

**AUTOMATIC
ANTENNA TUNER
SRA-2300
SERVICE MANUAL**

SRA-2300 SPECIFICATIONS

1. HF Frequency Range	1.8 to 30.0 MHz
2. Power Input Range: 1	0 to 150 watts (PEP)
3. Input Impedance Range	45 to 55 ohms
4. VSWR: Typical	less than 2:1
5. DC Input Requirement	13.8 VDC typical (optional 24 VDC)
6. DC Operating Range	10 to 15 VDC
7. Input Current: Average	.9 amps
8. Random set time	Typical: less than 2 seconds
9. Recurrent set time	Typical: less than 10 milliseconds
10. Antenna Length	8ft. 3.3-30MHz 23 to 80 ft. 1.8-30MHz
11. Operating Temperature	-35°C to +70° C.
12. Size	350x284x70 mm
13. Weight	3.4 Kilos

GENERAL

THE AUTOMATIC ANTENNA TUNER IS DESIGNED PRIMARILY FOR USE WITH END-FED UNBALANCED ANTENNAS SUCH AS WHIPS AND LONGWIRES. THE RADIATING PORTION OF THE ANTENNA IS CONNECTED DIRECTLY TO THE TUNER THRU A HIGH VOLTAGE INSULATOR. IT IS EXTREMELY IMPORTANT THAT THE ANTENNA TYPE, SITE LOCATION AND GROUNDING TECHNIQUE BE CORRECTLY CHOSEN SO THAT THE SYSTEM WILL RADIATE EFFECTIVELY.

BROADBAND RESONANT ANTENNAS (e.g. LOG PERIODIC) THAT COVER THE FULL RANGE OF THE SYSTEM MAY BE USED WITH THE TUNER IF DESIRED. NARROW BAND RESONANT ANTENNAS, SUCH AS DIPOLES, MAY ONLY BE USED IF THE ANTENNA VSWR (INCLUDING COAXIAL FEEDER) IS LESS THAN OR EQUAL TO 3:1 AT THE OPERATING FREQUENCY.

SELECTION

THE AUTOMATIC ANTENNA TUNER WILL OPERATE INTO ALMOST ANY END FED ANTENNA WITH A LENGTH OF 2.5 METERS OR MORE, PROVIDED AN EFFECTIVE GROUND IS USED THE ANTENNA EFFICIENCY WILL BE PROPORTIONAL TO LENGTH AND IN MOST APPLICATIONS WILL BE MAXIMUM AT A LENGTH OF 1/4 WAVELENGTH. THIS MEANS THAT THE LONGEST POSSIBLE ANTENNA SHOULD BE SELECTED FOR EACH INSTALLATION. VERY SHORT ANTENNAS ARE ONLY RECOMMENDED WHEN THERE IS NO OTHER ALTERNATIVE SUCH AS IN A VEHICULAR MOBILE INSTALLATION. THE PERFORMANCE OF SHORT WHIP ANTENNAS IS USUALLY VERY POOR, PARTICULARLY AT THE LOWER CHANNEL FREQUENCIES, AND RADIATION EFFICIENCY WILL BE ONLY A FEW PERCENT.

WHIP ANTENNA 2.5-3.0 METERS (8-9 FT)

THIS ANTENNA IS RECOMMENDED ONLY FOR VEHICULAR MOBILE INSTALLATIONS. THE SHORT LENGTH WILL RESULT IN POORER PERFORMANCE WHEN COMPARED WITH THE LONGER ANTENNAS.

WHIP ANTENNA 7 METERS (23 FT)

THIS ANTENNA IS RECOMMENDED FOR MARINE INSTALLATION ON SMALLER VESSELS. IT MAY ALSO BE USED IN BASE STATIONS IF THERE IS NO WAY OF USING A LONGER ANTENNA.

WHIP ANTENNA 10.7 METER (35 FT)

THIS IS THE PERFERRED ANTENNA FOR MARINE INSTALLATION EXCEPT WHEN THERE IS NO ROOM FOR A LONGWIRE ANTENNA. IT WILL ALSO PROVIDE REASONABLE EFFICIENCY FOR BASE STATION USE AND IS THE SMALLEST RECOMMENDED BASE ANTENNA.

LONGWIRE ANTENNA 23 METER (75 FT) AND 46 METER (150 FT)

FOR MOST APPLICATIONS THE LONGWIRE ANTENNA WILL GIVE THE BEST RESULTS AND IS RECOMMENDED WHEN PRACTICAL. THERE ARE ONLY A FEW OF THE MANY POSSIBLE METHODS OF INSTALLATION AND FREQUENTLY A DIFFERENT CONFIGURATION WILL BE THE BEST AT A PARTICULAR SITE.

INSTALLATION PROCEDURE

INSTALLATION CONSIDERATION

THE SRA-2300 REQUIRES ONLY A SOURCE OF 13.6 VDC (OPTIONALLY 24 VDC), AN RF TRANSMISSION LINE PLUS A SUITABLE GROUND SYSTEM. NO BANDSWITCH INFORMATION, LOW POWER TUNE OR HANDSHAKE IS REQUIRED, SINCE THE COUPLER TUNES ON VOICE. POWER CONSUMPTION IS NORMALLY LESS THAN 1 AMP, ALLOWING FOR A LIGHT 2 CONDUCTOR CABLE. THE POWER TERMINAL IS CLEARLY MARKED, AND THE PCB IS PROTECTED AGAINST POWER REVERSAL.

WEATHERDECK MOUNTING

WEATHERDECK MOUNTING CAN BE USED WITH OPTIONAL FIBERGLASS ENCLOSURE. YEARS OF EXPERIENCE HAVE SHOWN THAT INSIDE MOUNTING OR EVEN SPLASH-PROOF MOUNTING IS PREFERRED, PARTICULARLY IN COLD, DAMP ENVIRONMENTS.

THE BASE OF THE ANTENNA SHOULD BE CONNECTED TO THE HIGH VOLTAGE FEED-THROUGH INSULATOR ON THE TOP OF THE HOUSING. NOTE THAT THIS INSULATOR IS NOT DESIRED TO SUPPORT HEAVY MECHANICAL LOADS. IF SUCH LOADING IS ENCOUNTERED, THE USE OF A STRAIN INSULATOR IS DESIRABLE.

THE GROUND SYSTEM SHOULD BE CONNECTED TO THE 1/4 INCH STAINLESS STEEL STUD PROTRUDING FROM THE BOTTOM OF THE HOUSING. CONNECTION TO THE GROUND SYSTEM IS OF EXTREME IMPORTANCE FOR SUCCESSFUL INSTALLATION. GROUND RUNS OF OVER A FEW INCHES SHOULD BE MADE FROM 4 INCHES WIDE COPPER STRAP OR LARGER. THE ACTUAL GROUND SYSTEM SHOULD BE AS GOOD AS POSSIBLE. HOWEVER, COUPLERS IN GENERAL REQUIRE THE ANTENNA PARAMETERS TO BE WITHIN THE RANGE OF THE TUNING PARAMETERS OR THE COUPLERS IN THE SRA-2300 IS UNABLE TO SECOND-GUESS THE INSTALLER.

ELECTRICAL CHECKOUT

AFTER MECHANICAL INSTALLATION IS COMPLETED, THE SSB TRANSMITTER SHOULD BE ADJUST TO THE HIGHEST FREQUENCY DESIRED. A DIRECTIONAL WATTMETER SUCH AS BIRD MODEL 43 INSERTED INTO THE TRANSMISSION LINE, AND THE TRANSMITTER ENERGIZED. UPON APPLICATION OF RF ENERGY, THE COUPLER SHOULD BEGIN TO TUNE, INDICATED BY A GENERAL "CLATTERING" OF THE PC MOUNTED RELAYS. IF THE ANTENNA LENGTH AND GROUND PARAMETERS ARE WITHIN RANGE, A FEW SYLLABLES OF SPEECH SHOULD IMMEDIATELY CAUSE THE RELAY NOISE TO CEASE, REFLECTED POWER ON THE WATTMETER TO DROP TO A VALUE CONSISTENT WITH A BETTER THAN 2:1 VSWR AND THE PC MOUNTED "TUNED" LED TO ILLUMINATED.

INSTALLATIONS

ANTENNA INSTALLATION

THE ANTENNA SYSTEM IS A KEY PART OF THE COMMUNICATION SYSTEM AND FOR SATISFACTORY OPERATION THE SYSTEM MUST BE INSTALLED CORRECTLY. THE UNBALANCED ANTENNAS USED WITH THE AUTOMATIC ANTENNA TUNER USE THE GROUND AS HALF OF THE ANTENNA SYSTEM. THE GROUND FORMS AN "IMAGE" ANTENNA AND IS A CRITICAL PART OF THE SYSTEM. THIS MAKES IT ESSENTIAL TO CONSIDER BOTH THE GROUND AND THE ANTENNA WHEN DESIGNING THE SYSTEM INSTALLATION.

ANTENNA LOCATION

- A. THE ANTENNA SHOULD BE LOCATED IN A POSITION FREE OF OBSTRUCTIONS, PARTICULARLY IN THE DESIRED DIRECTION OF COMMUNICATION.
- B. THE ANTENNA SHOULD BE KEPT AS FAR AWAY AS POSSIBLE FROM BUILDINGS, TREES AND VEGETATION. IF METALLIC MASTS OR SUPPORTS ARE USED, ARRANGE THE INSULATORS SO THAT THE ANTENNA IS SPACED AT LEAST 2 METERS FROM THE MAST.
- C. REMEMBER THAT THE RADIATING PART OF THE ANTENNA STARTS AT THE TUNER. THE LOCATION OF THE BOTTOM PORTION OF THE ANTENNA IS VERY IMPORTANT.
- D. VERTICAL ANTENNAS HAVE AN OMNI-DIRECTIONAL RADIATION PATTERN AND WILL PROVIDE EQUAL PERFORMANCE IN ALL DIRECTIONS.
- E. HORIZONTAL WIRE ANTENNAS HAVE MAXIMUM RADIATION BROADSIDE TO THE ANTENNA WHEN THE FREQUENCY IS LESS THAN 1/4 WAVELENGTH. AS THE FREQUENCY INCREASES BEYOND 1/4 WAVELENGTH, LOBES WILL APPEAR IN THE RADIATION PATTERN WITH THE PRINCIPAL LOBES BECOMING CLOSER TO THE PLANE OF THE ANTENNA AS THE LENGTH INCREASES. AT ALL TIMES, RADIATION WILL BE MINIMUM AT THE END OF THE ANTENNA AND IT SHOULD BE LOCATED SO THAT THE ENDS POINT IN DIRECTIONS WHERE COMMUNICATIONS ARE NOT REQUIRED.
- F. THE "V" CONSTRUCTION MINIMIZES THE DIRECTIVITY OF THE HORIZONTAL ANTENNA AND IS RECOMMENDED FOR ALL AROUND COVERAGE. IN ADDITION, THE "V" ANTENNA IS A COMPROMISE BETWEEN VERTICAL AND HORIZONTAL POLARIZATION AND WILL GIVE GOOD RESULTS FOR COMMUNICATIONS WITH LAND OR MARINE MOBILES USING VERTICAL WHIP ANTENNAS.
- G. HIGH VOLTAGES (SOMETIMES EXCEEDING 5000 V) ARE PRESENT ON THE ANTENNA AND TUNER MUST BE LOCATED OR PROTECTED SO THAT THERE IS NO POSSIBILITY OF ACCIDENTAL CONTACT.
- H. DO NOT LOCATE THE ANTENNA CLOSE TO OTHER ANTENNA SYSTEM.
- I. MAKE SURE THAT THE ANTENNA IS RIGIDLY SUPPORTED. THE ANTENNA WILL DETUNE IF IT SAGS OR SWAYS.
- J. THE CONNECTION FROM THE TUNER TO THE GROUND MUST BE A SMALL PERCENTAGE OF THE TOTAL LENGTH OF THE ANTENNA. DO NOT LET THE LENGTH OF THE GROUND STRAP EXCEED 1-1.5 METERS. USE HEAVY WIRE OR STRAP FOR GROUND CONNECTION.

- K. WHIP ANTENNAS SHOULD BE CONNECTED WITH THE MINIMUM LENGTH OF WIRE (DO NOT EXCEED 0.6 METERS)
- L. DO NOT LOCATE THE TUNER FARTHER FROM THE TRANSCEIVER THAN NECESSARY. IF THE DISTANCE EXCEEDS 30 FEET (30 FT), IT IS RECOMMENDED THAT LOW LOSS COAXIAL CABLE, SUCH AS RG8 BE USED.

THE SSB TRANSMITTER SHOULD NOW BE ADJUST TO THE LOWEST DESIRED FREQUENCY, AND THE SPEECH TEST REPEATED. AGAIN, THE SRA-2300 SHOULD IMMEDIATELY SENSE THE MISMATCH, SWITCH INTO THE TUNE MODE AND RETUNE THE ANTENNA SYSTEM. THE TUNE CYCLE WILL TAKE SOMEWHAT LONGER AT THE LOWER FREQUENCIES, SINCE THE ALGORITHM MUST SEARCH THROUGH MORE POSSIBLE VALUES OF L AND C TO FIND AN APPROPRIATE COMBINATION. A FEW SECONDS OF SPEECH SHOULD RESULT IN AN "ALL TUNED" INDICATION. IF THE ANTENNA PARAMETERS ARE WITHIN THE SPECIFIED RANGE, AND THE ABOVE TESTS HAVE BEEN PERFORMED SUCCESSFULLY, THE SRA-2300 INSTALLATION AND TUNE-UP MAY BE CONSIDERED COMPLETE.

NOTE THAT, AS RECEIVED, THE MEMORY SYSTEM IN THE SRA-2300 WILL MOST LIKELY NOT CONTAIN PRESTORED DATA APPROPRIATE TO YOUR INSTALLATION. FOR THIS REASON, THE MEMORY FEATURE WILL LIKELY NOT BE IMPRESSIVE AT FIRST. TO ALLOW THE SRA-2300 TO "LEARN" YOUR ANTENNA'S REQUIREMENTS, SIMPLY PROCEED FROM FREQUENCY TO FREQUENCY, ALLOWING THE NORMAL TUNEUP TO TAKE PLACE. AS MORE AND MORE FREQUENCIES ARE "MEMORIZED" BY THE COMPUTER, IT SHOULD BE POSSIBLE TO RETURN TO A PREVIOUSLY USED FREQUENCY AND DISCOVER THAT THE COMPUTER IMMEDIATELY FLASHES THE "ALL TUNED" FLAG, USUALLY BEFORE THE FIRST SYLLABLE IS COMPLETED. IT SHOULD BE FURTHER NOTED THAT THE MEMORY SYSTEM IS CAPABLE OF STORING HUNDREDS OF INDIVIDUAL FREQUENCY/RELAY COMBINATIONS, BUT THAT MOST OF THESE COMBINATIONS ARE ACTUALLY USED IN THE LOWER OPERATING FREQUENCIES. THIS IS DONE IN ORDER TO PROVIDE BETTER MEMORY RESOLUTION AT THE LOWER FREQUENCIES WHERE ANTENNA SYSTEMS ARE INHERENTLY NARROWBAND. VERY OFTEN, ONE OR TWO MEMORY POSITIONS WILL GIVE ADEQUATE BAND COVERAGE AT FREQUENCIES IN THE HIGHER MARINE BANDS.

GROUND SYSTEM

THE GROUND SYSTEM IS KEY PART OF THE OVERALL ANTENNA SYSTEM AND IS THE PRIMARY CAUSE OF POOR PERFORMANCE AND THE DIFFICULTY OF ADJUSTING THE TUNER. THERE IS NO POINT IN INSTALLING THE ANTENNA UNLESS A GOOD GROUND CAN BE PROVIDED.

VEHICLE GROUNDS

CONNECT THE TUNER DIRECTLY TO THE FRAME OF THE VEHICLE. ENSURE THAT A HEAVY STRAP IS USED FROM THE TUNER GROUND LUG AND THAT THE CONNECTIONS ARE CLEARED OF ALL PAINT AND DIRT SO THAT SHINY METAL IS EXPOSED. MAKE SURE THAT THE GROUNDING POINT IS NOT INSULATED FROM OTHER PARTS OF THE VEHICLE BY NON-METALLIC COUPLINGS, BRUSHINGS, FIBERGLASS PANELS, ETC.

MARINE GROUNDS

A METAL HULLED VESSEL IN SALT WATER PROVIDES AN ALMOST IDEAL GROUND. THE TUNER SHOULD BE CONNECTED DIRECTLY TO THE HULL USING THE SHORTEST POSSIBLE GROUND STRAP. MAKE SURE THAT THE CONTACT POINT IS FREE FROM PAINT AND DIRT. ENSURE A GOOD CONTACT AREA FOR MINIMUM RESISTANCE.

WOODEN HULLED VESSELS PRESENT MORE OF A GROUNDING PROBLEM. IT IS NORMALLY NECESSARY TO BOND ALL LARGE METALLIC PARTS SUCH AS THE ENGINE PROPELLER SHAFT, ETC., AND SOMETIMES AN EXTERNAL GROUNDING PLATE SHOULD BE CONNECTED TO THE HULL. THE BONDING AND GROUNDING PLATE SHOULD TAKE INTO CONSIDERATION THE PROBLEMS OF ELECTROLYSIS. SEVERE DAMAGE MAY RESULT IF DISSIMILAR METALS ARE CONNECTED TOGETHER.

BASE STATION GROUNDS

IN AREAS OF GROUND CONDUCTIVITY, AN EFFECTIVE GROUND CAN BE MADE THRU A GROUNDING ROD. THE ROD SHOULD BE APPROXIMATELY 3 METERS IN LENGTH AND SHOULD BE INSTALLED AS CLOSE AS POSSIBLE TO THE TUNER. IT MAY BE NECESSARY TO USE SEVERAL GROUND RODS BONDED TOGETHER TO IMPROVE THE GROUND CONTACT. WATER PIPES ARE SOMETIMES RECOMMENDED AS GROUNDS AND MAY BE USED PROVIDED THE FOLLOWING CONDITIONS ARE MET:

- A. THE WATERPIPE IS CLOSE TO THE TUNER.
- B. THE WATERPIPE ENTERS THE GROUND VERY CLOSE TO THE TUNER BONDING POINT.
- C. THERE ARE NO JOINTS OR COUPLINGS IN THE PIPE THAT INCREASE THE RESISTANCE PATH TO GROUND.
- D. THE WATERPIPE ENTERS SOIL WITH GOOD CONDUCTIVITY.
- E. A LOW RESISTANCE CONTACT IS MADE TO THE WATERPIPE.

FREQUENTLY THE GROUND CONDUCTIVITY WILL NOT BE SUFFICIENT TO PROVIDE SATISFACTORY OPERATION OF THE TUNER. THIS IS ALMOST CERTAINLY THE CASE WITH WELL DRAINED SANDY, ROCKY OR LOAMY SOILS AND A COUNTERPOISE MUST BE USED AS GROUND SYSTEM. THIS IS ALSO VERY IMPORTANT IN A ROOFTOP INSTALLATION WHERE THERE IS NO EXISTING GROUND PLATE. THE GROUND WOULD BE A CONDUCTING SURFACE EXTENDING SEVERAL WAVELENGTHS IN ALL DIRECTIONS AROUND THE ANTENNA. ON A ROOFTOP, THIS SITUATION MAY BE APPROXIMATED BY PLACING A SCREEN OF CHICKEN MESH OR SIMILAR MATERIAL OVER THE ROOF OF THE BUILDING. MORE FREQUENTLY, A COUNTERPOISE SYSTEM OF A RADIAL WIRES MUST BE USED. WE RECOMMEND THE USE OF AT LEAST 8-10 RADIALS BONDED TOGETHER. IF THE ANTENNA IS AT GROUND LEVEL, THE RADIALS SHOULD BE BURIED A FEW INCHES BELOW THE SURFACE.

CORROSION

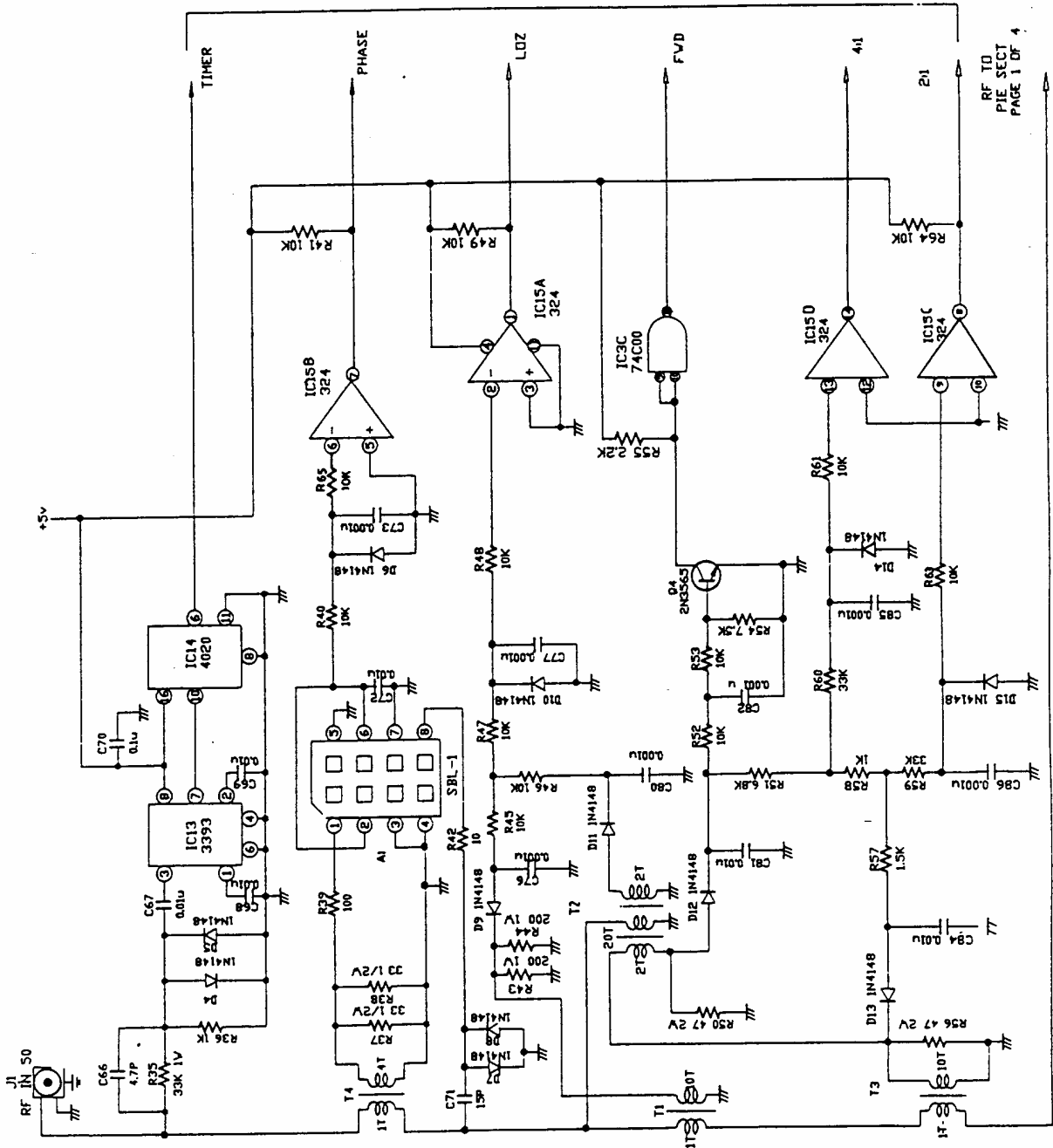
THE GROUND CONNECTIONS ARE SUBJECT TO CORROSION AND OXIDATION. ALL JOINTS MUST BE CLEAN AND THE HARDWARE ADEQUATELY TIGHTENED. THE JOINTS MAY BE PROTECTED BY AN APPLICATION OF SILICON GREASE, AND UNDER SEVERE CONDITIONS, COVERED WITH ELECTRICAL TAPE AND WATERPROOF VARNISH.

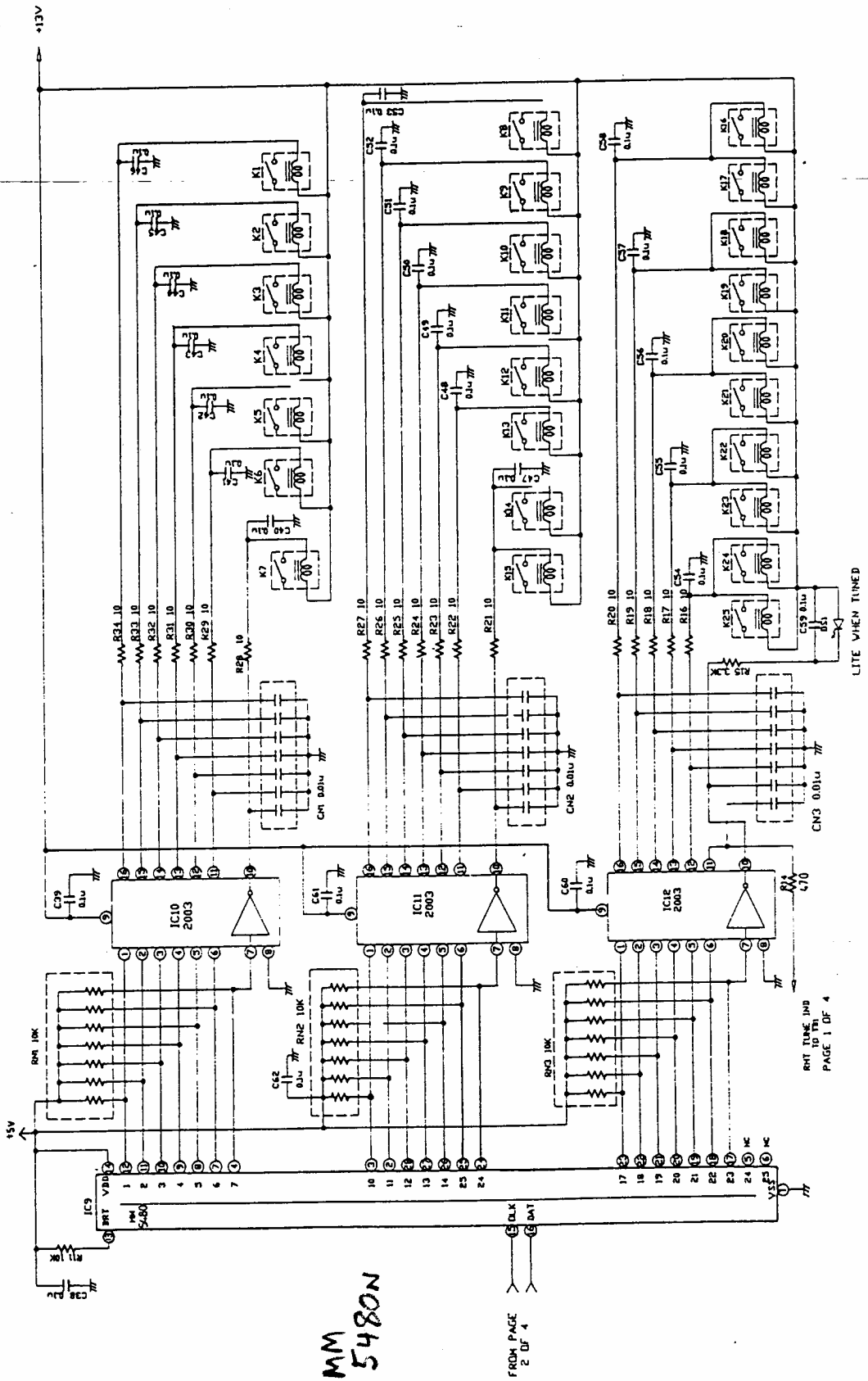
ANTENNA TUNER MOUNTING

THE TUNER IS MOUNTED USING THE PROPER MOUNTING EARS ON THE CASE. CHOOSE A LOCATION IMMEDIATELY ADJACENT TO THE ANTENNA FEED POINT. IN TRUNK MOUNTED MOBILE INSTALLATIONS IT IS VERY IMPORTANT THAT THE TUNER IS LOCATED SO THAT THE ANTENNA INSULATOR IS WITHIN A FEW CENTIMETERS OF THE ANTENNA EXIT HOLE. NOTE ALSO THAT THE ANTENNA LEAD MUST PASS THROUGH AN INSULATED BUSHING. HIGH VOLTAGE CONNECTING CABLE MUST BE USED.

ANTENNA CONNECTION

THE ANTENNA LEAD IS CONNECTED TO THE HIGH VOLTAGE INSULATOR. DURING OPERATION, USE TWO WRENCHES WHEN TIGHTENING THE NUT TO PREVENT THE STUD ROTATING. POTENTIALS OF SEVERAL THOUSAND VOLTS MAY BE PRESENT AT THE ANTENNA TERMINAL AND ADEQUATE PROTECTION MUST BE MADE AGAINST ACCIDENTAL CONTACT. IT IS ALSO NECESSARY TO ENSURE THAT THE ANTENNA IS SPACED AT LEAST 3 CENTIMETERS FROM THE CONDUCTING SURFACE. SHARP POINTS IN THE LEAD-IN WIRE SHOULD BE AVOIDED TO PREVENT CORONA DISCHARGES.

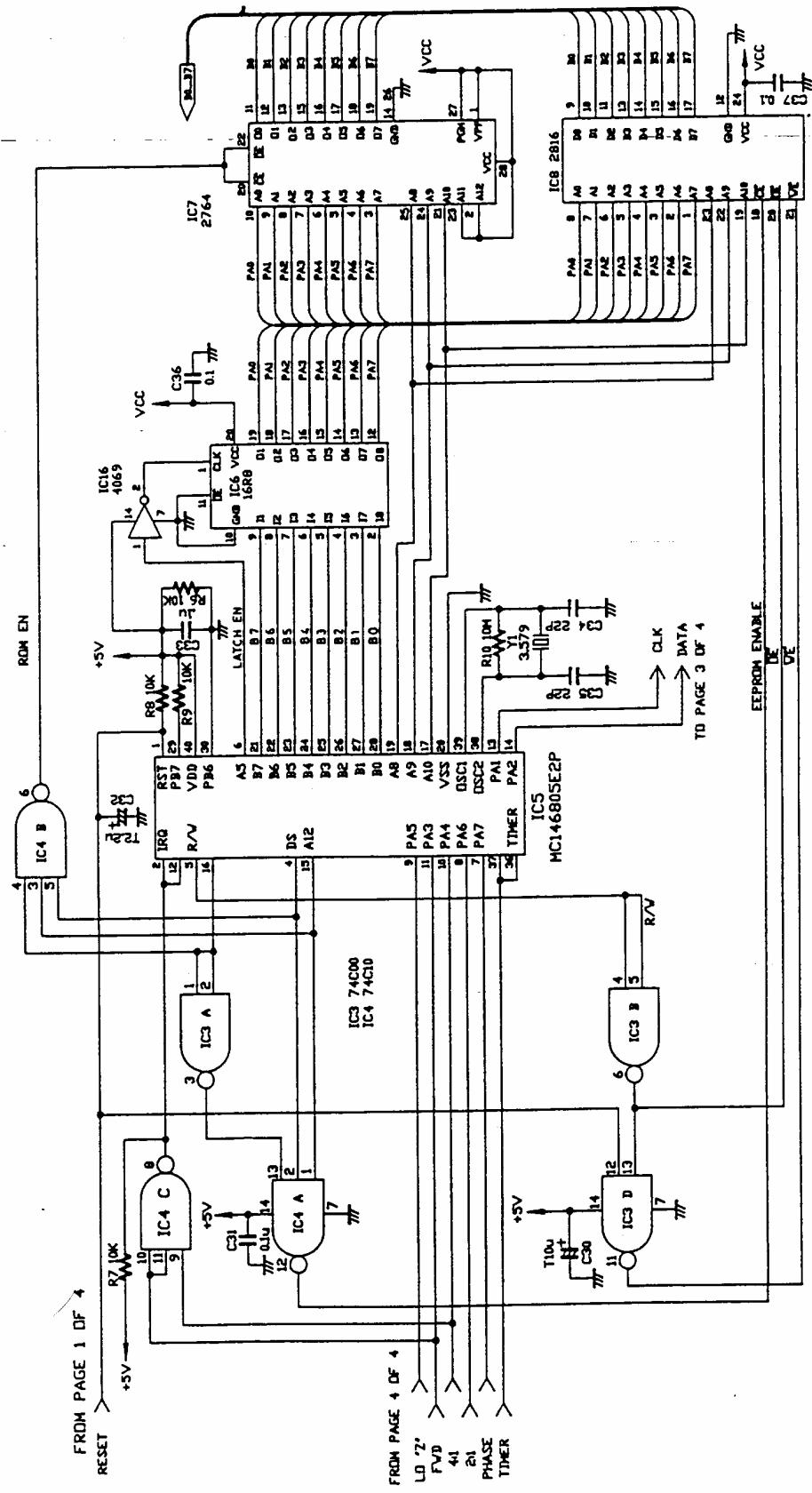


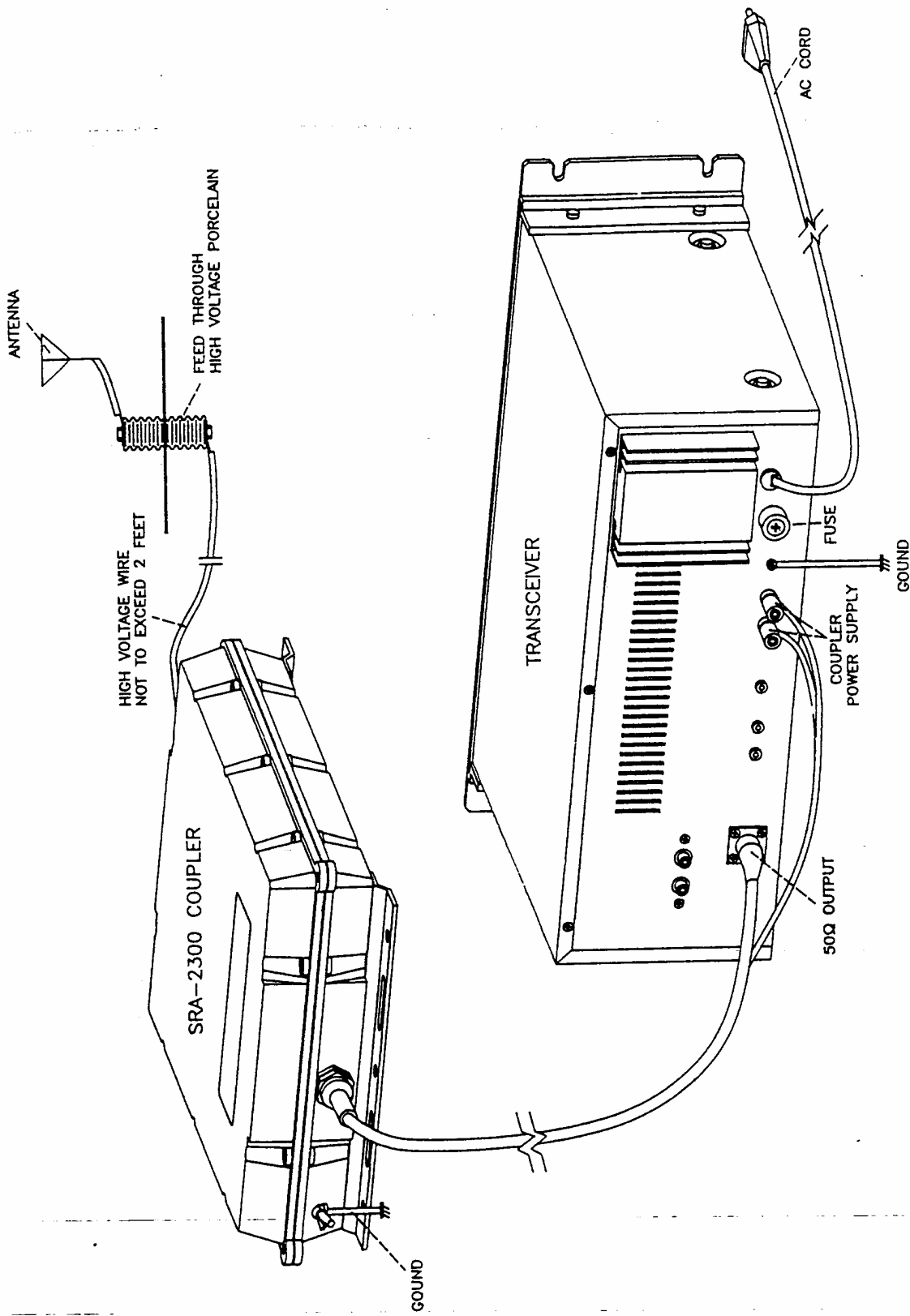


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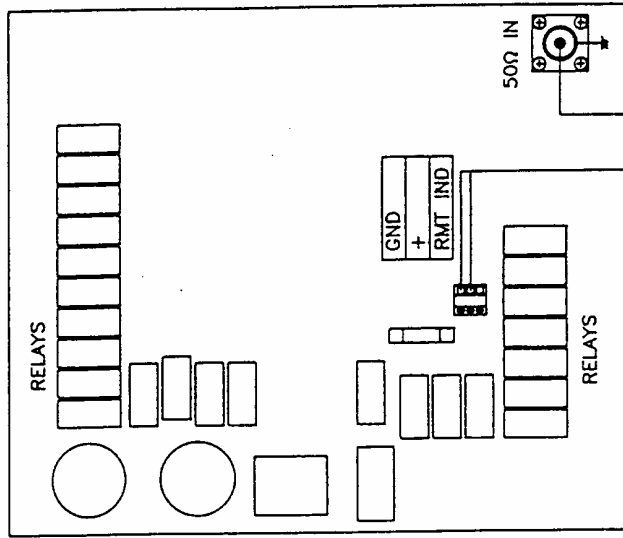
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COUPLER PCB



CABLE CONNECTION

TRANSCEIVER
(REAR VIEW)

