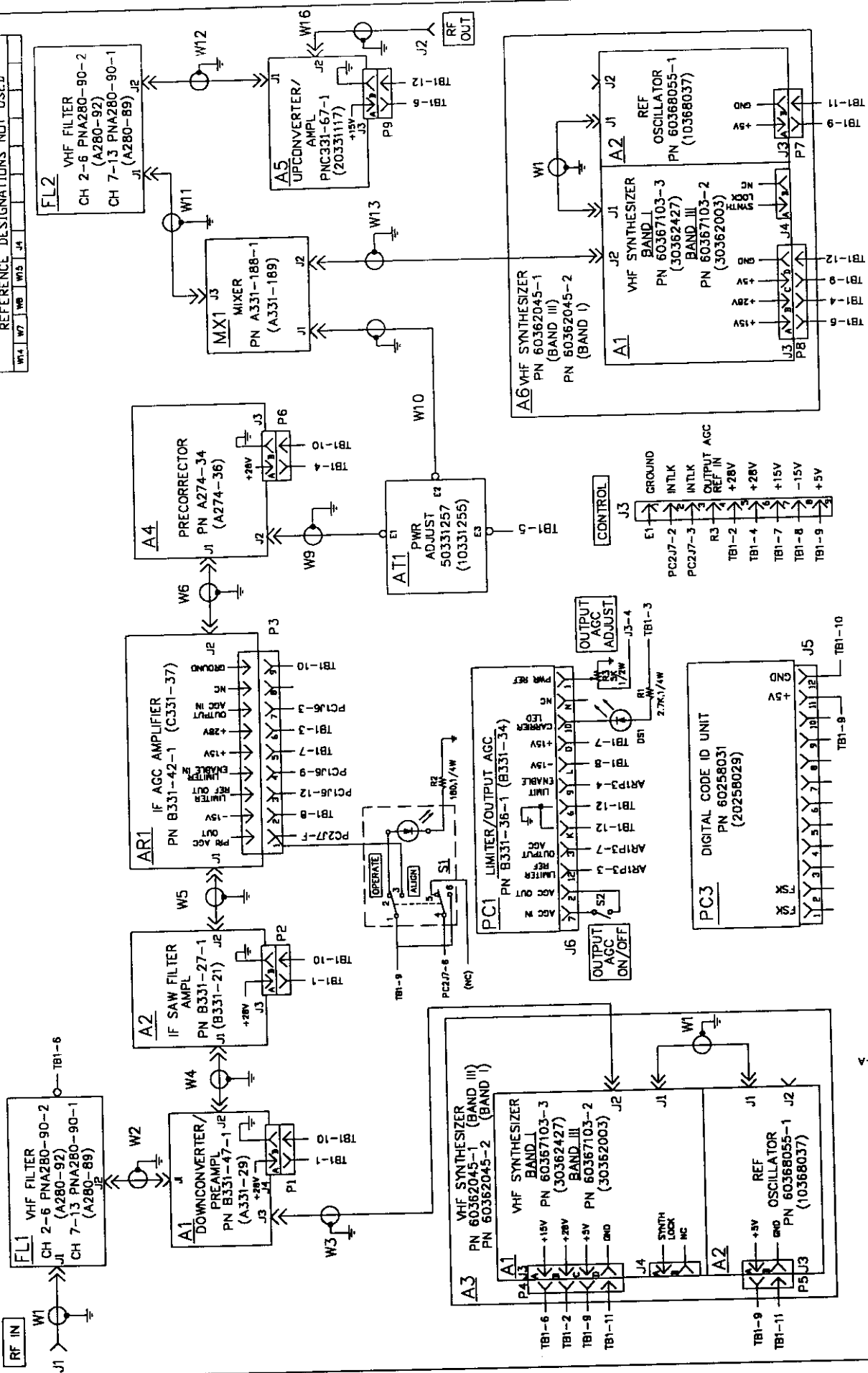


TVIE

SECTION V

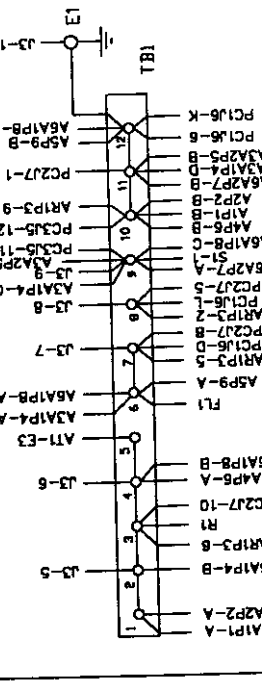
SCHEMATIC DIAGRAMS

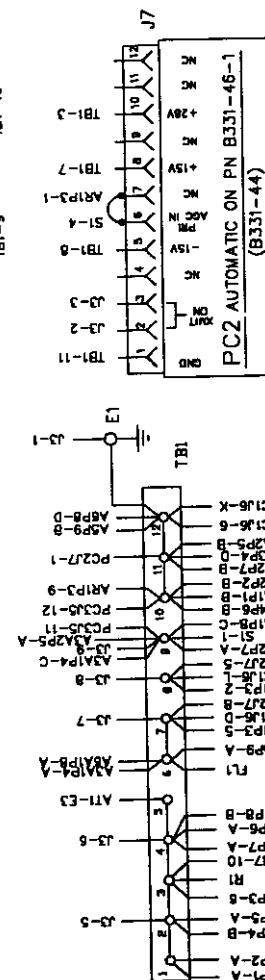
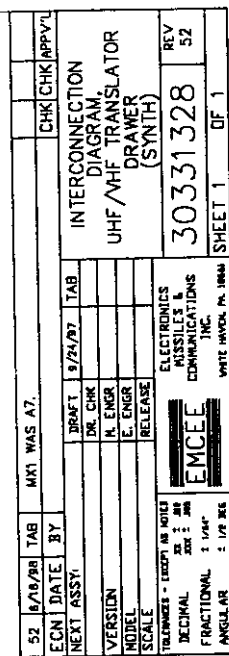
HIGHEST REFERENCE DESIGNATIONS											
FL2	A1	A6	MX1	PC3	R3	TB1	J7	W16	P9	DS1	J52
REFERENCE DESIGNATIONS NOT USED											
W14	W7	W8	W15	J4							

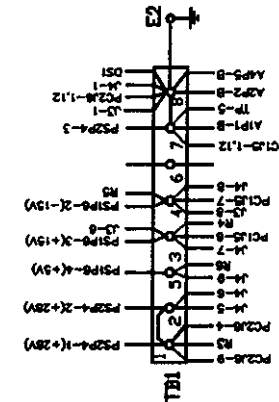
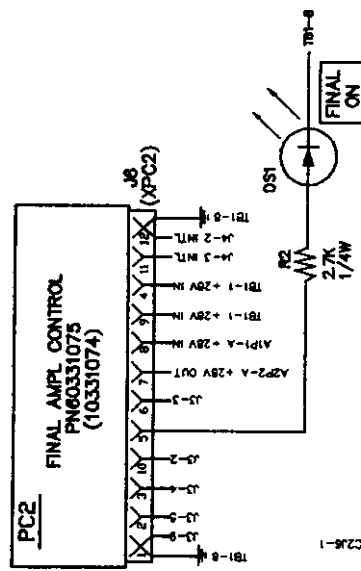
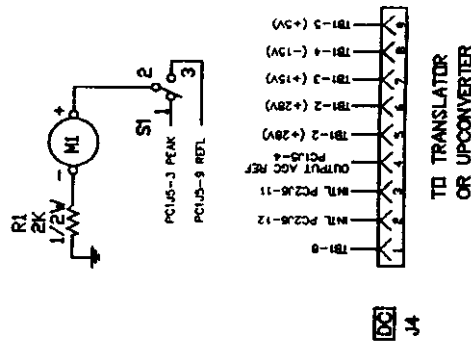
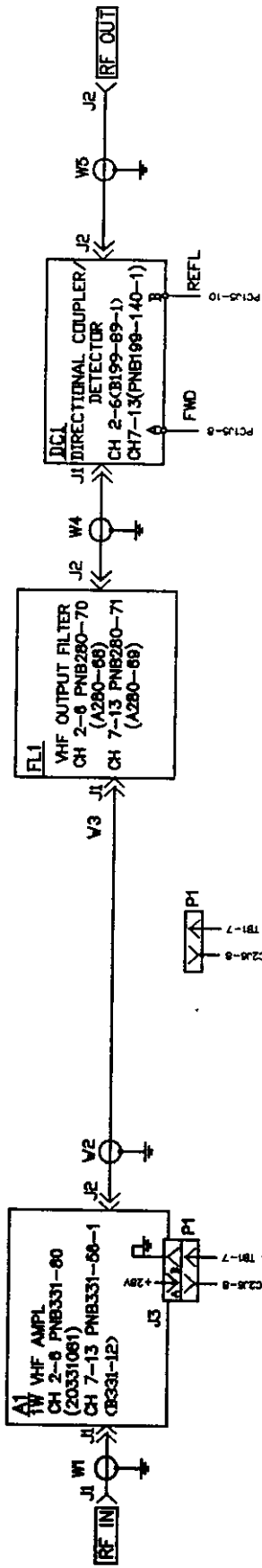


52	8/10/98	TAB	MX1 WAS A7	CHK	CHK	APPV
ECN	DATE	BY				
INTERCONNECTION DIAGRAM, VHF/VHF TRANSMITTER (SYNTH)						
DRFT	9/23/97	TAB				
DR. CHK	9/29/97	CTT				
M. ENGR						
E. ENGR						
RELEASE						
MODEL						
SCALE						
TELEPHONE						
DECIMAL						
FRACTIONAL						
ANGULAR						
EMCEE						
BROADCAST PRODUCTS INC.						
WHITE HAVEN, PA. 18463						
SHEET 1 OF 1						
REV 52						
30331324						

52	8/10/98	TAB	MX1 WAS A7	CHK	CHK	APPV
ECN	DATE	BY				
INTERCONNECTION DIAGRAM, VHF/VHF TRANSMITTER (SYNTH)						
DRFT	9/23/97	TAB				
DR. CHK	9/29/97	CTT				
M. ENGR						
E. ENGR						
RELEASE						
MODEL						
SCALE						
TELEPHONE						
DECIMAL						
FRACTIONAL						
ANGULAR						
EMCEE						
BROADCAST PRODUCTS INC.						
WHITE HAVEN, PA. 18463						
SHEET 1 OF 1						
REV 52						
30331324						





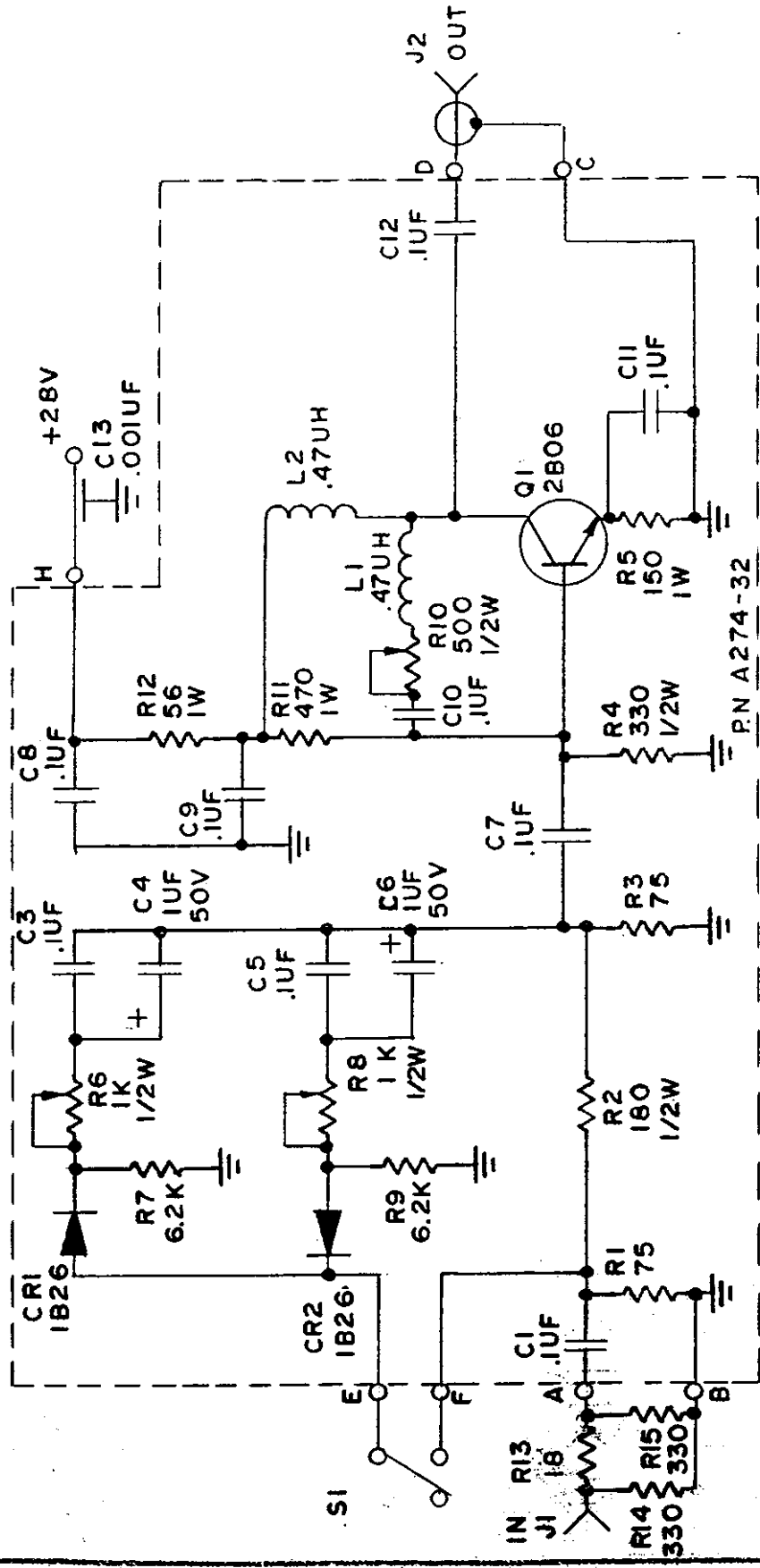


ECN	DATE	BY	CHK/CHK/APPV		
NEXT ASSY	7-28-68	GT			
VERSION	DR	CHK			
MODEL	E. ENGR				
SCALE	E. ENGR				
RELEASE					
TELEPHONE - KENNY AV OFFICE			ELECTRONICS		
DEC 2 1968			MISSILES &		
FRACTIONAL 5 1/4" X 1 1/4"			COMMUNICATIONS		
ANGULAR 5 1/4" X 1 1/4"			INC.		
			SHEET 1 OF 1		
			30331330		
			REV 51		
			INTERCONNECTION		
			DIAGRAM,		
			1 WATT VHF		
			AMPLIFIER		

INTERCONNECTION DIAGRAM, 1 WATT VHF AMPLIFIER											
ELECTRONICS & COMMUNICATIONS INC.											
30331330											
REV 51											
SHEET 1 OF 1											

TO POWER AMPL											
HIGHEST REFERENCE DESIGNATIONS											
REFERENCE DESIGNATIONS NOT USED											

**MODULE SCHEMATICS
ARE LISTED IN
ALPHANUMERICAL SEQUENCE**



PN A274-32

NOTES: UNLESS OTHERWISE SPECIFIED

- 1- ALL RESISTOR VALUES NOT MARKED ARE $\frac{1}{4}$ W, 5%. C13, J1 & J2 ARE NOT LOCATED ON PC BOARD.
- 2- COMPONENTS J1, R13, R14, R15, C13, J1 & J2 ARE NOT LOCATED ON PC BOARD.

REV	DATE	BY	CHK	APP'V'L
1	5-11-81	RB.B.		
2	5-15-81	RB.B.		
3	5-15-81	RB.B.		
4	5-15-81	RB.B.		
5	5-15-81	RB.B.		
6	5-15-81	RB.B.		
7	5-15-81	RB.B.		
8	5-15-81	RB.B.		
9	5-15-81	RB.B.		
10	5-15-81	RB.B.		
11	5-15-81	RB.B.		
12	5-15-81	RB.B.		
13	5-15-81	RB.B.		
14	5-15-81	RB.B.		
15	5-15-81	RB.B.		
16	5-15-81	RB.B.		
17	5-15-81	RB.B.		
18	5-15-81	RB.B.		
19	5-15-81	RB.B.		
20	5-15-81	RB.B.		

SCHEMATIC DIAGRAM
IF PRECORRECTOR

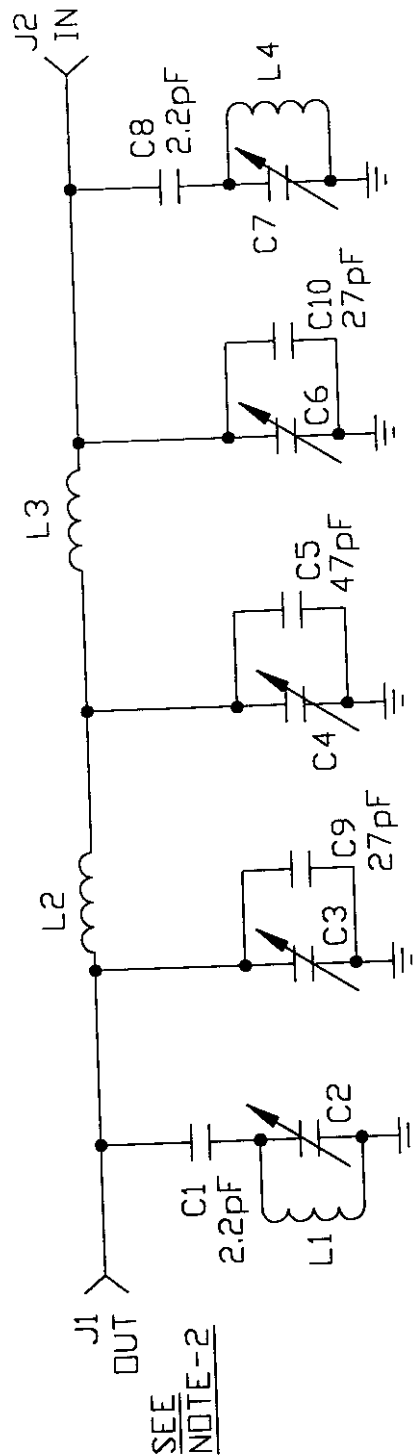
REV	DATE	BY	CHK	APP'V'L
1	5-11-81	RB.B.		
2	5-15-81	RB.B.		
3	5-15-81	RB.B.		
4	5-15-81	RB.B.		
5	5-15-81	RB.B.		
6	5-15-81	RB.B.		
7	5-15-81	RB.B.		
8	5-15-81	RB.B.		
9	5-15-81	RB.B.		
10	5-15-81	RB.B.		
11	5-15-81	RB.B.		
12	5-15-81	RB.B.		
13	5-15-81	RB.B.		
14	5-15-81	RB.B.		
15	5-15-81	RB.B.		
16	5-15-81	RB.B.		
17	5-15-81	RB.B.		
18	5-15-81	RB.B.		
19	5-15-81	RB.B.		
20	5-15-81	RB.B.		

101 FIGURES - EXCEPT AS NOTED
ORIGINAL - AX ±
FRACTIONAL - AX ±
ANGULAR - AX ±

ELECTRONICS
MISSILES &
COMMUNICATIONS

A 274-36

ISSUE E



NOTE :
 1-VARIABLE CAPACITORS C2, C3, C4, C6, & C7 ARE
 VALUED AT 2.2-21.5pF.
 2-CAPACITORS C1 & C8 ARE TYPICAL VALUES, BUT
 MAY BE CHANGED BY TEST DEPT.

1B	10-27-87	TAB	VALUE OF CAPACITORS IN NOTE-1 WAS 2.7-20.0pF	R.H.N.	R.H.N.
	7-15-82	W.J.H.	RECORD CHANGE NO ISSUE CHANGE REQ'D; REF ECN 5977	M.G.	M.H.G.
ECN	DATE	BY		CHK	CHK APPV'L

NEXT ASSY: P/L B280-70	DRAFT	4-28-78	C.T.T.
	DR. CHK	6-26-78	J.C.
VERSION	M. ENGR	9-27-78	G.B.
MODEL	E. ENGR		
SCALE NONE	RELEASE	11-1-78	J.F.T.

TOLERANCES - EXCEPT AS NOTED	
DECIMAL	XX $\pm$.010 XXX $\pm$.005
FRACTIONAL	$\pm$ 1/64"
ANGULAR	$\pm$ 1/2 DEG



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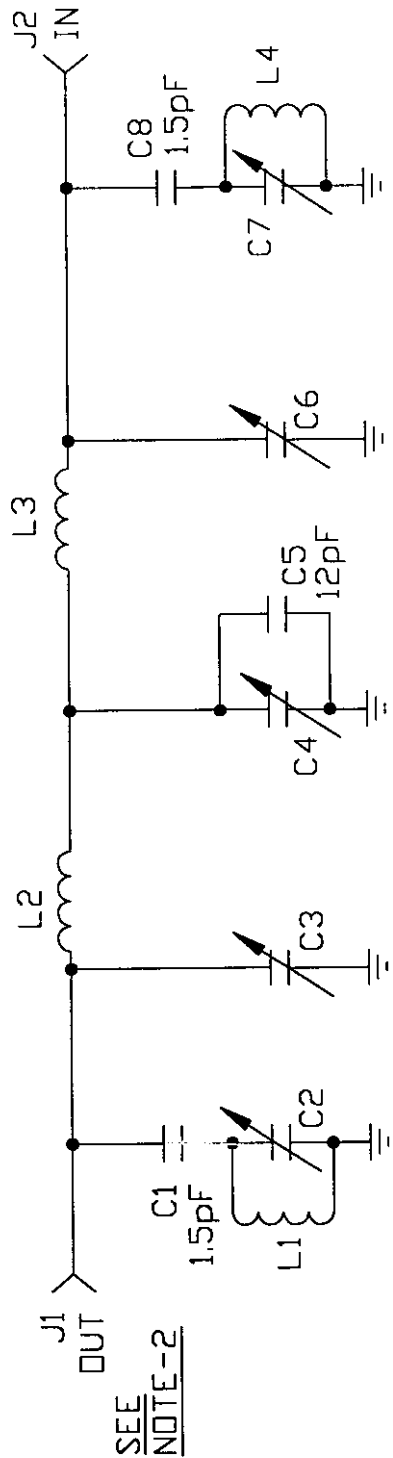
SCHEMATIC DIAGRAM,
 VHF OUTPUT FILTER
 LOW BAND (CH 2-6)

A280-68

REV 1B

SHEET 1 OF 1

CAD DWG 9-29-93

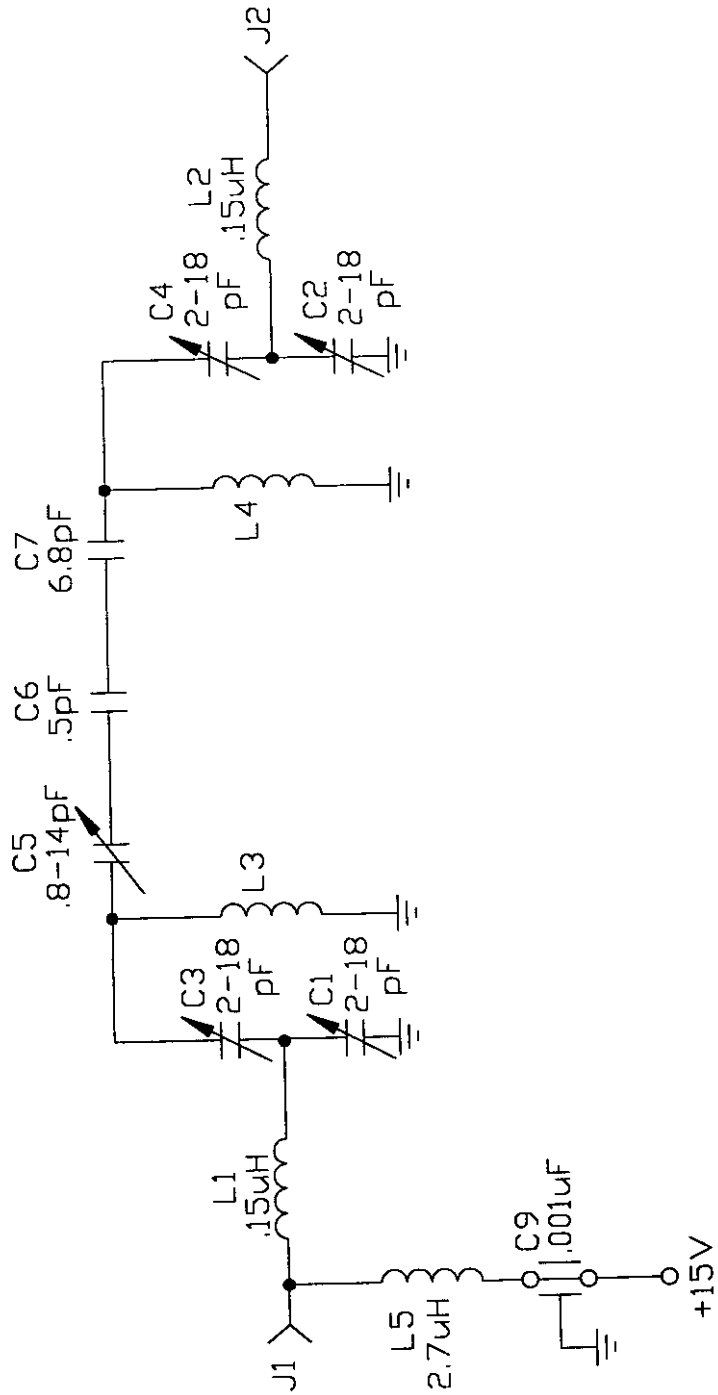


NOTE :
 1-VARIABLE CAPACITORS C2, C3, C4, C6, & C7 ARE
 VALUED AT 2.2-21.5pF.
 2-CAPACITORS C1 & C8 ARE TYPICAL VALUES, BUT
 MAY BE CHANGED BY TEST DEPT.

1B	10-27-87	TAB	VALUE OF CAPACITORS IN NOTE-1 WAS 2.7-20.0pF	R.H.N.	R.H.N.
	7-15-82	W.J.H.	RECORD CHANGE NO ISSUE CHANGE REQ'D; REF ECN 5977	M.G.	M.H.G.
ECN	DATE	BY		CHK	CHK APPV'L
NEXT ASSY:	P/L B280-71	DRAFT	4-28-78	C.T.T.	
VERSION		DR. CHK	6-26-78	J.C.	
MODEL		M. ENGR	9-27-78	G.B.	
SCALE	NONE	E. ENGR			
		RELEASE	11-1-78	J.F.T.	
TOLERANCES - EXCEPT AS NOTED					
DECIMAL	.XX ± .010				
FRACTIONAL	.XXX ± .005				
ANGULAR	± 1/64°				
			SCHEMATIC DIAGRAM, VHF OUTPUT FILTER HIGH BAND (CH 7-13)		
			A280-69		
			REV 1B		
			SHEET 1 OF 1		

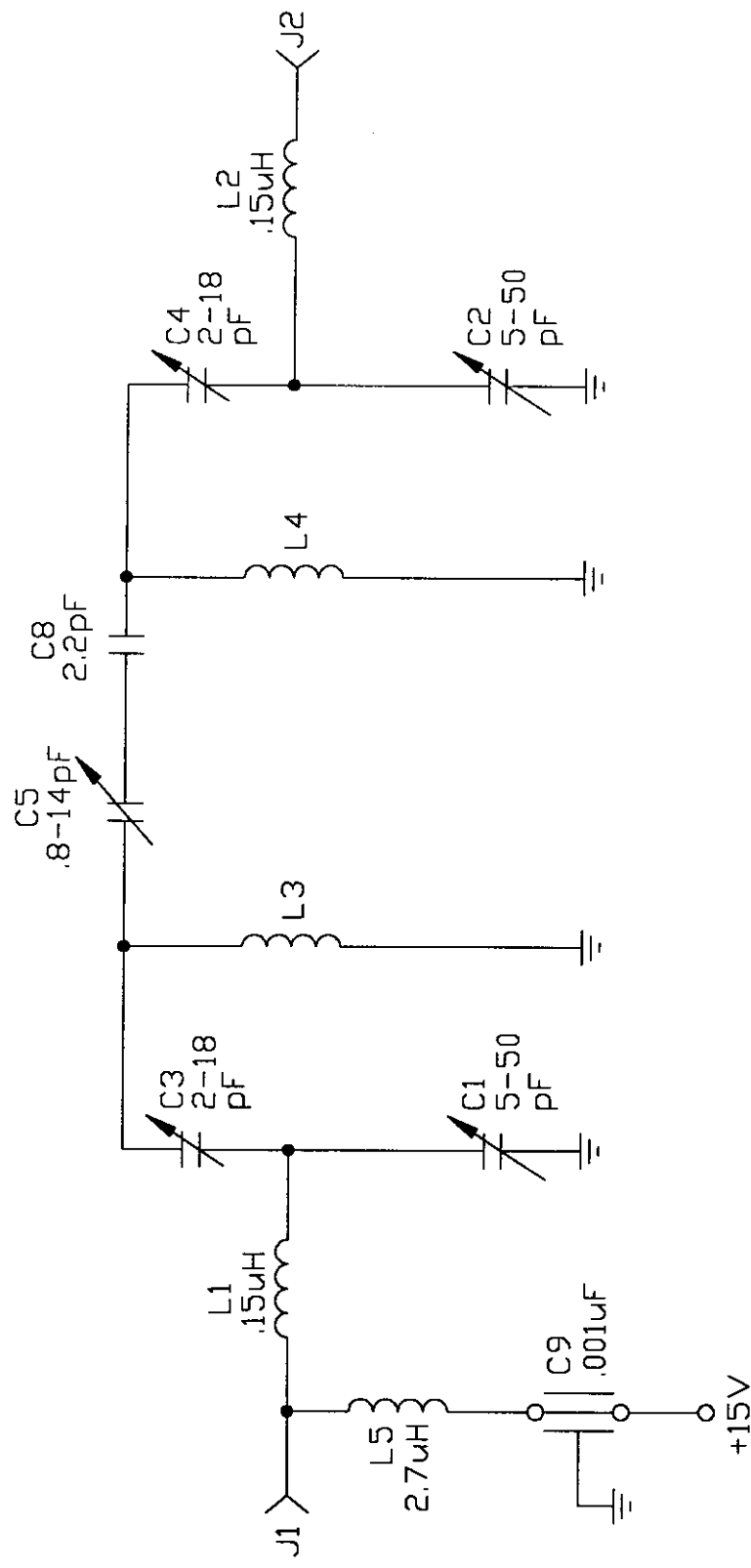
ELECTRONICS
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 COMMUNICATIONS
 INC.
 WHITE HAVEN, PA. 18661





ECN	DATE	BY	CHK		APPV'L
NEXT ASSY: P/L	A280-90-1	DRAFT	5-16-79	C.T.I.	
P/L	A280-91-1	DR. CHK	6-4-79	W.J.H.	
VERSION		M. ENGR			
MODEL		E. ENGR			
SCALE		RELEASE	6-26-79	G.B.	
TOLERANCES - EXCEPT AS NOTED					
DECIMAL	.XX	± .010			
FRACTIONAL	.XXX	± .005			
ANGULAR	± 1/64°				
			ELECTRONICS MISSILES & COMMUNICATIONS INC.		
			WHITE HAVEN, PA. 18661		
			SHEET 1 OF 1		
			A280-89		
			REV 1		

SCHEMATIC DIAGRAM,
VHF BANDPASS
FILTER (CH 7-13)



ECN	DATE	BY	CHK	CHK	APPV	L
NEXT ASSY: P/L A280-90						
P/L A280-91			DRAFT	5-16-79	C.T.T.	
VERSION			DR. CHK	6-4-79	W.J.H.	
MODEL			M. ENGR			
SCALE NONE			E. ENGR			
TOLERANCES - EXCEPT AS NOTED			RELEASE	9-3-93	R.H.N.	
DECIMAL			XX ± .010			
FRACTIONAL			XXX ± .005			
ANGULAR			± 1/64°			
			± 1/2 DEG			

SCHEMATIC DIAGRAM,
VHF BANDPASS
FILTER (CH 2-6)

A280-92

REV
1

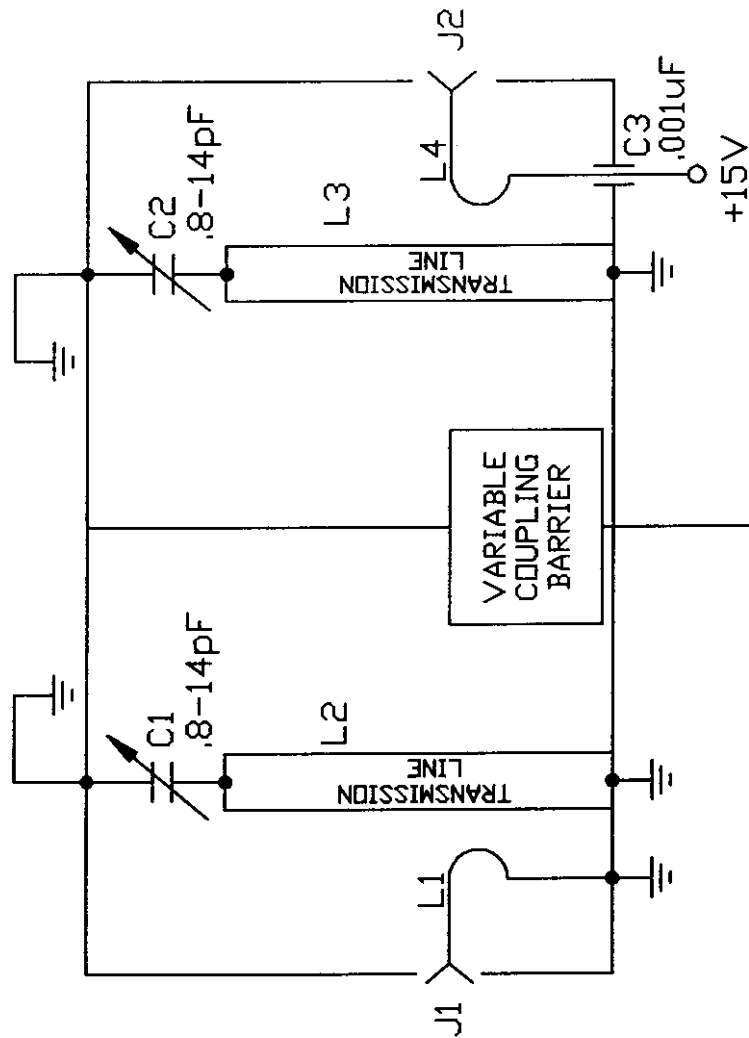
EMCEE

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MISSILES &
COMMUNICATIONS
INC.

WHITE HAVEN, PA. 18661

SHEET 1 OF 1

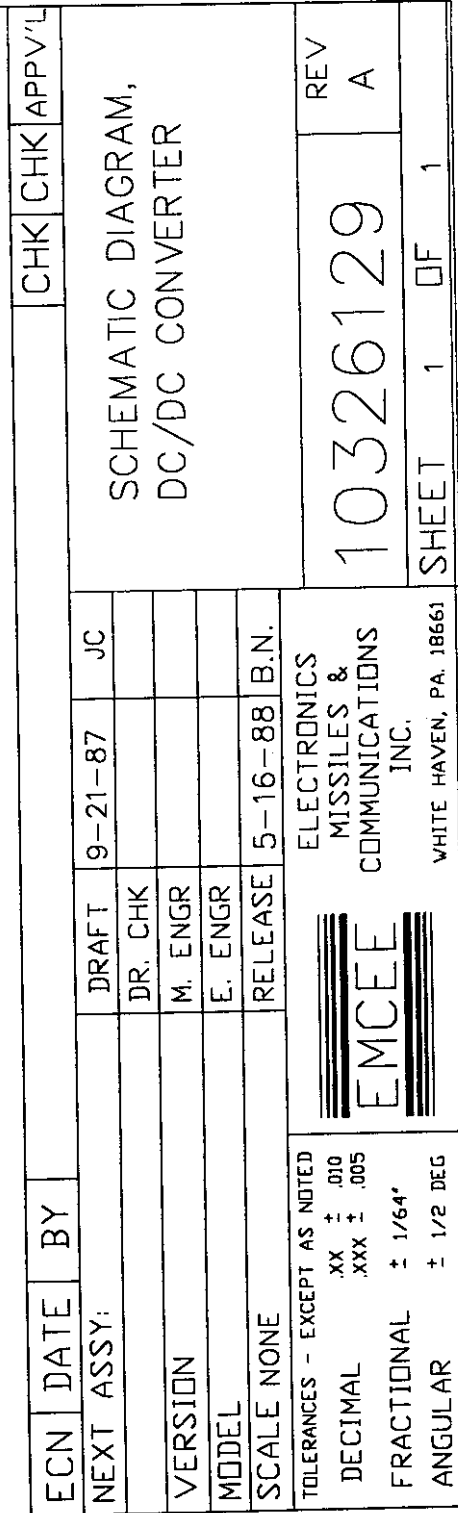
CAD DWG 9-29-93



B	12-29-89	T.B.	VALUES OF C1 & C2 WERE .8-10pf		C.T.T.	R.G.N.
ECN	DATE	BY			CHK	CHK APPV'L
NEXT ASSY: P/L B284-53			DRAFT	6-15-78	W.J.H.	
			DR. CHK	6-15-78	J.C.	
VERSION			M. ENGR	6-29-78	J.K.	
MODEL			E. ENGR			
SCALE			RELEASE	11-17-78	J.F.T.	
TOLERANCES - EXCEPT AS NOTED			ELECTRONICS MISSILES & COMMUNICATIONS INC.			
DECIMAL XX ± .010 XXX ± .005						
FRACTIONAL ± 1/64"						
ANGULAR ± 1/2 DEG						
			A284-6		REV B	
			SHEET 1		OF 1	

SCHMATIC DIAGRAM,
UHF BANDPASS
FILTER

WHITE HAVEN, PA. 18661

[illegible]

SCHEMATIC DIAGRAM, DC/DC CONVERTER

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INC.**

WHITE HAVEN, PA. 18661

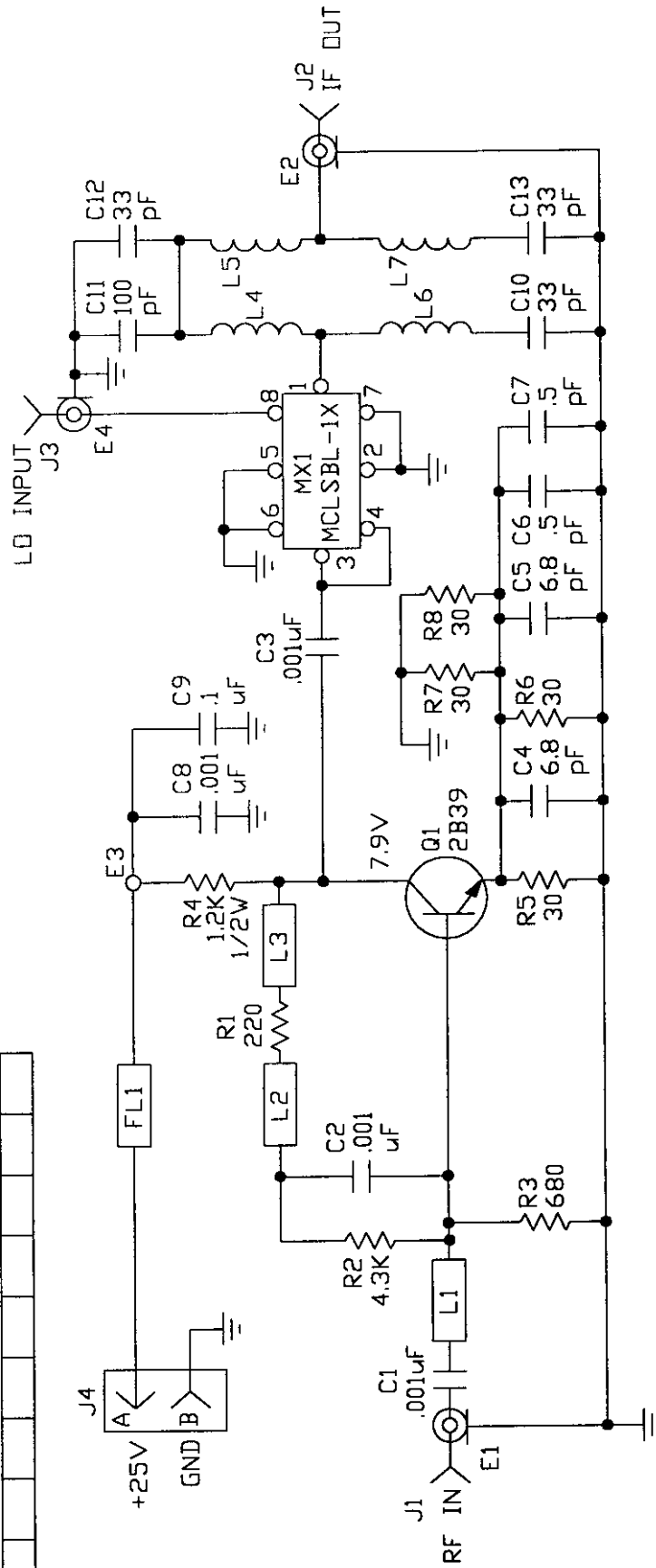
REV
A

10326129

SHEET 1 OF 1

HIGHEST REFERENCE DESIGNATIONS									
Q1	L3	FL1	R8	E4	MX1	L7	C13	J4	

REFERENCE DESIGNATIONS NOT USED									



NOTES UNLESS OTHERWISE SPECIFIED
 1-ALL RESISTORS VALUED AT 1/8W,
 5%.
 2-COMPONENTS J1,J2,J3,J4, AND FL1
 ARE NOT LOCATED ON PC BOARD.

B	12-29-89	TAB	ADDED J4 TO NOTE 2 ; ADDED 7.9V TO Q1	C.T.T.	R.G.N.
ECN	DATE	BY		CHK	CHK APPV'L
NEXT ASSY: P/L B331-30-1			DRAFT	9-7-84	C.T.T.
VERSION			DR. CHK		
MODEL			M. ENGR		
SCALE NONE			E. ENGR		
TOLERANCES - EXCEPT AS NOTED			RELEASE		
DECIMAL .xx ± .010			4-25-86		
FRACTIONAL .xxx ± .005			J.M.J		
ANGULAR ± 1/64°			4-25-86		
ANGULAR ± 1/2 DEG			J.M.J		



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 COMMUNICATIONS
 INC.

WHITE HAVEN, PA. 18661

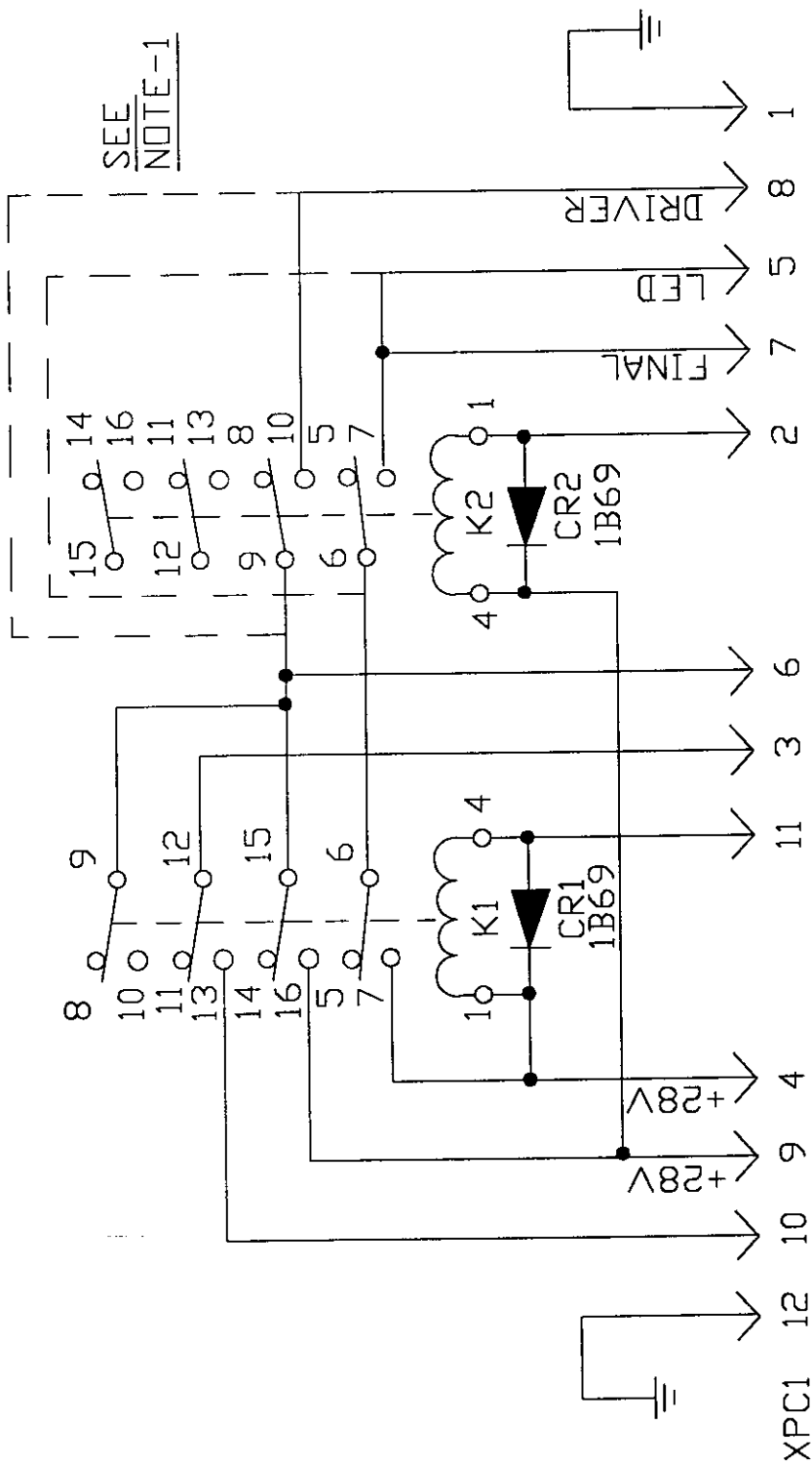
A 331-29

REV B

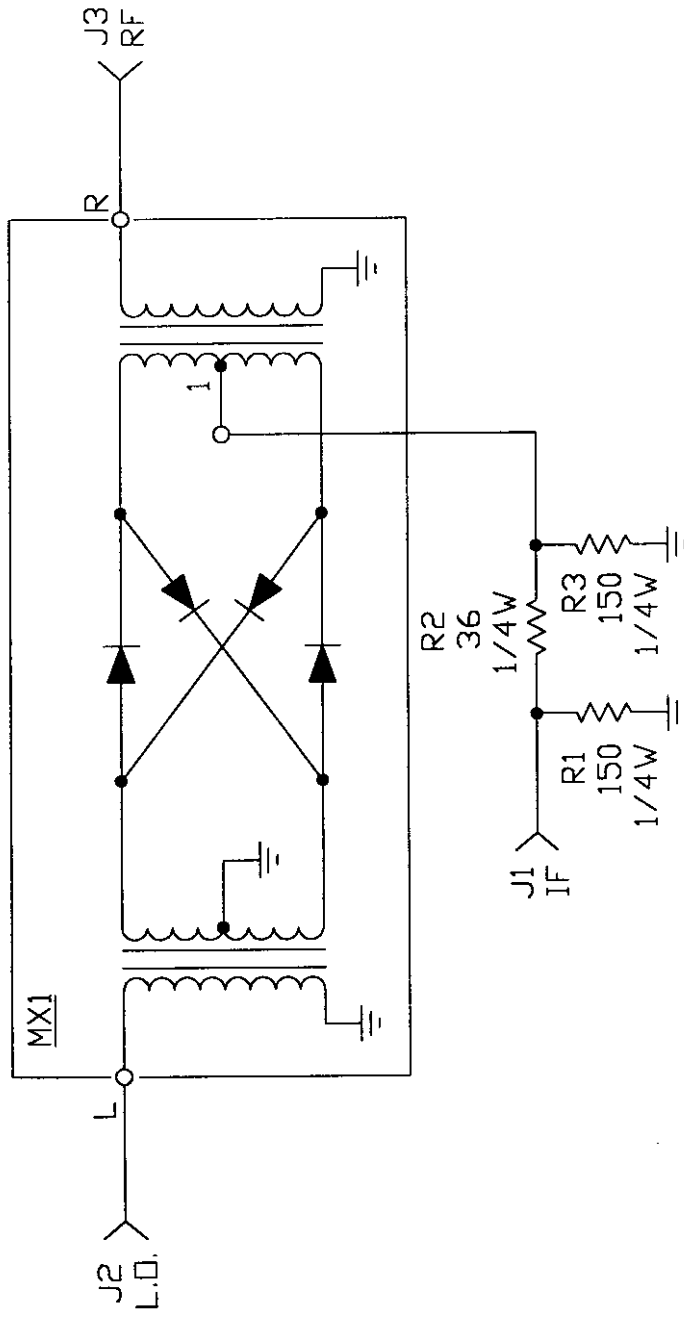
SHEET 1 OF 1

CAD DWG 7-14-94

1-WHEN NOT USING HIGHER POWER AMPL, RELAY K2 IS NOT REQ'D & JUMP PIN 6 TO PIN 7 AND PIN 9 TO PIN 10.



7065	7-6-89	T.M.	CHANGED NOTE-1 SEE ECN			CTT	RN
ECN	DATE	BY					
NEXT ASSY:			DRAFT	3-4-87	C.T.T	SCHEMATIC DIAGRAM, FINAL AMPL CONTROL	
VERSION			DR. CHK				
MODEL			M. ENGR				
SCALE			E. ENGR	8-21-87	R.N.		
			RELEASE	8-21-87	R.N.		
TOLERANCES - EXCEPT AS NOTED			ELECTRONICS MISSILES & COMMUNICATIONS INC.			REV B	
DECIMAL			.XX ± .010 .XXX ± .005			10331074	
FRACTIONAL			± 1/64"			SHEET 1 OF 1	
ANGULAR			± 1/2 DEG				



ECN	DATE	BY	CHK	CHK	APPV/L
NEXT ASSY: P/L	A331-188-1	DRAFT	5-26-87	W.J.H.	
VERSION		DR. CHK	7-7-87	C.T.T.	
MODEL		M. ENGR			
SCALE		E. ENGR			
TOLERANCES - EXCEPT AS NOTED		RELEASE	6-21-87	R.G.N.	
DECIMAL	XX ± .010 XXX ± .005				
FRACTIONAL	± 1/64"				
ANGULAR	± 1/2 DEG				
ELECTRONICS MISSILES & COMMUNICATIONS INC.					REV
EMCEE					A
WHITE HAVEN, PA. 18661					
SHEET 1					OF 1

SCHEMATIC DIAGRAM,
MIXER

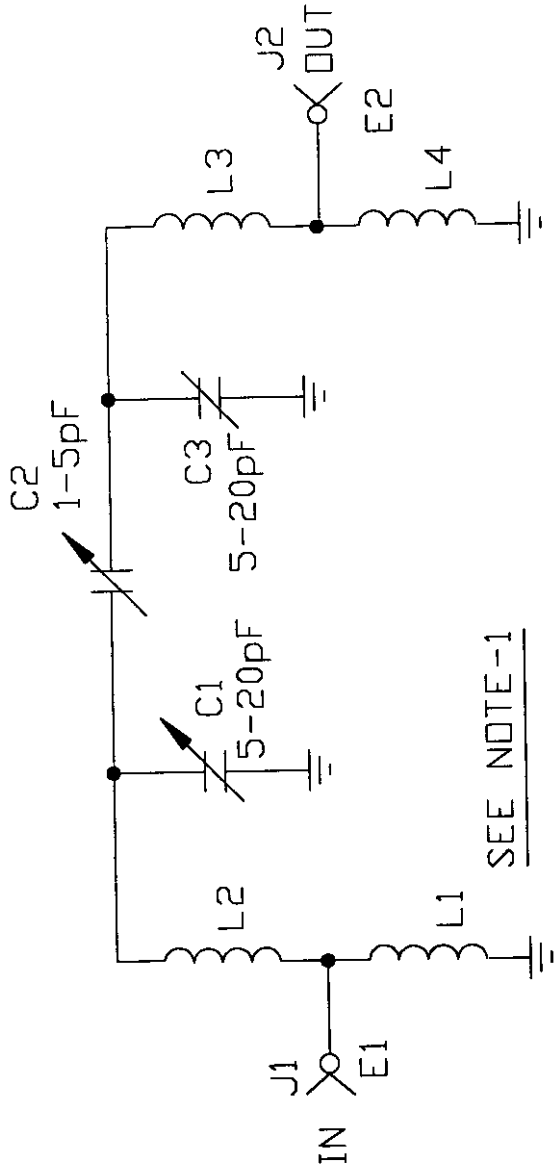
A331-189

DF 1

CAD DWG 6-6-94

HIGHEST REFERENCE DESIGNATIONS									
L4	C3	J2	E2						
REFERENCE DESIGNATIONS NOT USED									

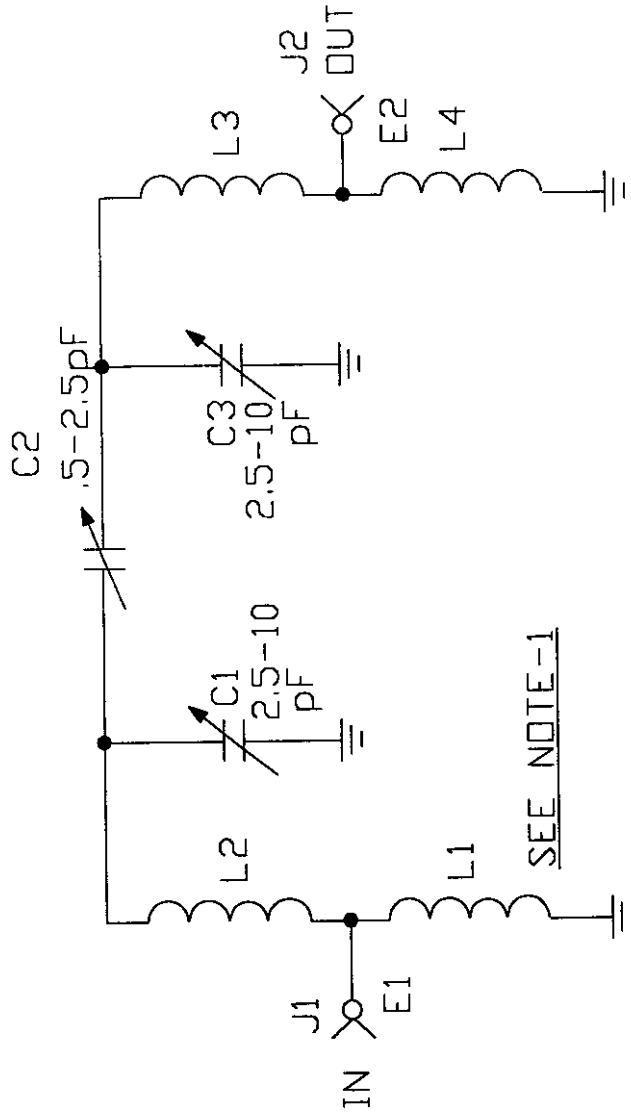
NOTES: UNLESS OTHERWISE SPECIFIED,
1-INDUCTORS L1,2,3,4 ARE TRANSMISSION
LINES.



A	7-11-89	C.T.T.	CHANGES CHANNELS FROM CH 46-69					R.N.
ECN	DATE	BY				CHK	CHK	APPV"L
NEXT ASSY:								
DRAFT			6-30-87	C.T.T.				
DR. CHK			7-16-87	W.H.				
M. ENGR			7-23-87	J.C.				
E. ENGR								
RELEASE			8-21-87	R.N.				
SCHEMATIC DIAGRAM, UHF L.D. BANDPASS FILTER (CH 14-40)								
TOLERANCES - EXCEPT AS NOTED DECIMAL XX ± .010 .XXX ± .005 FRACTIONAL ± 1/64" ANGULAR ± 1/2 DEG					ELECTRONICS MISSILES & COMMUNICATIONS INC. WHITE HAVEN, PA. 18661			
10331199					REV B			
SHEET 1					DF 1			

HIGHEST REFERENCE DESIGNATIONS									
L4	C3	J2	E2						
REFERENCE DESIGNATIONS NOT USED									

NOTES : UNLESS OTHERWISE SPECIFIED
1-INDUCTORS L1,2,3,4 ARE TRANSMISSION
LINES.

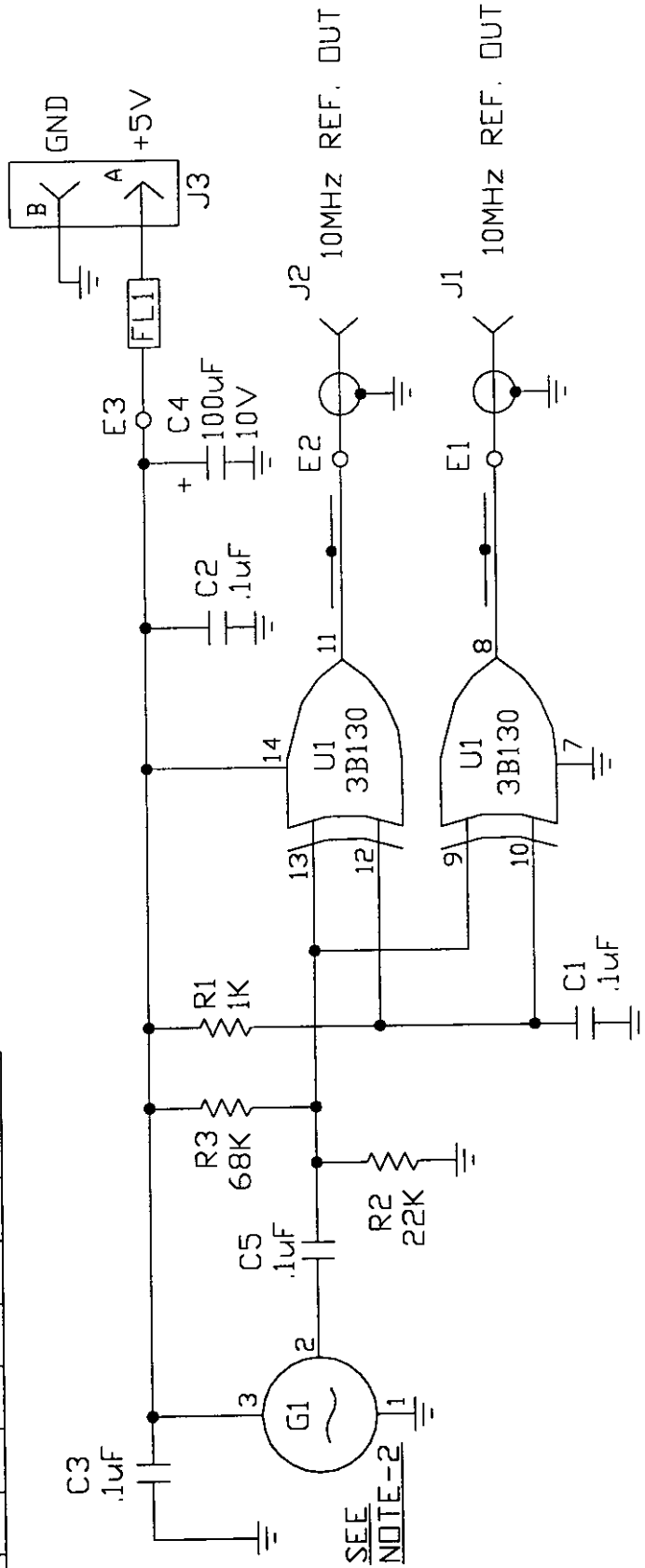


ECN	DATE	BY	RELEASED AT REV 52		CHK	CHK	APPV'L
NEXT ASSY:			DRAFT	4-8-88	C.I.T		
VERSION			DR. CHK				
MODEL			M. ENGR				
SCALE			E. ENGR				
TOLERANCES - EXCEPT AS NOTED			RELEASE	5-27-89	R.N.		
DECIMAL	.XX	± .010					
FRACTIONAL	.XXX	± .005					
ANGULAR	± 1/64°						
			ELECTRONICS MISSILES & COMMUNICATIONS INC.			REV 52	
			EMCEE			10331259	
			SCHEMATIC DIAGRAM, UHF L.O. BANDPASS FILTER (CH41-69)			SHEET 1 OF 1	

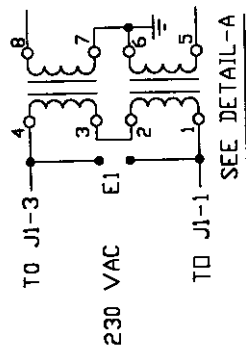
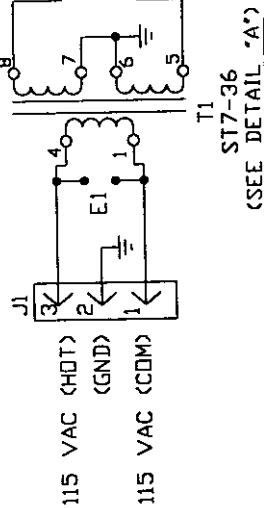
HIGHEST REFERENCE DESIGNATIONS									
C5	R3	U1	G1	E3	J3	FL1			
REFERENCE DESIGNATIONS NOT USED									

NOTES: UNLESS OTHERWISE SPECIFIED

- 1- COMPONENTS FL1 AND J1-J3 ARE NOT LOCATED ON BD ASSY.
- 2- FOR G1 (RTX0771AD), R2 IS 47K, C5 IS A 0 OHM RESISTOR AND R3 IS REMOVED.



B	12/10/98	TAB	ADDED NOTE-2.			CTT	CTT
293	8-10-95	VN	ADDED C5, R3; R2 VALUE WAS 4.7K			CTT	DB
ECN	DATE	BY	RELEASED AT REV 57			CHK	CHK APPV'L
NEXT ASSY:			DRAFT	7-03-90	SMP	SCHEMATIC DIAGRAM, REF. OSCILLATOR	
VERSION			DR. CHK	10-4-90	CTT		
MODEL			M. ENGR				
SCALE			E. ENGR	11-8-90	JL		
			RELEASE	6-14-95	BN		
TOLERANCES - EXCEPT AS NOTED			ELECTRONICS MISSILES & COMMUNICATIONS INC.			REV B	
DECIMAL XX ± .010 XXX ± .005						10368037	
FRACTIONAL ± 1/64°						SHEET 1 OF 1	
ANGULAR ± 1/2 DEG			WHITE HAVEN, PA. 18661				

[illegible]

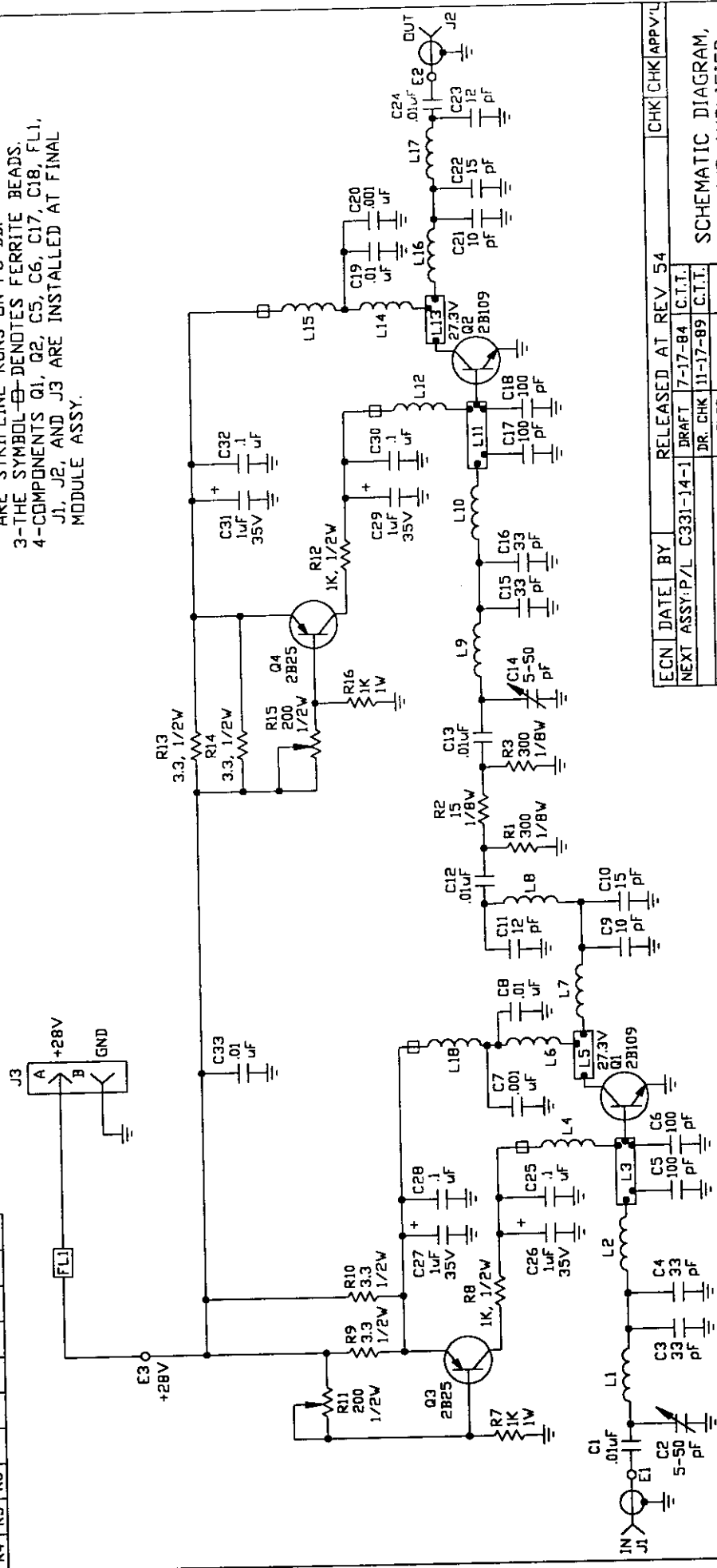
A1	3-20-89	SMP	1B137 WAS 1B33		C.T.I.	R.N.
6607	11-6-85	C.T.I.	ADDED DETAIL "A" AND E1 WAS RV1		W.J.H.	J.M.J.
6365	10-31-84	C.T.I.	ADDED C7,C8		W.J.H./C.	R.N.
ECN	DATE	BY			CHK	CHK APPV'L
NEXT ASSY:	70326117	DRAFT	2-23-84	C.T.I.		
	70326121	DR. CHK	5-8-84	W.J.H.		
VERSION		M. ENGR				
MODEL		E. ENGR	6-21-84	J.M.J.		
SCALE		RELEASE	6-21-84	R.D.		
TOLERANCES - EXCEPT AS NOTED						
DECIMAL	.XX ± .010 .XXX ± .005					REV
FRACTIONAL	± 1/64"				B	326-12 D
ANGULAR	± 1/2 DEG					
						SHEET 1 OF 1
						WHITE HAVEN, PA. 18661

CAD DWG 12-16-92

HIGHEST REFERENCE DESIGNATIONS									
Q4	C33	R16	E3	J3	L18	FL1			

REFERENCE DESIGNATIONS NOT USED									
R4	R5	R6							

NOTES : UNLESS OTHERWISE SPECIFIED
 1-ALL RESISTORS TOL. AT 5%.
 2-INDUCTORS L3, L5, L11, AND L13
 ARE STRIPLINE RUNS ON PC BD.
 3-THE SYMBOL  DENOTES FERRITE BEADS.
 4-COMPONENTS Q1, Q2, C5, C6, C17, C18, FL1,
 J1, J2, AND J3 ARE INSTALLED AT FINAL
 MODULE ASSY.



ECN	DATE	BY	RELEASED AT	REV	CHK	CHK	APPV	L
NEXT ASSY	P/L	C331-14-1	DRAFT	7-17-84	C.T.I.			
DR.	CHK	11-17-89	C.T.I.					
VERSION								
MODEL								
SCALE								
TOLERANCES - EXCEPT AS NOTED								
DECIMAL								
FRACTIONAL								
ANGULAR								

SCHEMATIC DIAGRAM,
 1W VHF AMPLIFIER,
 (CH 7-13)

B 331-12 54
 REV

EMCEE
 BROADCAST
 PRODUCTS
 INC.

WHITE HAVEN, PA. 18661

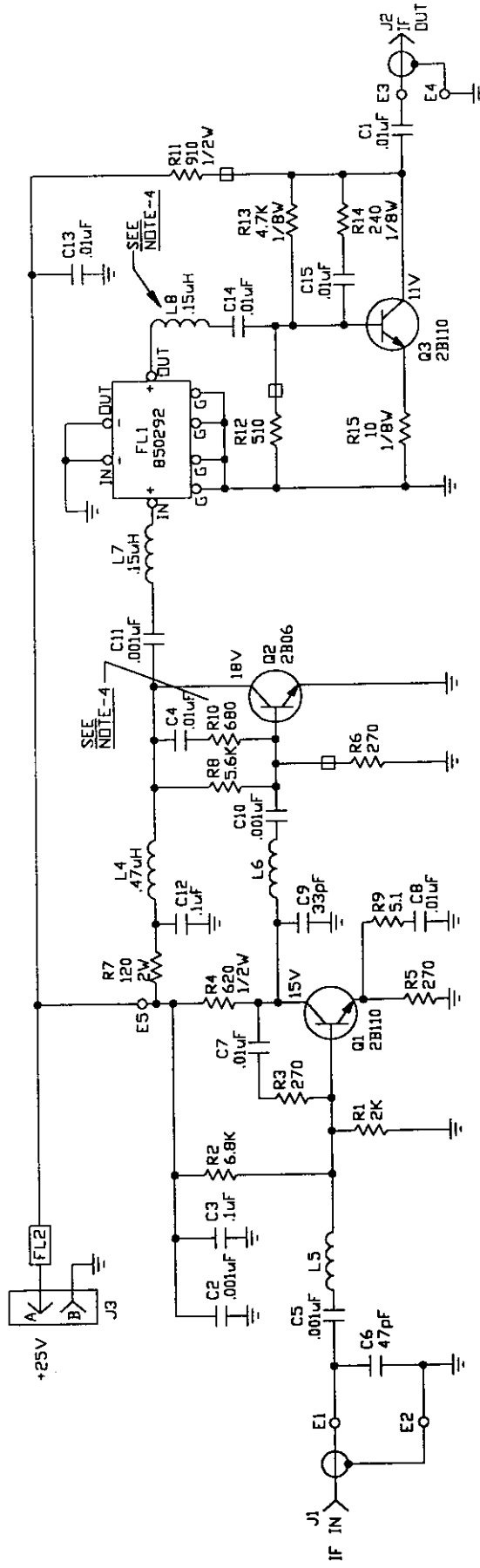
SHEET 1

DF 1

CAD DWG 5-28-96

NOTES : UNLESS OTHERWISE SPECIFIED
 1-ALL RESISTORS VALUED AT 1/4W, 5%.
 2-COMPONENTS J1,J2,J3, AND FL2 ARE NOT
 LOCATED ON PC BOARD.
 3-THE SYMBOL $\oplus$ INDICATES FERRITE BEADS.
 4-FOR LOW IF (33.4-38.9MHZ) CHANGE
 R10 TO 2.2K AND L8 TO .22uH, AND
 FL1 TO 850971.

HIGHEST REFERENCE DESIGNATIONS									
E5	R15	C15	L8	J3	FL2	Q3			
REFERENCE DESIGNATIONS NOT USED									
L3	L2	L1							



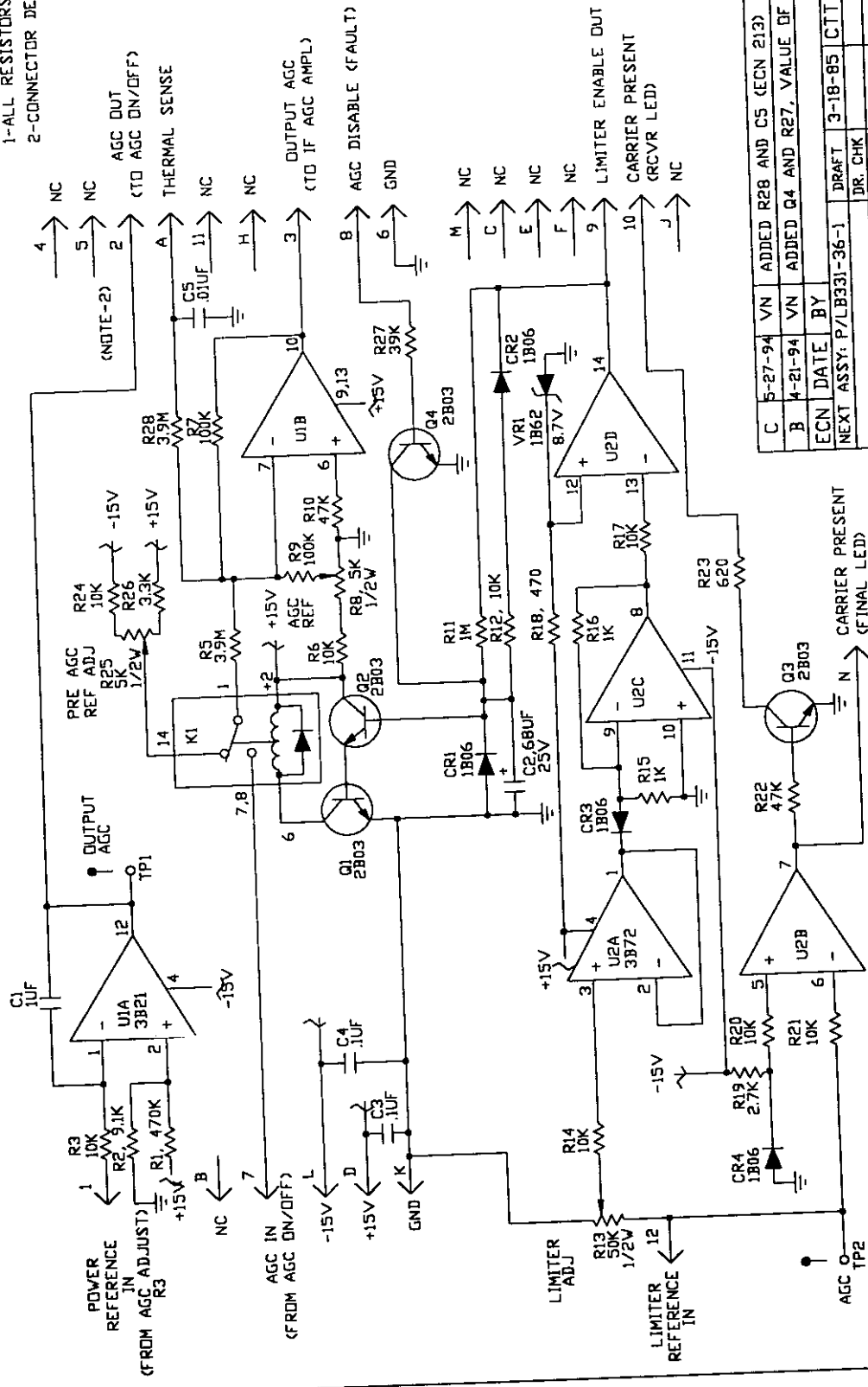
△

464	9/3/98	TAB	VALUE OF R10 WAS 470.	C.T.T.	
C	12-29-89	TAB	ADDED TRANSISTOR VOLTAGE, ADDED J3 TO NOTE 2	C.T.T.	RGN
A	8-31-88	SMP	ADDED NOTE 4	C.T.T.	RGN
ECN	DATE	BY		CHK	CHK APPV/L
NEXT ASSY: P/L B331-23-1			DRAFT	B-29-84	C.T.T.
VERSION			DR. CHK		
MODEL			M. ENGR		
SCALE			E. ENGR	4-25-86	JMJ
SCALE			RELEASE	4-25-86	JMJ
TOLERANCES - EXCEPT AS NOTED					
DECIMAL			XX : .010		
FRACTIONAL			XX : 1/64		
ANGULAR			XX : 1/2 DEG		
EMCEE			EMCEE BROADCAST PRODUCTS INC.		
SHEET 1			DF 1		
REV			B 331-21		D

SCHEMATIC DIAGRAM,
 IF AMPLIFIER
 W/SAW
 FILTER

CAD DWG 4-B-96

NOTES UNLESS OTHERWISE SPECIFIED
 1-ALL RESISTORS VALUED AT 1/4W, 5%
 2-CONNECTOR DESIGNATIONS ARE P.C. FINGERS



ECN	DATE	BY	ADDED R28 AND C5 (ECN 213)	CTT	JL	RGN
C	5-27-94	VN				
B	4-21-94	VN	ADDED Q4 AND R27, VALUE OF C2 WAS 10 UF			
CHK	CHK	CHK				

3-18-85	CTT					
DR. CHK						
H. ENGR						
E. ENGR	4-25-86	JMJ				
RELEASE	4-25-86	JMJ				

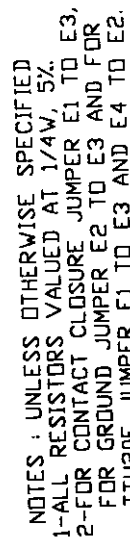
SCALE	NONE					
DECIMAL	10					
FRACTIONAL	1/64					
ANGULAR	1/2 DEG					

REVISION	3-18-85	CTT				
VERSION						
MODEL	4-25-86	JMJ				
SCALE	NONE					

EMCEE						
ELECTRONICS						
MISSILES &						
COMMUNICATIONS						
INC.						
WHITE HAVEN, PA. 18661						

B	331-34	C				
SHEET	1	DF	1			

HIGHEST REFERENCE DESIGNATIONS						
U2	Q4	R28	C5	CR4	VRI	K1
TP2						
REFERENCE DESIGNATIONS NOT USED						
R4						



HIGHEST REFERENCE DESIGNATIONS						
Q1	U1	R12	CR3	K1	E3	C3

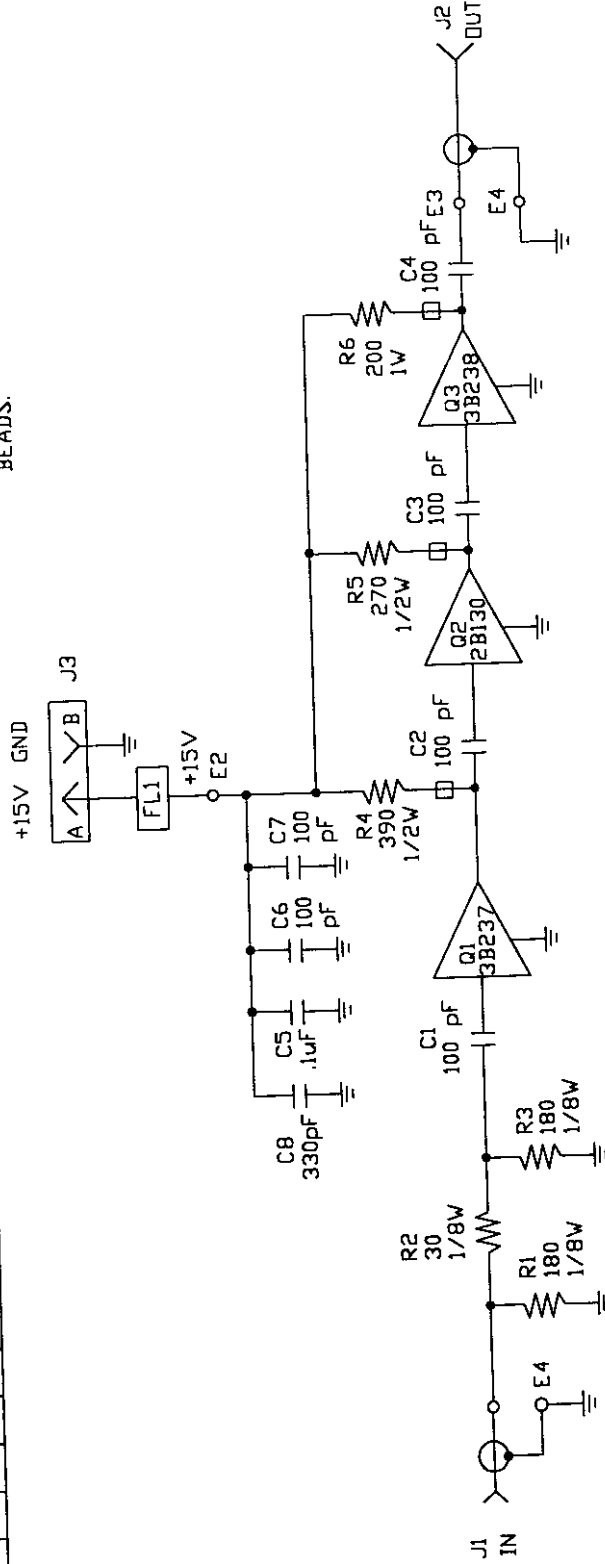
REFERENCE DESIGNATIONS NOT USED						

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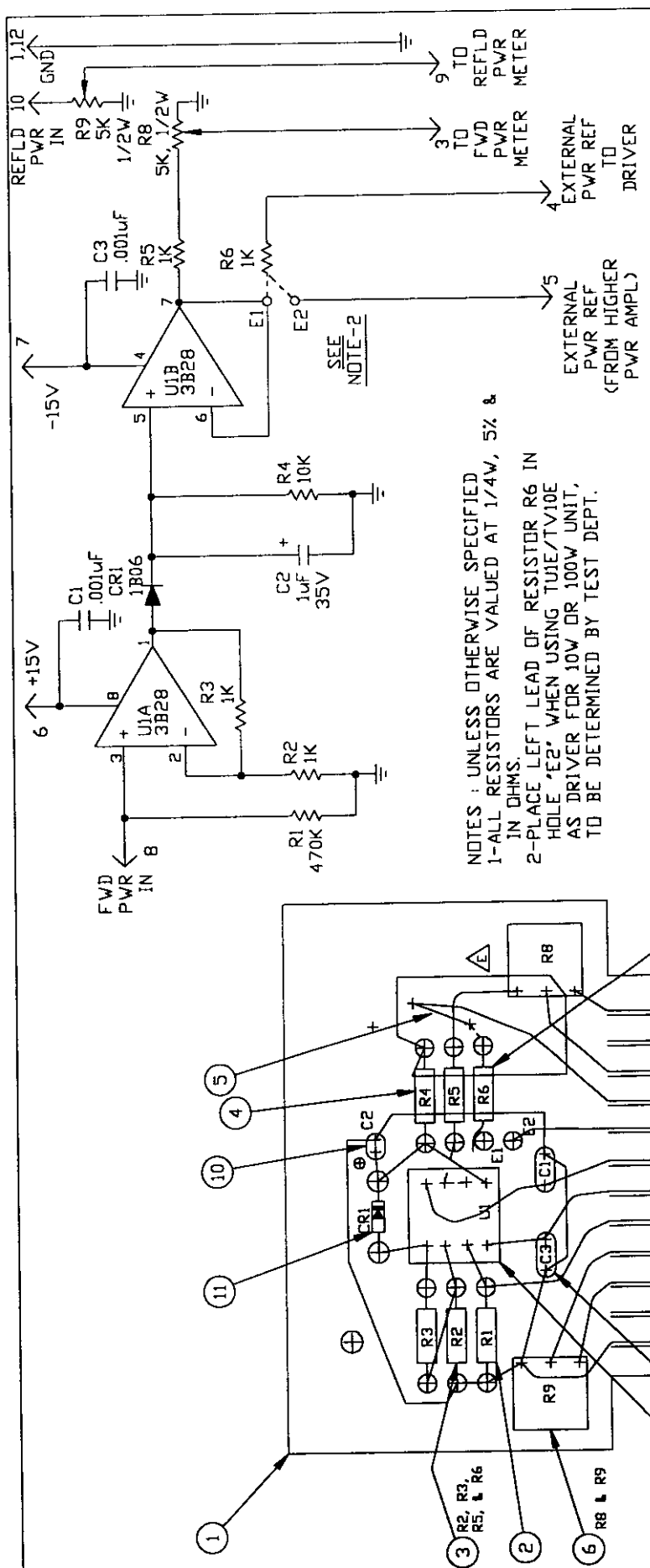
CAD DWG 10-17-95

HIGHEST REFERENCE DESIGNATIONS									
Q3	E4	R6	C8	J3	FL1				
REFERENCE DESIGNATIONS NOT USED									

NOTES : UNLESS OTHERWISE SPECIFIED
 1-ALL RESISTORS VALUED AT 5%.
 2-THE SYMBOL  INDICATES FERRITE BEADS.



362	B/12/96	CMG	Q1 WAS 2B129, Q3 WAS 2B131.						CHK	CHK	APPV
ECN	DATE	BY	RELEASED AT REV 54			SCHEMATIC DIAGRAM, UPCONVERTER AMPLIFIER					
NEXT ASSY:			DRAFT	12-9-87	C.T.T.						
			DR. CHK	7-10-89	C.T.T.						
VERSION			M. ENGR								
MODEL			E. ENGR			EMCEE EMCEE BROADCAST PRODUCTS INC. WHITE HAVEN, PA. 18661					
SCALE			RELEASE	11-11-89	RN						
TOLERANCES - EXCEPT AS NOTED											
DECIMAL .XX ± .05 FRACTIONAL ± 1/64" ANGULAR ± 1/2 DEG											



NOTES : UNLESS OTHERWISE SPECIFIED
1-ALL RESISTORS ARE VALUED AT 1/4W, 5% &
IN OHMS.
2-PLACE LEFT LEAD OF RESISTOR R6 IN
HOLE 'E2' WHEN USING TU1E/TV10E
AS DRIVER FOR 10W OR 100W UNIT,
TO BE DETERMINED BY TEST DEPT.

	D	6-25-98	CTT	CHANGED TO SHOW PROPER DEFINITION OF RUNS	C.T.T.		C.T.T.
	C	7/1/91	C.U.	RELABELED PIN OUTS OF BOARD	C.T.T.		C.T.T.
	B	5-30-90	TAB	RELOCATE JUMPER ITEM 50 TO PROPER HOLE LOCATION SHOW LEAD OR RG OUT OF HUG. HOLE	C.T.T.		C.T.T.
	A	7-19-88	M IM	CHANGED POLARITY OF C2	C.T.T.		C.T.T.

ECN	DATE	BY	NEXT ASSY: SEE DASH NO.	DRAFT	5-12-87	V.J.H.	CHK	CHK	APPROV
				DR. CHK	5-18-87	C.T.T.			
			VERSION	M. ENGR	7-23-87	J.C.			
			MODEL	E. ENGR	8-23-87	R.G.N.			
			SCALE NONE	RELEASE	8-23-87	R.G.N.			

ASSY & SCHEM. DIAG.
P.C. BOARD, PWR
METERING
D.C. AMPL.

TOLERANCES - EXCEPT AS NOTED		ELECTRONICS MISSILES & COMMUNICATIONS INC.		REV
DECIMAL	XX ± .010 XXX ± .005	EMCEE	PL B331-184	E
FRACTIONAL	± 1/64"			
ANGULAR	± 1/2 DEG		SHEET 1	QF 1
		WHITE HAVEN, PA. 18661		

① PCB ASSY & SD, PWR METERING DC AMPL-

CAD DWG 9-7-94

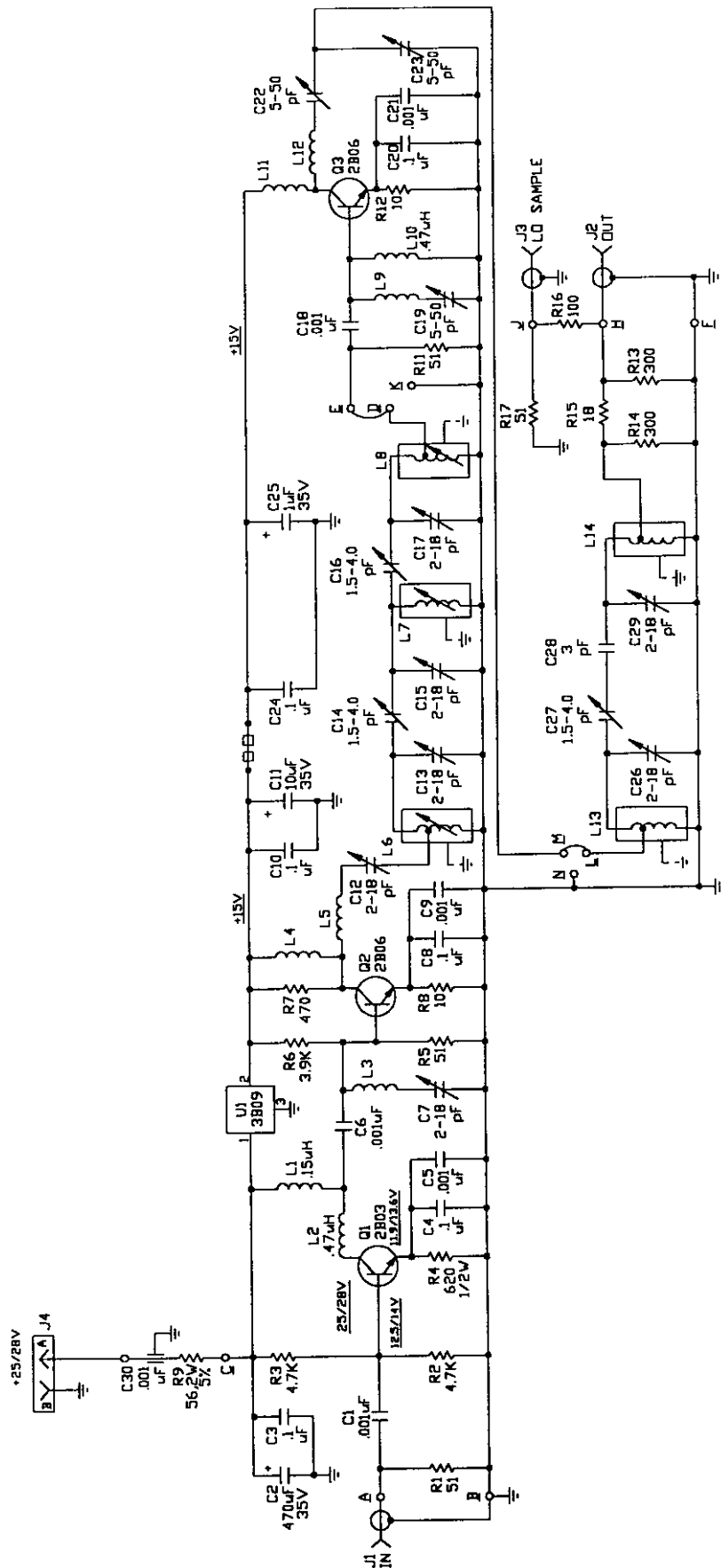
WHITE HAVEN, PA. 18661

SHEET 1 OF 1

SHEET 1 OF 1

SHEET 1 OF 1

NOTES: 1-UNLESS OTHERWISE SPECIFIED
1-THE SYMBOL $\oplus$ DENOTES A FERRITE BEAD.
2-ALL RESISTORS ARE 1/4W, 5%
3-COMPONENTS J1, J2, J3, J4, R9 AND C30 ARE
MOUNTED ON THE MODULE CAN.



D	3-16-94	VN	C11 WAS 47uF	C11	RCN	RCN
C	1-2-90	TAB	CHANGED TRANSISTOR VOLTAGES, ADDED J2, J4, R9 TO NOTE 3 C.T.T.	C11	RCN	RCN
	67967-5-89	CAB	ADDED RESISTOR R9	C11	RCN	RCN
ECN	DATE	BY		CHK	CHK	CHK
NEXT ASSY: SEE DASH NO. 3809						
PL	C331-16-1	PL	3331-19-1	DR	CHK	8-31-84 C.T.T.
VERSION				M	ENGR	
MODEL				E	ENGR	4-25-86 JMJ
SCALE	N/A			RELEASE	4-25-86	JMJ
TELEPHONES - CROFT IN NOTES						
DECIMAL						
FRACTIONAL						
ANGULAR						

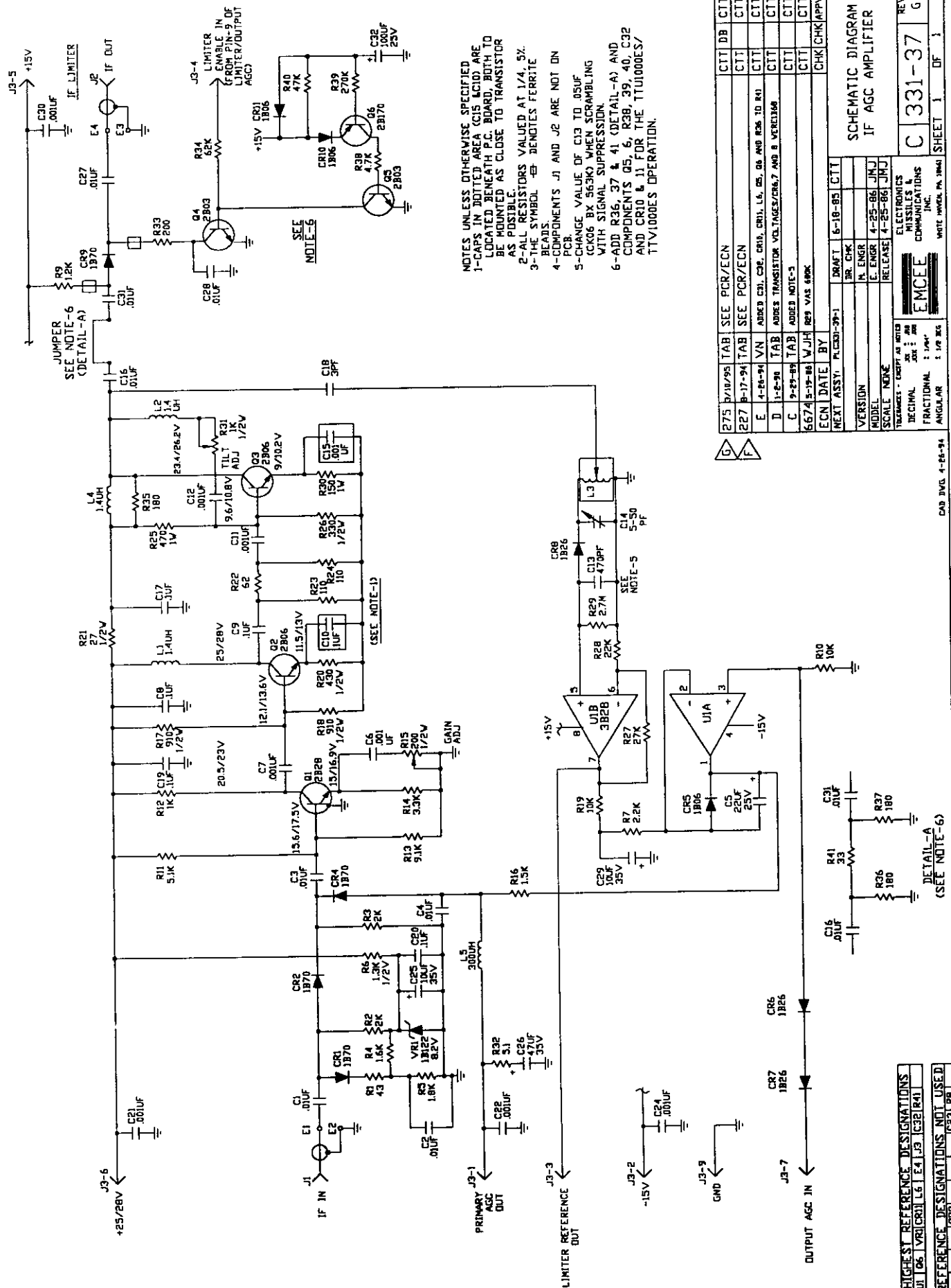
SCHEMATIC DIAGRAM,
X4
MULTIPLIER

C 331-24
REV D

SHEET 1 OF 1

HIGHEST REFERENCE DESIGNATIONS
C301, R17, J4, R31, U1
REFERENCE DESIGNATIONS NOT USED
R10

CAD DWG 10-9-95



275	3/10/95	TAB	SEE PCR/ECN	CIT	DB	CIT
227	8-17-94	TAB	SEE PCR/ECN	CIT		CIT
E	4-28-94	VN	ADDED C31, C32, CR1, CR2, CR3, CR4, CR5, CR6 AND R36 TO R41	CIT		CIT
D	1-2-98	TAB	ADDED TRANSISTOR VOLTAGES/CR6.7 AND B VERN1368	CIT		CIT
C	9-27-88	TAB	ADDED NOTE-3	CIT		CIT
6674	5-19-88	W/JH	R29 WAS 400K	CIT		CIT
ECN	DATE	BY		CHK	CHK	APPROV
NEXT ASSY: PL0031-39-1			DRAFT	6-18-85	CIT	
VERSION			BR. CHK			
MODEL			M. ENGR	4-25-86	JMU	
SCALE			E. ENGR	4-25-86	JMU	
			RELEASE	4-25-86	JMU	
TELEGRAMS - LEAVE AN NOTER			ELECTRONICS			
JUL 23 1986			MISSILES &			
FRACTIONAL			COMMUNICATIONS			
ANGULAR			INC.			
			WHITE PAPER, PM, JN404			
			SHEET 1 OF 3			
			REV			
			C 331-37			
			G			

REFERENCE DESIGNATIONS NOT USED



THE LINES ARE
CUT FOR PAL
OPERATION

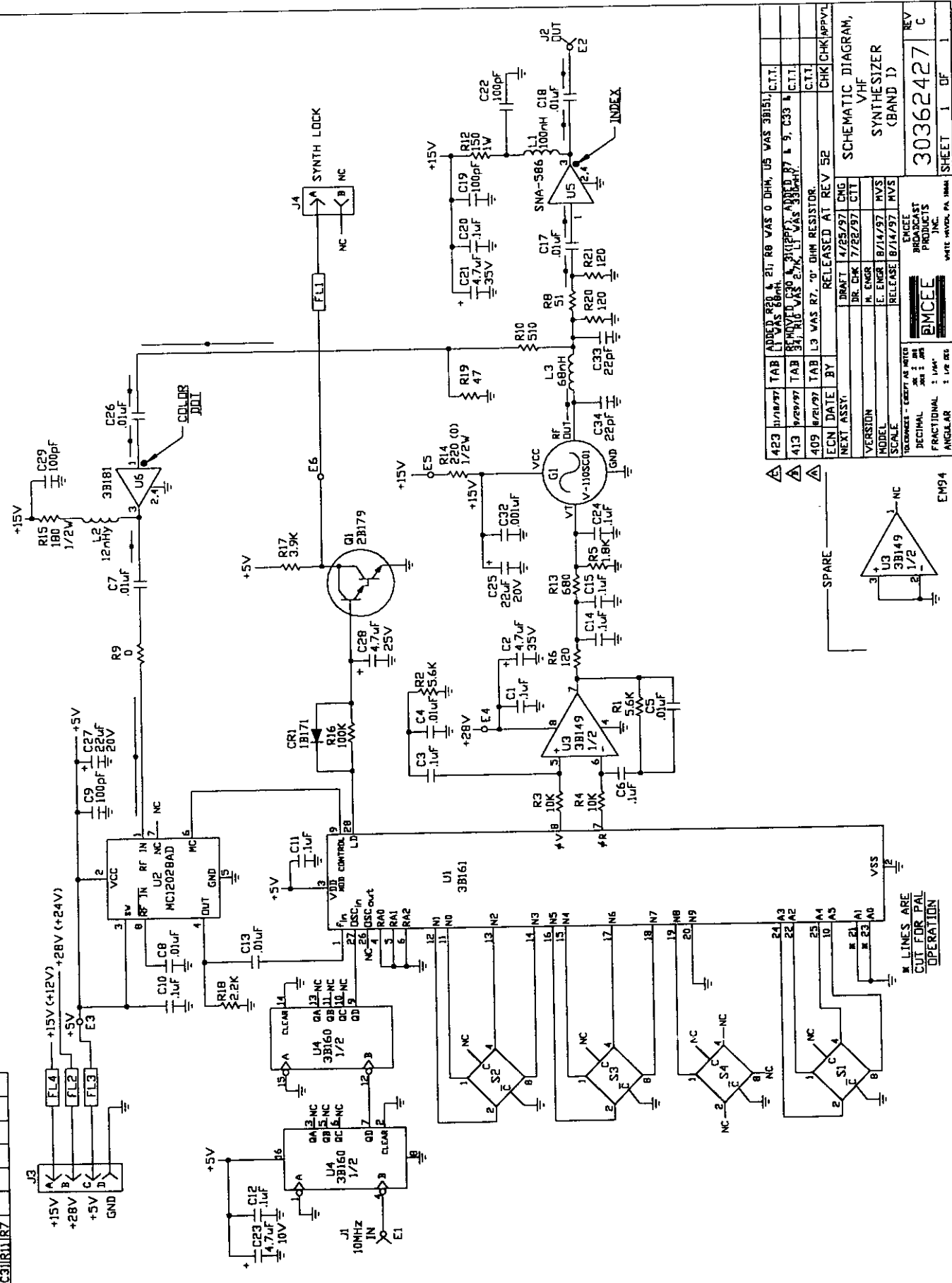
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SCHEMATIC DIAGRAM,
VHF
SYNTHESIZER
(PART 111)

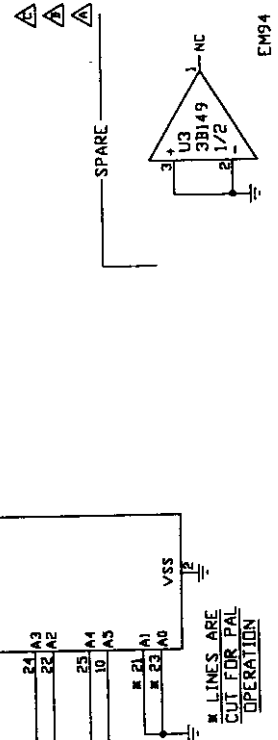
30362003	REV D
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NOTE:
1-VALUES IN PARENTHESES ARE
FOR RSVA2 OPERATION.

HIGHEST REFERENCE DESIGNATIONS	
C34 U6 R21	G1 S4 J4 I6 J3 GR1 F14 Q1
REFERENCE DESIGNATIONS NOT USED	
C30 L3 R1 R7	



423	11/18/97	TAB 1	ADDED R20 & R21, R8 WAS 0 OHM, U5 WAS 38181, L1 WAS 300nH.						
413	9/29/97	TAB 34	REMOVED C30 & 38181, ADDED R7 & 9, C33 & C34, R10 WAS 27K, L1 WAS 300nH.						
409	8/16/97	TAB L3	WAS R7, 0 OHM RESISTOR.						
ECN	DATE	BY	RELEASED AT	REV	52				
NEXT ASSY:									
VERSION									
MODEL									
SCALE									
TOUCHSCREEN - EXCEPT AS NOTED									
DECIMAL	INCHES	2							
FRACTIONAL	INCHES	1/16"							
ANGULAR	DEGREES	1							



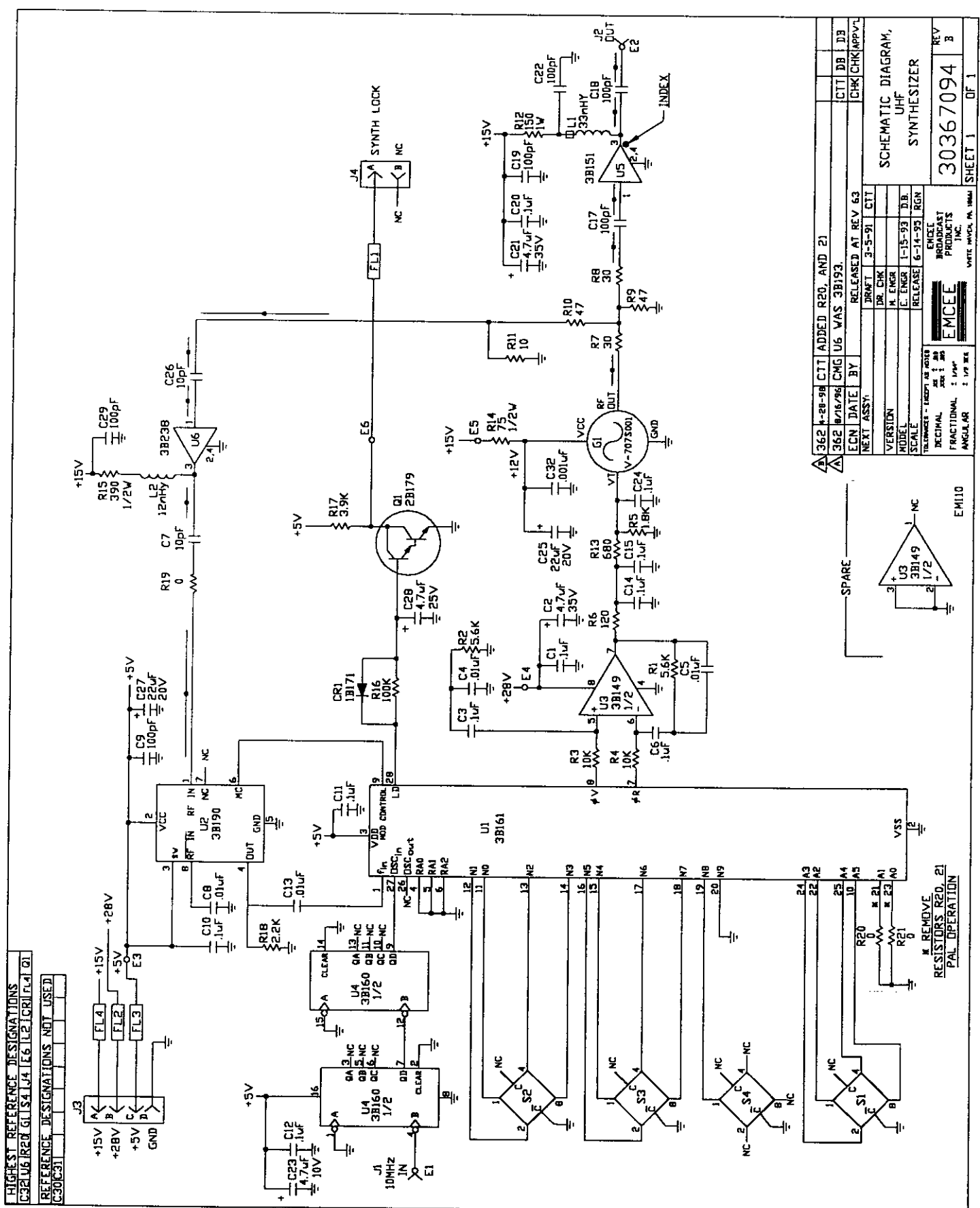
HIGHEST REFERENCE DESIGNATIONS	
C34 U6 R21	G1 S4 J4 I6 J3 GR1 F14 Q1
REFERENCE DESIGNATIONS NOT USED	
C30 L3 R1 R7	

ALL LINES ARE
CUT FOR PAL
OPERATION

30362427
REV C

SHEET 1 OF 1

EM94



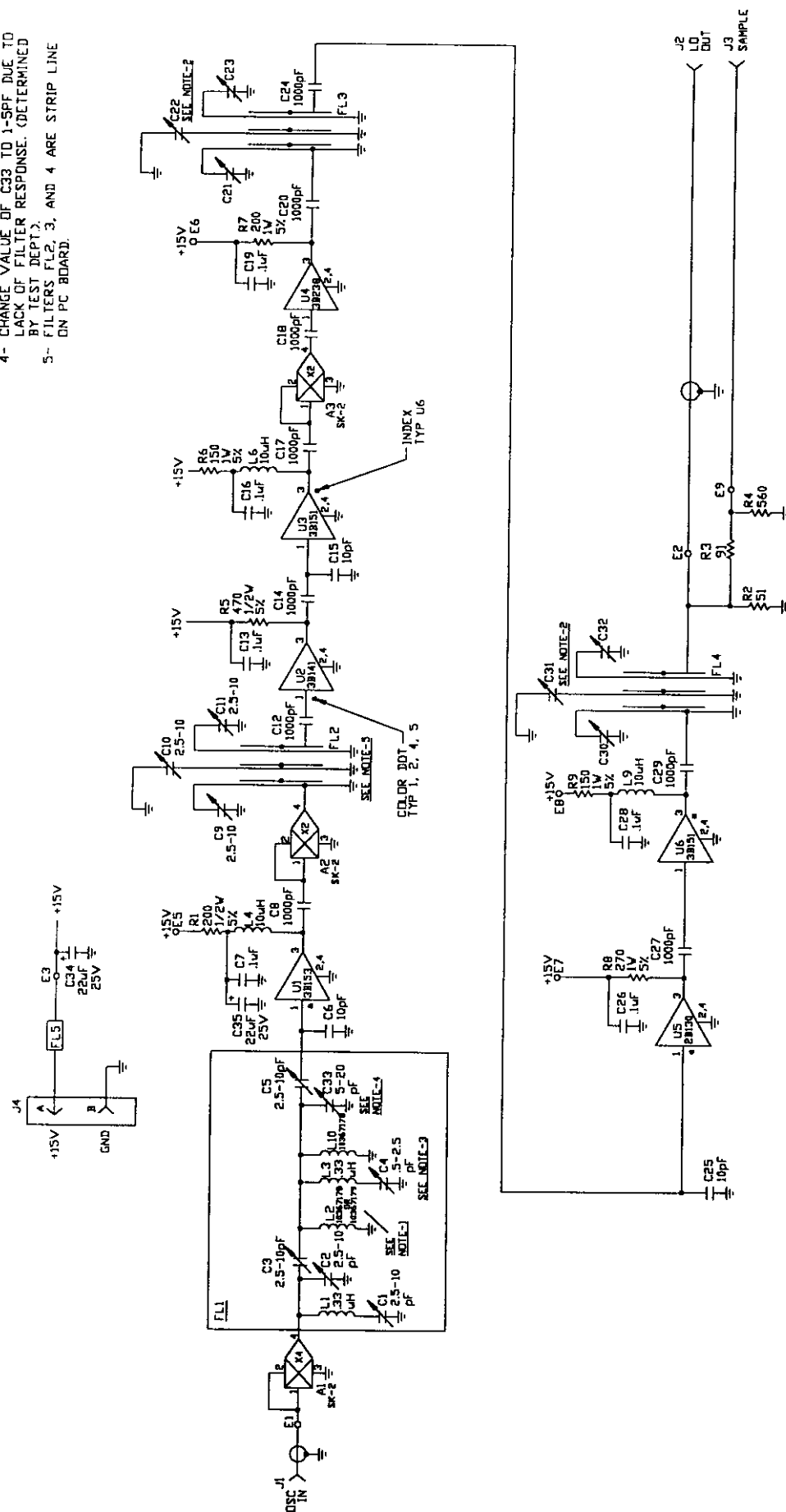
362	M-28-98	CTT	ADDED R20, AND 21			
362	016/96	CMG	U6 WAS 3B193.			
ECN	DATE	BY	RELEASED AT REV 63			
NEXT ASSY:			DRAFT	3-5-91	CTT	
			DWG	CHK		
VERSION			M	ENGR		
MODEL			E	ENGR	1-15-93	D.B.
SCALE			RELEASE	6-14-93	RGN	
TELEPHONE	1-800-4-A-NOISE		EMCEE PRODUCTS INC. WRITE: MEXCO, PM 18000			
DECIMAL	2 1/2	1/8	REV			
FRACTIONAL	2 1/8	1/4	30367094			
ANGULAR	2 1/2	DEG	B			
			SHEET 1 OF 1			

HIGHEST REFERENCE DESIGNATIONS				
J3	FL5	U6	A3	E8 L10 C35 R9

REFERENCE DESIGNATIONS NOT USED				
L5	L7	L8	E4	

NOTES: UNLESS OTHERWISE SPECIFIED.

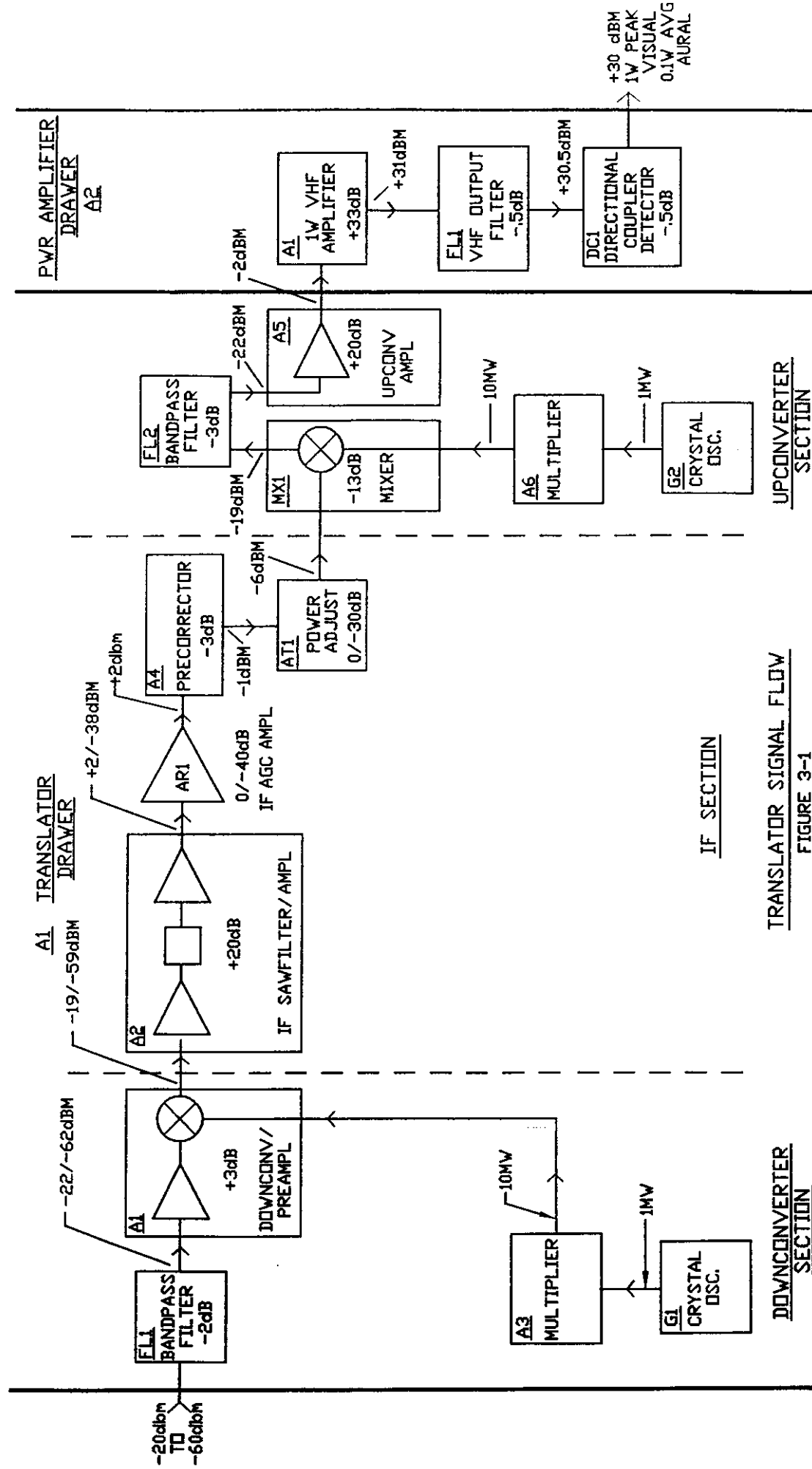
- 1- FOR COIL L2, USE 10367178 FOR CHANNELS 14-39 AND 10367179 FOR CHANNELS 38-83.
- 2- VARIABLE CAPACITORS C21, 22, 23, 30, 31, AND 32 VALUES ARE 2.5-10PF FOR CHANNELS 14-45 AND 1-SPF FOR CHANNELS 44-83.
- 3- FOR CHANNELS 69-83 CHANGE C4 (5-2.5PF) CAPACITOR TO 1-SPF VARIABLE CAPACITOR AND ADD L10.
- 4- CHANGE VALUE OF C33 TO 1-SPF DUE TO LACK OF FILTER RESPONSE. (DETERMINED BY TEST DEPT.).
- 5- FILTERS FL2, 3, AND 4 ARE STRIP LINE (ON PC BOARD).



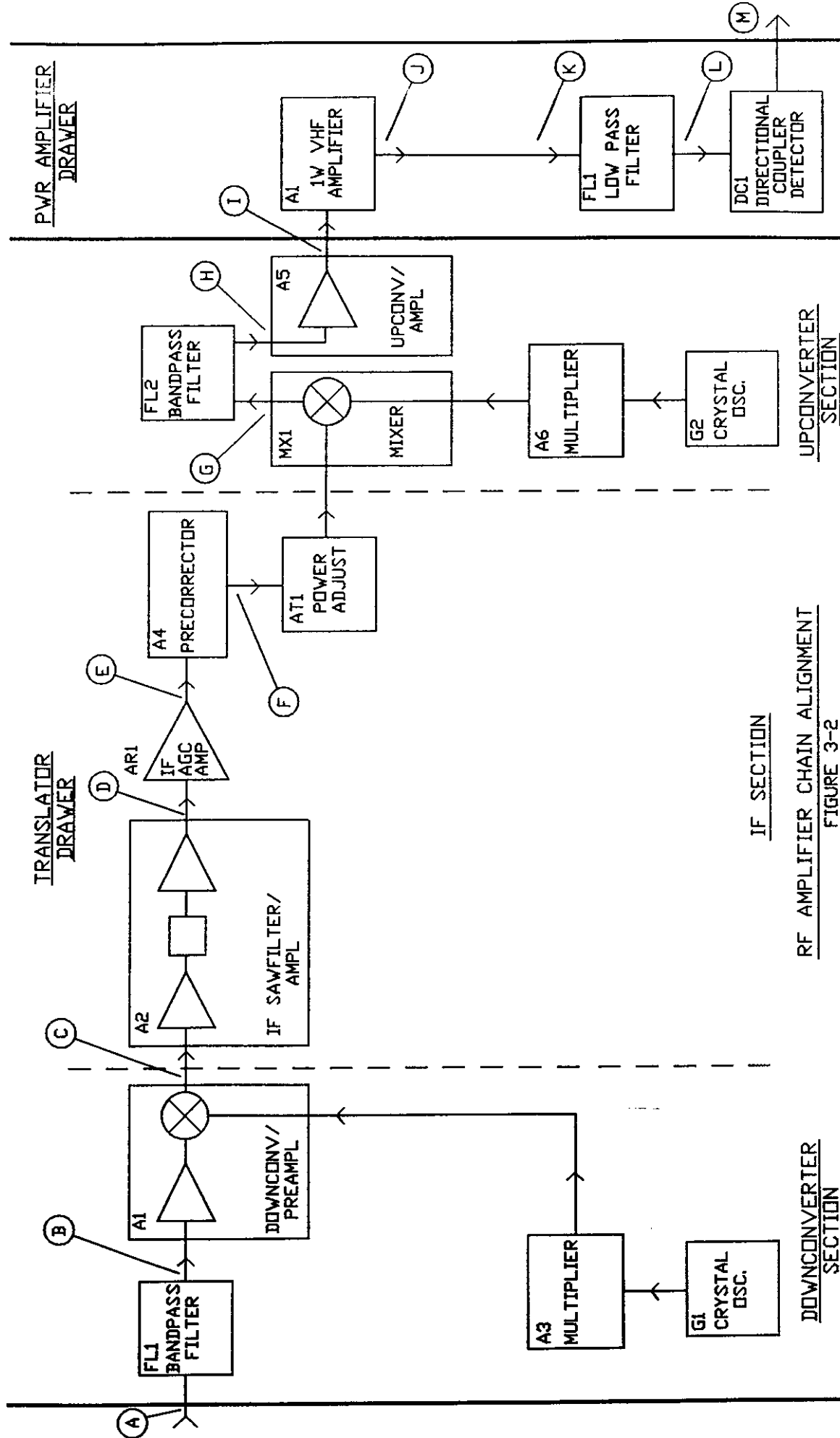
362	8/19/96	CMG	U4 WAS 28131
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[illegible]

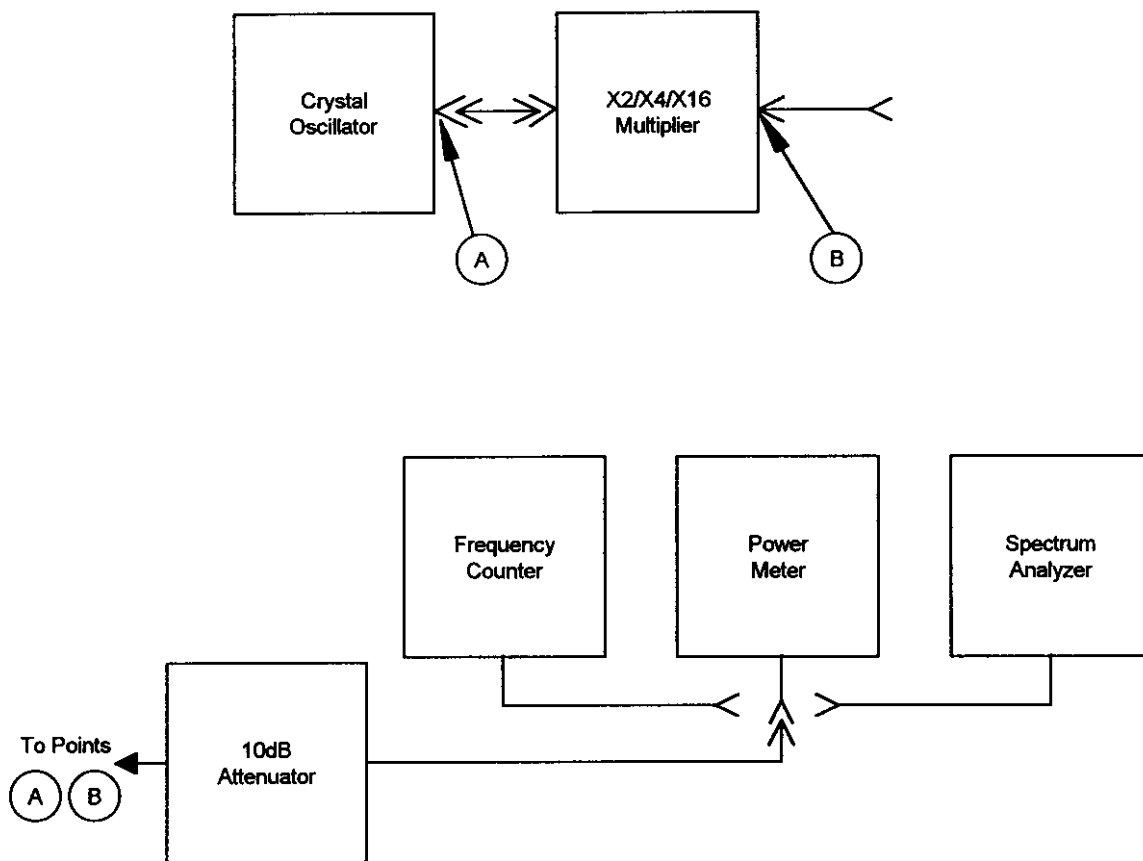
EMCEE



TRANSLATOR SIGNAL FLOW
FIGURE 3-1

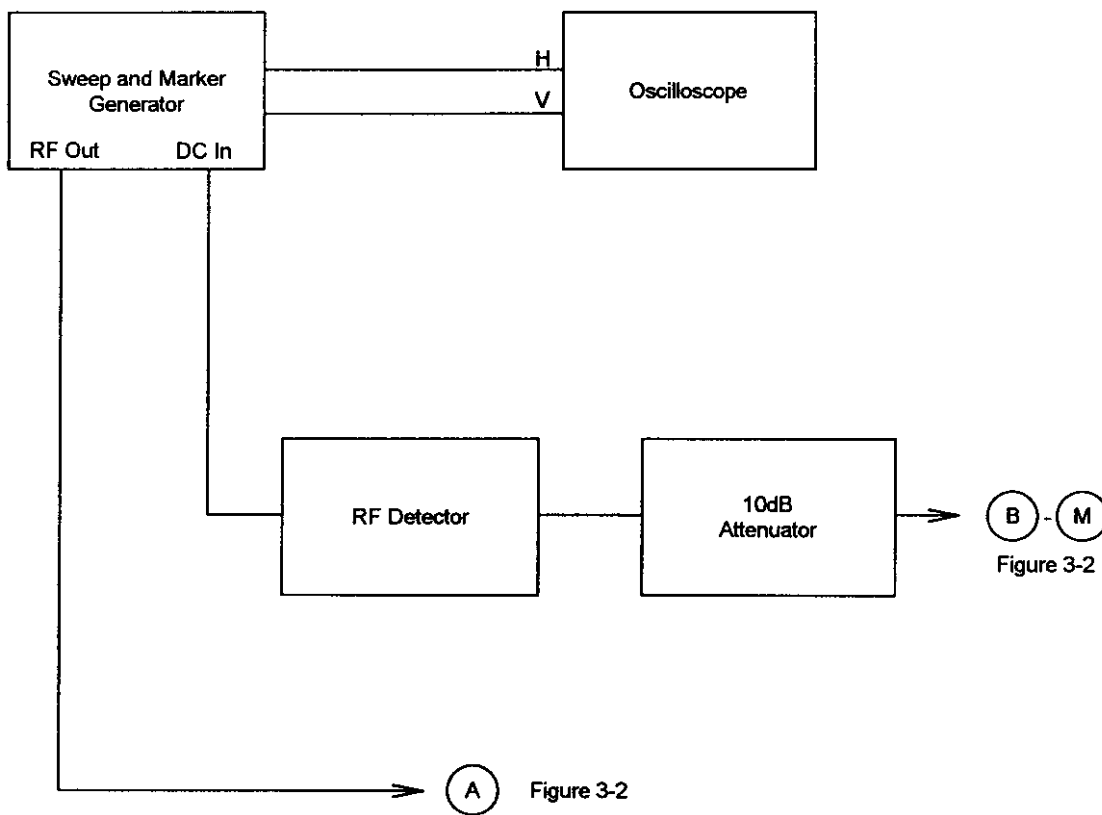


RF AMPLIFIER CHAIN ALIGNMENT
FIGURE 3-2



LOCAL OSCILLATOR CHAIN ALIGNMENT
FIGURE 3-3

0011cam



TEST EQUIPMENT SETUP
FIGURE 3-4

0012cam

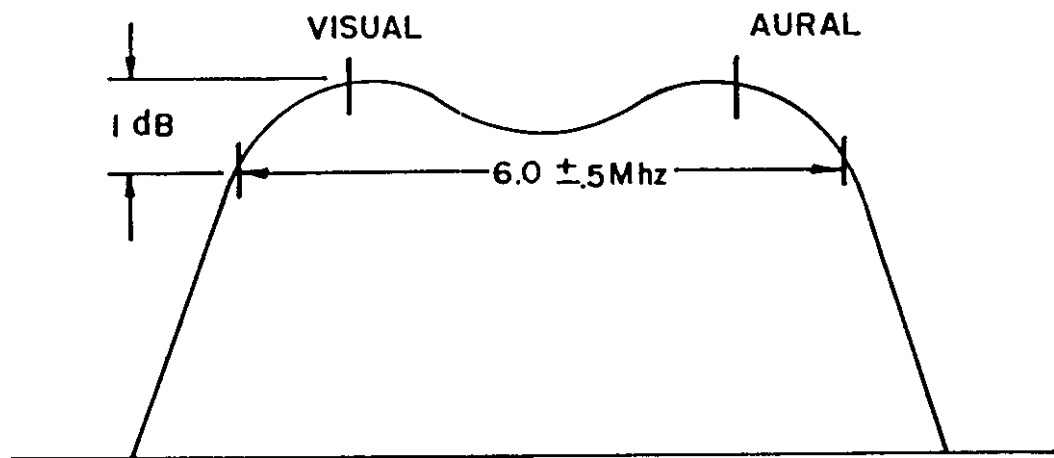


FIGURE 3-5A

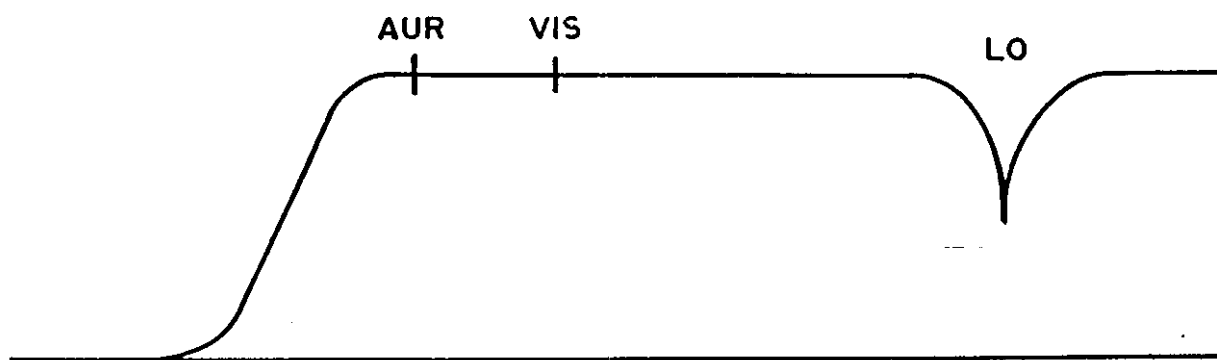


FIGURE 3-5B

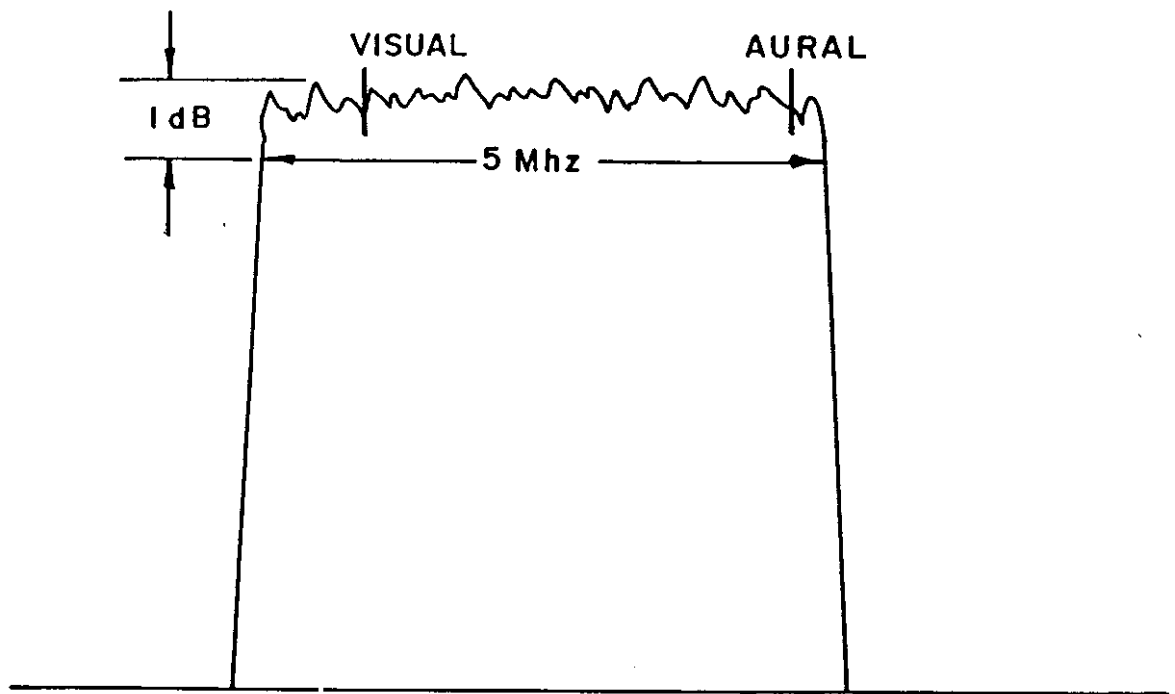


FIGURE 3-5C

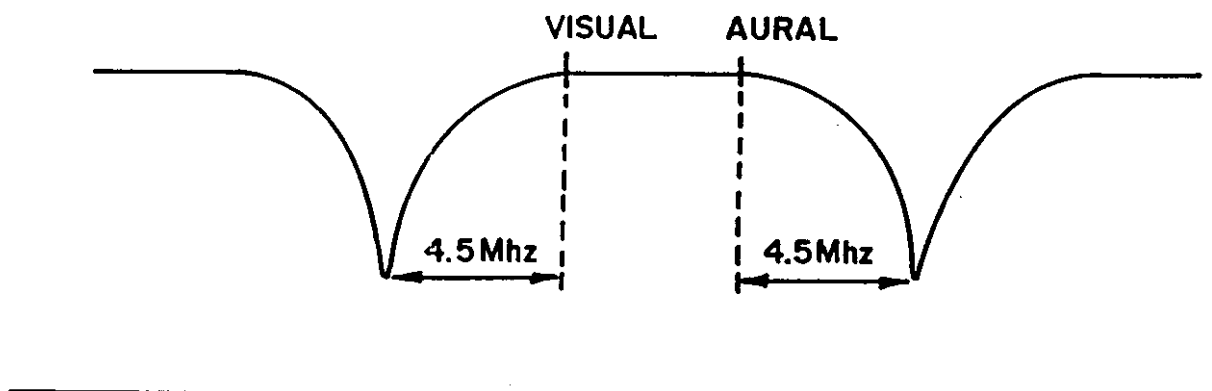
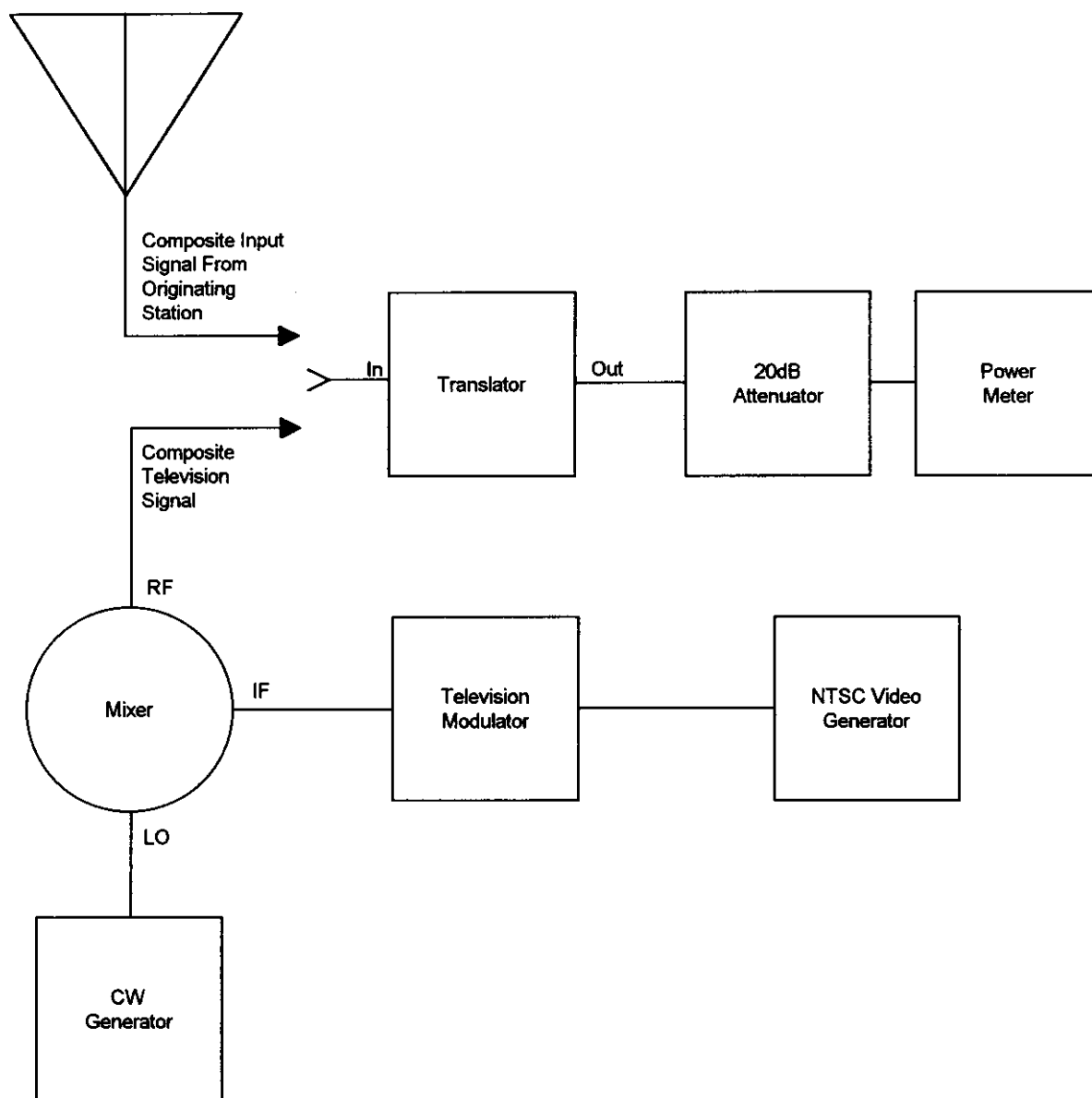


FIGURE 3-5D



OUTPUT POWER CALIBRATION
FIGURE 3-6

0013cam

3.5 Spare Modules and Components:

The following pages of this section contain the name, part number and schematic designator of each module found in the TV1E Translator which EMCEE considers as essential bench-stock items to be available to the technician at all times.

TRANSLATOR DRAWER SPARE MODULE LIST
INTERCONNECT 30331001/173

DESCRIPTION	VENDOR/PART #	DESIGNATOR
DOWNCONVERTER/PREAMPLIFIER	EMCEE/B331-47-1	A1
CRYSTAL OSCILLATOR	Vectron/254D57	G2
X2 MULTIPLIER (CH.2-6)	EMCEE/B280-76-1	A3/A6
OR	OR	
X4 MULTIPLIER (CH.7-13)	EMCEE/B331-19-1	A3/A6
OR	OR	
X16 MULTIPLIER (CH.14-69)	EMCEE/70367248	A3
IF SAW FILTER AMPLIFIER	EMCEE/B331-27-1	A2
IF AGC AMPLIFIER	EMCEE/B331-42-1	AR1
LIMITER/OUTPUT AGC	EMCEE/B331-36-1	PC1
UPCONVERTER AMPLIFIER	EMCEE/C331-67-1	A5
MIXER	EMCEE/A331-188-1	A7

TRANSLATOR DRAWER SPARE MODULE LIST
INTERCONNECT 30331324/328

DESCRIPTION	VENDOR/PART #	DESIGNATOR
DOWNCONVERTER/PREAMPLIFIER	EMCEE/B331-47-1	A1
10MHz REFERENCE OSCILLATOR	EMCEE/60368055-1	A3A2/A6A2
VHF SYNTHESIZER (CH.2-6)	EMCEE/60367103-3	A3A1/A6A1
OR	OR	
VHF SYNTHESIZER (CH.7-13)	EMCEE/60367103-2	A3A1/A6A1
OR	OR	
UHF SYNTHESIZER (CH.14-69)	EMCEE/60367103-1	A3A1
IF SAW FILTER AMPLIFIER	EMCEE/B331-27-1	A2
IF AGC AMPLIFIER	EMCEE/B331-42-1	AR1
LIMITER/OUTPUT AGC	EMCEE/B331-36-1	PC1
UPCONVERTER AMPLIFIER	EMCEE/C331-67-1	A5
MIXER	EMCEE/A331-188-1	MX1

POWER AMPLIFIER DRAWER SPARE MODULE LIST
INTERCONNECT 30331330

DESCRIPTION	VENDOR/PART #	DESIGNATOR
1W VHF AMPLIFIER	EMCEE/B331-80-1 (Ch.2-6)	A1
	OR	
	EMCEE/B331-56-1 (Ch.7-13)	A1
±15V/±5V POWER SUPPLY	EMCEE/70326117	PS1
+28V POWER SUPPLY	EMCEE/B319-167-1	PS2

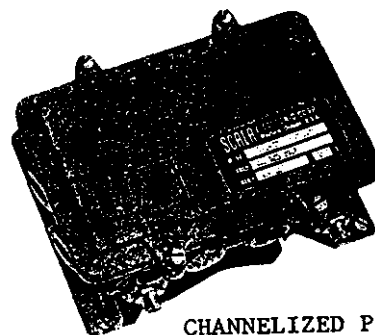
SECTION IV

DATA PAK



SUPER LOW-NOISE PREAMPLIFIERS

- VHF-TV
- FM
- UHF-TV



CHANNELIZED PREAMPS AVAILABLE
WITH SIMILAR SPECS SEE PRICE LIST

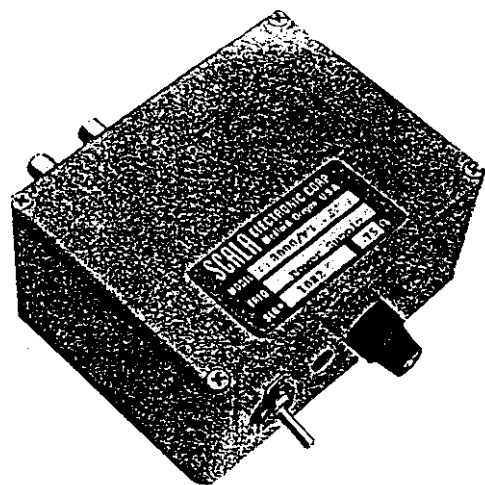
Scala/Triax-8000-series preamplifiers are designed for critical professional applications requiring high gain, very low noise figures, high output level, wide bandwidth with flat response, tight RF shielding and rugged mechanical design for high reliability. These state-of-the-art preamps are manufactured in Denmark, and distributed by Scala in North America. The preamps are housed in heavy weatherproof die-cast aluminum housings equipped with hardware for mast mounting. F connectors and 75-ohm impedance are standard while N connectors and/or 50-ohm impedance are available.

The 8000-series preamps are designed to be powered via the coaxial downlead. Scala offers the 8000/PS dual regulated power supply as well as the 8000/PSC power supply coupler which allows use of any adequate external 24VDC regulated power supply (negative ground). The 8000/PS and 8000/PSC each include RF/DC diplexing networks.

Four broadband models are available, covering the VHF-TV, FM and UHF-TV bands.

	MODEL 8000/1A	MODEL 8000/2A	MODEL 8000/3	MODEL 80065
Frequency Range	54-88 MHz (Chs. 2-6)	88-108 MHz (FM Band)	174-216 MHz (Chs. 7-13)	470-890 MHz (Chs. 14-83)
Gain	20 db	20 db	24 db	25 db
Gain Flatness	within 1.0 db			
Noise Figure	1.6 db	1.8 db	1.4 db	1.4 db
Maximum Output	+ 62 dbmv	+ 62 dbmv	+ 46 dbmv	+ 46 dbmv
Impedance In/Out	75 ohms (50 ohms optional)			
Return Loss In/Out	17/17 db	17/17 db	17/17 db	10/15 db
Power Required	100 ma. @24 VDC		30 ma. @24 VDC	
Shielding Factor	85 db minimum			
Connectors	F type (N type optional)			
Weight	3 pounds (1.35 kg.)			
Dimensions	4" x 5" x 6¼" (10 cm x 13 cm x 16 cm)			
Mounting	Attaches to 1¼" to 3" mast (30 to 80 mm)			

Note: Because of the broadband high-gain characteristics of these pre-amps, external prefiltering may be required in locations where high-level RF fields are present.

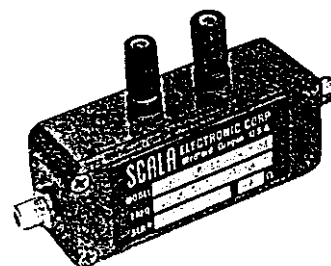


8000/PS DUAL POWER SUPPLY

The Scala 8000/PS AC Power Supply provides the necessary DC power for two Scala/Triax 8000-series low-noise preamps. Features include line fusing, LED output indicator, regulated 24 VDC output up to 500 ma., and RF/DC diplex networks to power the preamps via the coaxial downleads. F connectors are standard with N type connectors optional.

8000/PSC POWER SUPPLY COUPLER

The Scala 8000/PSC Power Supply Coupler allows use of an external 24 VDC source to power a Scala/Triax 8000-series low-noise preamplifier. The 8000/PSC includes an RF/DC diplex network and a protective blocking diode to prevent preamp damage due to application of improperly-polarized DC. RF connectors are F type (N type optional) and DC is connected to combination binding posts and banana jacks. The DC source must be negative ground with an output capability for the specific preamplifier.

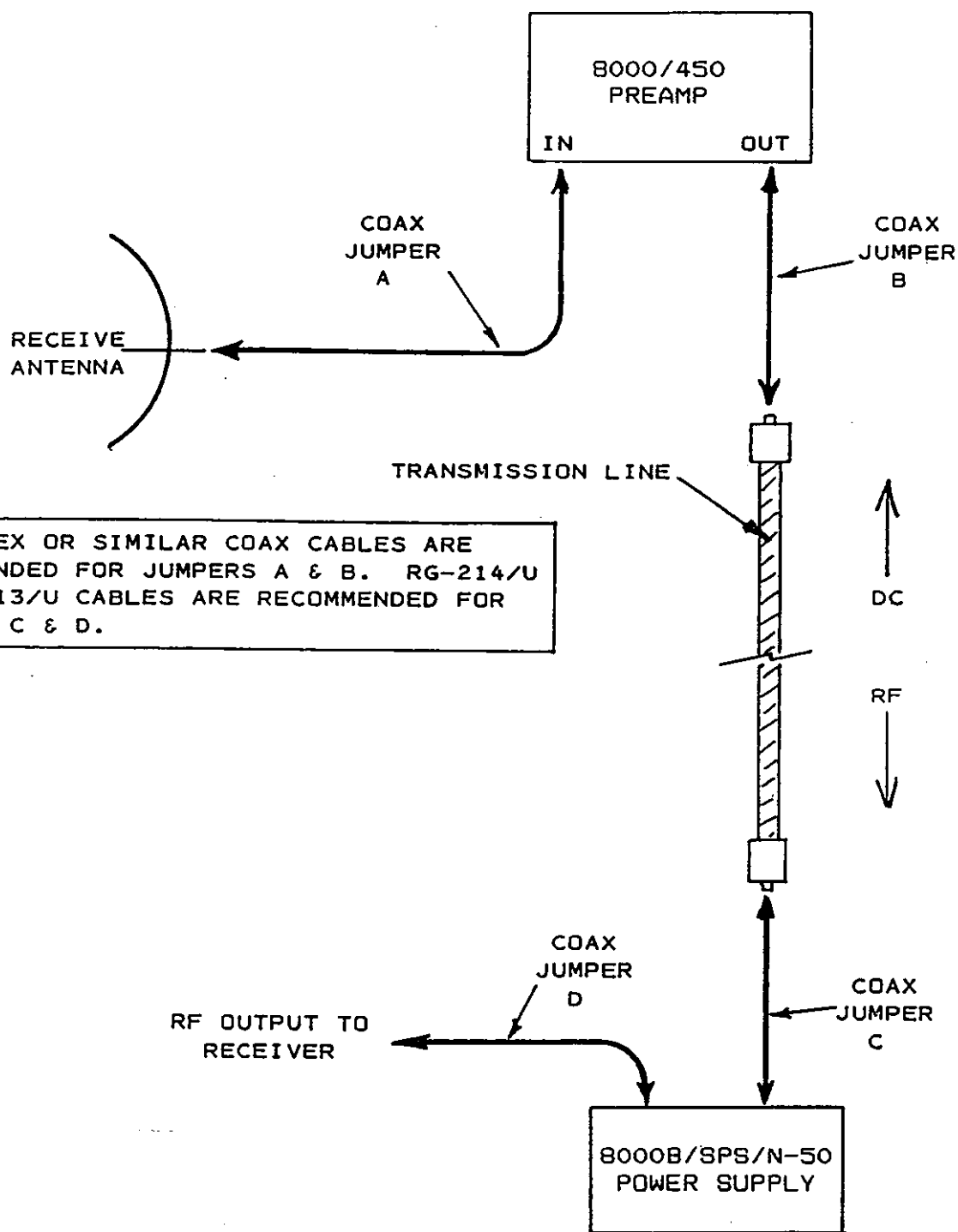


ORDERING INFORMATION

Model 80065/F	(UHF-TV Preamp with F connectors, 75 ohms)
Model 80065/N	(UHF-TV Preamp with N connectors, 75 ohms)
Model 8000/3F	(High-band VHF-TV Preamp, F connectors, 75 ohms)
Model 8000/3N	(High-band VHF-TV Preamp, N connectors, 75 ohms)
Model 8000/2F	(FM Preamp, F connectors, 75 ohms)
Model 8000/2N	(FM Preamp, N connectors, 75 ohms)
Model 8000/1F	(Low-band VHF-TV Preamp, F connectors, 75 ohms)
Model 8000/1N	(Low-band VHF-TV Preamp, N connectors, 75 ohms)
Model 8000/PS/F	(AC Power Supply, F connectors, 75 ohms)
Model 8000/PS/N	(AC Power Supply, N connectors, 75 ohms)
Model 8000/PSC/F	(Power Supply Coupler, F connectors)
Model 8000/PSC/N	(Power Supply Coupler, N connectors)

Note: For 50-ohm impedance, add suffix "-50" to any model number above which ends in "N". (50-ohm units are available only with type N connectors.)





SCALA

POST OFFICE BOX 4580
MEDFORD, OREGON 97501
(503) 779-6500

FAX: (503) 779-3991

8000/450 PREAMP

TYPICAL INSTALLATION

TCXOs (50 kHz to 140 MHz)

Series CO-252 and CO-254 offer the highest stability alternatives and broadest range of options within Vectron's line of TCXOs. The TCXOs on the adjacent pages are more limited in input/output alternatives and other options, but are smaller in size.

		50 kHz to 20 MHz CO-252 SERIES	20.1 MHz to 140 MHz CO-254 SERIES
FREQUENCY		Sine: 1 MHz to 20 MHz TTL: 200 kHz to 20 MHz CMOS: 50 kHz to 15 MHz HCMOS: 50 kHz to 20 MHz	Sine: 20.1 MHz to 140 MHz TTL: 20.1 MHz to 100 MHz CMOS: 20.1 MHz to 15 MHz HCMOS: 20.1 MHz to 50 MHz ECL: 20.1 MHz to 80 MHz
STABILITY	Temperature (Temp. Range A) +15°C to +35°C:	CO-252A17: $\pm 1 \times 10^{-7}$ CO-252A58: $\pm 5 \times 10^{-8}$	CO-254A57: $\pm 5 \times 10^{-7}$ CO-254A17: $\pm 1 \times 10^{-7}$
	(Temp. Range B) 0°C to +50°C:	CO-252B57: $\pm 5 \times 10^{-7}$ CO-252B27: $\pm 2 \times 10^{-7}$ CO-252B17: $\pm 1 \times 10^{-7}$	CO-254B16: $\pm 1 \times 10^{-6}$ CO-254B57: $\pm 5 \times 10^{-7}$ CO-254B27: $\pm 2 \times 10^{-7}$
	(Temp. Range C) 0°C to +70°C:	CO-252C16: $\pm 1 \times 10^{-6}$ CO-252C57: $\pm 5 \times 10^{-7}$ CO-252C37: $\pm 3 \times 10^{-7}$	CO-254C36: $\pm 3 \times 10^{-6}$ CO-254C16: $\pm 1 \times 10^{-6}$ CO-254C37: $\pm 3 \times 10^{-6}$
	(Temp. Range D) -20°C to +70°C:	CO-252D16: $\pm 1 \times 10^{-6}$ CO-252D57: $\pm 5 \times 10^{-7}$	CO-254D56: $\pm 5 \times 10^{-6}$ CO-254D16: $\pm 1 \times 10^{-6}$ CO-254D57: $\pm 5 \times 10^{-6}$
	(Temp. Range E) -40°C to +75°C:	CO-252E56: $\pm 5 \times 10^{-6}$ CO-252E26: $\pm 2 \times 10^{-6}$ CO-252E16: $\pm 1 \times 10^{-6}$	CO-254E56: $\pm 5 \times 10^{-6}$ CO-254E26: $\pm 2 \times 10^{-6}$ CO-254E16: $\pm 1 \times 10^{-6}$
	(Temp. Range F) -55°C to +85°C:	CO-252F56: $\pm 5 \times 10^{-6}$ CO-252F26: $\pm 2 \times 10^{-6}$ CO-252F16: $\pm 1 \times 10^{-6}$	CO-254F56: $\pm 5 \times 10^{-6}$ CO-254F26: $\pm 2 \times 10^{-6}$ CO-254F16: $\pm 1 \times 10^{-6}$
	(Temp. Range G) -55°C to +105°C:	CO-252G56: $\pm 5 \times 10^{-6}$	CO-254G56: $\pm 5 \times 10^{-6}$
	(Temp. Range H) -55°C to +125°C:	CO-252H15: $\pm 1 \times 10^{-6}$	CO-254H15: $\pm 1 \times 10^{-6}$
	Aging Rate	≤ 5 MHz: 5×10^{-7} /year (3×10^{-8} /day avg) > 5 MHz: 1×10^{-6} /year (5×10^{-8} /day avg)	
	Short Term (Allan Variance)	1×10^{-9} /second under constant conditions	
Frequency vs Supply	2×10^{-4} per percent in supply with 10 to 28 Vdc input; 1×10^{-7} per percent change in supply for 5 to 9 Vdc input		
OUTPUT / SUPPLY			
	Output level > 1 Vrms/1k Ω (1-20 MHz)	*Supply $\pm 5\%$ +15 Vdc, 4-15mA	Output level > 0.5 Vrms/50 Ω +15 Vdc, 20mA
Standard	> 1 Vrms/50 Ω (+13 dBm), 1-20 MHz	+15 Vdc, <30 mA	> 1 Vrms/50 Ω (+13 dBm)
Option "R"	TTL	+15 Vdc, <10 mA & +5 Vdc, 10-50 mA	TTL (to 100 MHz)
**Option "J"	TTL	+5 Vdc, 15-60 mA	TTL (to 70 MHz)
**Option "K"			ECL
**Option "M"			ECL (to 70 MHz)
Option "E"			
Other Options	HCMOS (50 kHz-20 MHz) CMOS (50 kHz-15 MHz)	+15 Vdc, 10-20 mA 5 to 15 Vdc, 3-15 mA	HCMOS (to 50 MHz) +5 Vdc, 10-30 mA
*Any supply in 10-24 Vdc range optional in lieu of +15 Vdc; current drain depends upon frequency **Options J and M are more economical than Options K and E respectively			
Harmonics and Sub-Harmonics (sine output)		20 dB below output. If internal multiplication is used (generally above 70 MHz but sometimes at lower frequencies) subharmonics are also down 20dB. Harmonics and subharmonic attenuation can be improved on special order.	
Phase Noise		See page 37 for standard and low noise Option L2 specifications	
FREQUENCY ADJUSTMENT			
Mechanical		Range sufficient to compensate for 5 to 10 years of crystal aging; settable to $< 1 \times 10^{-7}$	
Electronic Tuning Option Option "V"		VCXO operation permits remote frequency adjustment or locking onto an external frequency source. Add "V" to Model Number. Nominal range with 0 to +5 volt control input is 3×10^{-4} total (Wider deviations available). (For very wide deviation and/or linear voltage control, see TC/VCXOs in the VCXO section on page 76)	
SIZE/CONFIGURATION			
Standard (See drawings on page 37)	$2" \times 2" \times 3/4"$ (51 x 51 x 19mm); pins on base for pc board mounting. Most models available with reduced height, to 1/2". For smaller models, with height as low as 0.2" (5.1 mm), see our TCXOs on preceding pages.		
Options	Option "SW": $2" \times 2 1/4" \times 3/4"$ (51 x 57 x 19 mm) SMA output connector on side, pins for pc board mounting on base. Option "W": $2" \times 2" \times 3/4"$ (51 x 51 x 19 mm) SMA output connector, solder header and mounting studs on base. Option "U": $2" \times 2" \times 3/4"$ (51 x 51 x 19 mm) SMC output connector, solder header and mounting studs on base.		
ENVIRONMENTAL		See page 98 for environmental specifications and screen test option.	
HOW TO ORDER		See page 37	

ITFS/INSTRUCTIONAL TELEVISION FIXED SERVICE
MMDS/MULTICHANNEL MULTIPPOINT DISTRIBUTION SERVICE
OFS/OPERATIONAL FIXED SERVICE

GROUP	CHANNEL	BAND LIMIT MHz	VISUAL CARRIER FREQUENCY (MHz)	AURAL CARRIER FREQUENCY (MHz)
A	A-1	2500-2506	2501.25	2505.75
	A-2	2512-2518	2513.25	2517.75
	A-3	2524-2530	2525.25	2529.75
	A-4	2536-2542	2537.25	2541.75
B	B-1	2506-2512	2507.25	2511.75
	B-2	2518-2524	2519.25	2523.75
	B-3	2530-2536	2531.25	2535.75
	B-4	2542-2548	2543.25	2547.75
C	C-1	2548-2554	2549.25	2553.75
	C-2	2560-2566	2561.25	2565.75
	C-3	2572-2578	2573.25	2577.75
	C-4	2584-2590	2585.25	2589.75
D	D-1	2554-2560	2555.25	2559.75
	D-2	2566-2572	2567.25	2571.75
	D-3	2578-2584	2579.25	2583.75
	D-4	2590-2596	2591.25	2595.75
E	E-1	2596-2602	2597.25	2601.75
	E-2	2608-2614	2609.25	2613.75
	E-3	2620-2626	2621.25	2625.75
	E-4	2632-2638	2633.25	2637.75
F	F-1	2602-2608	2603.25	2607.75
	F-2	2614-2620	2615.25	2619.75
	F-3	2626-2632	2627.25	2631.75
	F-4	2638-2644	2639.25	2643.75
G	G-1	2644-2650	2645.25	2649.75
	G-2	2656-2662	2657.25	2661.75
	G-3	2668-2674	2669.25	2673.75
	G-4	2680-2686	2681.25	2685.75
H	H-1	2650-2656	2651.25	2655.75
	H-2	2662-2668	2663.25	2667.75
	H-3	2674-2680	2675.25	2679.75
	H-4 Not Assigned	-----	-----	-----
MDS	CH 1	2150-2156	2154.75	2150.25
	CH 2	2156-2162	2160.75	2156.25
	CH 2A	2156-2160	2158.75	-----

TV CHANNEL FREQUENCIES AND WAVELENGTH

Channel Number	FREQUENCY BAND MHz	PICTURE CARRIER MHz	½ Wave Length, Inches			Channel Number	FREQUENCY BAND MHz	PICTURE CARRIER MHz	½ Wave Length, Inches			
			Type of Dielectric						Type of Dielectric			
			Air	Foam	Solid				Air	Foam	Solid	
MDS-1	2150-2156	2154.75	2.74	2.19	1.81	U.H.F.	566-572	567.25	10.40	8.32	6.86	
MDS-2	2156-2162	2160.75	2.73	2.18	1.80		31	572-578	573.25	10.29	8.23	6.79
Low Band	2	54-60	106.8	85.50	70.50		32	578-584	579.25	10.19	8.15	6.72
	3	60-66	96.39	77.11	63.61		33	584-590	585.25	10.08	8.07	6.65
	4	66-72	87.79	70.23	57.94		34	590-596	591.25	9.98	7.98	6.59
	5	76-82	76.42	61.14	50.44		35	596-602	597.25	9.88	7.90	6.92
	6	82-88	83.25	70.91	56.73		36	602-608	603.25	9.78	7.82	6.45
	FM	88-108	(100.00)	59.04	47.23		38.96	37	608-614	609.25	9.69	7.75
Mid Band	A	120-126	48.69	38.95	32.13		38	614-620	615.25	9.59	7.67	6.33
	B	126-132	46.39	37.11	30.62		39	620-626	621.25	9.50	7.60	6.27
	C	132-128	44.30	35.44	29.24		40	626-632	627.25	9.41	7.52	6.21
	D	138-144	42.39	33.91	27.98		41	632-638	633.25	9.32	7.45	6.15
	E	144-150	40.64	32.51	26.82		42	638-644	639.25	9.23	7.38	6.09
	F	150-156	39.03	31.22	25.76		43	644-650	645.25	9.14	7.31	6.03
	G	156-162	37.54	30.03	24.77		44	650-656	651.25	9.06	7.25	5.98
	H	162-168	36.16	28.93	23.86		45	656-662	657.25	8.98	7.18	5.92
High Band	I	168-174	34.88	27.90	23.02		46	662-668	663.25	8.90	7.12	5.87
	7	174-180	33.68	26.95	22.23		47	668-674	669.25	8.82	7.05	5.82
	8	180-186	32.57	26.05	21.49		48	674-680	675.25	8.74	6.99	5.77
	9	186-192	31.53	25.22	20.80		49	680-686	681.25	8.66	6.93	5.71
	10	192-198	30.55	24.44	20.16		50	686-692	687.25	8.59	6.87	5.66
	11	198-204	29.63	23.70	19.55		51	692-698	693.25	8.51	6.81	5.62
	12	204-210	28.76	23.01	18.98		52	698-704	699.25	8.44	6.75	5.57
	13	210-216	27.94	22.35	18.44		53	704-710	705.25	8.37	6.69	5.52
Super Band	J	216-222	27.17	21.74	17.93		54	710-716	711.25	8.30	6.64	5.47
	K	222-228	26.44	21.15	17.45		55	716-722	717.25	8.23	6.58	5.43
	L	228-234	25.75	20.60	16.99		56	722-728	723.25	8.16	6.53	5.30
	M	234-240	25.09	20.07	16.56		57	728-734	729.25	8.09	6.47	5.34
	N	240-246	24.47	19.57	16.15		58	734-740	735.25	8.02	6.42	5.29
	O	246-252	23.87	19.10	15.75	59	740-746	741.25	7.96	6.36	5.25	
	P	252-258	23.31	18.65	15.38	60	746-752	747.25	7.90	6.32	5.21	
	Q	258-264	22.77	18.21	15.03	61	752-758	753.25	7.83	6.27	5.17	
	R	264-270	22.25	17.80	14.69	62	758-764	759.25	7.77	6.22	5.13	
	S	270-276	21.76	17.41	14.36	63	764-770	765.25	7.71	6.17	5.09	
	T	276-282	21.29	17.03	14.05	64	770-776	771.25	7.65	6.12	5.05	
	U	282-288	20.84	16.67	13.75	65	776-782	777.25	7.59	6.07	5.01	
U.H.F.	V	288-294	20.41	16.32	13.47	66	782-788	783.25	7.53	6.03	4.97	
	W	294-300	19.99	15.99	13.19	67	788-794	789.25	7.48	5.98	4.93	
	14	470-476	12.52	10.02	8.26	68	794-800	795.25	7.42	5.93	4.89	
	15	476-482	12.37	9.89	8.16	69	800-806	801.25	7.36	5.89	4.86	
	16	482-488	12.21	9.77	8.06							
	17	488-494	12.06	9.65	7.96							
	18	494-500	11.92	9.53	7.86							
	19	500-506	11.77	9.42	7.77							
	20	506-512	11.63	9.31	7.68							
	21	512-518	11.50	9.20	7.59							
	22	518-524	11.37	9.09	7.50							
	23	524-530	11.24	8.99	7.41							
	24	530-536	11.11	8.89	7.33							
	25	536-542	10.98	8.79	7.25							
	26	542-548	10.86	8.69	7.17							
	27	548-554	10.74	8.59	7.09							
	28	554-560	10.63	8.50	7.01							
29	560-566	10.51	8.41	6.94								

TV Channel Frequencies (MHz)

Color carrier appears at a frequency 3.58 MHz above the video carrier.
 Converter channel numbering schemes vary. We have provided space
 for you to record your own system's numbering scheme under
 "Your Converter."

Channel Labeling Schemes			Headend Type		
NCTA	Standard Converter	Your Converter	Standard Video Sound	HRC Video Sound	IRC/ICC Video Sound
Sub Band					
T-7			7 11.5		
T-8			13 17.5		
T-9			19 23.5		
T-10			25 29.5		
T-11			31 35.5		
T-12			37 41.5		
T-13			43 47.5		
VHF Low Band					
2	2		52.25 59.75	54 58.5 55.25	59.75
3	3		61.25 65.75	60 64.5 61.25	65.75
4	4		67.25 71.75	66 70.5 67.25	71.75
5	5		77.25 81.75		
6	6		83.25 87.75		
FM Band					
			72 76.5 73.25	77.75	
			78 82.5 79.25	83.75	
			84 88.5 85.25	89.75	
95	A-5		91.25 95.75	90 94.5 91.25	95.75
96	A-4		97.25 101.75	96 100.5 97.25	101.75
97	A-3		103.25 107.75	102 106.5 103.25	107.75
98	A-2		109.25 113.75	108 112.5 109.25	113.75
99	A-1		115.25 119.75	114 118.5 115.25	119.75
VHF Mid-Band					
14	A		121.25 125.75	120 124.5 121.25	125.75
15	B		127.25 131.75	126 130.5 127.25	131.75
16	C		133.25 137.75	132 136.5 133.25	137.75
17	D		139.25 143.75	138 142.5 139.25	143.75
18	E		145.25 149.75	144 148.5 145.25	149.75
19	F		151.25 155.75	150 154.5 151.25	155.75
20	G		157.25 161.75	156 160.5 157.25	161.75
21	H		163.25 167.75	162 166.5 163.25	167.75
22	I		169.25 173.75	168 172.5 169.25	173.75

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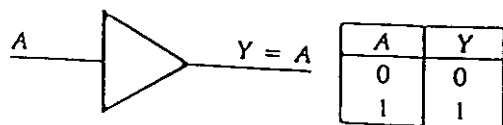
TV Channel Frequencies (MHz)

Channel Labeling Schemes			Headend Type		
NCTA	Standard Converter	Your Converter	Standard Video Sound	HRC Video Sound	IRC/ICC Video Sound
VHF High Band					
7	7		175.25 179.75	174 178.5 175.25	179.75
8	8		181.25 185.75	180 184.5 181.25	185.75
9	9		187.25 191.75	186 190.5 187.25	191.75
10	10		193.25 197.75	192 196.5 193.25	197.75
11	11		199.25 203.75	198 202.5 199.25	203.75
12	12		205.25 209.75	204 208.5 205.25	209.75
13	13		211.25 215.75	210 214.5 211.25	215.75
VHF Super Band					
23	J		217.25 221.75	216 220.5 217.25	221.75
24	K		223.25 227.75	222 226.5 223.25	227.75
25	L		229.25 233.75	228 232.5 229.25	233.75
26	M		235.25 239.75	234 238.5 235.25	239.75
27	N		241.25 245.75	240 244.5 241.25	245.75
28	O		247.25 251.75	246 250.5 247.25	251.75
29	P		253.25 257.75	252 256.5 253.25	257.75
30	Q		259.25 263.75	258 262.5 259.25	263.75
31	R		265.25 269.75	264 268.5 265.25	269.75
32	S		271.25 275.75	270 274.5 271.25	275.75
33	T		277.25 281.75	276 280.5 277.25	281.75
34	U		283.25 287.75	282 286.5 283.25	287.75
35	V		289.25 293.75	288 292.5 289.25	293.75
36	W		295.25 299.75	294 298.5 295.25	299.75
Hyper Band					
37	AA		301.25 305.75	300 304.5 301.25	305.75
38	BB		307.25 311.75	306 310.5 307.25	311.75
39	CC		313.25 317.75	312 316.5 313.25	317.75
40	DD		319.25 323.75	318 322.5 319.25	323.75
41	EE		325.25 329.75	324 328.5 325.25	329.75
42	FF		331.25 335.75	330 334.5 331.25	335.75
43	GG		337.25 341.75	336 340.5 337.25	341.75
44	HH		343.25 347.75	342 346.5 343.25	347.75
45	II		349.25 353.75	348 352.5 349.25	353.75
46	JJ		355.25 359.75	354 358.5 355.25	359.75
47	KK		361.25 365.75	360 364.5 361.25	365.75
48	LL		367.25 371.75	366 370.5 367.25	371.75
49	MM		373.25 377.75	372 376.5 373.25	377.75
50	NN		379.25 383.75	378 382.5 379.25	383.75

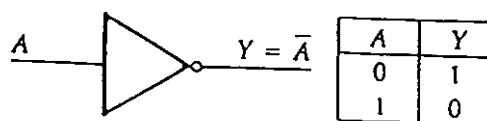
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TV Channel Frequencies (MHz)

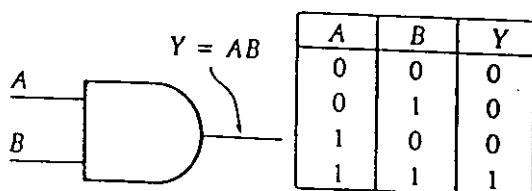
Channel Labeling Schemes			Headend Type					
NCTA	Standard	Your Converter	Standard		HRC		IRC/ICC	
			Video	Sound	Video	Sound	Video	Sound
Hyper Band (cont'd)								
51	OO		385.25	389.75	384	388.5	385.25	389.75
52	PP		391.25	395.75	390	394.5	391.25	395.75
53	QQ		397.25	401.75	396	400.5	397.25	401.75
54	RR		403.25	407.75	402	406.5	403.25	407.75
55	SS		409.25	413.75	408	412.5	409.25	413.75
56	TT		415.25	419.75	414	418.5	415.25	419.75
57	UU		421.25	425.75	420	424.5	421.25	425.75
58	VV		427.25	431.75	426	430.5	427.25	431.75
59	WW		433.25	437.75	432	436.5	433.25	437.75
60	XX		439.25	443.75	438	442.5	439.25	443.75
61	YY		445.25	449.75	444	448.5	445.25	449.75
62	ZZ		451.25	455.75	450	454.5	451.25	455.75
63			457.25	461.75	456	460.5	457.25	461.75
64			463.25	467.75	462	466.5	463.25	467.75
65			469.25	473.75	468	472.5	469.25	473.75
66			475.25	479.75	474	478.5	475.25	479.75
67			481.25	485.75	480	484.5	481.25	485.75
68			487.25	491.75	486	490.5	487.25	491.75
69			493.25	497.75	492	496.5	493.25	497.75
70			499.25	503.75	498	502.5	499.25	503.75
71			505.25	509.75	504	508.5	505.25	509.75
72			511.25	515.75	510	514.5	511.25	515.75
73			517.25	521.75	516	520.5	517.25	521.75
74			523.25	527.75	522	526.5	523.25	527.75
75			529.25	533.75	528	532.5	529.25	533.75
76			535.25	539.75	534	538.5	535.25	539.75
77			541.25	545.75	540	544.5	541.25	545.75
78			547.25	551.75	546	550.5	547.25	551.75
79			553.25	557.75	552	556.5	553.25	557.75
80			559.25	563.75	558	562.5	559.25	563.75
81			565.25	569.75	564	568.5	565.25	569.75
82			571.25	575.75	570	574.5	571.25	575.75
83			577.25	581.75	576	580.5	577.25	581.75
84			583.25	587.75	582	586.5	583.25	587.75
85			589.25	593.75	588	592.5	589.25	593.75
86			595.25	599.75	594	598.5	595.25	599.75
87			601.25	605.75	600	604.5	601.25	605.75



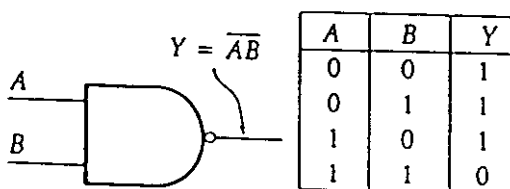
(a) Buffer



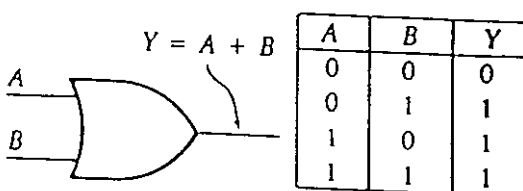
(b) Inverter



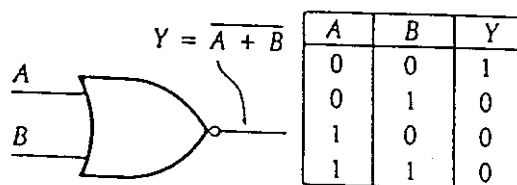
(c) AND



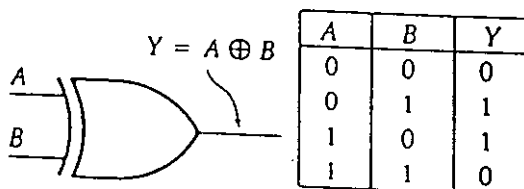
(d) NAND



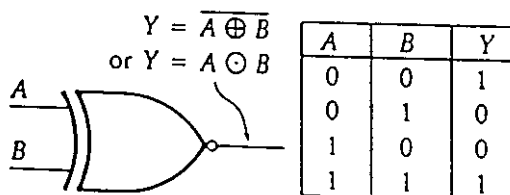
(e) OR



(f) NOR



(g) XOR



(h) XNOR (or equivalence)

	BUFFER
TTL	7417
ECL	MC10188
CMOS	MM74HC125

INVERTER
7404
MC10189
MM74HC04

AND
7408
MC10104
MM74HC08

NAND
7400
MC10121
MM74HC00

		OR
TTL	——	7432
ELL	——	MC10103
CMOS	——	MM74HC32

NOR
7402
MC10102
MM74HC02

XOR
7486
MC10113
MM74HC86

XNOR
74266
MC10107
MM74HC266

Note: This summary is based on positive logic.



Technical Bulletin #201

Power Conversion Chart

Frequently when working with several types of equipment it is necessary to convert from one form of power measurement to another. The accompanying chart will make these conversions easier.

Power dbm	Power Watts	Microvolts 50 Ohms	Microvolts 75 Ohms	Power dbmv	Power dbm	Power Watts	Microvolts 50 Ohms	Microvolts 75 Ohms	Power dbmv
-108.75	13.33 fw	0.82	1.00	-60	-48.75	13.33 nw	816.46	1000	0
-107.75	16.78 fw	0.92	1.12	-59	-47.75	16.78 nw	916.08	1122	1
-106.75	21.13 fw	1.03	1.26	-58	-46.75	21.13 nw	1028	1259	2
-105.75	26.60 fw	1.15	1.41	-57	-45.75	26.60 nw	1153	1413	3
-104.75	33.49 fw	1.29	1.58	-56	-44.75	33.49 nw	1294	1585	4
-103.75	42.16 fw	1.45	1.78	-55	-43.75	42.16 nw	1452	1778	5
-102.75	53.08 fw	1.63	2.00	-54	-42.75	53.08 nw	1629	1995	6
-101.75	66.82 fw	1.83	2.24	-53	-41.75	66.82 nw	1828	2239	7
-100.75	84.12 fw	2.05	2.51	-52	-40.75	84.12 nw	2051	2512	8
-99.75	105.90 fw	2.30	2.82	-51	-39.75	105.90 nw	2301	2818	9
-98.75	133.32 fw	2.58	3.16	-50	-38.75	133.32 nw	2582	3162	10
-97.75	167.84 fw	2.90	3.55	-49	-37.75	167.84 nw	2897	3548	11
-96.75	211.30 fw	3.25	3.98	-48	-36.75	211.30 nw	3250	3981	12
-95.75	266.01 fw	3.65	4.47	-47	-35.75	266.01 nw	3647	4467	13
-94.75	334.89 fw	4.09	5.01	-46	-34.75	334.89 nw	4092	5012	14
-93.75	421.60 fw	4.59	5.62	-45	-33.75	421.60 nw	4591	5623	15
-92.75	530.76 fw	5.15	6.31	-44	-32.75	530.76 nw	5152	6310	16
-91.75	668.19 fw	5.78	7.08	-43	-31.75	668.19 nw	5780	7079	17
-90.75	841.20 fw	6.49	7.94	-42	-30.75	841.20 nw	6485	7943	18
-89.75	1.06 pw	7.28	8.91	-41	-29.75	1.06 uw	7277	8913	19
-88.75	1.33 pw	8.16	10.00	-40	-28.75	1.33 uw	8165	10000	20
-87.75	1.68 pw	9.16	11.22	-39	-27.75	1.68 uw	9161	11220	21
-86.75	2.11 pw	10.28	12.59	-38	-26.75	2.11 uw	10279	12589	22
-85.75	2.66 pw	11.53	14.13	-37	-25.75	2.66 uw	11533	14125	23
-84.75	3.35 pw	12.94	15.85	-36	-24.75	3.35 uw	12940	15849	24
-83.75	4.22 pw	14.52	17.78	-35	-23.75	4.22 uw	14519	17783	25
-82.75	5.31 pw	16.29	19.95	-34	-22.75	5.31 uw	16291	19953	26
-81.75	6.68 pw	18.28	22.39	-33	-21.75	6.68 uw	18278	22387	27
-80.75	8.41 pw	20.51	25.12	-32	-20.75	8.41 uw	20509	25119	28
-79.75	10.59 pw	23.01	28.18	-31	-19.75	10.59 uw	23011	28184	29
-78.75	13.33 pw	25.82	31.62	-30	-18.75	13.33 uw	25819	31623	30
-77.75	16.78 pw	28.97	35.48	-29	-17.75	16.78 uw	28969	35481	31
-76.75	21.13 pw	32.50	39.81	-28	-16.75	21.13 uw	32504	39811	32
-75.75	26.60 pw	36.47	44.67	-27	-15.75	26.60 uw	36470	44668	33
-74.75	33.49 pw	40.92	50.12	-26	-14.75	33.49 uw	40920	50119	34
-73.75	42.16 pw	45.91	56.23	-25	-13.75	42.16 uw	45913	56234	35
-72.75	53.08 pw	51.52	63.10	-24	-12.75	53.08 uw	51515	63096	36
-71.75	66.82 pw	57.80	70.79	-23	-11.75	66.82 uw	57801	70795	37
-70.75	84.12 pw	64.85	79.43	-22	-10.75	84.12 uw	64854	79433	38
-69.75	105.90 pw	72.77	89.13	-21	-9.75	105.90 uw	72767	89125	39
-68.75	133.32 pw	81.65	100.00	-20	-8.75	133.32 uw	81646	100000	40
-67.75	167.84 pw	91.61	112.20	-19	-7.75	167.84 uw	91608	112202	41
-66.75	211.30 pw	102.79	125.89	-18	-6.75	211.30 uw	102786	125893	42
-65.75	266.01 pw	115.33	141.25	-17	-5.75	266.01 uw	115328	141254	43
-64.75	334.89 pw	129.40	158.49	-16	-4.75	334.89 uw	129400	158489	44
-63.75	421.60 pw	145.19	177.83	-15	-3.75	421.60 uw	145189	177828	45
-62.75	530.76 pw	162.91	199.53	-14	-2.75	530.76 uw	162905	199526	46
-61.75	668.19 pw	182.78	223.87	-13	-1.75	668.19 uw	182783	223872	47
-60.75	841.20 pw	205.09	251.19	-12	-0.75	841.20 uw	205086	251189	48
-59.75	1.06 nw	230.11	281.84	-11	0.00	1.00 mw	223607	273873	48.75
-58.75	1.33 nw	258.19	316.23	-10	0.25	1.06 mw	230110	281838	49
-57.75	1.68 nw	289.69	354.81	-9	1.25	1.33 mw	258187	316228	50
-56.75	2.11 nw	325.04	398.11	-8	2.25	1.68 mw	289691	354813	51
-55.75	2.66 nw	364.70	446.68	-7	3.25	2.11 mw	325039	398107	52
-54.75	3.35 nw	409.20	501.19	-6	4.25	2.66 mw	364699	446684	53
-53.75	4.22 nw	459.13	562.34	-5	5.25	3.35 mw	409199	501187	54
-52.75	5.31 nw	515.15	630.96	-4	6.25	4.22 mw	459129	562341	55
-51.75	6.68 nw	578.01	707.95	-3	7.25	5.31 mw	515152	630957	56
-50.75	8.41 nw	648.54	794.33	-2	8.25	6.68 mw	578010	707946	57
-49.75	10.59 nw	727.67	891.25	-1	9.25	8.41 mw	648537	794328	58
-48.75	13.33 nw	816.46	1000	0	10.25	10.59 mw	727671	891251	59
					11.25	13.33 mw	816460	1000000	60

0 dbm = 1 mw across 50 Ohms
0 dbmv = 1000 uv across 75 Ohms
1 femtowatt (fw) = 1×10^{-15} Watt
1 picowatt (pw) = 1×10^{-12} Watt

1 nanowatt (nw) = 1×10^{-9} Watt
1 microwatt (uw) = 1×10^{-6} Watt
1 milliwatt (mw) = 1×10^{-3} Watt

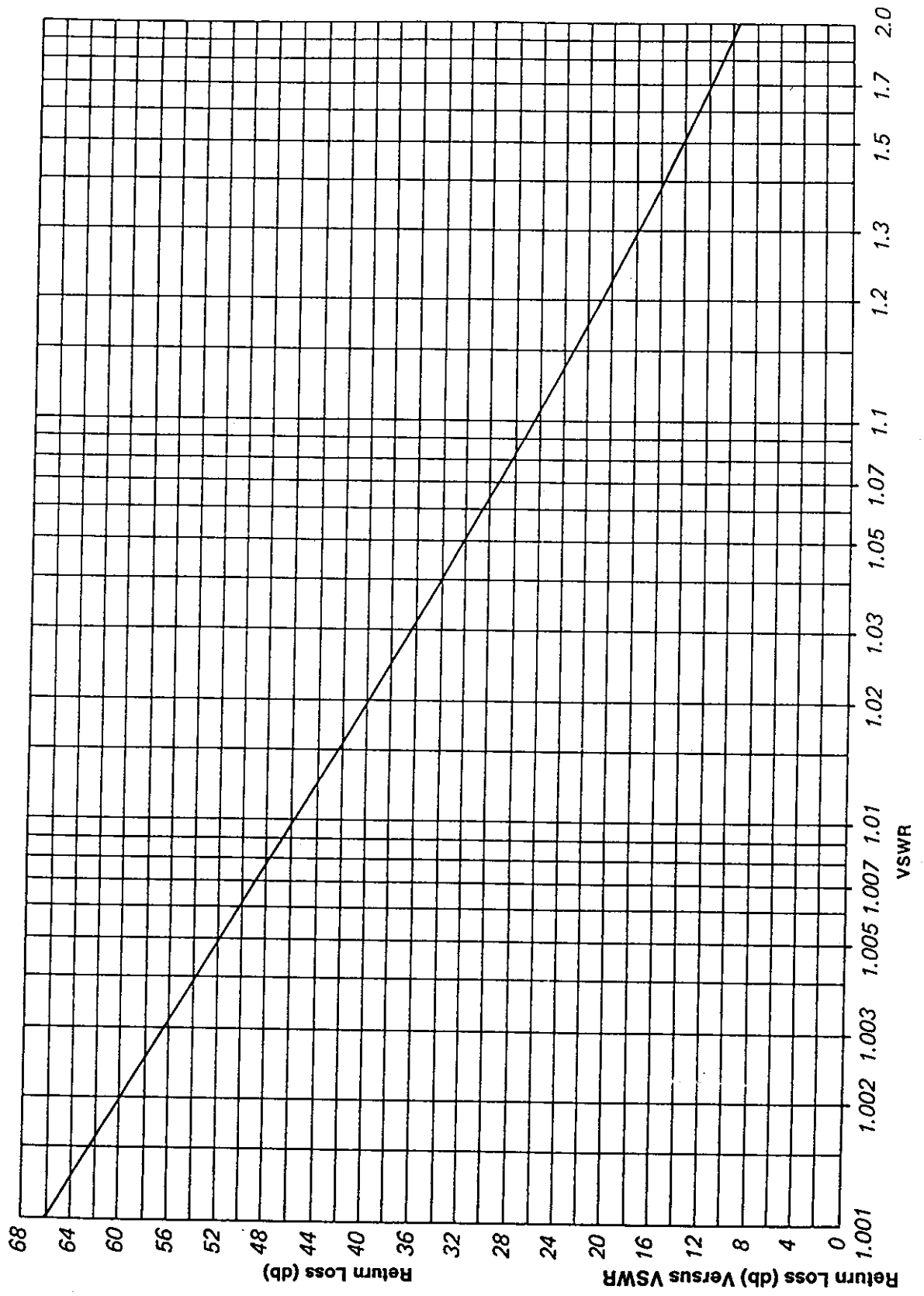
Voltage and Power Ratios to Decibels

2,000:1 to dB, express 2,000 as 2×10^3 ; the number of dB corresponding to a power ratio of 2 is very nearly 3, and the number of dB for a power ratio of 10^3 is 30. Therefore, the power ratio of 2,000:2 is approximately 30 dB + 3 dB — 33 dB. In the lower right-hand corner of the chart dB values for voltage and power ratios of integral powers of 10 are given.

Voltage Ratio	Power Ratio	-dB	Voltage Ratio	Power Ratio	Voltage Ratio	Power Ratio	-dB	Voltage Ratio	Power Ratio	Voltage Ratio	Power Ratio	-dB	Voltage Ratio	Power Ratio
1.000	1.000	0	1.000	1.000	.447	.200	7.0	2.239	5.012	.200	.0398	14.0	5.012	25.12
.989	.977	0.1	1.012	1.023	.442	.195	7.1	2.265	5.129	.197	.0389	14.1	5.070	25.70
.977	.955	0.2	1.023	1.047	.437	.191	7.2	2.291	5.248	.195	.0380	14.2	5.129	26.30
.966	.933	0.3	1.035	1.072	.432	.186	7.3	2.317	5.370	.193	.0372	14.3	5.188	26.92
.955	.912	0.4	1.047	1.096	.427	.182	7.4	2.344	5.495	.191	.0363	14.4	5.248	27.54
.944	.891	0.5	1.059	1.122	.422	.178	7.5	2.371	5.623	.188	.0355	14.5	5.309	28.18
.933	.871	0.6	1.072	1.148	.417	.174	7.6	2.399	5.754	.186	.0347	14.6	5.370	28.84
.923	.851	0.7	1.084	1.175	.412	.170	7.7	2.427	5.888	.184	.0339	14.7	5.433	29.51
.912	.832	0.8	1.096	1.202	.407	.166	7.8	2.455	6.026	.182	.0331	14.8	5.495	30.20
.902	.813	0.9	1.109	1.230	.403	.162	7.9	2.483	6.166	.180	.0324	14.9	5.559	30.90
.891	.794	1.0	1.122	1.259	.398	.159	8.0	2.512	6.310	.178	.0316	15.0	5.623	31.62
.881	.776	1.1	1.135	1.288	.394	.155	8.1	2.541	6.457	.176	.0309	15.1	5.689	32.36
.871	.759	1.2	1.148	1.318	.389	.151	8.2	2.570	6.607	.174	.0302	15.2	5.754	33.11
.861	.741	1.3	1.161	1.349	.385	.148	8.3	2.600	6.761	.172	.0295	15.3	5.821	33.88
.851	.724	1.4	1.175	1.380	.380	.145	8.4	2.630	6.918	.170	.0288	15.4	5.888	34.67
.841	.708	1.5	1.189	1.413	.376	.141	8.5	2.661	7.079	.168	.0282	15.5	5.957	35.48
.832	.692	1.6	1.202	1.445	.372	.138	8.6	2.692	7.244	.166	.0275	15.6	6.026	36.31
.822	.676	1.7	1.215	1.479	.367	.135	8.7	2.723	7.413	.164	.0269	15.7	6.095	37.15
.813	.661	1.8	1.230	1.514	.363	.132	8.8	2.754	7.586	.162	.0263	15.8	6.166	38.02
.804	.646	1.9	1.245	1.549	.359	.129	8.9	2.786	7.762	.160	.0257	15.9	6.237	38.90
.794	.631	2.0	1.259	1.585	.355	.126	9.0	2.818	7.943	.159	.0251	16.0	6.310	39.81
.785	.617	2.1	1.274	1.622	.351	.123	9.1	2.851	8.128	.157	.0246	16.1	6.383	40.74
.776	.603	2.2	1.288	1.660	.347	.120	9.2	2.884	8.318	.155	.0240	16.2	6.457	41.69
.767	.589	2.3	1.303	1.698	.343	.118	9.3	2.917	8.511	.153	.0234	16.3	6.531	42.66
.759	.575	2.4	1.318	1.738	.339	.115	9.4	2.951	8.710	.151	.0229	16.4	6.607	43.65
.750	.562	2.5	1.334	1.778	.335	.112	9.5	2.985	8.913	.150	.0224	16.5	6.683	44.67
.741	.550	2.6	1.349	1.820	.331	.110	9.6	3.020	9.120	.148	.0219	16.6	6.761	45.71
.733	.537	2.7	1.365	1.862	.327	.107	9.7	3.055	9.333	.146	.0214	16.7	6.839	46.77
.724	.525	2.8	1.380	1.905	.324	.105	9.8	3.090	9.550	.145	.0209	16.8	6.918	47.86
.716	.513	2.9	1.396	1.950	.320	.102	9.9	3.126	9.772	.143	.0204	16.9	6.998	48.98
.708	.501	3.0	1.413	1.995	.316	.100	10.0	3.162	10.00	.141	.0200	17.0	7.079	50.12
.700	.490	3.1	1.429	2.042	.313	.0977	10.1	3.199	10.23	.140	.0195	17.1	7.151	51.29
.692	.479	3.2	1.445	2.089	.309	.0955	10.2	3.236	10.47	.138	.0191	17.2	7.244	52.48
.684	.468	3.3	1.462	2.138	.306	.0933	10.3	3.273	10.72	.137	.0186	17.3	7.328	53.70
.676	.457	3.4	1.479	2.188	.302	.0912	10.4	3.311	10.96	.135	.0182	17.4	7.413	54.95
.668	.447	3.5	1.496	2.239	.299	.0891	10.5	3.350	11.22	.133	.0178	17.5	7.499	56.23
.661	.437	3.6	1.514	2.291	.295	.0871	10.6	3.388	11.48	.132	.0174	17.6	7.586	57.54
.653	.427	3.7	1.531	2.344	.292	.0851	10.7	3.428	11.75	.130	.0170	17.7	7.674	58.88
.646	.417	3.8	1.549	2.399	.288	.0832	10.8	3.467	12.02	.129	.0166	17.8	7.762	60.26
.638	.407	3.9	1.567	2.455	.285	.0813	10.9	3.508	12.30	.127	.0162	17.9	7.852	61.66
.631	.398	4.0	1.585	2.512	.282	.0794	11.0	3.548	12.59	.126	.0159	18.0	7.943	63.10
.624	.389	4.1	1.603	2.570	.279	.0776	11.1	3.589	12.88	.125	.0155	18.1	8.035	64.57
.617	.380	4.2	1.622	2.630	.275	.0759	11.2	3.631	13.18	.123	.0151	18.2	8.128	66.07
.610	.372	4.3	1.641	2.692	.272	.0741	11.3	3.673	13.49	.122	.0148	18.3	8.222	67.61
.603	.363	4.4	1.660	2.754	.269	.0724	11.4	3.715	13.80	.120	.0145	18.4	8.318	69.18
.596	.355	4.5	1.679	2.818	.266	.0708	11.5	3.758	14.13	.119	.0141	18.5	8.414	70.79
.589	.347	4.6	1.698	2.884	.263	.0692	11.6	3.802	14.45	.118	.0138	18.6	8.511	72.44
.582	.339	4.7	1.718	2.951	.260	.0676	11.7	3.845	14.79	.116	.0135	18.7	8.610	74.13
.575	.331	4.8	1.738	3.020	.257	.0661	11.8	3.890	15.14	.115	.0132	18.8	8.710	75.86
.569	.324	4.9	1.758	3.090	.254	.0646	11.9	3.936	15.49	.114	.0129	18.9	8.811	77.62
.562	.316	5.0	1.778	3.162	.251	.0631	12.0	3.981	15.85	.112	.0126	19.0	8.913	79.43
.556	.309	5.1	1.799	3.236	.248	.0617	12.1	4.027	16.22	.111	.0123	19.1	9.016	81.28
.550	.302	5.2	1.820	3.311	.245	.0603	12.2	4.074	16.60	.110	.0120	19.2	9.120	83.18
.543	.295	5.3	1.841	3.388	.243	.0589	12.3	4.121	16.98	.108	.0118	19.3	9.226	85.11
.537	.288	5.4	1.862	3.467	.240	.0575	12.4	4.169	17.38	.107	.0115	19.4	9.333	87.10
.531	.282	5.5	1.884	3.548	.237	.0562	12.5	4.217	17.78	.106	.0112	19.5	9.441	89.13
.525	.275	5.6	1.905	3.631	.234	.0550	12.6	4.266	18.20	.105	.0110	19.6	9.550	91.20
.519	.269	5.7	1.928	3.715	.232	.0537	12.7	4.315	18.62	.104	.0107	19.7	9.661	93.33
.513	.263	5.8	1.950	3.802	.229	.0525	12.8	4.365	19.05	.102	.0105	19.8	9.772	95.50
.507	.257	5.9	1.972	3.890	.227	.0513	12.9	4.416	19.50	.101	.0102	19.9	9.886	97.72
.501	.251	6.0	1.995	3.981	.224	.0501	13.0	4.467	19.95	.100	.0100	20.0	10.000	100.00
.496	.246	6.1	2.018	4.074	.221	.0490	13.1	4.519	20.42					
.490	.240	6.2	2.042	4.169	.219	.0479	13.2	4.571	20.89		10 ³	30		10 ³
.484	.234	6.3	2.065	4.266	.216	.0468	13.3	4.624	21.38	10 ²	10 ⁴	40	10 ²	10 ⁴
.479	.229	6.4	2.089	4.365	.214	.0457	13.4	4.677	21.88					
.473	.224	6.5	2.113	4.467	.211	.0447	13.5	4.732	22.39	10 ³	10 ⁵	50		10 ⁵
.468	.219	6.6	2.138	4.571	.209	.0437	13.6	4.786	22.91		10 ⁶	60	10 ³	10 ⁶
.462	.214	6.7	2.163	4.677	.207	.0427	13.7	4.842	23.44	10 ⁴	10 ⁷	70		10 ⁷
.457	.209	6.8	2.188	4.786	.204	.0417	13.8	4.898	23.99		10 ⁸	80	10 ⁴	10 ⁸
.452	.204	6.9	2.213	4.898	.202	.0407	13.9	4.955	24.55		10 ⁹	90		10 ⁹
										10 ⁵	10 ¹⁰	100	10 ⁵	10 ¹⁰
											10 ¹¹	110		10 ¹¹
										10 ⁶	10 ¹²	120	10 ⁶	10 ¹²

dBm—DBW—Powers of 10 and Prefixes Expressed in Watts

dBm	dBW	Watts Whole Number or Decimal Number	Multiple or Submultiple	Prefix
+150	+120	1,000,000,000,000	10^{12}	1 Terawatt
+140	+110	100,000,000,000	10^{11}	100 Gigawatts
+130	+100	10,000,000,000	10^{10}	10 Gigawatts
+120	+90	1,000,000,000	10^9	1 Gigawatt
+110	+80	100,000,000	10^8	100 Megawatts
+100	+70	10,000,000	10^7	10 Megawatts
+90	+60	1,000,000	10^6	1 Megawatt
+80	+50	100,000	10^5	100 Kilowatts
+70	+40	10,000	10^4	10 Kilowatts
+60	+30	1,000	10^3	1 Kilowatt
+50	+20	100	10^2	1 Hectowatt (100 w)
+40	+10	10	10^1	1 Decawatt (10 w)
+30	0	1	10^0	1 Watt
+20	-10	0.1	10^{-1}	1 Deciwatt (100 mw)
+10	-20	0.01	10^{-2}	1 Centiwatt (10 mw)
0	-30	0.001	10^{-3}	1 Milliwatt
-10	-40	0.0,001	10^{-4}	100 Microwatts
-20	-50	0.00,001	10^{-5}	10 Microwatts
-30	-60	0.000,001	10^{-6}	1 Microwatt
-40	-70	0.0,000,001	10^{-7}	100 Nanowatts
-50	-80	0.00,000,001	10^{-8}	10 Nanowatts
-60	-90	0.000,000,001	10^{-9}	1 Nanowatt
-70	-100	0.0,000,000,001	10^{-10}	100 Picowatts
-80	-110	0.00,000,000,001	10^{-11}	10 Picowatts
-90	-120	0.000,000,000,001	10^{-12}	1 Picowatt



Temperature

$$32 + \frac{9}{5}^{\circ}\text{C} = ^{\circ}\text{F}$$

$$\frac{5}{9} (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$$

$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$
-50	-58	125	257
-45	-49	130	266
-40	-40	135	275
-35	-31	140	284
-30	-22	145	293
-25	-13	150	302
-20	-4	155	311
-15	5	160	320
-10	14	165	329
-5	23	170	338
0	32	175	347
5	41	180	356
10	50	185	365
15	59	190	374
20	68	195	383
25	77	200	392
30	86	205	401
35	95	210	410
40	104	215	419
45	113	220	428
50	122	225	437
55	131	230	446
60	140	235	455
65	149	240	464
70	158	245	473
75	167	250	482
80	176	255	491
85	185	260	500
90	194	265	509
95	203	270	518
100	212	275	527
105	221	280	536
110	230	285	545
115	239	290	554
120	248	295	563
		300	572

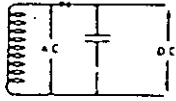
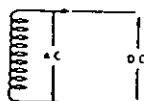
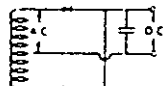
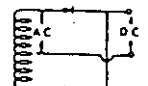
Fractions of an Inch to Decimal and Millimeter

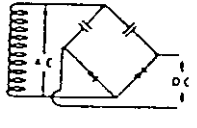
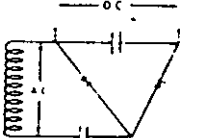
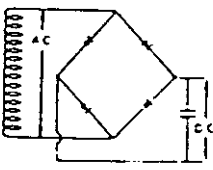
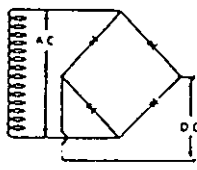
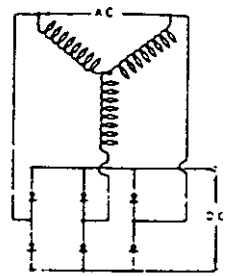
$$1 \text{ inch} = 25.4 \text{ mm}$$

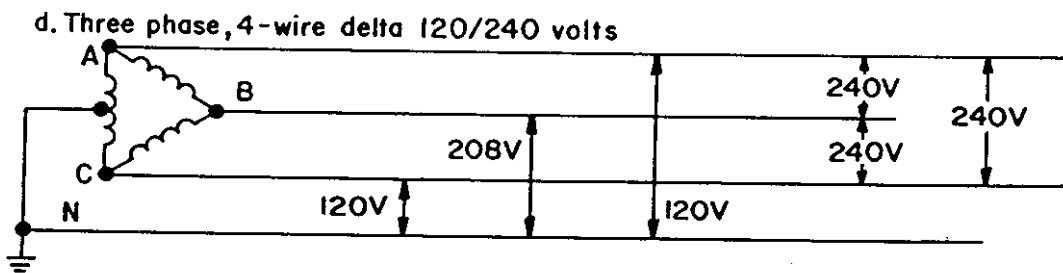
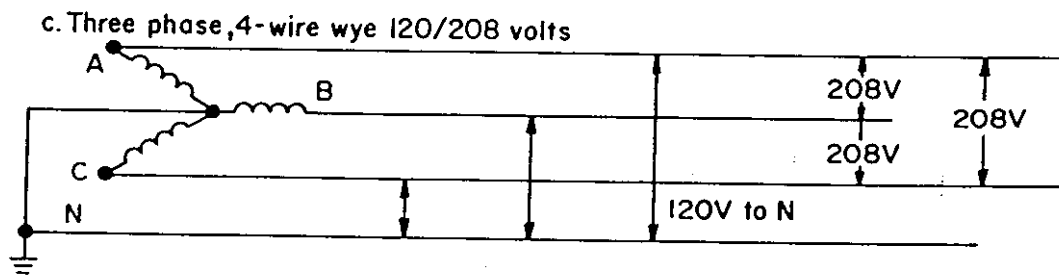
Inch	Decimal Inch	Millimeter	Inch	Decimal Inch	Millimeter
$\frac{1}{16}$	0.0156	0.397	$\frac{3}{16}$	0.5156	13.097
$\frac{1}{8}$	0.0313	0.794	$\frac{1}{2}$	0.5313	13.494
$\frac{3}{16}$	0.0469	1.191	$\frac{5}{8}$	0.5469	13.891
$\frac{1}{4}$	0.0625	1.588	$\frac{3}{4}$	0.5625	14.288
$\frac{5}{16}$	0.0781	1.984	$\frac{7}{8}$	0.5781	14.684
$\frac{3}{8}$	0.0938	2.381	$\frac{15}{16}$	0.5938	15.081
$\frac{7}{16}$	0.1094	2.778	$\frac{1}{1}$	0.6094	15.478
$\frac{1}{2}$	0.1250	3.175	$\frac{1}{1}$	0.6250	15.875
$\frac{5}{8}$	0.1406	3.572	$\frac{1}{1}$	0.6406	16.272
$\frac{3}{4}$	0.1563	3.969	$\frac{1}{1}$	0.6563	16.689
$\frac{7}{8}$	0.1719	4.366	$\frac{1}{1}$	0.6719	17.066
$\frac{15}{16}$	0.1875	4.763	$\frac{1}{1}$	0.6875	17.463
$\frac{1}{1}$	0.2031	5.159	$\frac{1}{1}$	0.7031	17.859
$\frac{1}{1}$	0.2188	5.556	$\frac{1}{1}$	0.7188	18.256
$\frac{1}{1}$	0.2344	5.953	$\frac{1}{1}$	0.7344	18.653
$\frac{1}{1}$	0.2500	6.350	$\frac{1}{1}$	0.7500	19.050
$\frac{1}{1}$	0.2656	6.747	$\frac{1}{1}$	0.7656	19.447
$\frac{1}{1}$	0.2813	7.144	$\frac{1}{1}$	0.7813	19.844
$\frac{1}{1}$	0.2969	7.541	$\frac{1}{1}$	0.7969	20.241
$\frac{1}{1}$	0.3125	7.938	$\frac{1}{1}$	0.8125	20.638
$\frac{1}{1}$	0.3281	8.334	$\frac{1}{1}$	0.8281	21.034
$\frac{1}{1}$	0.3438	8.731	$\frac{1}{1}$	0.8438	21.431
$\frac{1}{1}$	0.3594	9.128	$\frac{1}{1}$	0.8594	21.828
$\frac{1}{1}$	0.3750	9.525	$\frac{1}{1}$	0.8750	22.225
$\frac{1}{1}$	0.3906	9.922	$\frac{1}{1}$	0.8906	22.622
$\frac{1}{1}$	0.4063	10.319	$\frac{1}{1}$	0.9063	23.019
$\frac{1}{1}$	0.4219	10.716	$\frac{1}{1}$	0.9219	23.416
$\frac{1}{1}$	0.4375	11.113	$\frac{1}{1}$	0.9375	23.813
$\frac{1}{1}$	0.4531	11.509	$\frac{1}{1}$	0.9531	24.209
$\frac{1}{1}$	0.4688	11.906	$\frac{1}{1}$	0.9688	24.606
$\frac{1}{1}$	0.4844	12.303	$\frac{1}{1}$	0.9844	25.003
$\frac{1}{1}$	0.5000	12.700	$\frac{1}{1}$	1.0000	25.400

Inch and Millimeter

Inch	0	1/8	1/4	3/8	1/2	5/8	3/4	7/8	Inch
0	0.0	3.18	6.35	9.52	12.70	15.88	19.05	22.22	0
1	25.40	28.58	31.75	34.92	38.10	41.28	44.45	47.62	1
2	50.80	53.98	57.15	60.32	63.50	66.68	69.85	73.02	2
3	76.20	79.38	82.55	85.72	88.90	92.08	95.25	98.42	3
4	101.6	104.8	108.0	111.1	114.3	117.5	120.6	123.8	4
5	127.0	130.2	133.4	136.5	139.7	142.9	146.0	149.2	5
6	152.4	155.6	158.8	161.9	165.1	168.3	171.4	174.6	6
7	177.8	181.0	184.2	187.3	190.5	193.7	196.8	200.0	7
8	203.2	206.4	209.6	212.7	215.9	219.1	222.2	225.4	8
9	228.6	231.8	235.0	238.1	241.3	244.5	247.6	250.8	9
10	254.0	257.2	260.4	263.5	266.7	269.9	273.0	276.2	10
11	279	283	286	289	292	295	298	302	11
12	305	308	311	314	317	321	324	327	12
13	330	333	337	340	343	346	349	352	13
14	356	359	362	365	368	371	375	378	14
15	381	384	387	391	394	397	400	403	15
16	406	410	413	416	419	422	425	429	16
17	432	435	438	441	445	448	451	454	17
18	457	460	464	467	470	473	476	479	18
19	483	486	489	492	495	498	502	505	19
20	508	511	514	518	521	524	527	530	20
Inch	0	1/8	1/4	3/8	1/2	5/8	3/4	7/8	Inch

CIRCUIT		SINGLE PHASE HALF WAVE		SINGLE PHASE CENTER TAP	
SCHEMATIC					
		CAPACITIVE LOAD	RESISTIVE INDUCTIVE LOAD	CAPACITIVE LOAD	RESISTIVE INDUCTIVE LOAD
A.C. INPUT VOLTAGE	PEAK	$1.0 \times DC$	$3.14 \times DC$	$1.0 \times DC$	$1.57 \times DC$
	RMS	$0.7 \times DC$	$2.22 \times DC$	$0.7 \times DC$	$1.11 \times DC$
ACTUAL P.I.V.		$2.0 \times DC$	$3.14 \times DC$	$2.0 \times DC$	$3.14 \times DC$

CIRCUIT		SINGLE PHASE DOUBLER	SINGLE PHASE FULL WAVE BRIDGE		THREE PHASE FULL WAVE BRIDGE
SCHEMATIC		 			
			CAPACITIVE LOAD	RESISTIVE INDUCTIVE LOAD	
A.C. INPUT VOLTAGE	PEAK	$0.5 \times DC$	$1.0 \times DC$	$1.57 \times DC$	$1.05 \times DC$
	RMS	$0.35 \times DC$	$0.7 \times DC$	$1.11 \times DC$	$.735 \times DC$
ACTUAL P.I.V.		$1.0 \times DC$	$1.0 \times DC$	$1.57 \times DC$	$1.05 \times DC$



AC DISTRIBUTION - 600 VOLTS OR LESS

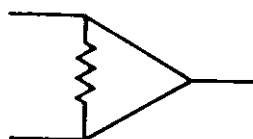
DIRECTIONAL COUPLER



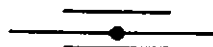
90° HYBRID



POWER DIVIDER



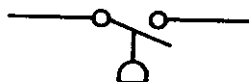
BALANCED STRIPLINE



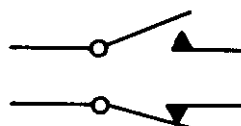
UNBALANCED STRIPLINE



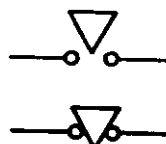
PRESSURE ACTUATED
SWITCH



MOMENTARY TOGGLE
SWITCH



SAFETY INTERLOCK
SWITCH



SURGE ARRESTER



THERMAL ELEMENT



INTERNATIONAL SERIES DESCRIPTION

The INTERNATIONAL SERIES is a high reliability line of open-frame power supplies designed to operate from the wide range of AC power sources found worldwide.

This feature greatly simplifies your inventory and service considerations by allowing the use of one standard power supply regardless of destination. Additionally, these models are designed to meet many domestic and European regulatory agency requirements.

If you plan to distribute your products worldwide, obtaining necessary agency approvals can be greatly simplified by specifying POWER-ONE INC. INTERNATIONAL SERIES.

INTERNATIONAL SERIES
DC POWER SUPPLIES

DRAWING NO. 51281 REV. H

SPECIFICATIONS AND APPLICATION DATA

VOLTAGE/CURRENT RATING CHART

MODEL

SINGLE OUTPUT

	+2V	+5V	+12V	+15V	+18-20V	+24V	+28V	-5V	-12V	-15V	-18-20V	-24V	CASE
HAS-1.5/OVP-A	1.5		0.9 or 0.9										B
HA15-0.9-A													B
HA24-0.5-A						0.5 or 0.5							B
HB2-3-A	3.0	3.0	1.7	1.5			1.2	1.0					B
HB5-3/OVP-A													B
HB12-1.7-A													B
HB15-1.5-A													B
HB24-1.2-A													B
HB28-1-A													B
HC2-6-A	6.0	6.0											C
HC5-6/OVP-A													C
HC12-3.4-A			3.4	3.0									C
HC15-3-A													C
HC24-2.4-A						2.4	2.0						C
HC28-2-A													C
HD2-12-A	12.0	12.0											D
HD5-12/OVP-A													D
HD12-6.8-A			6.8	6.0									D
HD15-6-A													D
HD24-4.8-A						4.8	4.0						D
HD28-4-A													D
HE2-18-A	18.0	18.0											E
HE5-18/OVP-A													E
HE12-10.2-A			10.2										E
HE15-9-A				9.0									E
HE24-7.2-A						7.2							E
HE28-6-A							6.0						E
HN5-9/OVP-A		9.0											N
HN12-5.1-A			5.1										N
HN15-4.5-A				4.5									N
HN24-3.6-A						3.6							N
HN28-3-A							3.0						N

DUAL OUTPUTS

	+2V	+5V	+12V	+15V	+18-20V	+24V	+28V	-5V	-12V	-15V	-18-20V	-24V	CASE
HAA5-1.5/OVP-A	1.5		1.0 or 0.8										AA
HAA15-0.8-A													AA
HAA24-0.6-A						0.4 or 0.6							AA
HAA512-A	2.0	0.5 or 0.5									0.4 or 0.6		AA
HAD12-0.4-A		0.4							0.4				B
HAD15-0.4-A			0.4							0.4			B
HBB5-3/OVP-A	3.0												BB
HBB15-1.5-A			1.7 or 1.5										BB
HBB24-1.2-A						0.9 or 1.2							BB
HBB512-A	3.0	1.25 or 1.25									0.9	1.2	BB
HCC5-6/OVP-A	6.0												CC
HCC15-3-A			3.4 or 3.0										CC
HCC24-2.4-A						1.8 or 2.4							CC
HCC512-A	6.0	2.5 or 2.5									1.8 or 2.4		CC
HDD15-5-A		5.0 or 5.0											CC

TRIPLE OUTPUTS

	+2V	+5V	+12V	+15V	+18-20V	+24V	+28V	-5V	-12V	-15V	-18-20V	-24V	CASE
HAAA-18V-A	2.0	0.4 or 0.4											AA
HAAA-40V-A	3.0	1.0 or 0.8											BAA
HCAA-60V-A	6.0	1.0 or 1.0											D
HCB8-75V-A	6.0	1.7 or 1.5											CCB
HCB8-105V-A	12.0	1.7 or 1.5											CCB
CP131-A	8.0	1.7 or 1.5											131

HIGH VOLTAGE

	+48	+120	+180	+200	+250	CASE
HB48-0.5-A	0.5					B
HC48-1-A	1.0					C
HD48-3-A	3.0					D
HE48-4-A	4.0					E
HB120-0.2-A		2				B
HB200-0.12-A			12 or 12			B
HB250-0.1-A					0.1	B

* -12V (or -15V) requires jumper on PCB for -5V.
 † for 12V, refer to chassis silkscreen
 ‡ for 180V, refer to chassis silkscreen
 ▽ 12V to 15V adjustable output
 — indicates no remote sense

Specifications subject to change without notice.

FEATURES

- VDE transformer construction
- 1.05% regulation
- I.C. burned-in to MIL-883 Lev. B
- Chassis notched for AC input
- 100/120/220/230-240 VAC
- Industry standard size
- 2 hour burn-in period
- Remote sense - most outputs
- UL recognized/CSA certified
- OVP on 5V outputs
- Full-rated to 50°C
- Foldback/current limit

SPECIFICATIONS

- AC INPUT: 100/120/220/230-240 VAC** +10%, -13%, 47-63 Hz. (Derate output current 10% for 50 Hz operation.) See AC connection table under APPLICATION NOTES for jumper information. Fuse information is next to outline and mounting drawings.
- DC OUTPUT: See Voltage/Current Rating Chart. Adjustment range ±5% minimum.
- LINE REGULATION: ±0.5% for a 10% line change.
- LOAD REGULATION: ±0.5% for a 50% load change.
- OUTPUT RIPPLE: 2V to 15V units: 5.0mV PK-PK maximum
20V to 200V units: 0.02% PK-PK maximum.
- TRANSIENT RESPONSE: ≤50μseconds for a 50% load change.
- SHORT CIRCUIT AND OVERLOAD PROTECTION: Automatic current limit/foldback
- OVERVOLTAGE PROTECTION: Built-in on all 5V outputs. Set at 6.2V ±4V. Other models use optional overvoltage protection.
- REMOTE SENSING: Provided on most models, open sense lead protection built-in.
- STABILITY: ±0.3% for 24 hour period after 1 hour warm-up.
- TEMPERATURE RATING: 0°C to 50°C full-rated, derated linearly to 40% at 70°C.
- TEMPERATURE COEFFICIENT: ±0.03%/°C maximum
- EFFICIENCY (typical): 2V and 5V units: 45%
12V and 15V units: 55%
20V and 24V units: 60%
48V through 250V units: 60%
- VIBRATION: Per MIL-STD-810C, Method 514, Procedure X CRT.G-1
- SHOCK: Per MIL-STD-810C, Method 516, Procedure Y
- **Tolerance for 230VAC operation is ±15%, -10%

WARRANTY

POWER-ONE, INC. warrants each power supply of its manufacture that does not perform to published specifications, as a result of defective materials or workmanship, for a period of two (2) full years from the date of original delivery.

POWER-ONE, INC. assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations or liabilities are expressed or implied.

PRODUCTS RETURNED FOR REPAIR

Please follow this procedure when returning products for servicing:

1. Contact Power-One's Customer Service Department for authorization to return products:

POWER-ONE, INC. PHONE: (805) 987-8741
 740 Calle Plano (805) 987-3891
 Camarillo, CA 93010 (800) 235-9943
 USA TWX: 910-336-1297

2. A Returned Material Authorization (RMA) will be issued and must appear on all shipping documents and containers.

3. Products must be returned freight pre-paid.

Products returned freight collect or without an RMA number will be rejected and returned freight collect.

APPLICATION NOTES

PAGE 2

REMOTE SENSE

Remote sense terminals may be used to compensate for output line losses and provide for a remote point of regulation. Figure 1 shows the proper termination for a power supply with remote sensing.

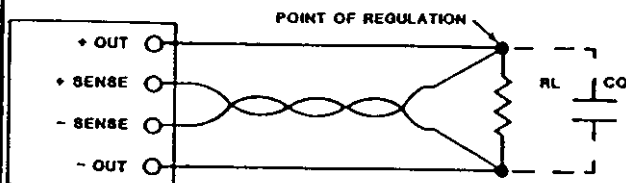


FIGURE 1

Load lines must be sized to prevent an excessive voltage drop from the output to the load. Since the point of regulation is at the load, the power supply must compensate for line losses. Excessive load line losses may affect current limiting, AC line dropout point and OVP margin (if applicable).

Leads should be sized to drop no more than 0.5V - the less the better. Use of a twisted pair or shielded pair for the sense lines is recommended for noise immunity. In problem applications, the use of a small AC decoupling capacitor (.1 to 10uF) across the sense terminals is highly recommended. In some applications there may be a tendency for the power supply to oscillate due to the additional phase shift caused by the series resistance and inductance in the load leads. The addition of capacitor C_o will reduce output impedance and provide stability. The recommended value of C_o is 100uF per ampere or 50uF per foot and can be the sum of the distributed decoupling capacitors found in most systems.

All Power-One supplies have open sense lead protection to protect the load from an overvoltage condition if the sense leads are removed. There is no need to strap the sense terminals to the output terminals in the local sense mode.

OVERVOLTAGE PROTECTION (OVP)

An overvoltage protection circuit, commonly referred to as a crowbar, is used to prevent damage to voltage sensitive loads such as TTL logic. Trip point of the OVP is usually set at 115% - 135% of the output voltage. The OVP will short the output terminals upon sensing a fault condition. The primary fuse of the supply will blow if the supply is not foldback current limited. Nuisance tripping of the OVP is a common problem. Noise from input line spikes or load noise can cause an OVP to fire. The INTERNATIONAL SERIES has OVP noise filtering to prevent nuisance tripping and reduced transformer interwinding capacitance to minimize input line susceptibility.

COMMON-MODE LATCH UP

In certain instances dual power supplies can exhibit a problem known as common-mode latch up. This occurs when the positive supply comes up first and forces a reverse bias condition on the negative supply. The negative supply latches up in a current limit condition. Power-One has incorporated a unique anti-latch circuit into every dual power supply in the INTERNATIONAL SERIES which will minimize this problem.

EMI/RFI

These linear power supplies have inherently low conducted and radiated noise levels. For most system applications they will meet the requirements of FCC Docket 20780 for Class A equipment and VDE 0871 for Class A equipment without additional noise filtering. For special applications consult factory.

COOLING

Convection cooling is adequate where non-restricted air flow is available. When operating in a confined area, moving air or conduction cooling is recommended.

SAFETY SPECIFICATIONS

The INTERNATIONAL SERIES power supplies were designed to meet or exceed requirements for the following specifications: IEC 380, IEC 435, VDE 0730 Part 2, VDE 0804, EN6057, CEE 10 Part 2P, UL 1012, CSA 22.2 No. 143, CSA 22.2 No. 154. Specifically, field terminal to terminal spacing is 5.25 mm with 9.0 mm creepage to other metal, leakage current is less than 5.0uA and dielectric withstanding voltages are 3750 VAC input to chassis, 3750 VAC input to output and 300 VDC output to chassis.

GROUNDING

Grounding considerations in designing a power distribution system are often overlooked but can have a significant impact on overall system performance. A single point system ground should be employed where possible to eliminate ground loops and improve regulation.

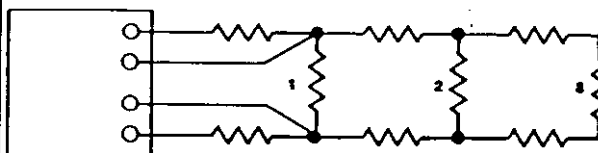


FIGURE 2

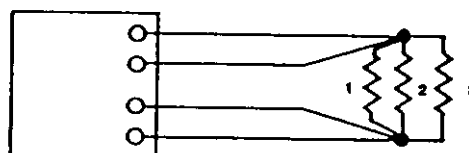


FIGURE 3

Figure 2 shows a simple but undesirable connection scheme. Regulation at loads 2 and 3 becomes progressively worse due to voltage drops in the finite wire resistance between loads. Figure 3 shows an improved connection system in which regulation is maintained at all three loads because wire losses are not cumulative.

AC INPUT CONSIDERATIONS

Almost all power supplies use a capacitive input filter that draws current only at the peaks of the AC input voltage. The peak to RMS ratio can be very high, typically 3 to 1. When a supply is turned on, the input capacitor has a very low impedance and draws an initially high surge current until it charges to its nominal voltage. The input surge current can be as high as 20 times the rated input current and lasts for several cycles of the AC input.

AC CONNECTION AND FUSING *

The five wire input to the INTERNATIONAL SERIES provides four voltage ranges: 100/120/220/230-240** +10%, -13%. See chassis AC connection table (Figure 4) for the jumpering requirements. For convenience the jumper sequence from the Hi-Vol series is retained. Extended low line tolerance provides additional drop out margin in areas where line voltages are marginal. Inputs must be fused.

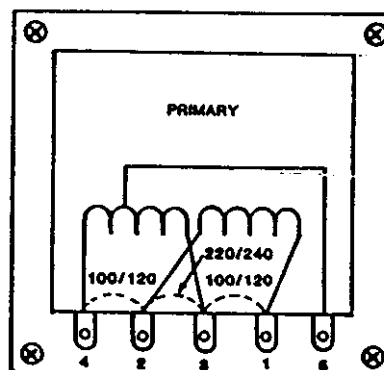


FIGURE 4

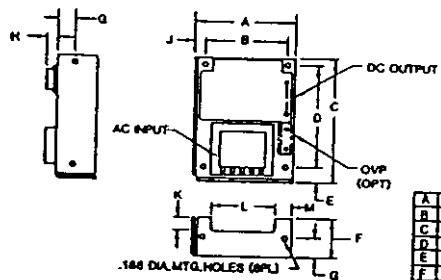
AC INPUT, 47-63 HZ				
FOR USE AT	100 VAC	120 VAC	220 VAC	230/240 VAC
JUMPER	1&3 2&4	1&3 2&4	2&3	2&3
APPLY AC	1&5	4&1	1&5	4&1

*NOTE: Use 700°C. iron for soldering input connections.

Varnish acts as flux and is solder strippable.

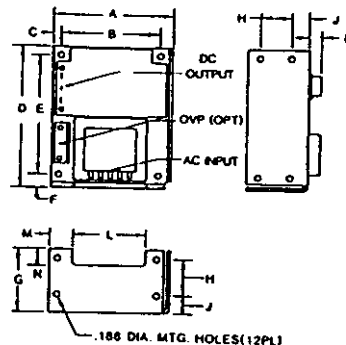
**Tolerance for 230VAC operation is +15%, -10%.

OUTLINE AND MOUNTING DRAWINGS

B CASE
WT. 2LBS.

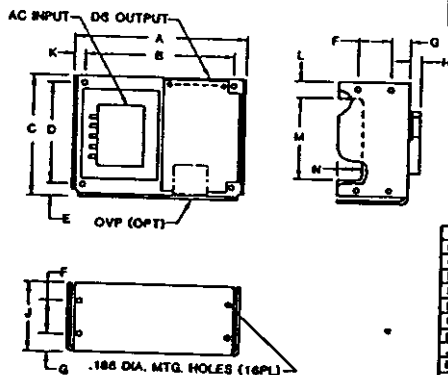
	INCH	MM
A	4.00	101.60
B	3.375	85.73
C	4.87	123.70
D	4.125	104.78
E	4.50	114.30
F	1.82	46.18
G	0.75	19.05
H	0.450	11.43
J	0.38	9.65
K	0.57	14.48
L	2.80	71.12
M	0.784	20.17

FUSE AT: 0.5/0.25 AMPS FOR 100-120/220-240 VAC

C CASE
WT. 4LBS.

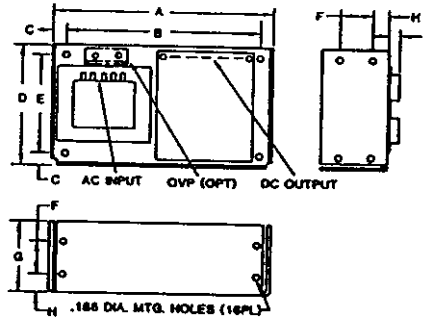
	INCH	MM
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	5.82	147.75
E	4.875	123.83
F	0.50	12.70
G	2.50	63.50
H	1.250	31.75
J	0.75	19.05
K	0.450	11.43
L	2.85	72.39
M	1.025	26.04
N	0.665	16.89

FUSE AT: 1.0/0.5 AMPS FOR 100-120/220-240 VAC

N CASE
WT. 6LBS.

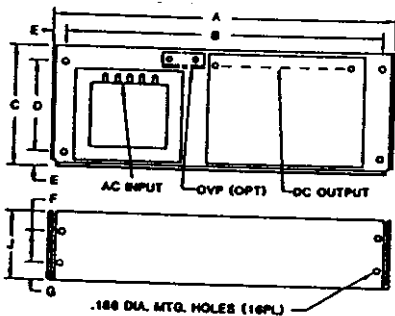
	INCH	MM
A	7.00	177.80
B	6.250	158.75
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.325	8.25
J	2.75	69.85
K	0.38	9.65
L	0.640	16.26
M	3.35	85.10
N	1.00	25.40

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC

D CASE
WT. 7.5LBS.

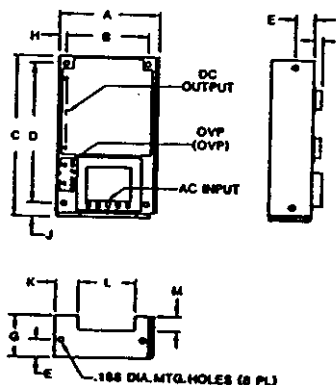
	INCH	MM
A	9.00	228.60
B	8.000	203.20
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.325	8.25

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC

E CASE
WT. 10LBS.

	INCH	MM
A	11.00	279.40
B	10.000	254.00
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.650	16.51
J	2.75	69.85

FUSE AT: 3.0/1.5 AMPS FOR 100-120/220-240 VAC

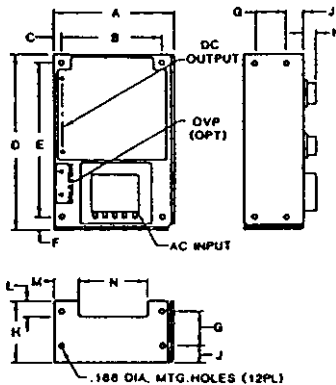
AA CASE
WT. 2LBS.

	INCH	MM
A	4.00	101.60
B	3.375	85.73
C	6.50	165.10
D	4.125	104.78
E	0.75	19.05
F	0.450	11.43
G	1.82	46.18
H	0.38	9.65
J	0.50	12.70
K	0.825	21.09
L	2.37	60.30
M	0.37	9.40

FUSE AT: 0.5/0.25 AMPS FOR 100-120/220-240 VAC
NTAA: 0.75/0.375 AMPS FOR 120-220/220-240VAC

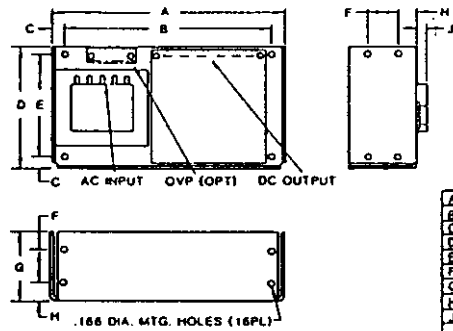
OUTLINE AND MOUNTING DRAWINGS

PAGE 4

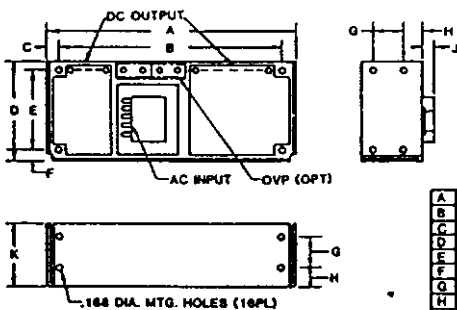
BB CASE
WT. 4LBS.

	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	7.00	177.80
E	6.250	158.75
F	0.50	12.70
G	1.250	31.75
H	2.50	63.50
J	0.75	19.05
K	0.450	11.43
L	0.665	16.89
M	1.025	26.04
N	2.85	72.39

FUSE AT: 1.0/0.5 AMPS FOR 100-120/220-240 VAC

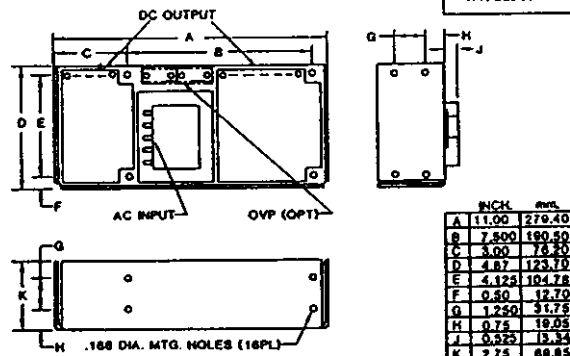
CC CASE
WT. 7LBS.

	INCH	mm
A	9.38	238.25
B	8.375	212.73
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.525	13.34

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC
HCC512: 3.0/1.5 AMPS FOR 100-120/220-240 VACBAA CASE
WT. 5LBS.

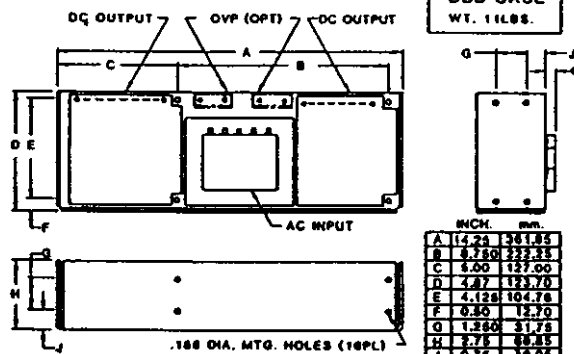
	INCH	mm
A	10.25	260.35
B	8.250	209.85
C	0.50	12.70
D	4.00	101.60
E	3.375	85.73
F	0.37	9.40
G	1.250	31.75
H	0.75	19.05
J	0.450	11.43
K	2.50	63.50

FUSE AT: 1.0/0.5 AMPS FOR 100-120/220-240 VAC

CBB CASE
WT. 8LBS.

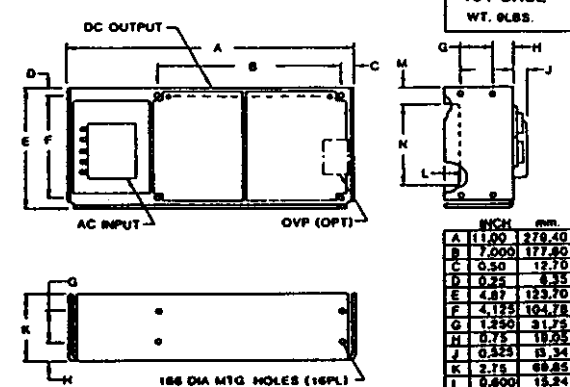
	INCH	mm
A	11.00	279.40
B	7.500	190.50
C	3.00	76.20
D	4.87	123.70
E	4.125	104.78
F	0.50	12.70
G	1.250	31.75
H	0.75	19.05
J	0.525	13.34
K	2.75	69.85

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC

DBB CASE
WT. 11LBS.

	INCH	mm
A	14.25	361.85
B	8.750	222.25
C	6.00	152.00
D	4.87	123.70
E	4.125	104.78
F	0.50	12.70
G	1.250	31.75
H	2.75	69.85
J	0.75	19.05
K	0.825	20.89

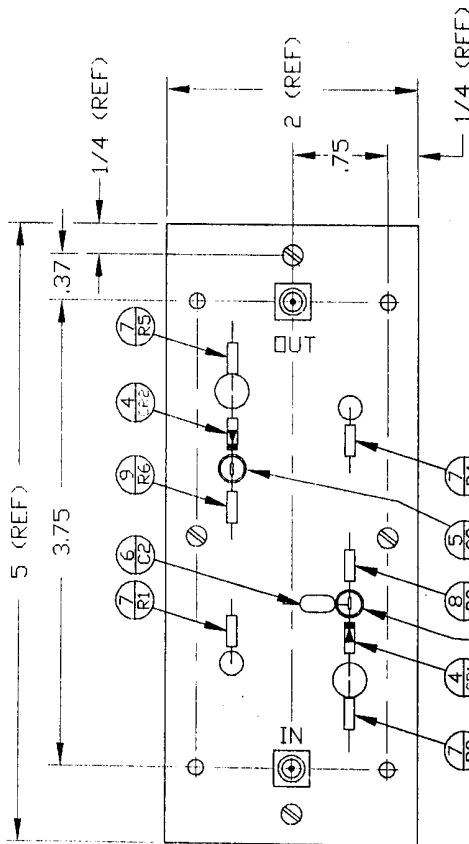
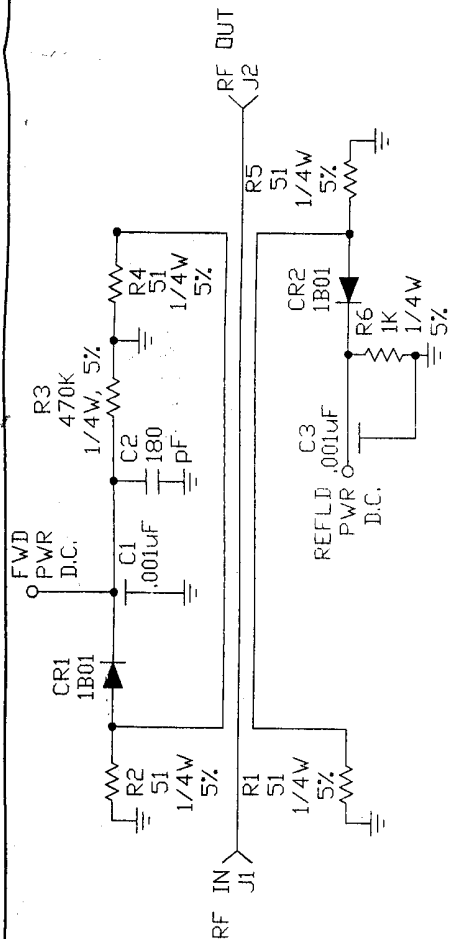
FUSE AT: 3.0/1.5 AMPS FOR 100-120/220-240 VAC

131 CASE
WT. 9LBS.

	INCH	mm
A	11.00	279.40
B	7.000	177.80
C	0.50	12.70
D	0.25	6.35
E	4.87	123.70
F	4.125	104.78
G	1.250	31.75
H	0.75	19.05
J	0.525	13.34
K	2.75	69.85
L	0.600	15.24
M	0.440	11.18
N	2.25	57.15

FUSE AT: 3.0/1.5 AMPS FOR 100-120/220-240 VAC

NOTES : UNLESS OTHERWISE SPECIFIED
 1-CONNECTORS J1 & J2 ARE TO HAVE ALL PINS EXCEPT
 CENTER CONDUCTOR TRIMMED FLUSH WITH BASE OF
 CONNECTORS.
 2-CONNECTORS J1 & J2 ARE TO BE SOLDERED ALL AROUND
 BASE OF CONNECTORS, AND IN RELATION SHIP SQUARE TO
 PC BOARD, AS SHOWN.



SEE NOTE-1

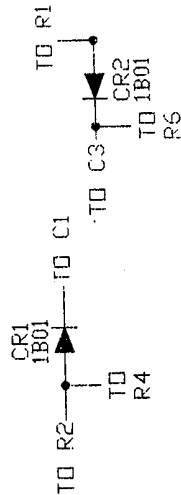
(-1) FA & SD, DIRECTIONAL COUPLER, 16 db UHF & 26 db

VHF HIGH BAND

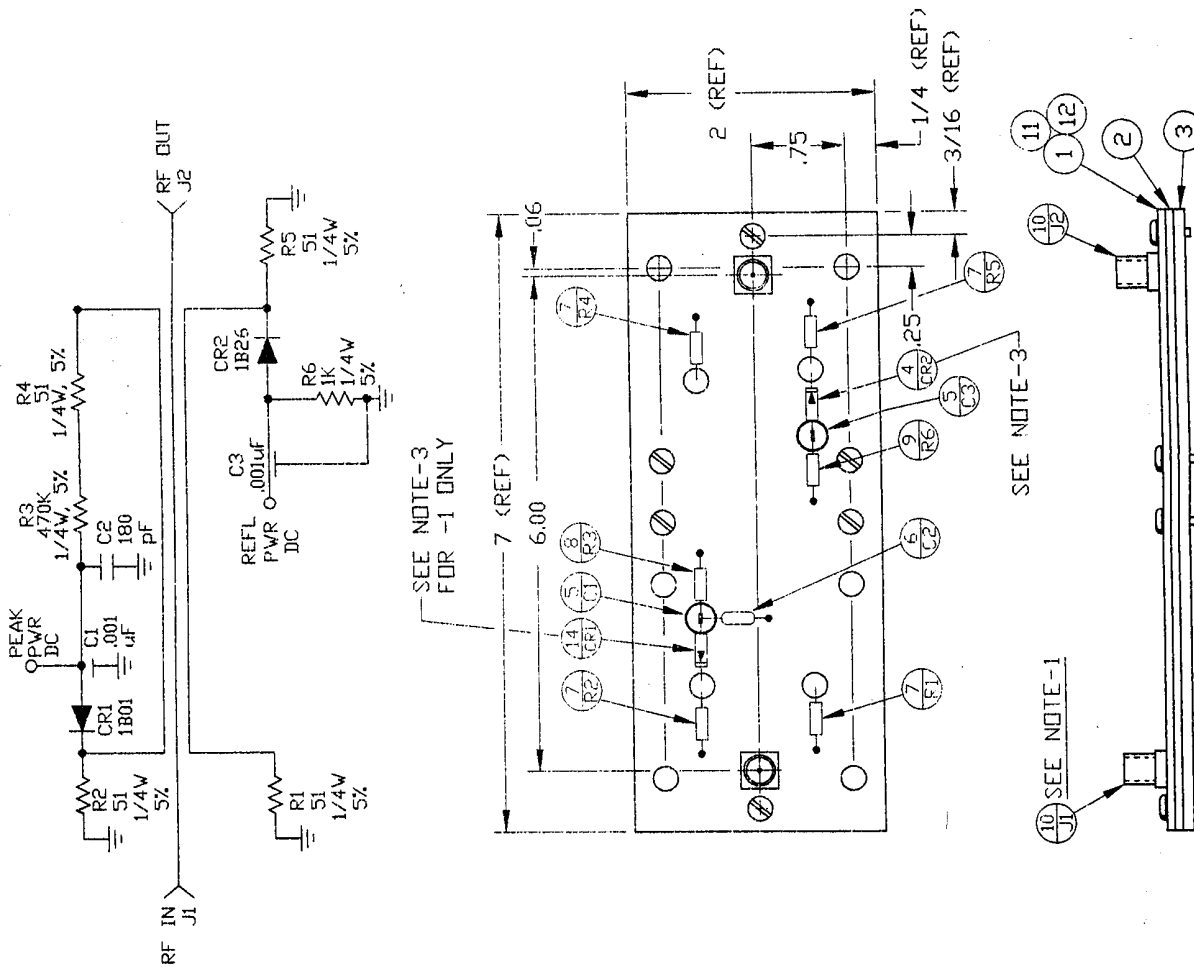
ECN	DATE	BY	T.M.	IN SD, FWD WAS PEAK	C.T.T.	C.T.T.
B	1-1-91					
NEXT ASSY:					CHK	CHK APPV
VERSION						
MODEL						
SCALE						
TOLERANCES - EXCEPT AS NOTED						
DECIMAL	XX ± .005					
FRACTIONAL	XXX ± .005					
ANGULAR	± 1/64°					
DRAFT 5-12-87						
DR. CHK 5-18-87						
M. ENGR 7-23-87						
E. ENGR 8-21-87						
RELEASE 8-21-87						
W.J.H.						
C.T.T.						
J.C.						
R.G.N.						
R.G.N.						
ELECTRONICS MISSILES & COMMUNICATIONS INC.						
EMCEE						
P/L B199-140						
REV B						
SHEET 1 OF 1						

CAD DWG 11-15-94

NOTES : UNLESS OTHERWISE SPECIFIED
 1-CONNECTORS J1 & J2 ARE TO HAVE ALL PINS EXCEPT CENTER CONDUCTOR TRIMMED FLUSH WITH BASE OF CONNECTOR.
 2-CONNECTORS J1 & J2 ARE TO BE SOLDERED ALL AROUND BASE OF CONNECTORS, AND IN A RELATIONSHIP SQUARE TO P.C. BOARD, AS SHOWN.
 3-WHEN COUPLER IS USED ON JOB 331, DIODES CR1 & CR2 ARE TO BE INSTALLED AS FOLLOWS : FOR ① ONLY



① ASSY & SCHEMATIC, COUPLER, CH 2-6, 30db ISSUE : B



7043	2-9-89	SMP	ITEM 4 WAS CALLED OUT AS MSCH-101 AND ON DVC CR2 WAS 1B01 C.T.T.	C.T.T.
B	7-19-88	MJM	CR2 WAS 1B64	C.T.T.
A	10-13-87	JC	ADD -1 PART FOR JOB 331. DIODES REVERSED PER NOTE-3	J.C.
ECN	DATE	BY	CHK	CHK/APPV
NEXT ASSY:	P/L	D280-136,	DRAFT	10-23-81 JAL
140, 143, 145, 162	DR. CHK	10-29-81 W.J.H.		
VERSION	M. ENGR	11-11-81 M.H.G.		
MODEL	E. ENGR			
SCALE	NONE	RELEASE	6-7-82	F.D.
TOLERANCES - EXCEPT AS NOTED				
DECIMAL	XX ± .02			
FRACTIONAL	XXX ± .00			
ANGULAR	± 1/64°			
	± 1/2 DEG			
EMCEE ELECTRONICS MISSILES & COMMUNICATIONS INC. WHITE HAVEN, PA. 18661				
PL B199-89			REV	C
SHEET 1			DF 1	

CAD DWG 1-12-96