

INSTRUCTION MANUAL

ST-4A SCA TUNER

NOTE: THE INSTRUCTION MANUAL FOR THE SCA/880-A TUNER  
MODULE FOLLOWS PAGE 9 OF THIS MANUAL.

WARNING: TO PREVENT FIRE OR  
ELECTRIC SHOCK, DO NOT EXPOSE  
THIS APPLIANCE TO RAIN OR  
MOISTURE.

## INTRODUCTION

WELCOME ! ! ! !

IT IS INDEED A PRIVILEGE TO INCLUDE YOU IN OUR CONSTANTLY  
EXPANDING JOHNSON ELECTRONIC'S "FAMILY".

YOUR ST-4A SCA TUNER IS SPECIFICALLY DESIGNED, MANUFACTURED  
AND SOLD FOR RESTRICTED USE BY FM STATIONS HOLDING SUBCARRIER AUTHORIZATION  
AND/OR OTHER AUTHORIZED COMMERCIAL USERS OPERATING UNDER AUTHORIZATION  
ISSUED BY THE FEDERAL COMMUNICATIONS COMMISSION.

THE INTRODUCTION OF THE ST-4A UTILIZING MONOLITHIC CIRCUIT SYSTEMS  
AND DUAL GATE FIELD EFFECT TRANSISTORS IS CONSISTENT WITH JOHNSON'S POLICY  
OF ESTABLISHING THE "STATE OF THE ART" IN SCA MULTIPLEX EQUIPMENT.

JOHNSON'S MANUFACTURING KNOW-HOW (SINCE 1951), RELIABLE  
COMPONENTS AND TOUGH QUALITY CONTROL IS YOUR GUARANTEE THAT YOU OWN  
THE FINEST SCA SOLID-STATE RECEIVING EQUIPMENT MONEY CAN BUY.

## WARRANTY

ALL JOHNSON ELECTRONIC'S INC. MANUFACTURED EQUIPMENT  
IS UNDER WARRANTY TO BE FREE FROM DEFECTS IN WORKMANSHIP  
FOR THE LIFETIME OF THE UNIT.

MATERIAL AND COMPONENTS ARE GUARANTEED FOR A FULL YEAR  
FROM THE DATE OF THE ORIGINAL PURCHASE. TRANSPORTATION  
CHARGES MUST BE PREPAID ON EQUIPMENT RETURNED FOR SERVICE.

THIS WARRANTY DOES NOT EXTEND TO EQUIPMENT WHICH HAS BEEN  
SUBJECTED TO ACCIDENTS, MISUSE OR IMPROPER INSTALLATION  
CONTRARY TO INSTRUCTIONS FURNISHED BY US.

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NOTE: THE INSTRUCTION MANUAL FOR THE SCA/880-A TUNER MODULE  
FOLLOWS PAGE 9 OF THIS MANUAL.

## GENERAL DESCRIPTION

THE ST-4A SCA TUNER CONSISTS OF TWO SECTIONS:

1. THE ST-4A MAIN FRAME, ENCLOSURE, AUDIO AMPLIFICATION AND DISTRIBUTION.
2. THE SCA/880-A TUNER MODULE. THE INSTRUCTION MANUAL FOR THE SCA/880-A CAN BE FOUND IN SECTION 2 OF THIS MANUAL.

FIGURE 1 SHOWS THE REAR VIEW OF THE ST-4A FOR IDENTIFICATION OF THE LABELED COMPONENTS AS FOLLOWS:

- A. FUSE: THE PROPER FUSE IS A 1/8 AMP SLO-BLO TYPE. DO NOT REPLACE THE FUSE WITH A LARGER VALUE OR STANDARD FAST-ACTING TYPE.
- B. OUTPUT TERMINAL STRIP: THIS IS AN UNGROUNDED 600 OHM CENTER TAPPED OUTPUT USING THE TWO OUTER TERMINALS. USING THE CENTER TERMINAL AND EITHER OUTER TERMINAL RESULTS IN A 150 OHM OUTPUT.
- C. PHONO CONNECTOR 600 OHM SINGLE ENDED OUTPUT
- D. F TYPE COAXIAL ANTENNA CONNECTOR: A MATING CONNECTOR IS SUPPLIED WITH THE ST-4A

FIGURE 2 SHOWS THE TOP VIEW OF THE ST-4A TUNER FOR IDENTIFICATION OF THE LABELED COMPONENTS AS FOLLOWS:

- A. SCA/880-A MODULE: THE MODULE IS SECURED BY 2 PLASTIC CIRCUIT BOARD SUPPORTS AND 2 SCREW, METAL SPACER AND LOCKWASHER ASSEMBLIES FOR GROUNDING.
- B. SCA/880-A POWER AND AUDIO CONNECTOR: THIS MALE CONNECTOR ACCEPTS THE FEMALE CABLE CONNECTOR OF THE TUNER MODULE. BOTH MAIN AND SUBCHANNEL AUDIO ARE TERMINATED HERE.
- C. PROGRAM SELECTOR CONNECTOR: THIS MALE CONNECTOR IS USED TO SELECT EITHER MAIN OR SUBCHANNEL AUDIO FOR FURTHER PROCESSING IN THE AUDIO OUTPUT AMPLIFIER. A FEMALE JUMPER PLUG IS SUPPLIED. THIS CONNECTOR IS ALSO USED TO MATE WITH THE OPTIONAL MAIN/SUB SELECTOR SWITCH ASSEMBLY. THE MAIN/SUB SELECTOR SWITCH IS AN OPTIONAL FEATURE AND IF DESIRED, IS LOCATED ON THE FRONT PANEL.

- D. OUTPUT LEVEL CONTROL: THIS CONTROL PERMITS THE INSTALLER TO SET THE OUTPUT LEVEL (B AND C OF FIGURE 1). THE MAXIMUM OUTPUT (WITH PROPER MODULATION) IS 5 VOLTS PEAK TO PEAK AT THE SINGLE ENDED OUTPUT AND 4 VOLTS PEAK TO PEAK AT THE 600 OHM TRANSFORMER OUTPUT.
- E. AUDIO OUTPUT CONNECTOR:  
THE AUDIO OUTPUT CABLE TERMINATES HERE.
- F. LOW LEVEL A. C. TRANSFORMER CONNECTOR  
THE POWER TRANSFORMER SECONDARY TERMINATES HERE.
- G. PILOT LAMP CONNECTOR: THE FRONT PANEL (LIGHT EMITTING DIODE) POWER ON INDICATOR CONNECTS HERE. A SUITABLE VOLTAGE DROPPING RESISTOR IS LOCATED ON THE POWER AND AUDIO CIRCUIT BOARD.

SEE FIGURE 3 FOR A DETAILED LAYOUT OF THE AUDIO ETCHED CIRCUIT BOARD.

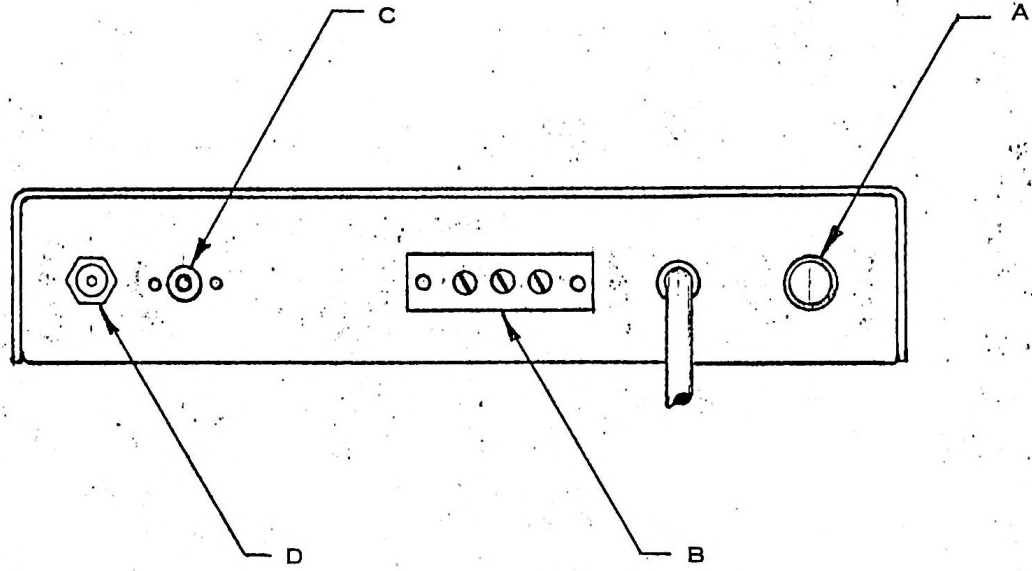


FIGURE 1

REAR PANEL

ST-4A TUNER

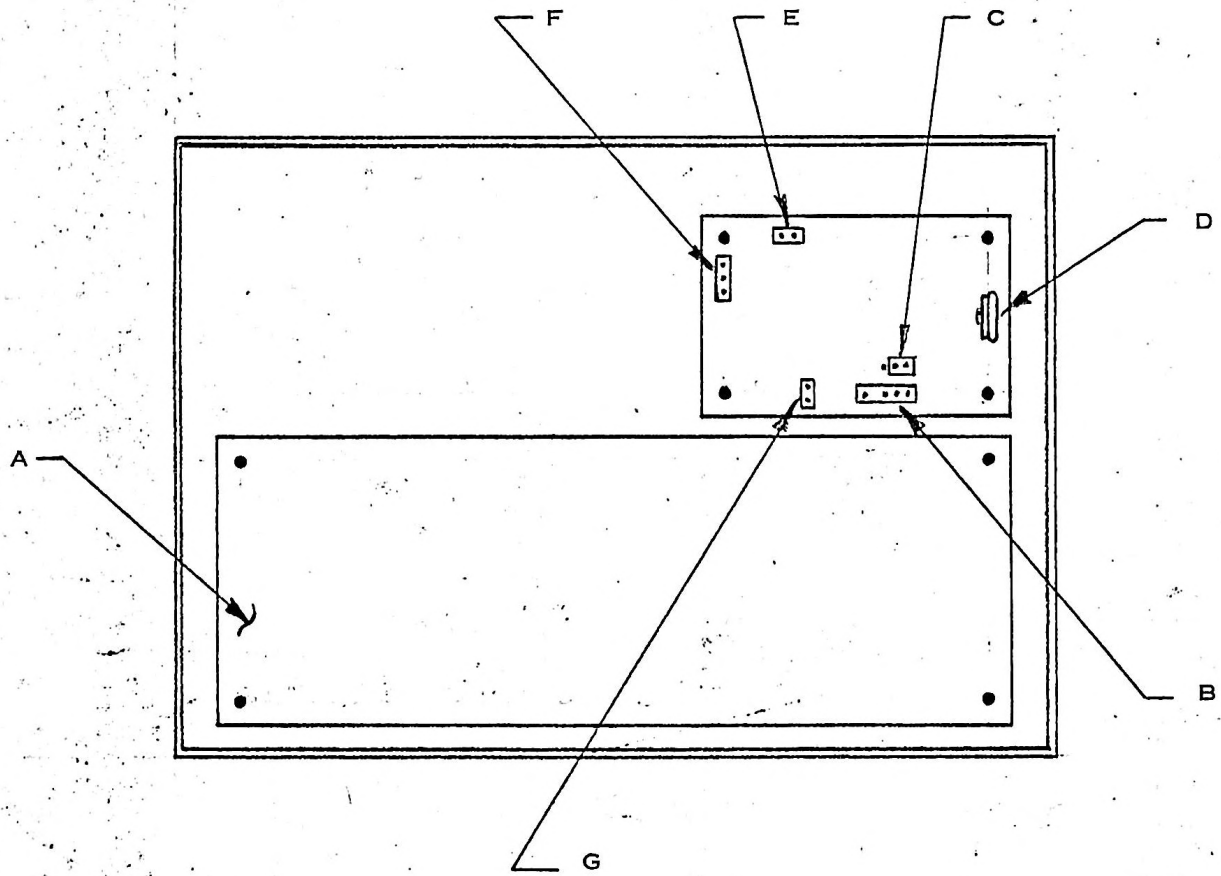


FIGURE 2  
TOP VIEW ST-4A TUNER





SEMI-CONDUCTOR COMPLEMENT

<u>SCHEMATIC REFERENCE DESIGNATION</u>	<u>JOHNSON PART No.</u>	<u>JEDEC OR VENDOR No.</u>	<u>FUNCTION</u>
D61 THRU D64	DI-10	IN4003	POWER RECTIFIERS AND OUTPUT PROTECTION DIODES
Q61	TR-62	741C OP AMP	OUTPUT AMPLIFIER

NOTE: ALL OTHER COMPONENTS SHOULD BE ORDERED BY THE SCHEMATIC SYMBOL  
AND THE TUNER MODEL NUMBER.

SPECIFICATIONS

AUDIO:

MAIN CHANNEL

$\pm 3$  DB, 30-15,000Hz. (75 USEC DEEMPHASIS)

SUB CHANNEL

$\pm 3$  DB, 30 TO 6000 Hz. (150 USEC DEEMPHASIS)

AUDIO OUTPUT:

EITHER CHANNEL

1.8 VOLTS RMS SINGLE ENDED OUTPUT  
1.4 VOLTS RMS 600 OHM TRANSFORMER  
(TRANSFORMER SUPPLIED AT NO EXTRA COST)

HUM AND NOISE FLOOR:

-65 DB BELOW 100% MODULATION (SUB)

SIZE:

1-7/8" H x 10-1/4" W x 7-3/4" D

WEIGHT:

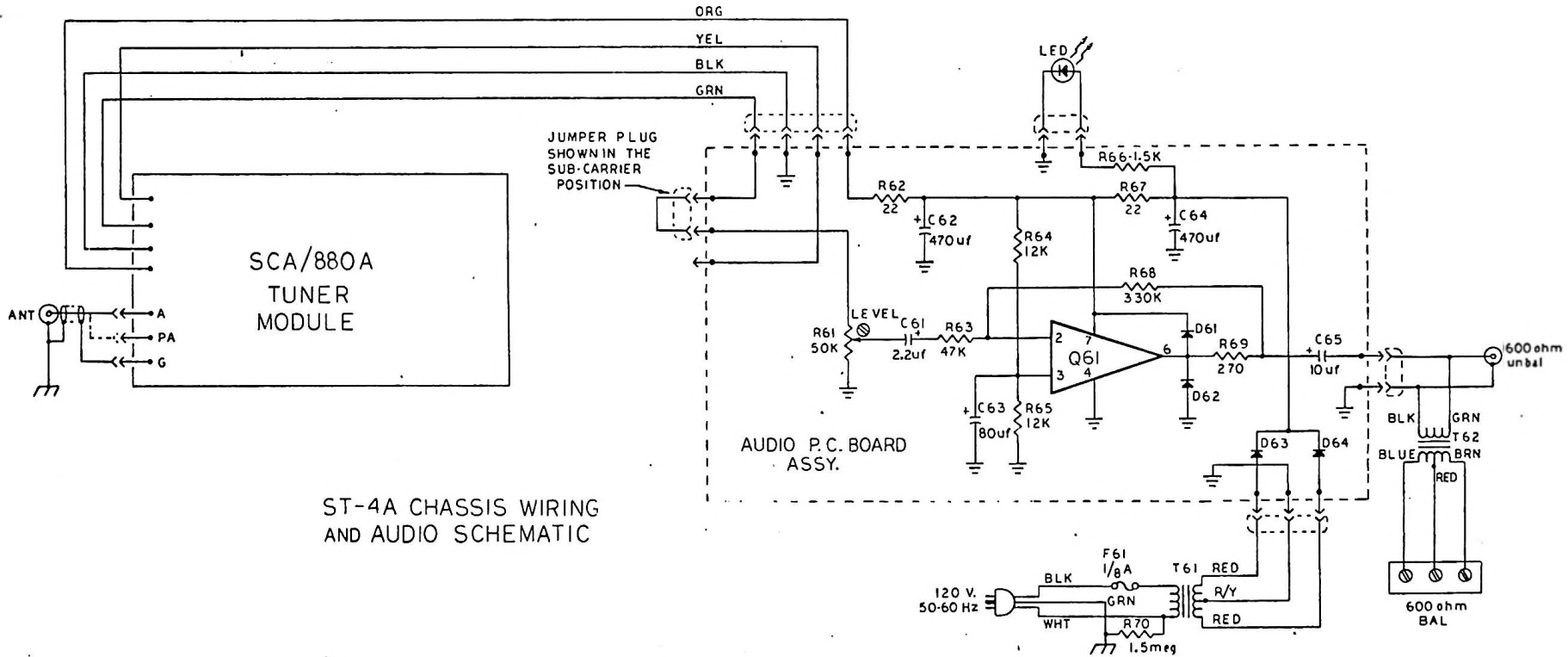
2-3/4 LBS.

NOTE: FOR OTHER SPECIFICATIONS -- SEE SCA/880-A SECTION OF THIS MANUAL.

## CIRCUIT OPERATION

THE FOLLOWING REFERS TO THE SCHEMATIC DIAGRAM LOCATED ON THE FINAL PAGE OF THE ST-4A SECTION OF THIS MANUAL.

MAIN OR SUBCHANNEL AUDIO IS DIRECTED TO LEVEL CONTROL R61. THE GAIN OF Q61 IS DETERMINED BY THE EXPRESSION  $R68/R63$ . IT SHOULD BE NOTED THAT R69 IS IN THE FEEDBACK LOOP. THE AUDIO LEVEL @ TERMINAL 6 OF Q61 IS GREATER THAN THAT AT THE OUTPUT TERMINAL(S). THIS IS BECAUSE R69 IN CONJUNCTION WITH D61 AND D62 IS USED TO PREVENT TRANSIENTS FED FROM THE OUTPUT, DESTROYING GAIN BLOCK Q61. R64 AND R65 DETERMINE THE OPERATING POINT OF TERMINALS 2,3 AND 6 OF Q61. C65 IS USED TO PREVENT THE PIN 6 VOLTAGE FROM BEING APPLIED TO THE OUTPUT TERMINAL(S). R62 AND R67 PROVIDE VOLTAGE DISTRIBUTION. C62, C63 AND C64 SMOOTH THE RIPPLE VOLTAGE. D63, D64 AND T61 ARE A CONVENTIONAL FULL WAVE RECTIFIER ARRANGEMENT.



ST-4A CHASSIS WIRING  
AND AUDIO SCHEMATIC

All Dimensions And Specified Fin. Are For Finished Parts And Must Be Met After Thickness Of _____ Finish Is Applied	Item	Description	Mat. Specifications		Part Number
			Temp	Mo	
Unless Otherwise Specified Tolerances Are Three Digits After Decimal Plus or Minus .003 Two Digits After Decimal or Fractional Dimension - Angles Plus or Minus 15° Up to 14 In. Plus or Minus .03 (1/32) Above 14 In. Plus or Minus .06 (1/16) Commercial Tolerances Apply For Saws, Taps, And Bar Stock	Drawn By	7/73	JOHNSON ELECTRONICS, INC.		SCHEMATIC ST-4A TUNER
	Checked By		P. O. BOX 1475 CAMELBURG, FLORIDA		
Approved By	Date				D2000-1090

## GENERAL DESCRIPTION

THE SCA/880-A TUNER MODULE IS A COMPLETE FM AND SCA TUNER MOUNTED ON A GLASS EPOXY CIRCUIT BOARD WITH DIMENSIONS OF 84 X 230 MILLIMETERS. BOTH MAIN AND SUBCHANNEL AUDIO ARE AVAILABLE VIA CONNECTOR FOR ADDITIONAL PROCESSING IN ANY JOHNSON SCA SERIES AMPLIFIER. THE SCA/880-A IS FURNISHED WITH AN ANTENNA CONNECTOR ASSEMBLY AND A MAIN-SUB JUMPER ASSEMBLY FOR EASY INSTALLATION IN THE JOHNSON ST-4A TUNER AND ANY SCA SERIES AMPLIFIER. AN OPTIONAL MAIN/SUB SWITCH ASSEMBLY IS ALSO AVAILABLE FOR THOSE WHO WISH TO SWITCH TO THE MAIN PROGRAM FOR SPECIAL EVENTS.

THE SCA/880-A USES TWO DIODE PROTECTED DUAL GATE D-MOS FIELD EFFECT RF AMPLIFIERS (Q1 AND Q2). THESE DEVICES HAVE VERY LINEAR AGC CONTROL CHARACTERISTICS. THE AGC ACTION DOES NOT INTRODUCE DETUNING OF THE FOUR R.F. TUNED CIRCUIT. BOTH DEVICES ARE IN THE AGC LOOP AND PROVIDE GREATER THAN 100DB GAIN REDUCTION. THIS RESULTS IN AN OVERALL TUNER DYNAMIC RANGE OF OVER 120DB WITH MINIMAL CROSS MODULATION.

THE MIXER (Q4) USES A DIFFERENTIAL AMPLIFIER WITH BALANCED IF OUTPUT. THE LOCAL OSCILLATOR SIGNAL, GENERATED BY BI-POLAR TRANSISTOR Q3, IS COUPLED TO THE CONSTANT CURRENT TRANSISTOR ASSOCIATED WITH THE DIFFERENTIAL AMPLIFIER CONTAINED WITHIN MIXER INTEGRATED CIRCUIT Q4. THE BALANCED OUTPUT OF THE MIXER IS A CLEAN 10.7 MHZ REPLICA OF THE INCOMING FREQUENCY BECAUSE THE DIFFERENTIAL AMPLIFIER CANCELS THE LOCAL OSCILLATOR SIGNAL PLUS HARMONICS. THE MIXER OUTPUT MATCHING TRANSFORMER IS TUNED TO THE DIFFERENCE FREQUENCY ELIMINATING THE SUM FREQUENCY.

TRANSFORMER T1, FILTERS FL1 AND FL2 ARE SELECTED FOR ALTERNATE CHANNEL SELECTIVITY AND CROSS-TALK SPECIFICATIONS, UTILIZING S SPECTRUM ANALYZER AND TRACKING GENERATOR.

THE INTEGRATED CIRCUIT DEVICE (Q5) PROVIDES ALL FUNCTIONS FOR THE COMPREHENSIVE 10.7 MHZ IF SYSTEM. Q5 AND ASSOCIATED CIRCUITRY AMPLIFIES, LIMITS, DOES LEVEL DETECTION, SUPPLIES AGC CONTROL VOLTAGE TO TWO RF AMPLIFIER STAGES, DETECTS (QUADRATURE), SQUELCHES THE AUDIO AT LOW OR NOISY RF LEVELS AND SUPPLIES A LOGARITHMIC RF SIGNAL STRENGTH INDICATION VIA TEST POINT 2. (SEE PAGE NO. 12 FOR A GRAPH).

FOLLOWING MAIN CHANNEL DETECTION, BUT BEFORE DEEMPHASIS, THE SCA CARRIER IS APPLIED TO A THREE POLE BAND PASS FILTER THAT SUPPLIES SIGNAL TO THE MULTIFUNCTION INTEGRATED CIRCUIT DEVICE (Q6). AMPLIFICATION, LIMITING, DETECTION, AUDIO PREAMPLIFICATION, AND A SQUELCH CONTROL VOLTAGE ARE SUPPLIED BY (Q6) AND ASSOCIATED CIRCUITRY.

THE SCA AUDIO IS MUTED OR SQUELCHED BY AN "AND" GATE ARRANGEMENT OF BI-POLAR TRANSISTOR SWITCHES (Q7) AND (Q8), BOTH OF WHICH ARE ADJUSTED BY CONTROLS R-37 AND R-42. THESE SWITCHES ARE CONNECTED IN SERIES AND BOTH MUST BE ON TO RESTORE THE SCA AUDIO. SWITCH (Q7) IS CONTROLLED BY THE PRESENCE OR ABSENCE OF THE SUBCARRIER. SWITCH (Q8) IS CONTROLLED BY THE RF CARRIER. THE CARRIER MUTE CONTROL CAN BE PRESET TO MUTE THE SCA AUDIO FROM LESS THAN 1 MICROVOLT TO GREATER THAN 1 VOLT RF INPUT.

FOLLOWING THE SCA DETECTOR THE AUDIO IS APPLIED THROUGH A LOW PASS FILTER AND DEEMPHASIS NETWORK TO A CONNECTOR FOR FURTHER PROCESSING IN THE MOTHER (SCA SERIES) AMPLIFIER.

THE MAIN CHANNEL AUDIO IS ALSO PRESENT AT THE OUTPUT CONNECTOR AND CAN BE USED TO DRIVE THE (SCA SERIES) S/A-10 OR S/A-25 AMPLIFIER.

SCA/880-A TECHNICAL SPECIFICATIONS

MAIN CHANNEL

ANTENNA INPUT	50/72 OHM UNBALANCED
FREQUENCY	88 TO 108 MHZ
SENSITIVITY	1.2 MICROVOLTS FOR 40DB QUIETING
SELECTIVITY	65DB ALTERNATE CHANNEL
AUDIO OUTPUT	0.25 VRMS INTO 50K OHMS
DISTORTION	LESS THAN .5%
CAPTURE RATIO	LESS THAN 1.5 DB
AGC RANGE	100 DB
HUM AND NOISE	-70 DB (90% MODULATION)

SUBCHANNEL

FREQUENCY	67 KHZ STANDARD, 41 KHZ OPTIONAL
SENSITIVITY	3.5 MICROVOLTS FOR 30DB QUIETING (10% INJECTION)
DEVIATION	6 KHZ DEVIATION
AUDIO OUTPUT	.25 VOLT RMS INTO 25K OHMS
DISTORTION	LESS THAN 1% @ $\pm$ 6 KHZ DEVIATION
DEEMPHASIS	150 MICROSECONDS STANDARD
HUM AND NOISE	-65DB (6 KHZ DEVIATION) 400 HZ.

CROSSTALK

MAIN TO SUB	-55 DB OR GREATER
STEREO	-55 DB OR GREATER
SUB TO SUB	-55 DB OR GREATER

**INPUT IMPEDANCE**

**50/72 OHM WITH F-61A CONNECTOR**

**MUTE**

**TRIPLE SYSTEM WITH THRESHOLD CONTROL  
FOR CARRIER AND SUBCARRIER**

**POWER REQUIREMENT**

**SUPPLIED BY SCA SERIES AMPLIFIER  
OR ST-4, ST-4A TUNER**

**SIZE**

**9" W x 1.2" D x 3.3" H**

**WEIGHT**

**8 OUNCES**

**OPTIONAL ACCESSORIES**

**AP-2 ANTENNA PREAMPLIFIER**

**THE SCA/880-A IS CERTIFIED AND COMPLIES WITH PART 15 OF FCC RULES AND REGULATIONS.**

**THE SCA/880-A IS UL APPROVED.**



## INSTALLATION

THE SCA/880-A HAS BEEN THOROUGHLY TESTED AND ADJUSTED TO YOUR EXACT FREQUENCY AND SHOULD REQUIRE NO ADJUSTMENTS PRIOR TO INSTALLATION.

LOCATION

THE SCA/880-A IS INSTALLED IN ANY SCA SERIES AMPLIFIER VIA 2 CARD GUIDES THAT HOLD THE ASSEMBLY SECURELY IN PLACE. THE ANTENNA CONNECTOR ASSEMBLY, UTILIZING THE COAXIAL CABLE, IS THEN INSTALLED AND CONNECTED TO THE SCA/880-A. THE OUTER LEAD (SHIELD) GOES ON (GND). THE INNER LEAD GOES ON (A) OR (PA) DEPENDING ON WHETHER YOU WANT TO USE A STANDARD ANTENNA OR USE AN ANTENNA PREAMPLIFIER. THESE CONNECTIONS WILL HAVE ALREADY BEEN MADE WHEN YOU ORDER A COMPLETE TUNER OR RECEIVER. POWER IS SUPPLIED BY THE ST-4, ST-4A TUNER OR AN SCA SERIES AMPLIFIER.

ANTENNA

SATISFACTORY SCA MULTIPLEX RECEPTION CAN BE ACHIEVED ONLY WITH A PROPERLY SELECTED AND INSTALLED ANTENNA. GOOD DIRECTIONAL CHARACTERISTICS IN AN ANTENNA WILL MINIMIZE MULTIPATH (CROSSTALK) RECEPTION WHEN PROPERLY ORIENTED. IT IS RECOMMENDED THAT THE ANTENNA BE ZONE CUT TO YOUR FREQUENCY AND HAVE 72 OHMS IMPEDANCE. JOHNSON ELECTRONICS HAS A COMPLETE LINE OF ANTENNAS.

ANTENNA ORIENTATION

A SOLDERLESS MATING CONNECTOR (F-59A) IS SUPPLIED WITH THE SCA/880-A FOR CONNECTION TO THE DOWN LEAD COAXIAL CABLE. IN THE ABSENCE OF A FIELD STRENGTH METER TEST POINT 2 CAN BE USED TO INDICATE WHEN THE ANTENNA IS RECEIVING MAXIMUM SIGNAL. THE ANTENNA SHOULD BE ORIENTED FOR BEST SIGNAL AND LOWEST MULTIPATH. IN MARGINAL SIGNAL AREAS, OR WHERE A LONG ANTENNA FEED CABLE CANNOT BE AVOIDED, A NARROW BAND, MAST MOUNTED, ANTENNA PREAMPLIFIER (JOHNSON AP-2) IS RECOMMENDED. THE ANTENNA PREAMPLIFIER SHOULD BE MAST MOUNTED TO PLACE THE GAIN AHEAD OF THE CABLE LOSSES.

## OPERATIONAL GUIDE

THE OPERATIONAL GUIDE IS A SECTION DEVOTED TO A DISCUSSION OF THE CONTROLS, TEST POINTS, AND FUNCTIONS OF THE SCA/880-A. MANY COMMERCIAL USERS OF SCA EQUIPMENT EMPLOY TWO OR MORE FM RADIO STATIONS IN THEIR OPERATION. IT IS SOMETIMES NECESSARY TO CHANGE EQUIPMENT FROM ONE STATION OR FREQUENCY TO ANOTHER.

THEREFORE, CHANGING THE SCA/880-A FROM ONE CHANNEL TO ANOTHER WILL ALSO BE DISCUSSED IN THIS SECTION. REFER TO THE COMPONENT LAYOUT DRAWING AND THE SCHEMATIC DIAGRAM AT THE END OF THIS MANUAL.

THERE ARE THREE TEST POINTS AND TWO VARIABLE CONTROLS IN THE SCA/880-A TEST POINT 1 IS ASSOCIATED WITH THE LOCAL OSCILLATOR AND WILL BE DISCUSSED LATER IN THIS SECTION.

TEST POINT 2 (TP2) IS USED TO INDICATE THE RELATIVE RF SIGNAL STRENGTH. THE VOLTAGE IS POSITIVE WITH RESPECT TO GROUND. THERE IS A SMALL RESIDUAL VOLTAGE WITH NO RF INPUT THAT IS TYPICALLY LESS THAN 1 VOLT. THE RESIDUAL VOLTAGE AT TP2 WILL START TO RISE AT LESS THAN 1 MICROVOLT INPUT AND WILL BE 4.5 VOLTS OR LESS WITH AN RF INPUT OF 1 VOLT. THUS THE RANGE OF RF INPUT INDICATED AT TP2 IS IN EXCESS OF 120 DB. SEE PAGE 12 FOR A GRAPH.

TEST POINT 2

CARRIER MUTE CONTROL

PART OF THE VOLTAGE INDICATED AT TP2 IS USED IN THE "AND" GATE SCA AUDIO MUTE CIRCUIT (Q8). THE REASON FOR THIS APPROACH AND THE PURPOSE OF THE CARRIER MUTE CONTROL (R42) IS TO PRESET THE AMOUNT OF LOW LEVEL RF INPUT SIGNAL THAT WILL HOLD THE SCA AUDIO ON. THIS IS NOT TO BE CONFUSED WITH MAIN CHANNEL MUTING. THE SCA/880-A IS SHIPPED PRESET TO MUTE AT LESS THAN 3 UV. THE RANGE OF THE CARRIER MUTE CONTROL IS LESS THAN 1 MICROVOLT TO INFINITY. THIS FEATURE IS USEFUL IN FRINGE AREAS WHICH ARE SUBJECTED TO RF SIGNAL DROPOUTS OR IN CASES WHERE THE TRANSMITTER IS TURNED OFF. THE TUNER IS ALLOWED TO MUTE WHEN THE SIGNAL FADES BELOW A PRESET LEVEL PREVENTING NOISE FROM APPEARING IN THE SCA PROGRAM. FULL COUNTERCLOCKWISE ROTATION OF THE CARRIER MUTE CONTROL WILL PERMIT THE RF SIGNAL TO DECAY DOWN TO A LOW LEVEL (LESS THAN 1 MICROVOLT) BEFORE THE SCA AUDIO IS MUTED. FULL CLOCKWISE ROTATION OF THE CONTROL WILL CAUSE THE SCA PROGRAM TO BE MUTED AT ANY PRACTICAL RF INPUT LEVEL (UP TO 1 VOLT).

TEST POINT 3

TEST POINT 3 (TP3) IS ASSOCIATED WITH THE SCA SUBCARRIER SECTION OF THE SCA/880-A. THE VOLTAGE AT TP3 IS PRIMARILY AN AC VOLTAGE (67 KHZ) THAT IS CLAMPED TO A DC VOLTAGE REFERENCE. THE AC COMPONENT INCREASES WITH AN INCREASE IN SCA INJECTION. THE DC COMPONENT DECREASES WITH AN INCREASE IN INJECTION. THE AC COMPONENT INCREASES LINEARLY WITH AN INCREASE IN INJECTION. THE RESIDUAL AC COMPONENT IS LOW AND RELATIVELY FIXED IN THE SCA/880-A. TP3 CAN THEREFORE BE USED TO INDICATE THE PERCENTAGE OF INJECTION (UP TO ABOUT 30%) WITH AN AC VOLTMETER WHEN CALIBRATED AT THE FACTORY ON A GIVEN MODULE.

SUBCARRIER MUTE CONTROL

THE VOLTAGE INDICATED AT TP3 IS USED AS THE SECOND INPUT TO THE "AND" GATE SCA AUDIO MUTE CIRCUIT. SUBCARRIER MUTE CONTROL R37 IS USED TO MAKE THE SUBCHANNEL MUTE THRESHOLD SETTING. THIS CONTROL HAS BEEN SET AT THE FACTORY TO MUTE AT 6DB BELOW 10% INJECTION (3 KHz) AND SHOULD NOT REQUIRE FURTHER ADJUSTMENT. IF ADJUSTMENT BECOMES NECESSARY, THE SCA SUBCHANNEL MUST BE ON THE AIR TO SET THIS CONTROL. THE SUBCARRIER MUTE CONTROL IS SET IN THE FOLLOWING MANNER. TURN THE CONTROL CLOCKWISE UNTIL THE SCA PROGRAM MUTES. THEN, TURN THE CONTROL COUNTER-CLOCKWISE 1/8 TURN PAST THE POINT THAT FULLY RESTORES THE SCA PROGRAM.

CHANGING CHANNELS

THE REMAINDER OF THE OPERATIONAL GUIDE SECTION WILL DISCUSS CHANGING THE FREQUENCY OF THE SCA/880-A FROM ONE FM CHANNEL TO ANOTHER. THE FOLLOWING DISCUSSION IS BASED ON USING THE TRANSMITTED FM SIGNAL. THE TOOLS REQUIRED ARE A HIGH IMPEDANCE VOLTMETER AND AN .07 INCH PLASTIC HEX WRENCH IN GOOD CONDITION, TO PREVENT BACKLASH AND POSSIBLE DAMAGE TO THE COIL CORES. THE FORMULA FOR THE CRYSTAL FREQUENCY IS:

$$\text{CRYSTAL FREQUENCY} = \frac{\text{OPERATING FREQUENCY} - 10.7 \text{ MHz}}{2}$$

NOTE: ALL THE COILS IN THE "FRONT END" OF THE SCA/880-A WILL ADJUST CLOCKWISE WHEN GOING TO A LOWER FREQUENCY AND COUNTER-CLOCKWISE FOR A HIGHER FREQUENCY.

WITH VOLTMETER ON TP1 (+ POLARITY 5.V SCALE), ADJUST OSCILLATOR COIL L5 CLOCKWISE FOR AN ABRUPT INCREASE OF THE INDICATED VOLTAGE. AFTER FINDING THE PEAK, CONTINUE CLOCKWISE UNTIL THE VOLTAGE DECREASES SLIGHTLY. THIS IS DONE TO ESTABLISH STABLE OSCILLATOR STARTING CONDITIONS. THE MULTIPLIER COIL L6 CAN BE APPROXIMATELY POSITIONED AT THIS TIME BY ADJUSTING IT FOR A DIP IN THE INDICATED TP1 VOLTAGE.

RF COILS L1 THRU L4 AND DOUBLER COIL L6 ARE ADJUSTED FOR MAXIMUM POSITIVE VOLTAGE AT TP2. THERE IS A SMALL RESIDUAL VOLTAGE AT TP2 THAT IS TYPICALLY LESS THAN 1 VOLT WITH NO RF INPUT. WHEN THE FREQUENCY CHANGE BEING MADE IS GREAT AND/OR THE DESIRED INCOMING SIGNAL IS WEAK, THERE WILL BE NO REAL INDICATION AT TP2. PROGRESSIVELY ADJUST L1 THRU L4 AND L6 (NO MORE THAN 1 TURN AT A TIME) IN THE DIRECTION OF THE DESIRED FREQUENCY UNTIL AN INCREASE IN VOLTAGE INDICATION APPEARS AT TP2. L1, L2, L3, L4 AND L6 MAY THEN BE ADJUSTED FOR MAXIMUM INDICATION AT TP2. A LOW LEVEL SIGNAL SHOULD BE USED WHILE MAKING THE FINAL ADJUSTMENTS.

UNDER STRONG SIGNAL CONDITIONS THE AGC SYSTEM WILL TEND TO COUNTERACT THE ADJUSTMENTS BEING MADE. AS A GIVEN COIL APPROACHES RESONANCE THEREBY INCREASING THE GAIN, THE AGC SYSTEM WILL DECREASE THE GAIN. THE NET RESULT IS A BROAD RESPONSE TO THE ADJUSTMENT(S) BEING MADE. IT IS UNWISE TO SET UP EQUIPMENT USING FIFTY THOUSAND MICROVOLTS AND EXPECT IT TO PERFORM WELL IN THE OUTER REACHES OF THE FRINGE AREAS. A STEP ATTENUATOR IS A GREAT ASSET. THE AMOUNT OF SIGNAL CAN BE SWITCHED IN OR OUT AS DESIRED.

OSCILLATOR AND MULTIPLIER

RF AND MULTIPLIER COILS

STRONG SIGNALS

IN THE ABSENCE OF ONE "IN LINE" COAX PADS SHOULD BE USED IF ATTENUATION OF THE SIGNAL IS REQUIRED.

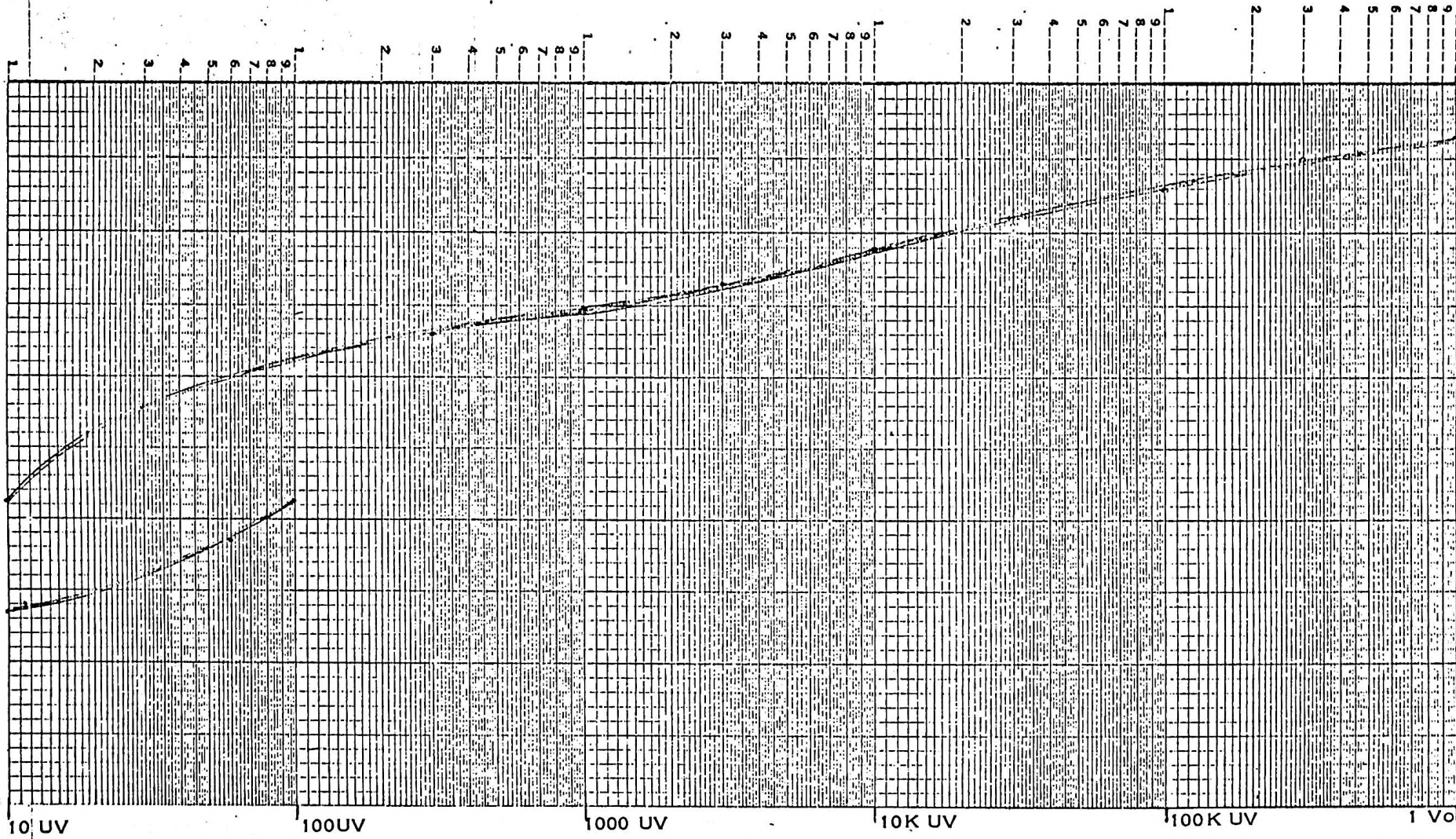
IT IS SOMETIMES NECESSARY TO CHANGE CHANNELS WHEN OUT OF THE RANGE OF THE DESIRED RADIO STATION. RARELY WILL ONE FIND A SIGNAL GENERATOR WITH THE FREQUENCY DIAL ACCURACY NECESSARY TO PRESET THE EXACT CENTER FREQUENCY. THE CENTER FREQUENCY CAN BE FOUND BY CAREFULLY POSITIONING THE SIGNAL GENERATOR FREQUENCY DIAL FOR ZERO VOLTAGE DROP ACROSS R25 IN THE SCA/880-A. (SEE COMPONENT LOCATION ON PAGE 13). THE IR DROP WILL CHANGE POLARITY AS THE SIGNAL GENERATOR FREQUENCY IS MOVED THROUGH CENTER FREQUENCY. THIS, OF COURSE, CAN BE DONE ONLY AFTER THE OSCILLATOR AND MULTIPLIER COILS HAVE BEEN ADJUSTED. THE SIGNAL GENERATOR USED NEED NOT HAVE MODULATION CAPABILITY. IT IS DESIRABLE, HOWEVER, FOR IT TO HAVE A CALIBRATED OUTPUT ATTENUATOR.

NOTE: THE ABOVE PARAGRAPH IS TRUE ONLY IF THE MAIN CHANNEL DETECTOR COIL L8 HAS NOT BEEN MISADJUSTED.

SIGNAL GENERATOR

SEMICONDUCTOR COMPLEMENT

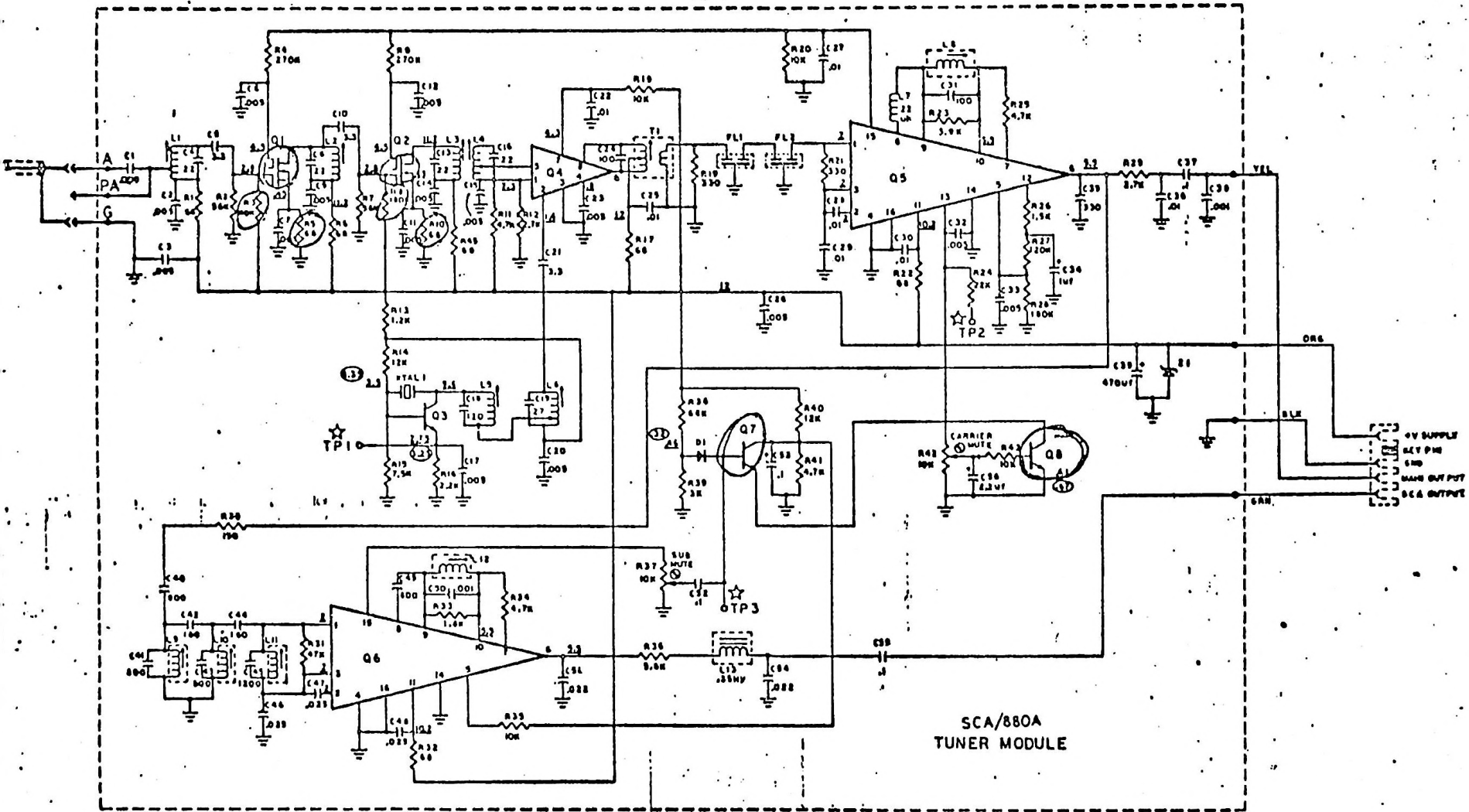
<u>SCHEMATIC REFERENCE DESIGNATION</u>	<u>JOHNSON PART No.</u>	<u>JEDEC OR VENDOR PART NUMBER</u>	<u>FUNCTION</u>
Q1, Q2	TR-89	SD306DE	RF AMPLIFIERS
Q3	TR-37	2N3293	OSCILLATOR
Q4	TR-57	CA3053	MIXER
Q5	TR-55	CA3089E (RCA)	IF SYSTEM
Q6	TR-55	CA3089E (RCA)	SUBCARRIER SYSTEM
Q7, Q8	TR-29	2N2484	MUTE SWITCH
D1	DI-2	AA-119	MUTE SWITCH
Z1	DI-19	IN4742A	REGULATOR



1 UV -- (LOWER CURVE) -- 10 UV

TYPICAL CURVE SHOWING TP-2 VOLTAGE  
VERSUS ANTENNA INPUT SIGNAL IN MICROVOLTS

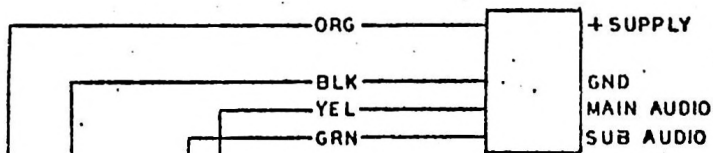




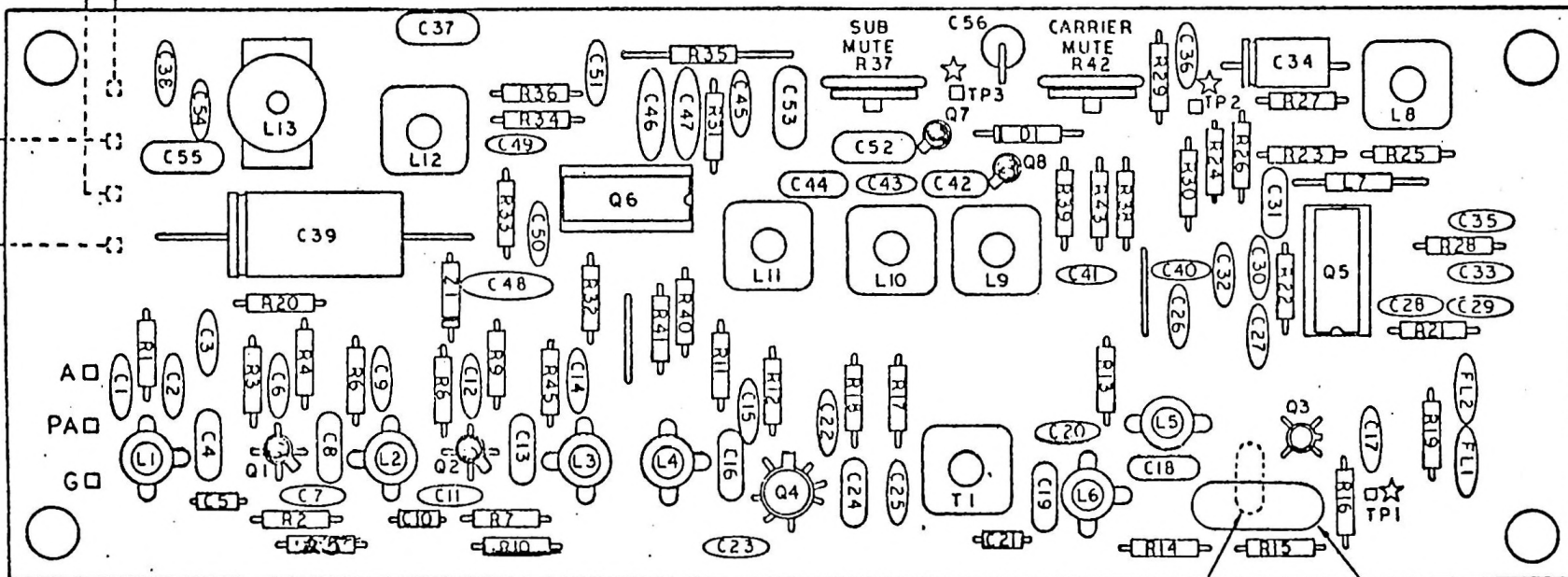
SCA/880A  
TUNER MODULE

D.C. VOLTAGE MEASUREMENTS TAKEN WITH A 11MEG OHM METER.  
 XX DENOTES POSITIVE VOLT IN RESPECT TO GROUND WITH NO SIGNAL INPUT AND XTAL1 REMOVED.  
 ( ) DENOTES NORMAL OPERATING VOLTAGES WITH A 1000MICROVOLT INPUT SIGNAL

Rev.	Description	App. Date	App. Name
1	SCHEMATIC	7/73	



Q:7  
Q:8  
Changed from  
TR-29-70 - TR101



Q1  
Q2  
Changed from  
TR89 to TR56

R5 + R10  
Changed from  
68 ohm to 270 ohm

R3 + R8  
Changed from  
150K to 330K

ALTERNATE  
LOCATION  
(XTAL1)

All Dimensions And Specified Fits Are For Plated Parts And Must Be Met After Thickness Of _____		Description		All Specifications		Finish Specifications		Part Number	
Finish Is As Shown		Sample Must Be Approved By Eng. Dept. Before Processing With Fabrication		Yes	No	Material			
Unless Otherwise Specified Tolerances Are Three Digits After Decimal Plus or Minus .041 Two Digits After Decimal or Fractional Dimension - Angles Plus or Minus 1/2°		Drawn By	Date	JOHNSON ELECTRONICS, INC.		The SCA/880A TUNGR MODULE		Rev	
Up to 24 in. Plus or Minus .03 (1/201) Above 24 in. Plus or Minus .04 (1/161) Commercial Tolerances Apply For Some Tolerances See Part Draw		Checked By	Date	P. O. BOX 1078		Drawing Number		Rev	
		Approved By	Date	CAMDENWAY, FLORIDA		D2000-1089			

## SAFETY INSTRUCTIONS

### TUNER MODELS ST-4 AND ST-4A

READ INSTRUCTIONS -- THESE SAFETY INSTRUCTIONS AND THE OPERATING INSTRUCTIONS OF THE TUNER SHOULD BE READ BEFORE THE APPLIANCE IS OPERATED.

RETAIN INSTRUCTIONS -- THE SAFETY AND OPERATING INSTRUCTIONS SHOULD BE RETAINED FOR FUTURE REFERENCE.

HEED WARNINGS -- ALL WARNINGS ON THE TUNER AND IN THE OPERATING INSTRUCTIONS SHOULD BE ADHERED TO.

FOLLOW INSTRUCTIONS -- ALL OPERATING AND USE INSTRUCTIONS SHOULD BE FOLLOWED.

WATER AND MOISTURE -- THE TUNER (AND THE ASSOCIATED AMPLIFIER) SHOULD NOT BE USED NEAR WATER -- FOR EXAMPLE, NEAR A BATHTUB, WASHBOWL, KITCHEN SINK, LAUNDRY TUB, IN A WET BASEMENT OR NEAR A SWIMMING POOL, ETC.

WALL MOUNTING -- THE TUNER SHOULD PROPERLY BE INSTALLED ON A WALL SHELF. WHERE THIS IS NOT PRACTICAL, THE KEY HOLE SLOTS IN THE BOTTOM MAY BE USED TAKING CARE THAT THE ANCHOR DEVICES DO NOT EXTEND TOO FAR INTO THE UNIT.

VENTILATION -- THE APPLIANCE SHOULD BE SITUATED SO THAT ITS LOCATION OR POSITION DOES NOT INTERFERE WITH ITS PROPER VENTILATION. THE APPLIANCE SHOULD NOT BE SITUATED ON ANY SURFACE THAT MAY BLOCK THE VENTILATION OPENINGS; OR, PLACED IN A BUILT-IN INSTALLATION, SUCH AS A BOOKCASE OR CABINET THAT MAY IMPEDE THE FLOW OF AIR THROUGH THE VENTILATION OPENINGS.

HEAT -- THE TUNER SHOULD BE SITUATED AWAY FROM HEAT SOURCES SUCH AS RADIATORS, HEAT REGISTERS, STOVES OR OTHER APPLIANCES (INCLUDING AMPLIFIERS) THAT PRODUCE HEAT.

POWER SOURCES -- THE TUNER SHOULD BE CONNECTED TO A POWER SUPPLY ONLY OF THE TYPE DESCRIBED IN THE OPERATING INSTRUCTIONS OR AS MARKED ON THE TUNER.

GROUNDING OR POLARIZATION -- PRECAUTIONS SHOULD BE TAKEN SO THAT THE GROUNDING OR POLARIZATION MEANS OF THE TUNER IS NOT DEFEATED.

POWER CORD PROTECTION -- POWER SUPPLY CORDS SHOULD BE ROUTED SO THAT THEY ARE NOT LIKELY TO BE WALKED ON OR PINCHED BY ITEMS PLACED ON OR AGAINST THEM. PAY PARTICULAR ATTENTION TO CORDS AT PLUGS, CONVENIENCE RECEPTACLES AND THE POINT WHERE THEY EXIT THE TUNER.

## SAFETY INSTRUCTIONS

### TUNER MODELS ST-4 AND ST-4A

POWER LINES -- THE OUTDOOR ANTENNA SHOULD BE LOCATED AWAY FROM POWER LINES.

OUTDOOR ANTENNA GROUNDING -- IF AN OUTSIDE ANTENNA IS CONNECTED TO THE RECEIVER, BE SURE THE ANTENNA SYSTEM IS GROUNDED SO AS TO PROVIDE SOME PROTECTION AGAINST VOLTAGE SURGES AND BUILT UP STATIC CHARGES. SECTION 810 OF THE NATIONAL ELECTRICAL CODE, ANSI/NFPA No. 70-1978, PROVIDES INFORMATION WITH RESPECT TO PROPER GROUNDING OF THE MAST AND SUPPORTING STRUCTURE, GROUNDING OF THE LEAD-IN WIRE TO AN ANTENNA DISCHARGE UNIT, SIZE OF GROUNDING CONDUCTORS, LOCATION OF ANTENNA DISCHARGE UNIT, CONNECTION TO GROUNDING ELECTRODES, AND REQUIREMENTS FOR THE GROUNDING ELECTRODE. SEE FIGURE 65.1.

NON-USE PERIODS -- THE POWER CORD OF THE TUNER SHOULD BE UNPLUGGED FROM THE OUTLET WHEN LEFT UNUSED FOR A LONG PERIOD OF TIME.

OBJECT AND LIQUID ENTRY -- CARE SHOULD BE TAKEN SO THAT OBJECTS DO NOT FALL AND LIQUIDS ARE NOT SPILLED INTO THE ENCLOSURE THROUGH OPENINGS.

DAMAGE REQUIRING SERVICE -- THE TUNER SHOULD BE SERVICED BY QUALIFIED SERVICE PERSONNEL WHEN:

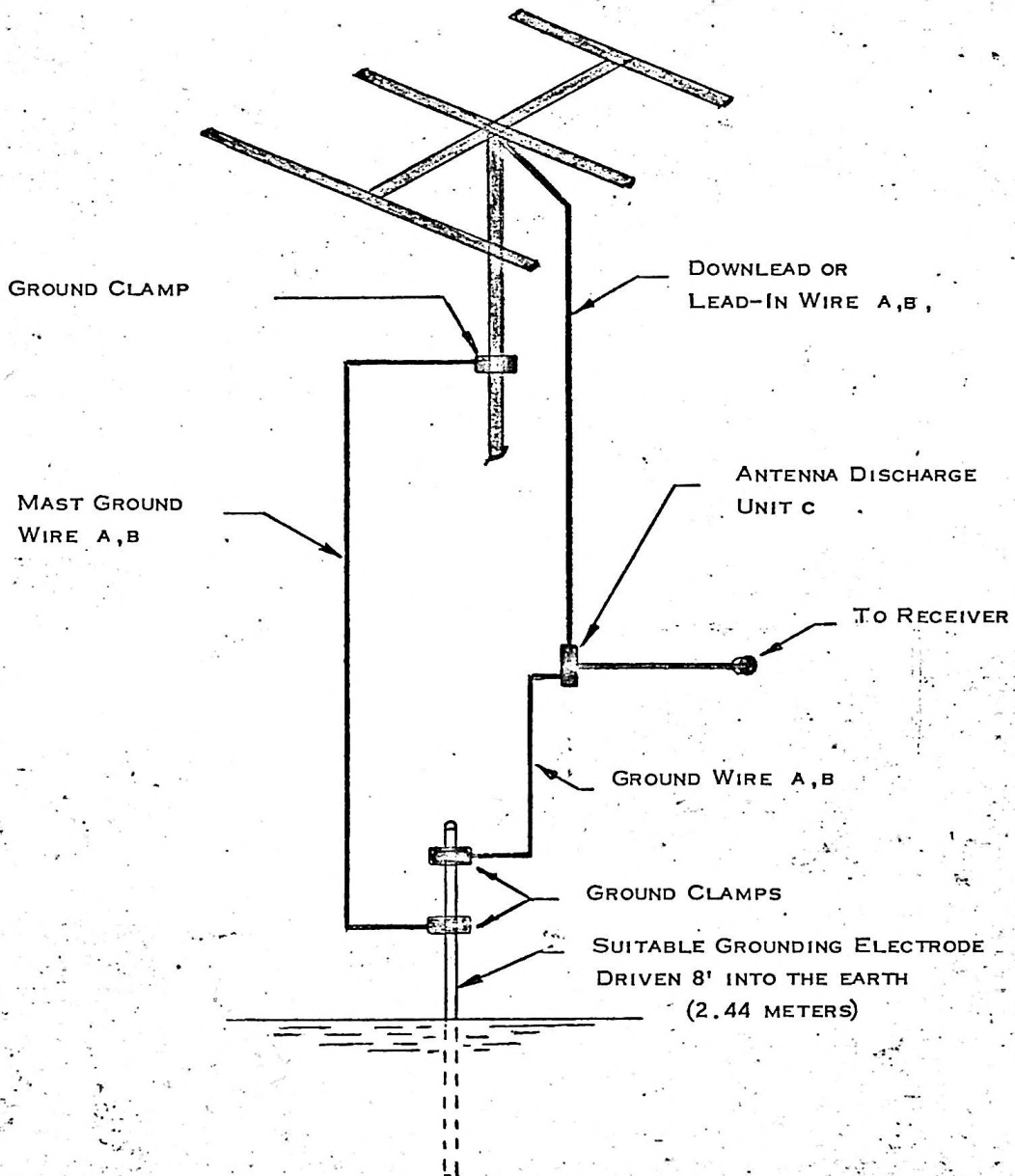
- A. THE POWER SUPPLY CORD OR THE PLUG HAS BEEN DAMAGED, OR;
- B. OBJECTS HAVE FALLEN OR LIQUID HAS BEEN SPILLED INTO THE ENCLOSURE, OR;
- C. THE TUNER HAS BEEN EXPOSED TO WATER, OR;
- D. THE TUNER DOES NOT APPEAR TO OPERATE NORMALLY OR EXHIBITS A MARKED CHANGE IN PERFORMANCE, OR;
- E. THE APPLIANCE HAS BEEN DROPPED OR THE ENCLOSURE DAMAGED.

SERVICING -- THE END USER SHOULD NOT ATTEMPT TO SERVICE THIS APPLIANCE -- FOR EXAMPLE: THE STORE MANAGER, HIS EMPLOYEES, THE BUILDING MAINTENANCE MAN OR ANYONE OTHER THAN THE FIRM PROVIDING THE MUSIC SERVICE SHOULD NOT ATTEMPT TO SERVICE THE TUNER.

ALL SERVICING SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL

FOOTNOTE -- SAFETY INSTRUCTIONS SIMILAR TO THE ABOVE ARE REQUIRED BY UNDERWRITERS LABORATORIES, INC. TO BE PROVIDED WITH TUNERS. THEY ARE COMMON SENSE IDEAS AND SHOULD APPLY TO AMPLIFIERS AND OTHER EQUIPMENT USED BY MUSIC AND SOUND CONTRACTORS.

EXAMPLE OF ANTENNA GROUNDING AS PER NATIONAL ELECTRICAL  
CODE INSTRUCTIONS



- A. USE NO. 10 AWG COPPER OR NO. 8 AWG ALUMINUM OR NO. 17 AWG COPPER-CLAD STEEL OR BRONZE WIRE, OR LARGER AS GROUND WIRES FOR BOTH MAST AND LEAD-IN.
- B. SECURE LEAD-IN WIRE FROM ANTENNA TO ANTENNA DISCHARGE UNIT AND MAST GROUND WIRE TO BUILDING WITH STAND-OFF INSULATORS, SPACED FROM 4 FEET (1.22 METERS) TO 6 FEET (1.83 METERS) APART.
- C. MOUNT ANTENNA DISCHARGE UNIT AS CLOSELY AS POSSIBLE TO WHERE LEAD-IN ENTERS BUILDING.

FIGURE 65.1