Regency® COMMUNICATIONS, INC.

SERVICE MANUAL

UHF POWER AMPLIFIER

MODEL ACU100 A/B
AASCU100 A/B

1227 S. PATRICK DRIVE
SATELLITE BEACH, FL.

0300-4240-700

PRINTED IN USA
7-81

INDEX

THEORY OF OPERATION

The Regency ACU100 Series is a series of UHF power amplifiers in the UHF (450-512 MHz) communications band with band splits from 450-476 MHz, designated A and from 470-512 MHz, designated B. The series is capable of amplifying an input power level of 0.5W to more than 100W. The ACU100A/B is designed for use with the MCCU01RA/B and MCCU01DA/B rack mount UHF transceiver. The AASCU100A/B has an antenna switch for simplex operation and is intended to be used with the MCCU01A/B rack mount UHF transceivers. A circuit description will follow. The first three stages Q101, Q102 and Q103 are located on the driver board. The final stage, consisting of Q201 and Q202 operating in parallel, are found on the 100W PA Board.

The predriver (Q101) is a class C amplifier in the frequency range 450-512 MHz. It amplifies a 0.5W signal from the exciter to 3.0W with a DC collector current of 0.5A. The input match circuit consists of C101, C102 and the microstrip between them. The output of Q101 is matched to the input of amplifier Q102 with C107, C112 and the microstrip between them.

Amplifier Q102 is a class C amplifier in the frequency range 450-512 MHz. It amplifies the 3.0W output of Q101 to 15W with a DC collector current of 1.5A. The output of Q102 is matched to the input of amplifier Q103 with C111, C113, C114, C115 and the microstrip between them.

Amplifier Q103 is a class C amplifier in the 450-512 MHz frequency range. It amplifies the 15W output of Q102 to 45W with a DC collector current of 7A. The output of Q103 is matched to the parallel input impedance of Q201 and Q202 by C118, C137, the coaxial cable, C201-C208 and the microstrip line.

The final amplifier stage, Q201 and Q202, is capable of amplifying 45W to over 100W in the 450-512 MHz frequency range. The final amplifier stage is matched to 50 ohms with C209-C214 and the microstrip lines.

The final devices Q201 and Q202 are protected from a short or open circuit at the output of the ACU100 by a VSWR detection circuit which controls the amount of drive to the ACU100 and thus its power output. Q105 controls the VSWR voltage feedback to the final device in the exciter. With a good match on the output both Q104 and Q105 are saturated and the VSWR voltage and exciter drive are both maximums. When the microstrip directional coupler senses sufficient reflected power at the output, both Q104 and Q105 come out of saturation, the power output is reduced.

The antenna switch (AASCU100A/B only) isolates the receiver from the transmitter and switches the antenna between the transmitter output and the receiver input. In the transmit mode keyed 13.6 biases both CR101 and CR102 on thus providing an RF path from the transmitter to the antenna and shorting the receiver input. In receive mode both CR101 and CR102 have no bias and act as open circuits.

A low pass filter attenuates the higher order carrier harmonics to at least 63dB below the carrier. The filter components are C127, L111 and C128.

Tuning Procedure

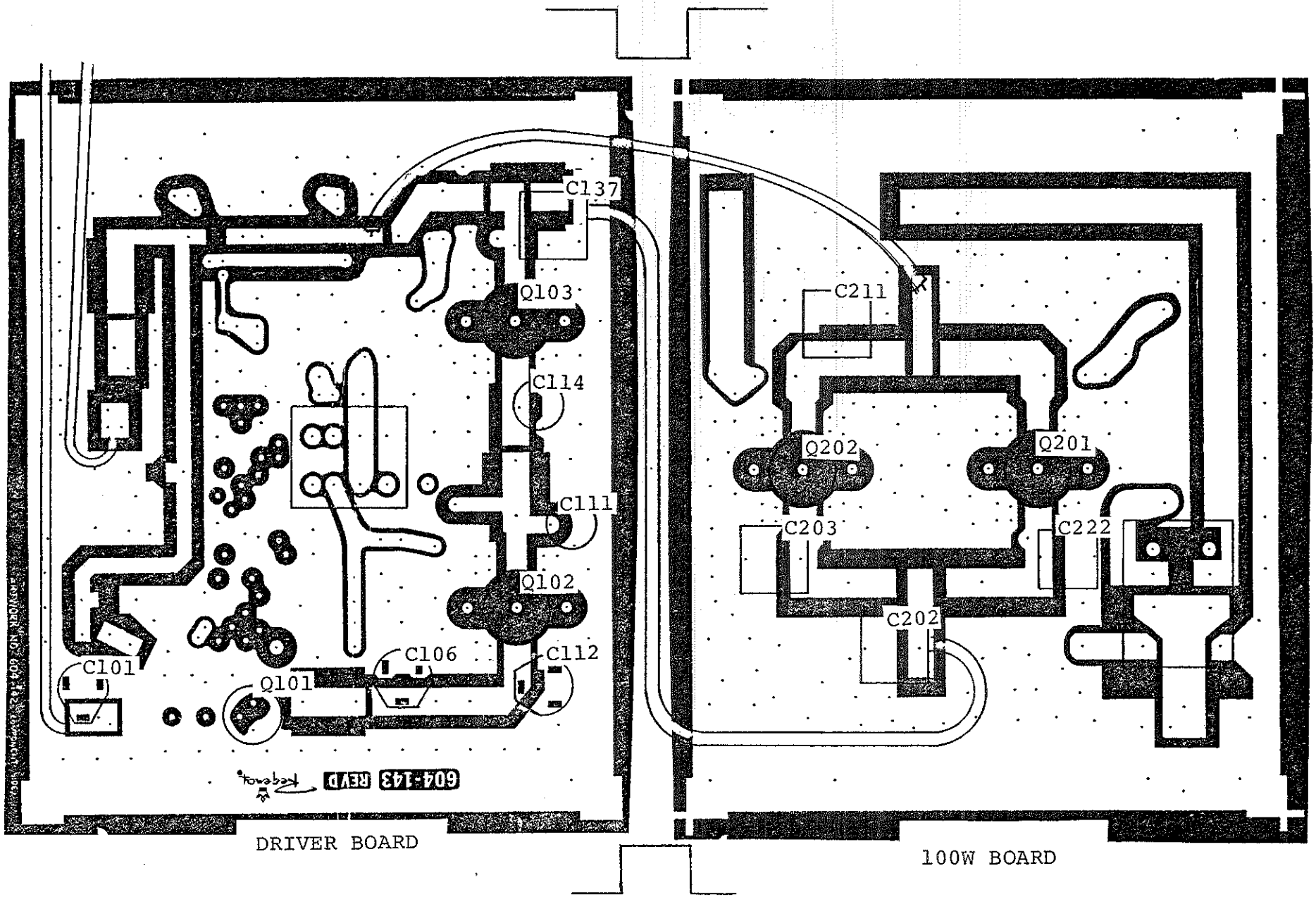
1. The following preset conditions are recommended on the variable capacitors.

Minimum capacitance	C222, C223
1/2 maximum capacitance	C101, C112, C202, C211
3/4 maxmium capacitance	C114

2. Tune the exciter as given in the instructions of the appropriate service manual for at least 0.5W. Place a wattmeter between the output of the exciter and the input to the power amplifier. Tune C101 for minimum reflected power.
3. While monitoring the RF power output of the ACU100, first tune C114 for maximum power. Second tune C202, then C211, C112, C222 and C223 for maximum power out.
4. Measure the supply voltage of each power supply at its power amplifier input and adjust the voltage if not 13.6 VDC +0.2V while transmitting.
5. Monitor the DC voltages across R202 and R203. If the voltages are not within 0.05 VDC of each other retune C202, C211, C222 and C223. If either voltage exceeds 0.4 VDC tune C211 so 0.4 VDC is not exceeded.
6. When operating under rules limiting maximum output power to 110W, tune C211 toward maximum capacitance (for best efficiency) to 110W.
7. When operating under rules limiting maximum output power to 75W, set the power supply to Q201 and Q202 to 11 VDC. Tune C211 toward maximum capacitance (for best efficiency) to 75W.

TABLE OF PERFORMANCE LIMITS

STEP	PARAMETER	MIN	TYP	MAX	UNITS
3	RF power	100	125	140	W
5	Voltage R202, R203		0.3	0.4	VDC



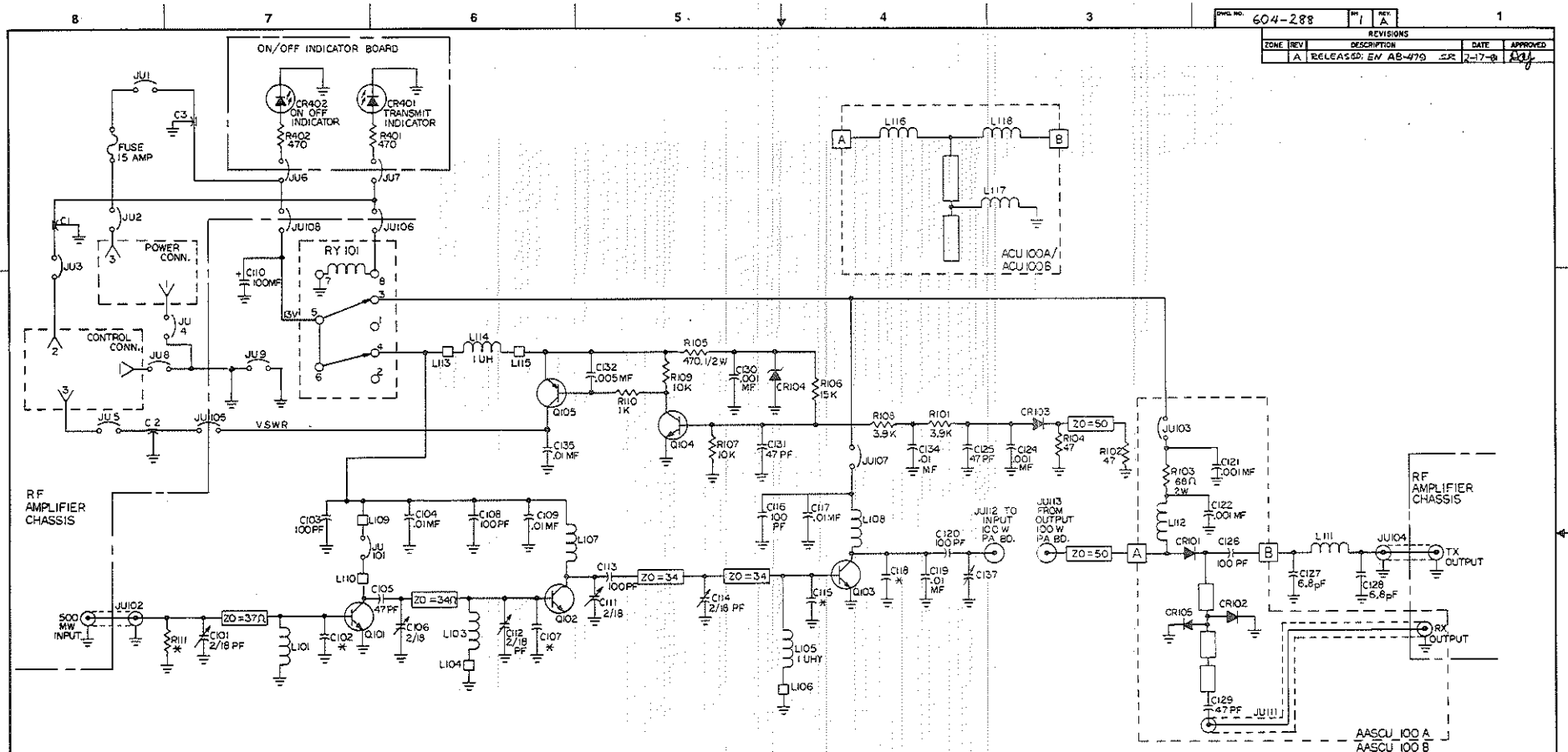
TUNING CAPACITOR LOCATIONS

SPECIFICATIONS

Frequency Range	450 - 512 MHz 2 bands
Operating Temp	-30°C to +60°C
Size (W-D-H)	17" x 4½" x 20" rack mounted
Weight	22.0 lbs.
Power	13.6 VDC
Current drain	@ 13.6 VDC
Transmit	28A
Antenna	50 ohms

TRANSMITTER

Pwr Output @ continuous key	100W
DC power into final	200W
Spur & harm conducted	-63dB max
Spur & harm radiated	-63dB max
Operating bandwidth	±5 MHz
Trans carrier attack	EIA 100ms max



MODEL	C102	C107	C115	C118	R111
ACU 100A	10 PF	40 PF	40	40	100
ACU 100B	6.8 PF	33 PF	33	33	330
ASSCU 100A	10 PF	40 PF	40	40	100
ASSCU 100B	6.8	33 PF	33	33	330

REFERENCE DESIGNATION	
LAST USED	NOT USED
R111	
C137	C136
L118	L102
RY101	
Q105	
CR104	
JU113	
JU9	

NOTES
1. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE IN OHMS. 1/4W.
2. ⌒ DENOTES SOLDER IN JUMPERS.
   ——— DENOTES BOARD BOUNDARIES.
3. - - - - - - - DENOTES OPTION VARIATION.

DWG NO. 604-288 SH 1 REV A

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	RELEASED: EN AB-479 SR	2-17-81	

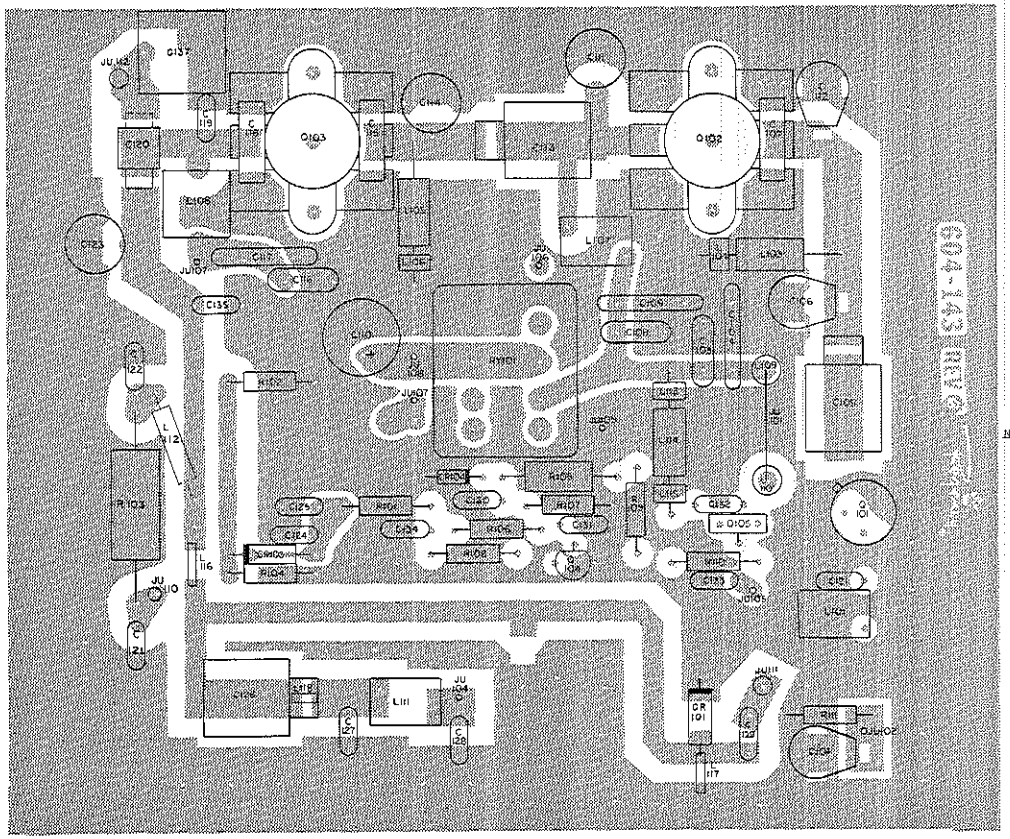
		APPROVALS	DATE
		DRAWN SR	1-21
		CHECKED	
		OPTICAL SUPV	
		ENGR	
		MATERIAL	
	ASSCU-100	FINISH	
	ACU-100		
NEXT ASSY	USED ON		
APPLICATION	DO NOT SCALE DRAWING		

COMMUNICATIONS INC. SATELLITE BEACH, FLORIDA 32937

SCHEMATIC
ACU-100/AASCU-100 DRIVER BD.

SIZE D PART NUMBER 604-288 REV A

SCALE NONE SHEET 1 OF 1



REDUCE TO 5.250 ±.003

NOTE
DASHED COMPONENTS INDICATE ACU-1000 APPLICATION.

ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	RELEASE E-171	6-20-79	
	B	EN AA-845	8-14-79	
	C	EN AA-954	11-9-80	
	D	EN AB-150	6-25-80	
	E	EN AB-694	4-7-81	
	F	EN AB-742 DCO 4-21-81	4-28-81	

APPLICATION	USED ON	NEXT ASSY
ACU-1000	ACU-45	

DO NOT SCALE DWG.

APPROVALS / DATE

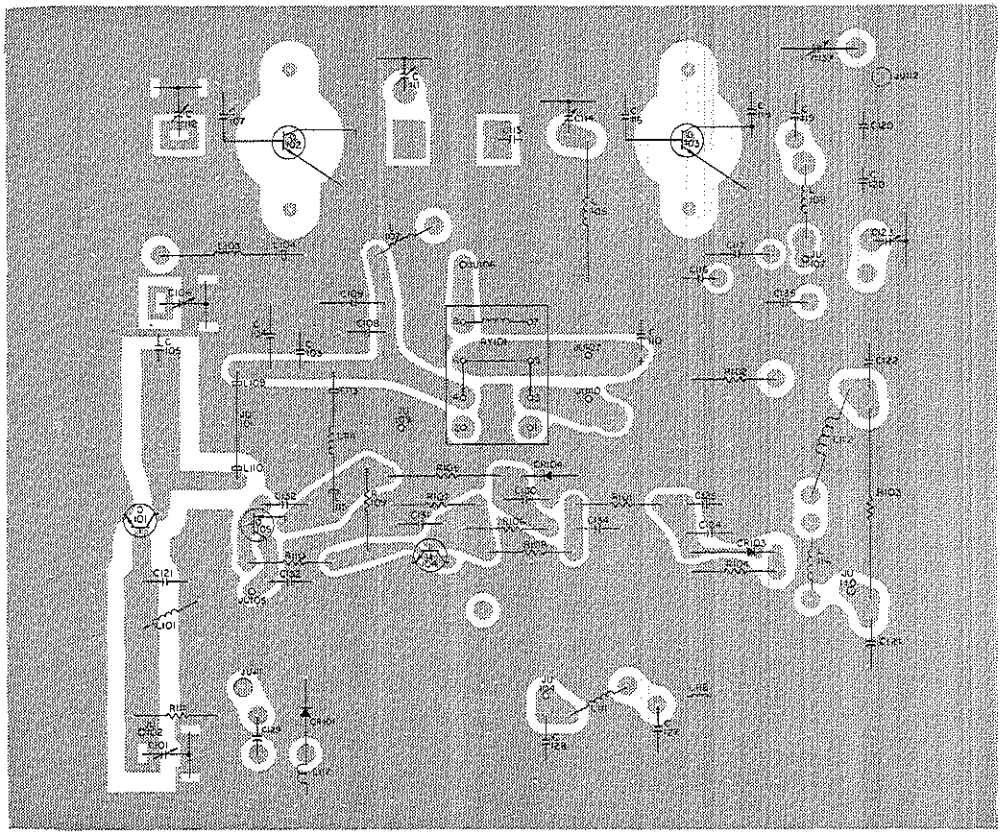
COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

PARTS PLACEMENT
ACU-45 PA BD

SIZE D | PART NUMBER 604-160 | REV F

SCALE 4/1 | SHEET 1 OF 1

REDUCE TO 5.250 ±.003



REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	RELEASE R-171	6-21-79	[illegible]
	B	EN AA-845	8-14-79	[illegible]
	C	EN AA-934 CJR 1-80	1-9-80	[illegible]
	D	EN AB-150 CJR 3-80	6-25-80	[illegible]
	E	EN AB-694 JDJ 4-1-81	4-7-81	[illegible]
	F	EN AB-743 DCD 4-21-81	4-21-81	[illegible]

			APPROVALS	DATE
			DRAWN	
			CHECKED	
			ENG APPR.	
	ACU-100		MFG APPR.	
NEXT ASSY	ACU-45			
APPLICATION	USED ON	DO NOT SCALE DWG.		

COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

PARTS OVERLAY
ACU-45 PA. BD.

SIZE D | PART NUMBER 604-159 | REV F

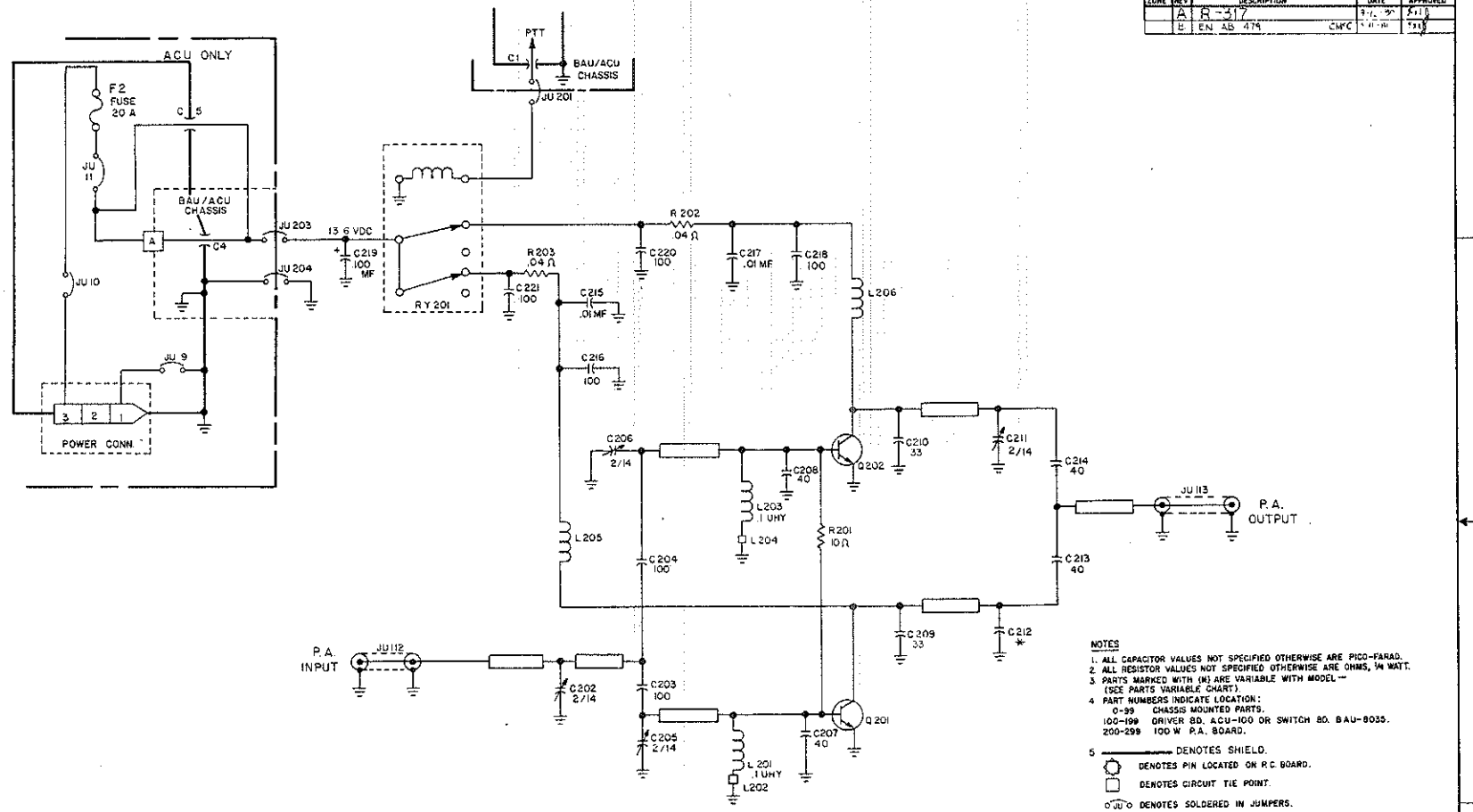
SCALE 4/1 | SHEET 1 OF 1

PARTS LIST - ACU100 DRIVER BOARD

MODELS ACU100A, ACU100B, AASCH100A, AASCU100B

LOCATION	DESCRIPTION	PART NUMBER	MODEL(S) UNIQUE TO
CAPACITORS			
C101	2.5-20pF Trim	1517-0000-034	
C102	10pF CD 10 NPO 500V	1500-0100-905	ACU100A,AASCU100A
C102	6.8pF CD 10 NPO 500V	1500-0689-905	ACU100B,AASCU100B
C103	100pF CD 10 500V	1500-0100-905	
C104	.01mF CD +8-2 500V	1503-0103-008	
C105	47pF Mica 10% T101	1522-0470-002	
C106	2.5-20pF Trim	1517-0000-034	
C107	40pF Mica	1522-5418-303	ACU100A,AASCU100A
C107	33pF Mica	1522-5418-304	ACU100B,AASCU100B
C108	100pF CD 10% 500V	1500-0101-905	
C109	.01mF CD +8-2 500V	1503-0103-008	
C110	100mF E 16V 85D	1513-0101-002	
C111	2-18pF Trim	1517-0000-041	
C112	2.5-20pF Trim	1517-0000-034	
C113	100pF Mica 10% %101	1522-0101-002	
C114	2-18pF Trim	1517-0000-041	
C115	40pF Mica	1522-5418-303	ACU100A,AASCU100A
C115	33pF Mica	1522-5418-304	ACU100B,AASCU100B
C116	100pF CD 10% 500V	1500-0101-905	
C117	.01mF CD +8-2 500V	1503-0103-008	
C118	40pF Mica	1522-5418-303	ACU100A,AASCU100A
C118	33pF Mica	1522-5418-304	ACU100B,AASCU100B
C119	.01mF CD 100V	1501-0103-010	
C120	100pF 5% 250V	1522-0101-007	
C121	.001mF CD +8-2 50V	1503-0102-003	AASCU100A,AASCU100B
C122	.001mF CD +8-2 50V	1503-0102-003	AASCU100A,AASCU100B
C123	not used		
C124	.001mF CD +8-2 50V	1503-0102-003	
C125	47pF RD 5% NPO 50V	1524-0470-002	
C126	100pF Mica 5% 250V	1522-0101-007	AASCU100A,AASCU100B
C127	6.8pF Mica	1522-0689-006	
C128	6.8pF Mica	1522-0689-006	
C129	47pF RD 5% NPO 50V	1524-0470-002	AASCU100A,AASCU100B
C130	.001mF CD +8-2 50V	1503-0102-003	
C131	47pF RD 5% NPO 50V	1524-0470-002	
C132	.005mF +8-2 50V	1503-0502-005	
C133	.01mF CD +8-2 50V	1503-0103-007	
C134	.01mF CD +8-2 50V	1503-0103-007	
C135	not used		
C136	not used		
C137	1.7-14pF Trim	1517-0000-045	
RESISTORS	(All resistors are ¼W 5% unless otherwise noted)		
R101	12K ohms	4704-0123-032	
R102	47 ohms comp ¼W 10%	5700-0470-042	
R103	68 ohms 2W	4700-0680-046	

LOCATION	DESCRIPTION	PART NUMBER	MODEL(S) UNIQUE TO
R104	47 ohms comp ¼W 10%	5700-0470-042	
R105	470 ohms ½W 10%	4701-0471-044	
R106	15K	4704-0153-032	
R107	10K ohms	4704-0103-032	
R108	3.9K	4704-0392-032	
R109	10K ohms	4704-0103-032	
R110	1K	4704-0102-032	
R111	100 ohms comp 10%	4700-0101-042	ACU100A,AASCU100A
R111	330 ohms comp 10%	4700-0330-042	ACU100B,AASCU100B
COILS, CHOKES			
L101	choke LM-2	1803-5125-902	
L102	not used		
L103	.1 uhy choke RF	1802-0108-008	
L104	ferrite bead	2502-0000-001	
L105	.1 uhy choke RF	1802-0108-008	
L106	ferrite bead	2502-0000-001	
L107	choke LM-2	1803-5125-902	
L108	.15 uhy choke RF	1803-3269-000	
L109	ferrite bead	2502-0000-001	
L110	ferrite bead	2502-0000-001	
L111	choke molded 1½ turns	1803-5125-907	
L112	choke 1 uH	1802-0010-008	AASCU100A,AASCU100B
L113	ferrite bead	2052-0000-001	
L114	10 uhy choke RF	1802-0010-008	
L115	ferrite bead	2502-0000-001	
L116	braid flat	6011-0000-002	ACU100A,ACU100B
L117	braid flat	6011-0000-002	ACU100A,ACU100B
L118	braid flat	6011-0000-002	ACU100A,ACU100B
DIODES			
CR101	diode pin UM9401	4815-3408-601	AASCU100A,AASCU100B
CR102	diode pin UM9484	4815-3408-600	AASCU100A,AASCU100B
CR103	diode sil IN4148	4805-1241-200	
CR104	diode Zener IN5231B	4804-0000-031	
CR105	diode pin UM9484	4815-3408-600	AASCU100A,AASCU100B
TRANSISTORS			
Q101	MRF 629	4804-3402-301	
Q102	MRF 641	4804-3269-803	
Q103	MRF 646	4804-3269-804	
Q104	SPS-951-1	4801-0000-016	
Q105	pwr PNP SJE 1608	4802-0000-003	
RELAY			
RY101	relay 12V	4500-32510900	



PARTS VARIABLE *

MODEL	C212		
AASCU100A / ACU 100A / BAU 8035A	15 pF		
AASCU100B / ACU 100B / BAU 8035B	10 pF		

REFERENCE DESIGNATION	
LAST USED	NOT USED
C220	C201
R 203	
L 206	
RY 201	
JU 11	JU 1-8
C5	C2, C3
JU 203	JU 202

NOTES
1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD.
2. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, ¼ WATT.
3. PARTS MARKED WITH (*) ARE VARIABLE WITH MODEL — (SEE PARTS VARIABLE CHART)
4. PART NUMBERS INDICATE LOCATION:
   0-99 CHASSIS MOUNTED PARTS.
   100-199 DRIVER BD. ACU-100 OR SWITCH BD. BAU-8035.
   200-299 100 W P.A. BOARD.
5. ——— DENOTES SHIELD.
   ○ DENOTES PIN LOCATED ON P.C. BOARD.
   □ DENOTES CIRCUIT TIE POINT.
   ○JU○ DENOTES SOLDERED IN JUMPERS.
   ○JU○ DENOTES HARDWIRE JUMPERS-USER SELECTED.
   ○JU○ DENOTES PLUGGED IN JUMPERS (OPTIONS).
   ——— DENOTES BOARD BOUNDARIES.
   - - - - DENOTES OPTION VARIATIONS.
6. THIS SCHEMATIC IS USED IN CONJUNCTION WITH P.C. BOARD 604-149, PARTS PLACEMENT 604-247, ARTWORK 604-148.

DWG NO. 604-150 SH 1 REV S

ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	R-317		
	B	EN AB 479 CMPC		

APPROVALS	DATE
DRAWN CLP	5-12-80
CHECKED	
ENGR APPR	
MFG APPR	
QUAL	

COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

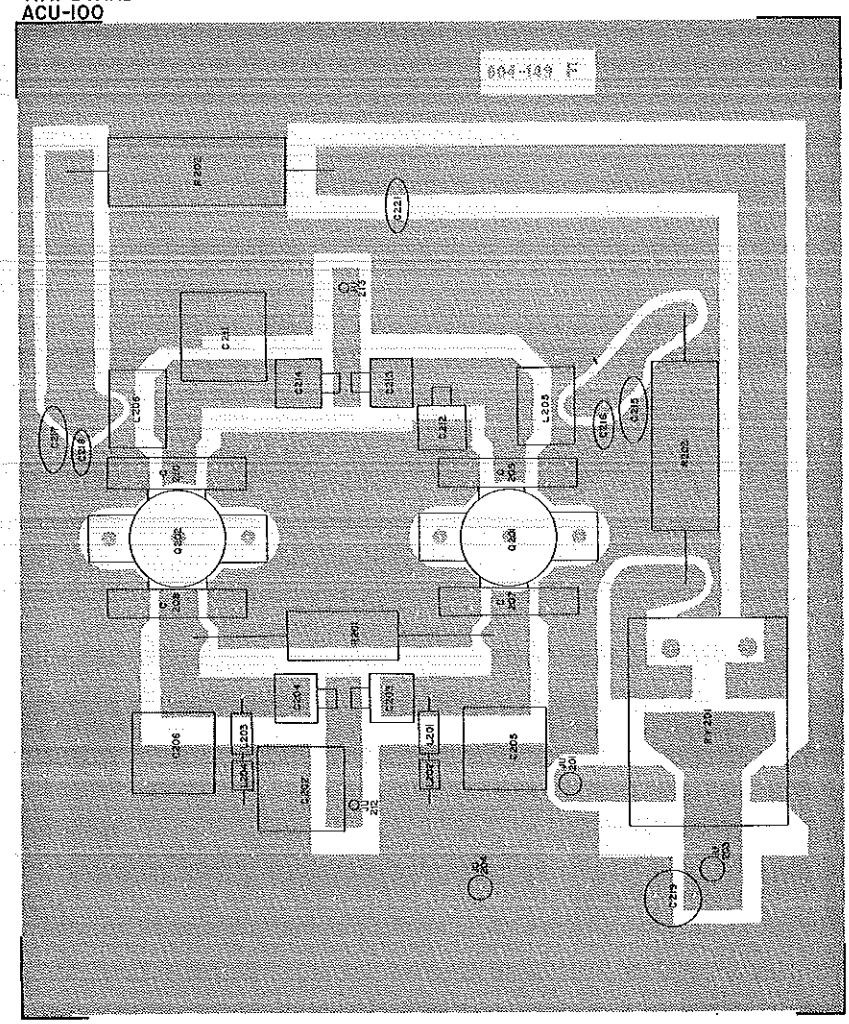
SCHEMATIC BAU/ACU100 P.A.

SIZE D | PART NUMBER 604-150 | REV S

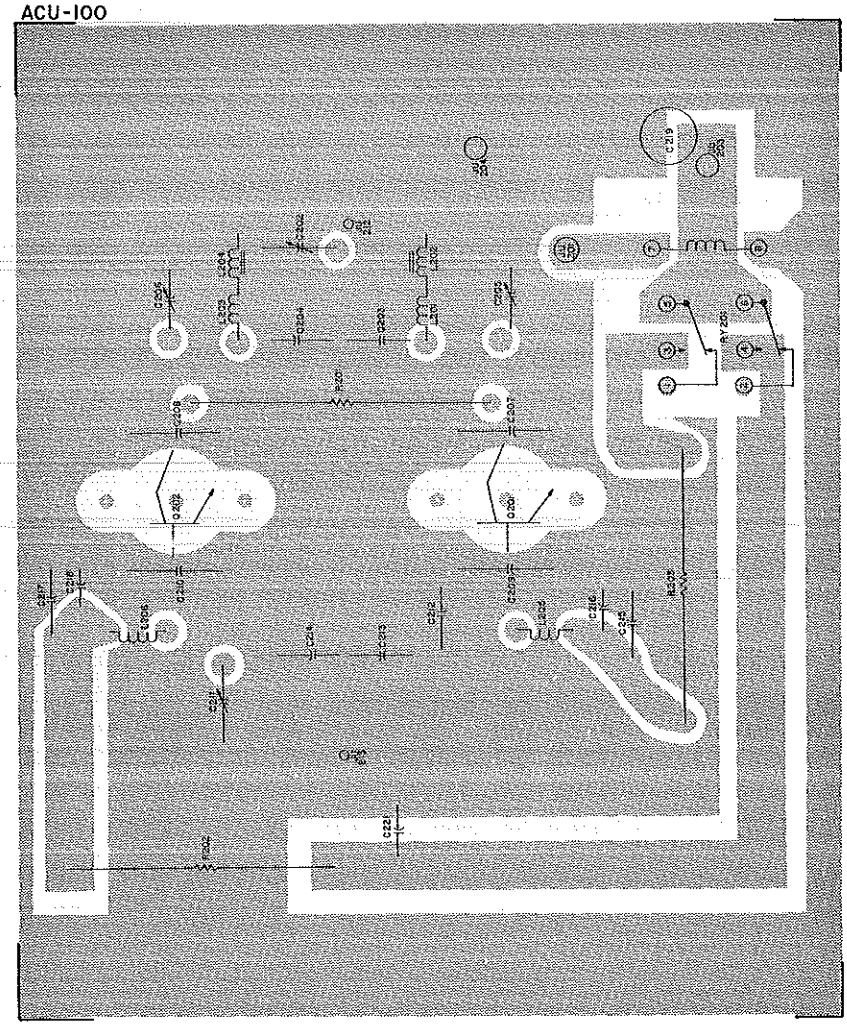
SCALE NONE | SHEET 1 OF 1

NEXT ASSY	USED ON
	BAU 8035 A, B
	AASCU 100 A, B
	ACU100 A, B
APPLICATION	DO NOT SCALE DWG

P.A. BOARD
ACU-100



P. A. BOARD
ACU-100



PARTS LIST - 100W P. A. BOARD

LOCATION	DESCRIPTION	PART NUMBER	
CAPACITORS			
C201	not used		
C202	1.7 - 14pF Trim	1517-0000-045	
C203	100pf Mica	1522-0101-007	
C204	100pF Mica	1522-0101-007	
C205	1.7 - 14pF Trim	1517-0000-045	
C206	1.7 - 14pF Trim	1517-0000-045	
C207	40pF Mica bracket	1522-5418-303	
C208	40pF Mica bracket	1522-5418-303	
C209	33pF Mica bracket	1522-5418-304	
C210	33pF Mica bracket	1522-5418-304	
C211	1.7 - 14pF Trim	1517-0000-045	
C212	15pF Mica	1522-0150-006	Range A
C212	10pF Mica	1522-0100-006	Range B
C213	40pF Mica	1522-0400-006	
C214	40pF Mica	1522-0400-006	
C215	.01mF CD 500V	1503-0103-008	
C216	100pF CD 500V	1500-0101-905	
C217	.01mF CD 500V	1503-0103-008	
C218	100pF CD 500V	1500-0101-905	
C219	100mF E 16V	1513-0101-002	
C220	100pF CD 500V	1500-0101=905	
RESISTORS (All resistors are 10% unless otherwise noted)			
R201	10 ohms 1W	4700-0100-045	
R202	.04 ohms 5W	4707-0048-043	
R203	.04 ohms 5W	4707-0048-043	
COILS			
L201	.1 uhy choke RF	1802-0108-008	
L202	ferrite bead	2502-0000-001	
L203	.1 uhy choke RF	1802-0108-008	
L204	ferrite bead	2502-0000-001	
L205	.15 uhy choke RF	1803-3269-000	
L206	.15 uhy choke RF	1803-3269-000	
TRANSISTORS			
Q201	MRF 648	4804-3269-805	
Q202	MRF 648	4804-3269-805	
RY201	relay 12V	4500-3269-100	