inc.
Component Products Sales and Service
P.O. Box 66191
O'Hare International Airport
Chicago, Illinois 60666

5.2.2 Other Correspondence

Motorola, Inc.
Component Products Sales and Service
2553 N. Edgington Street
Franklin Park, Illinois 60131

5.3 GENERAL OFFICES

Motorola Communications and Electronics
Inc.
Communications Group Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196
Telephone: 312-576-3900

MOTOROLA INC.
Communications Sector

MOTOROLA HF-SSB
Automatic Antenna Tuners
2-18 MHz, 2-30 MHz

1. DESCRIPTION

1.1 GENERAL

Motorola HF-SSB automatic antenna tuners are antenna matching networks rated at 125 or 150 watts peak envelope power (PEP). Selection of the network components for antenna matching is performed by a microprocessor-based circuit that monitors antenna conditions each time that a channel is changed. The entire tuning process usually takes less than one second. Microprocessor control eliminates the need for programming, preset adjustments, manual tuning, or manual adjustments during installation or operation.

The automatic antenna tuner can accommodate any number of channels automatically. New channels can be added at any time without adjusting the tuner.

1.2 MODELS

Automatic antenna tuner models are available in two frequency ranges, 2-18 MHz and 2-30 MHz, as shown in the table below.

Frequency Range	Models
2-18 MHz	T1959B, T1961B, F2261A
2-30 MHz	F2260A, F2259A, F2262A

These models match the impedance of an end-fed antenna (23- to 35-foot vertical whip or 23- to 60-foot random length wire) into a nominal 50-ohm impedance source with a frequency range from 2-18 MHz or 2-30 MHz.

Models T1959B and T1961B (2-18 MHz) or F2260A and F2259A respectively (2-30 MHz) differ only in supplied kits. Models T1959B and F2260A are supplied with a cable kit, intended for land mobile applications, and can tune mobile antennas 8 feet high or longer. Models T1961B and F2259A are intended for marine use and the cables are assembled in the field. A special control cable connector kit, TRN4423A, is supplied with the TRITON marine radio.

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Models F2261A (2-18 MHz) and F2262A (2-30 MHz) are basically the same tuners as T1961B and F2259A, but have a heavy-duty housing for outside marine mounting.

Model T1962B Antenna Tuner is capable of matching a 23-foot whip antenna from 2-9 MHz, and is intended for marine use.

1.3 HOUSINGS

Automatic antenna tuners feature two different housings intended for different installations. The light-compact tuner housing (for models T1959B, F2260A, T1961B, F2259A, T1962B) is intended for general purpose indoor-outdoor installations. These automatic antenna tuners include stainless-steel hardware and a weather-resistant housing providing corrosion resistance and durability. Installation is simple; the automatic tuning capability eliminates the need to open the tuner housing during installation.

The Heavy Duty Tuner Housing (for models F2261A, F2262A) is intended for use under the especially difficult environmental conditions of marine deck installations. It is also intended for use in land base stations. All connections, RF and control, are inside the tuner, through special feedthrough connectors.

NOTE

Older versions of Motorola single-sideband radios must be modified before they can be used with these tuners. For installation details, refer to the appropriate instruction section as follows:

Instruction section 68P02926G01-O applies to T1961B, T1962B, F2259A, F2261A, and F2262A Antenna Tuners.

Instruction section 68P02926G02-O applies to T1959B, F2260A, F2261A, and F2262A Antenna Tuners.

2. PREOPERATIONAL CHECK

The antenna tuner is inspected at the factory. However, if the tuner is intended for installation in a remote location or if it has been held in stock for several months, a preoperational check is recommended.

The recommended setup for the preoperational check consists of all of the components that comprise the radio system, with the antenna being replaced by an antenna simulator circuit. The recommended setup is shown in Figure 1.

NOTE

For models T1959B and F2260A only, a TKN8119A Mobile Antenna Matching Harness must be used when checking a mobile whip antenna. Figure 2 shows a recommended setup.

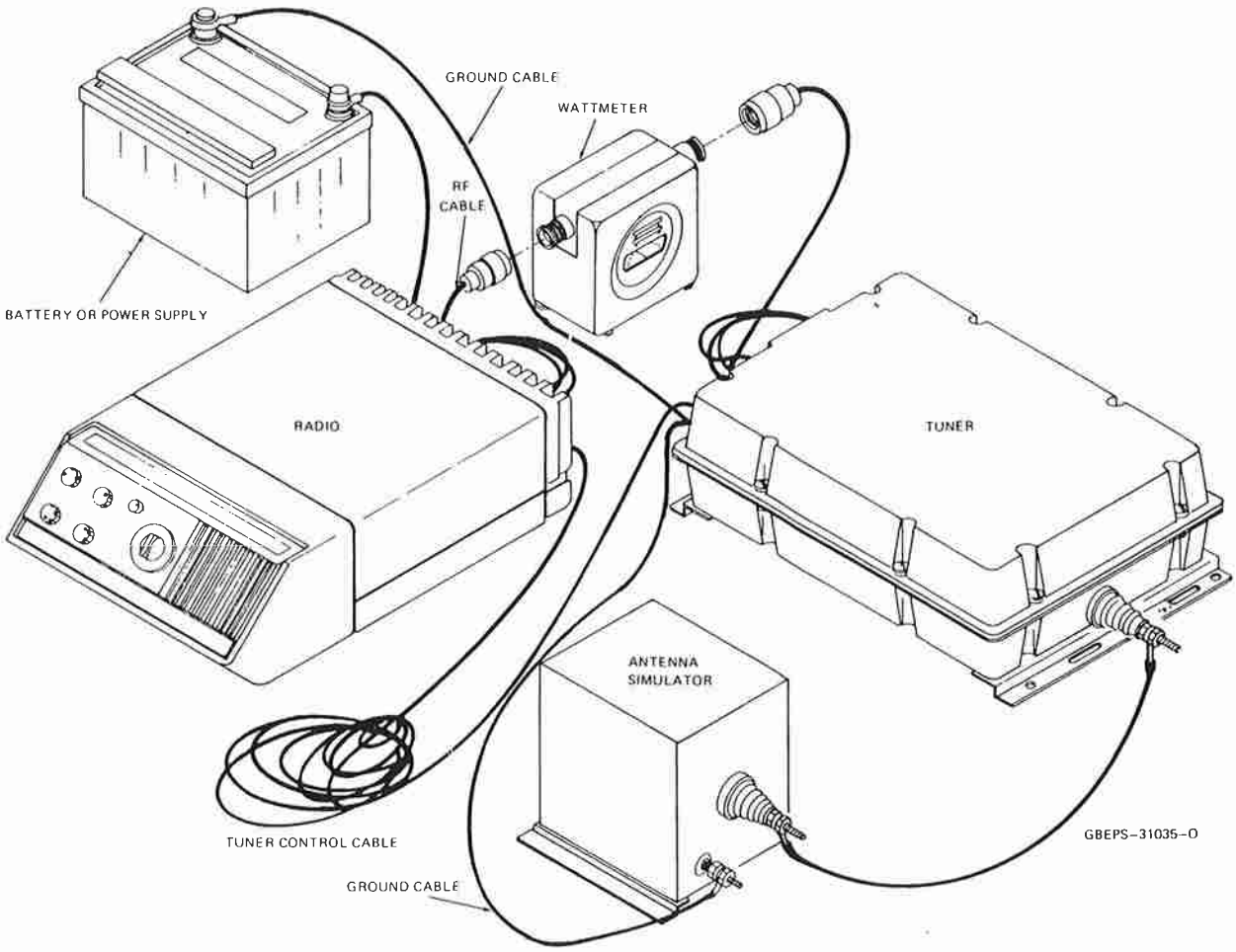


Figure 1. Typical Pre-Operational Check Configuration
For heavy-duty tuners, the cable connections are inside the tuner housing.

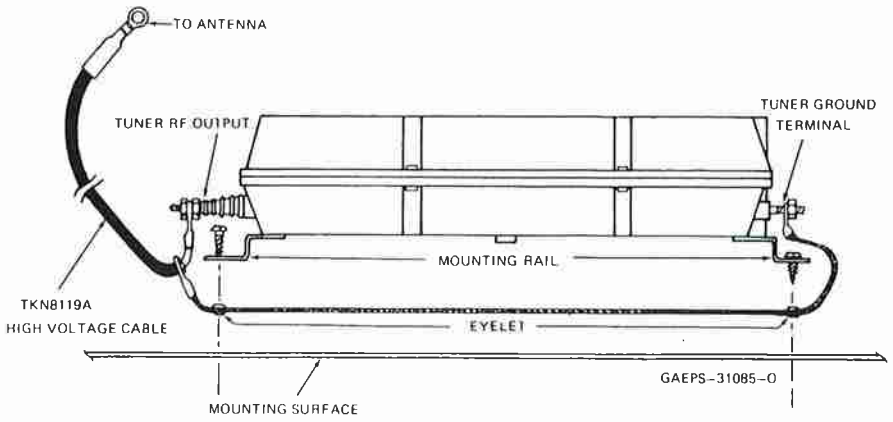


Figure 2. TKN8119A Mobile Antenna Matching Harness

Circuits for construction of the antenna simulator shown in Figure 1, are shown in Figures 3 through 5.

NOTE

Figures 3 and 4 apply only to 23- to 60-foot antennas, either whip or long wire.

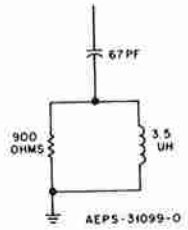


Figure 3. Antenna Simulator Circuit, 2-10.8 MHz, for models T1962B, F2261A, F2262A, T1961B, and T1962B.

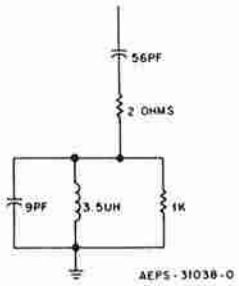


Figure 4. Antenna Simulator Circuit, 10.8-30 MHz, for models T1961B, F2261A, F2262A, and F2259A.

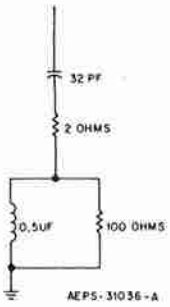


Figure 5. Mobile Whip Antenna Simulator Circuit for models T1959B, F2260A

Select and construct the antenna simulator circuit that corresponds both to the antenna tuner model being checked and also to the operating range of the radio.

CAUTION

These antenna simulator circuits are recommended only for system tests in the tune-up mode. Tests in other modes should be made only if the simulator circuits are constructed with parts that are rated to handle maximum transmitter power.

To ensure proper operation of the tuner, the radio must be adjusted for a tune power level of 3.5 ±1 W into a 50-ohm load. Refer to the radio instruction manual for the procedure for adjusting the radio power level in the tune mode.

Check the tuner operation as follows:

Step 1. Set up the components of the radio installation as shown in Figure 1.

Step 2. Select Channel 1 and turn on the radio. During the initial 1 to 2 seconds, the wattmeter should indicate a power level of approximately 3 watts. The radio should then return to the receive mode.

CAUTION

Step 3 should be performed only with an antenna simulator rated for full transmit power, or with a properly installed antenna.

Step 3. Whistle into the microphone. Check the wattmeter for forward and reverse power levels. The forward power level should be more than three times the reverse power level.

Step 4. Repeat steps 2 and 3 for each of the other radio channels. Ensure that the proper antenna simulator is used for each channel frequency.

3. MAINTENANCE

3.1 RECOMMENDED TEST EQUIPMENT

The test equipment listed in Table 1 is recommended for maintaining and troubleshooting the automatic antenna tuner.

Table 1. Recommended Test Equipment

Item	Motorola model	Purpose
DC Multimeter	S-1063	Measure dc voltages
Oscilloscope	R-1104	Checking waveforms
In-line Wattmeter	S1350	Measuring forward and reverse power
50-ohm RF Load	T-1013	Dummy load used for tune power level
Antenna Simulator	See Figures 3-5	Substitute for antenna
Motorola SSB Radio	-	RF source

3.2 PREVENTIVE MAINTENANCE

Check all external surfaces of the equipment to see that they are clean. Inspect all connecting cables and wires for damage or loose connections. It is especially important that the ground and antenna wires make good connections at the tuner. Carefully check the antenna and verify that it is properly insulated from any metal objects.

If the equipment surfaces are dirty, wash the external surfaces with mild soap and water using a clean cloth. Be careful not to allow the electronic components or connectors to get wet.

Preventive maintenance should be scheduled regularly, such as monthly, quarterly or annually. The interval of maintenance depends on equipment usage and environment.

3.3 TROUBLESHOOTING

Check for proper operation of the tuner by performing the procedure listed under the Preoperational Check paragraph of this manual. If the tuner is not operating properly, use the notes on the schematic diagram and the attached troubleshooting chart to localize the defective component.

4. THEORY OF OPERATION

Differences between the 2-18 MHz and the 2-30 MHz tuners are restricted only to certain circuits, as indicated where appropriate.

4.1 CIRCUIT FUNCTION

A fixed-length antenna presents greatly varying impedances when operated over a wide frequency range. The tuner must enable the antenna to resonate by compensating for the capacitive or inductive reactance present. It must also match the resistive component of the antenna to present a 50-ohm load to the radio output. These antenna tuners are designed to perform both of these functions automatically in less than 2.5 seconds without making any preliminary adjustments or settings.

4.2 CIRCUIT CONFIGURATIONS

Two different circuit configurations are used to tune the antenna. To match antennas with capacitive reactance, a pi configuration (parallel capacitance, series inductance, parallel capacitance) is used. To match antennas with inductive reactance, an L configuration (series inductance, parallel capacitance) is used.

4.3 CIRCUIT DESCRIPTIONS

4.3.1 Tuning Elements

The tuning elements of the antenna tuner consist of inductive and capacitance components that are switched into the rf circuit by a series of reed relays. The tuning elements are selected by the tuner microcomputer, which controls the transistor driver circuits and thus activates the relays. The tuning element network consists of a pi circuit with parallel capacitance. In addition, there is an output inductance of 26.25 microhenries that can be selected by the microcomputer, and a fixed output capacitance of 50 picofarads.

There are five steps of switchable input and output capacitance arranged in binary order, in which the value of one switchable capacitance is half the value of the next largest switchable capacitance. The values of switchable input capacitance are 2000, 1000, 500, 250, and 120 picofarads. The values of switchable output capacitance are 400, 200, 100, 50 and 27 picofarads. The values of switchable output capacitance for the model T1962A are 50 and 100 picofarads.

NOTE

The 30 MHz tuners have an additional 65 pF input capacitor.

There are ten steps of switchable inductance arranged in binary order. The values of switchable inductance are .08, .15, .29, .55, 1.05, 1.99, 3.8, 7.24, 13.78, and 26.25 microhenries.

NOTE

The 30 MHz tuners have an additional relay which shorts the 1.05, 1.99, 3.8, 7.24, and 13.78 microhenry coils.

4.3.2 Phase Detector

The phase detector circuit consists primarily of T1, U1, U2, U3, and U6D. This circuit compares the phase of the rf voltage to the phase of the rf current and generates either a logic high or logic low at U6-14. When the antenna and the tuner present an inductive load to the rf output of the radio, the rf current lags the rf voltage, resulting in a logic high (5V) at U6-14. When the antenna and tuner present a capacitive load to the rf output of the radio, the rf current leads the rf voltage, resulting in a logic low (0 V) at U6-14.

4.3.3 VSWR Detector

The VSWR detector consists primarily of T2 and U6C. A voltage proportional to the forward power of the transmitter output is developed at U6-10. A voltage proportional to the reverse power of the transmitter output is developed at U6-11. If both U5B and U5C are not activated by the microcomputer, U6-13 drops from 5 volts to 0 volts when a VSWR of 4:1 is achieved. If U5B is activated, the 5- to 0-volt transition occurs when a VSWR of 2:1 is achieved. If U5C is activated, the 5- to 0-volt transition occurs when a VSWR of 1.5:1 is achieved.

NOTE

The 2-30 MHz tuners have successive VSWR changes of 4:1, 2.2:1, and 1.5:1.

4.3.4 Channel Change Circuit

The channel change circuit consists primarily of transistors Q28-Q33 and inverter U7C. When a radio channel change takes place, the channel change circuit applies a negative-going, 0.5-second pulse to the POWER ACK and TUNED INPUT ports of the microcomputer. This pulse prevents the microcomputer from beginning a tuning sequence until the radio channel change is completed. One-half second after the channel change is complete, a transition from 5 volts to 0 volts occurs at U7-6. This transition enables the microcomputer to begin its tuning sequence. The channel change circuit responds only to channel selections made with the channel selection knob. If channel change is initiated by the A/B button, the tune line circuit is used to initiate the tuning sequence. Refer to the paragraph that describes the tune line circuit.

4.3.5 Tune Power Detector

The tune power detector consists of U5A, U6A, and U6B. A voltage proportional to the forward power from the transmitter output is applied to U6-5. When the forward power level is between 1 and 6 watts, U5A is activated and a logic low is applied to the POWER ACK port of the microcomputer to verify that the proper power level for tuning is present.

4.3.6 Tune Line Circuit

The tune line circuit consists of U5F, U5G, U7E, U7F, and a portion of U9. During a tuning sequence, U8-33 applies a low to U7-14. The high at U7-15 activates U5G which applies a low to the antenna tune (ANT TUNE) line. A low on the ANT TUNE line enables the radio to key the transmitter on the selected channel at a low power level (approximately 3 watts).

When the radio is in the receive mode, 3.3 V are applied to the ANT TUNE line by the radio if a B channel is being received. If an A channel is being received, 12 V are applied to the ANT TUNE line. U5F is activated by the 12 volts applied during A-channel reception; U5F is deactivated when 3.3 volts are applied during B-channel reception. The logic high at U8-33 produces a low at U7-12 that enables the transmission gate in U9 to apply the output voltage of U5F to U8-31. The output of U5F is 0 V when an A channel is selected, 5 V when a B channel is selected.

When the tuner is not in a tuning sequence, a transition in the voltage level at U8-31 is an indication of a channel change from an A to a B channel or vice versa. This transition initiates a tuning sequence for the newly selected channel.

4.3.7 Voltage Control and Regulation

The voltage control and regulation circuit consists of Q23, Q24 and U4. Final voltage regulation is provided by U4.

4.3.8 Microcomputer

Microcomputer U8 controls the operation of the automatic antenna tuner. All of the programs that control the operation of the tuner are stored in the internal memory of the microcomputer.

4.4 SEQUENCE OF TUNER OPERATION

4.4.1 Power Applied

When dc power is applied to the SWITCHED A+ line (GRN), the microcomputer is reset.

4.4.2 Initialization and 4:1 VSWR Detection

The microcomputer applies a low to U8-33 to produce a .4-volt signal on the ANT TUNE line. The radio is thus enabled in the tune mode and generates an on-channel signal of approximately 3 watts. If the VSWR is greater than 4:1, U6C applies a high to U8-39 and the microcomputer begins the 4:1 VSWR tuning sequence. If the VSWR is less than or equal to 4:1, U6C applies a low to U8-39 and the tuner makes no change in the configuration of the tuning elements until a channel change occurs.

4.4.3 4:1 VSWR Tuning Sequence

The microcomputer begins a sequence of switching tuning elements in and out of the rf line. During the tuning sequence, the microcomputer monitors the voltage level at U8-1 and U8-39. When a 4:1 match is achieved, a low is applied to U8-39. A list of tuning elements used to achieve the 4:1 VSWR is stored in the microcomputer memory, and the microcomputer begins the 2:1 VSWR sequence. If a 4:1 VSWR cannot be achieved, the tuner reverts to the tuning configuration previously stored in the microcomputer memory and begins to terminate the tuning sequence.

4.4.4 2:1 VSWR Tuning Sequence

U8-31 goes high to turn on U5B. If the VSWR is greater than 2:1, U6C applies a high to U8-39 and the microcomputer begins a sequence of switching tuning elements in and out of the rf line. (If the VSWR is less than 2:1, the 1.5:1 VSWR tuning sequence is initiated.) During the tuning sequence, the microcomputer monitors the voltage level at U8-1 and U8-39. When a 2:1 match is achieved, U6 applies a low to U8-39. A list of tuning elements used to achieve the 2:1 VSWR is stored in the microcomputer memory, and the microcomputer begins the 1.5:1 VSWR sequence. If a 2:1 VSWR cannot be achieved, the tuner reverts to the tuning configuration previously stored in the microcomputer memory and begins to terminate the tuning sequence.

4.4.5 1.5:1 VSWR Tuning Sequence

U8-31 goes low to turn off U5B, and U8-32 goes high to turn on U5C. If the VSWR is greater than 1.5:1, U6C applies a high to U8-39 and the microcomputer begins a sequence of switching tuning elements in and out of the rf line. During the tuning sequence, the microcomputer monitors the voltage level at U8-1 and U8-39. When a 1.5:1 match is achieved, U6 applies a low to U8-39. A list of tuning elements used to achieve the 1.5:1 VSWR is stored in the microcomputer memory, and the microcomputer then begins to terminate the tuning sequence. U8-32 goes low to turn off U5C. If a 1.5:1 VSWR cannot be achieved, the tuner reverts to the tuning configuration previously stored in the microcomputer memory and begins to terminate the tuning sequence.

4.4.6 Termination of Tuning Sequence

U8-33 goes high to allow the radio to revert to the receive mode. The microcomputer memory retains a list of the circuit elements that were switched in when the sequence ended. These circuit elements remain selected until a voltage transition occurs at ANT TUNE (VIO), SWITCHED A+ (GRN), or CHANNEL CHANGE (BLU). Tuner operation following these transitions is described in the following paragraphs.

4.4.7 Transition at ANT TUNE (VIO)

A voltage transition on the ANT TUNE line indicates a change in radio channel from an A channel to a B channel, or vice versa. The voltage transition is applied via U5F and U9 to U8-11. All tuning elements are switched out and the microcomputer begins initialization and 4:1 VSWR detection.

4.4.8 Transition at SWITCHED A+ (GRN)

If voltage is removed from the SWITCHED A+ line, the list of selected circuit elements stored in the microcomputer memory is lost. When power is reapplied to the SWITCHED A+ line, the microcomputer is reset and the initialization and 4:1 VSWR detection process begins.

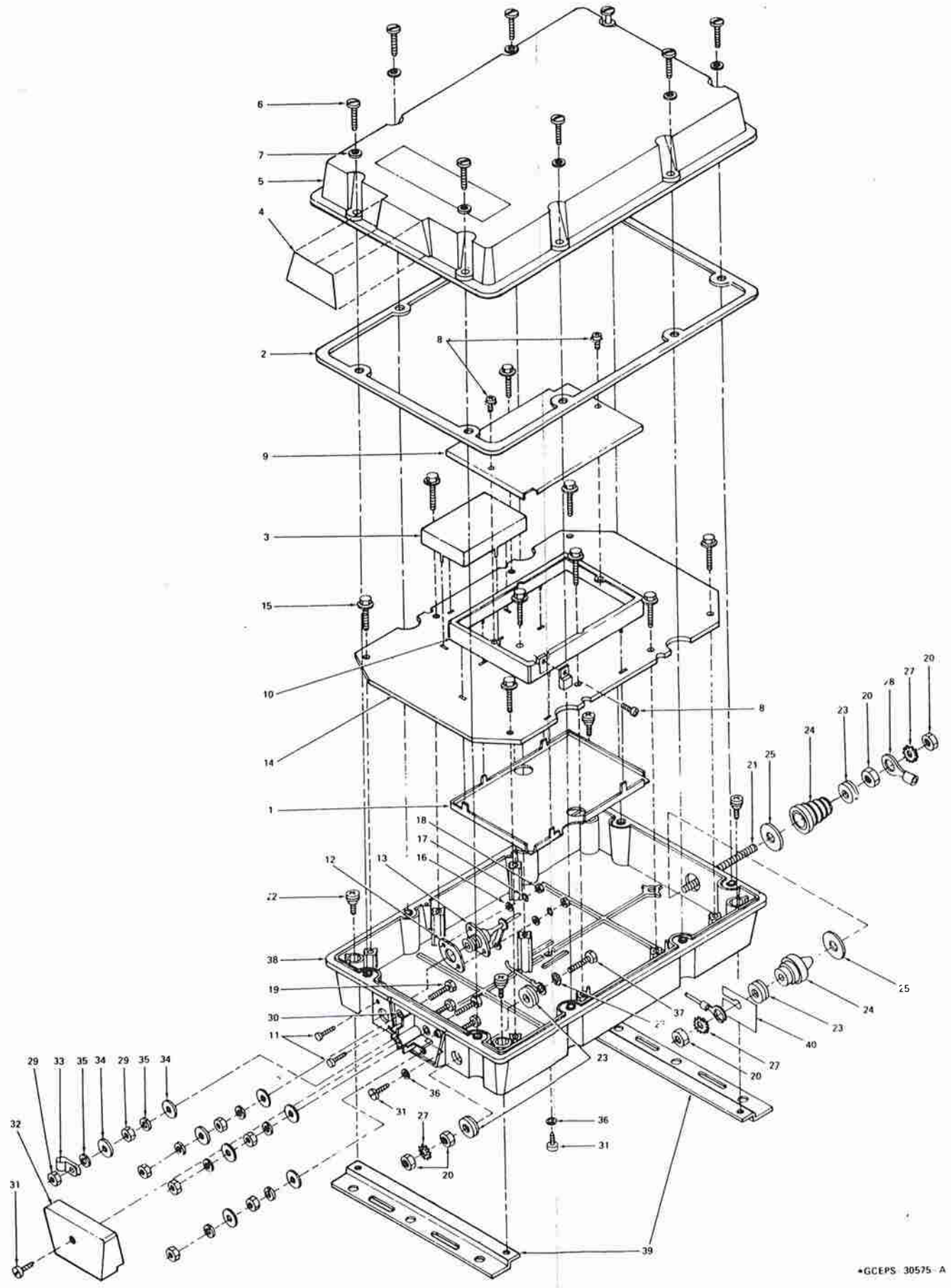
4.4.9 Transition at Channel Change

When a channel is changed by means of the channel-selection knob on the radio, a positive-going pulse is applied to the CHANNEL CHANGE line (BLU). A low is applied at U8-34 and U8-39 to inhibit tuning until channel selection is complete. One-half second after channel selection is complete, a low-to-high transition occurs at U8-34 and U8-39, and a high-to-low transition occurs at U8-28. The microcomputer then proceeds through initialization and 4:1 VSWR detection.

4.4.10 Tune Power Variations

If during a tuning sequence the tune power level falls below 1 watt or rises above 6 watts for more than two seconds, the tuning sequence is stopped and the tuner reverts to the circuit configuration previously stored in the microcomputer memory. This configuration is used for antenna matching until a channel change occurs and the tune power is between 1 and 6 watts. When these two conditions are met the microcomputer proceeds to initialization and 4:1 VSWR detection.

If tune power falls outside the 1- to 6-watt range for less than 2 seconds, the microcomputer resumes the tuning sequence that was underway prior to the level change.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