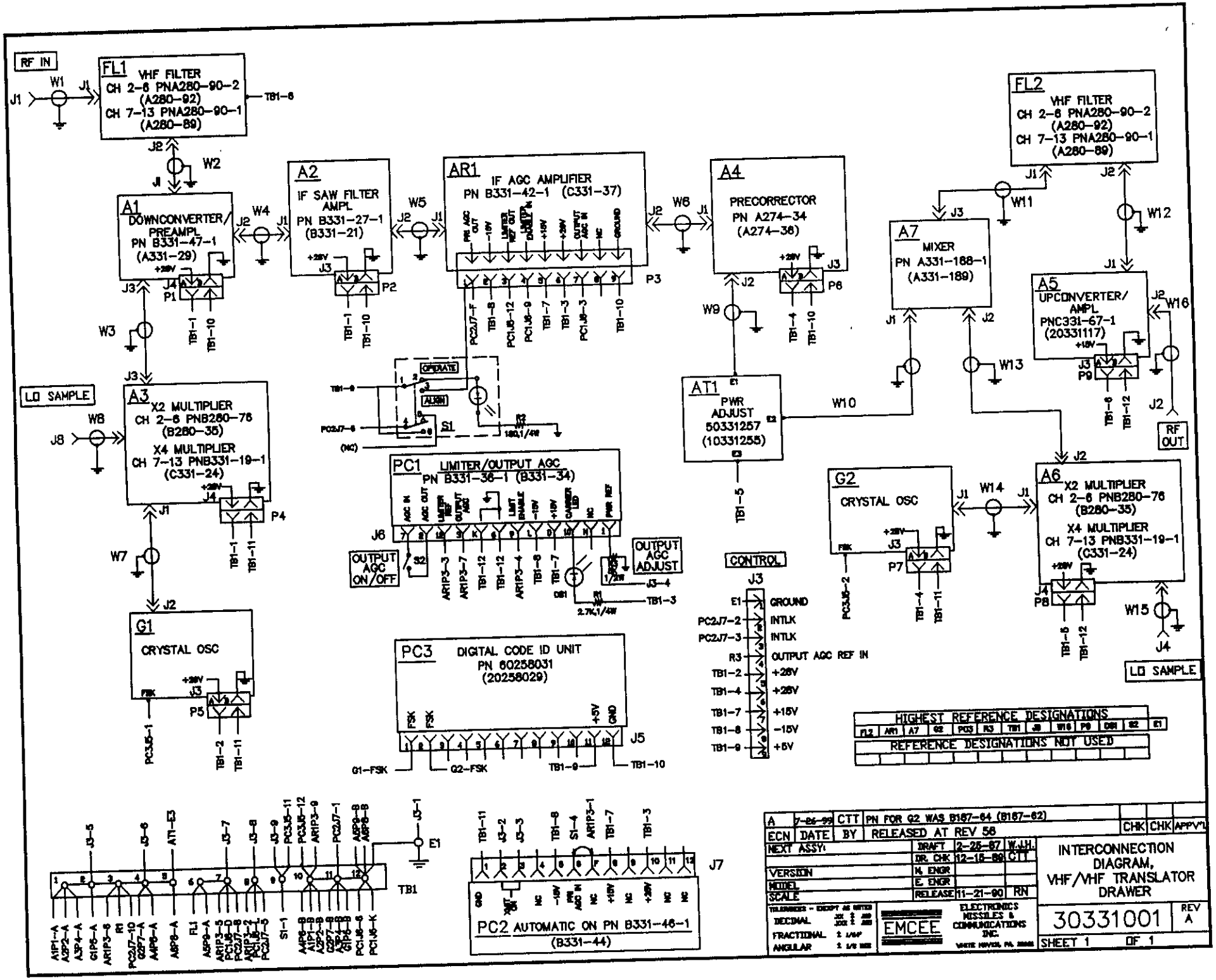
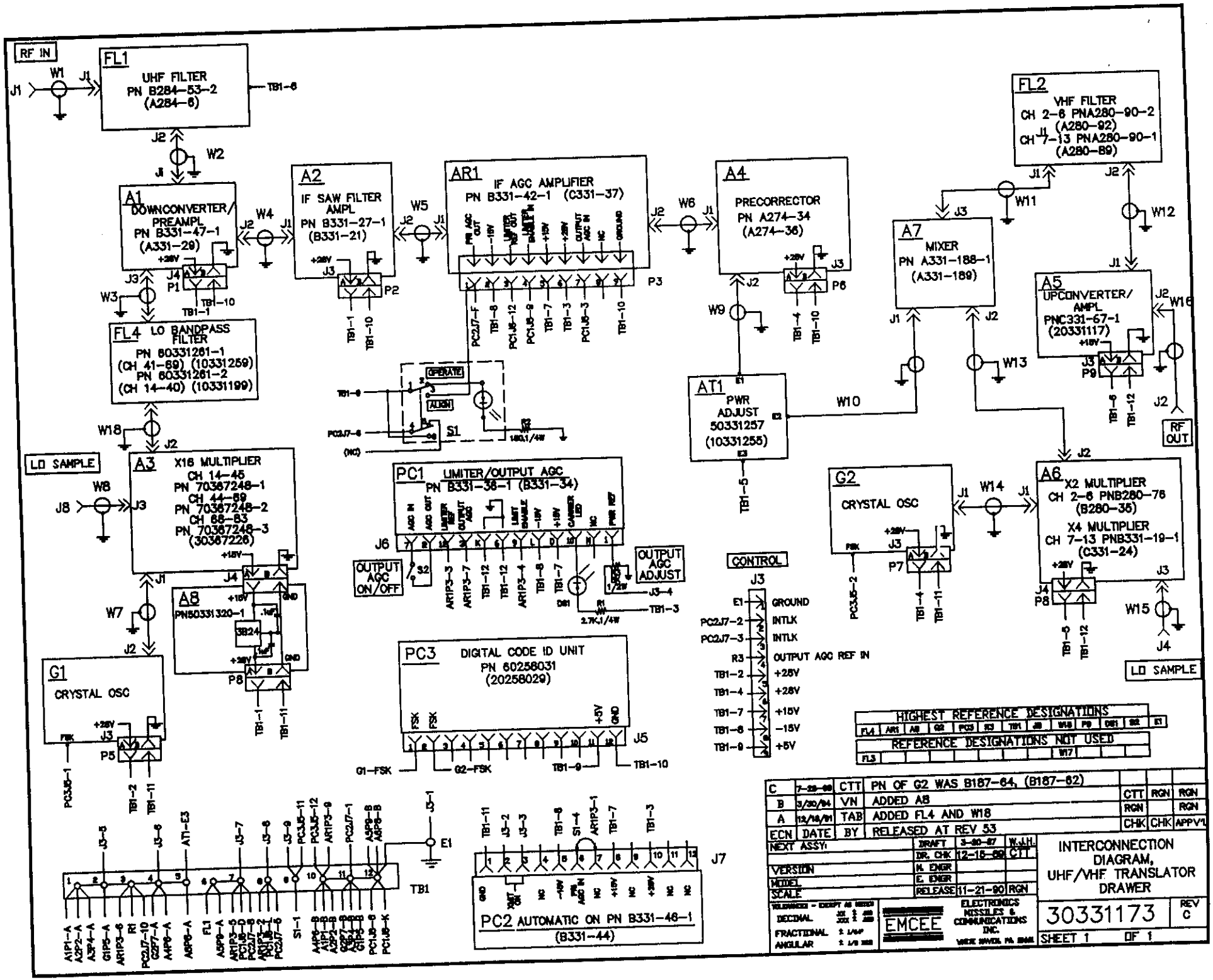
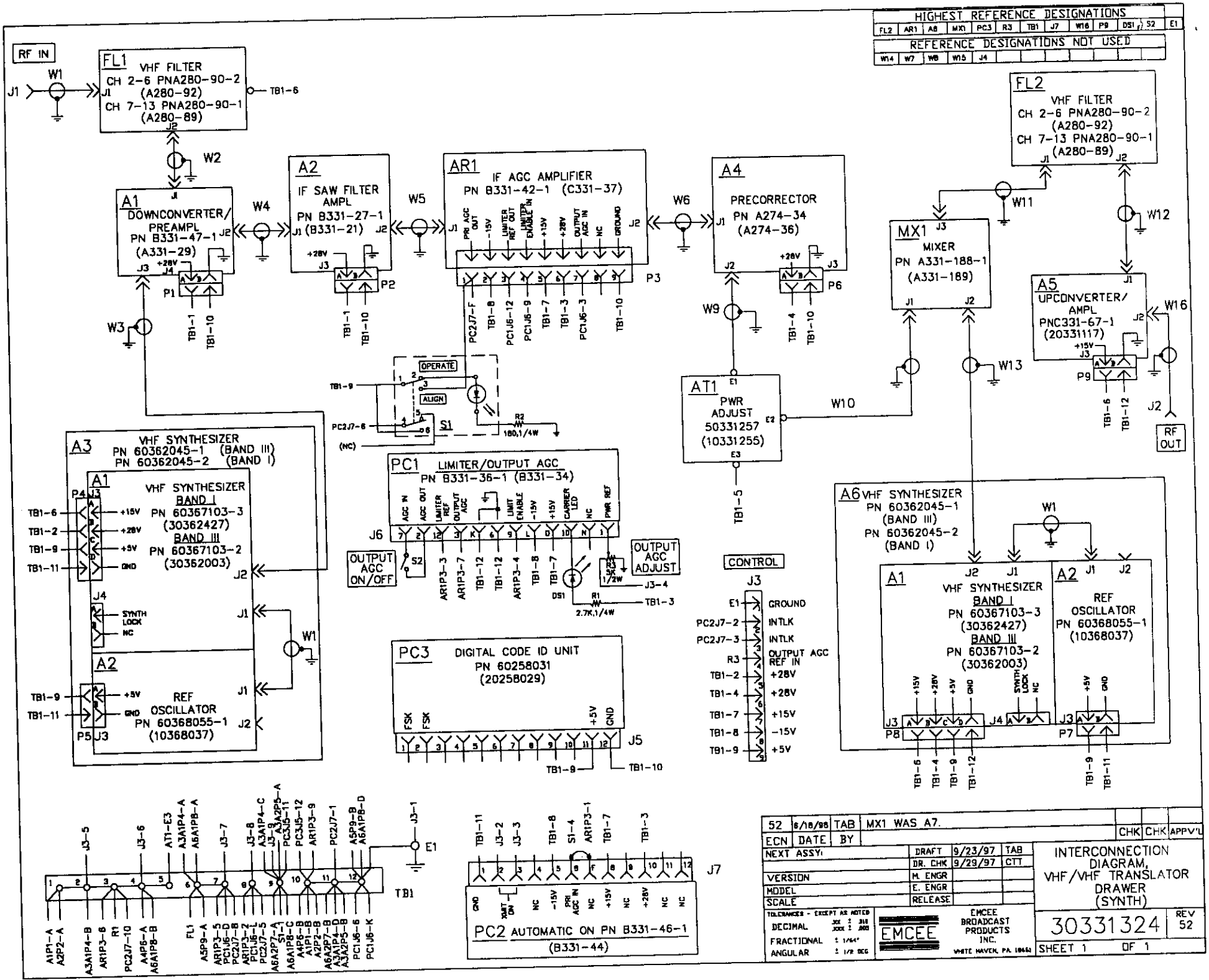
TV1E

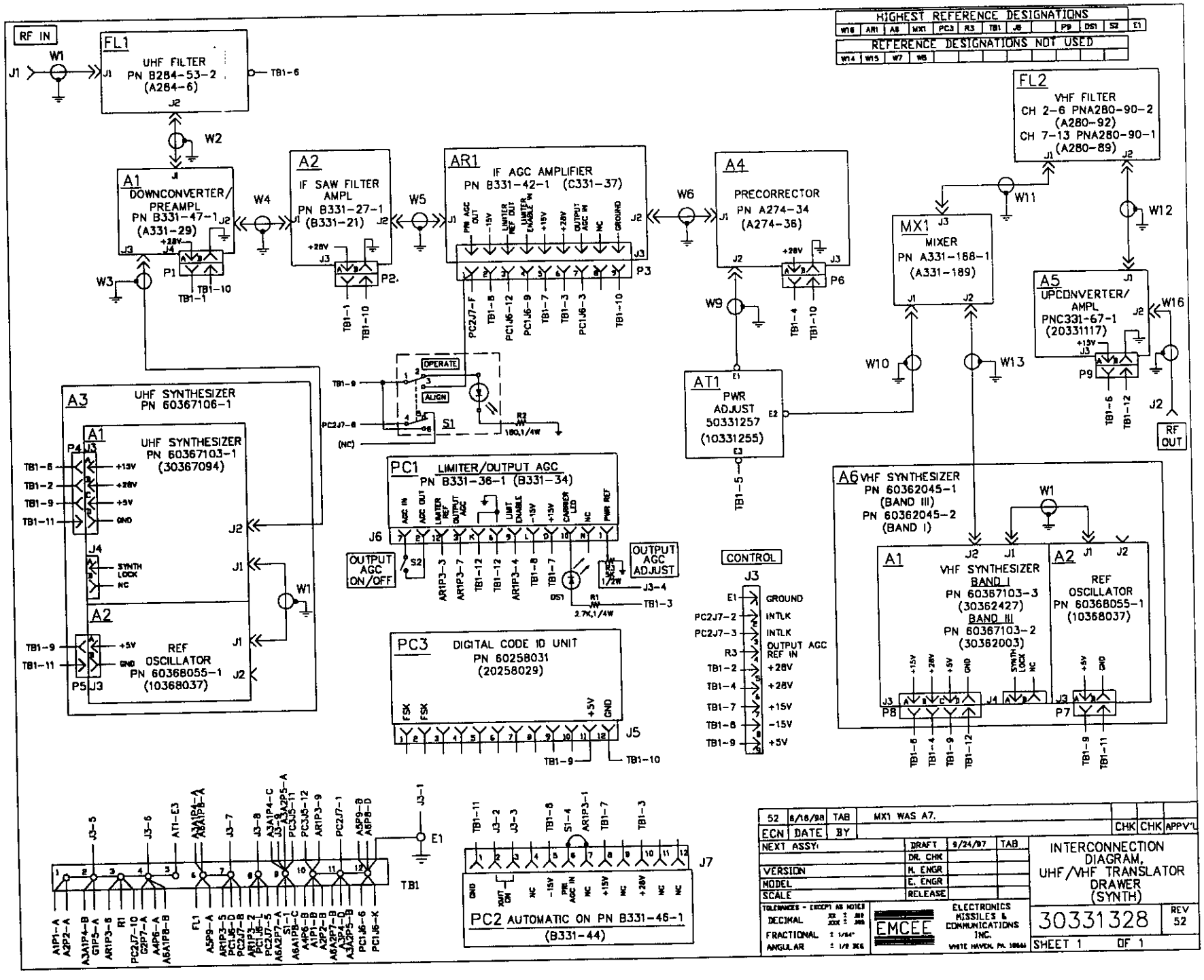
SECTION V

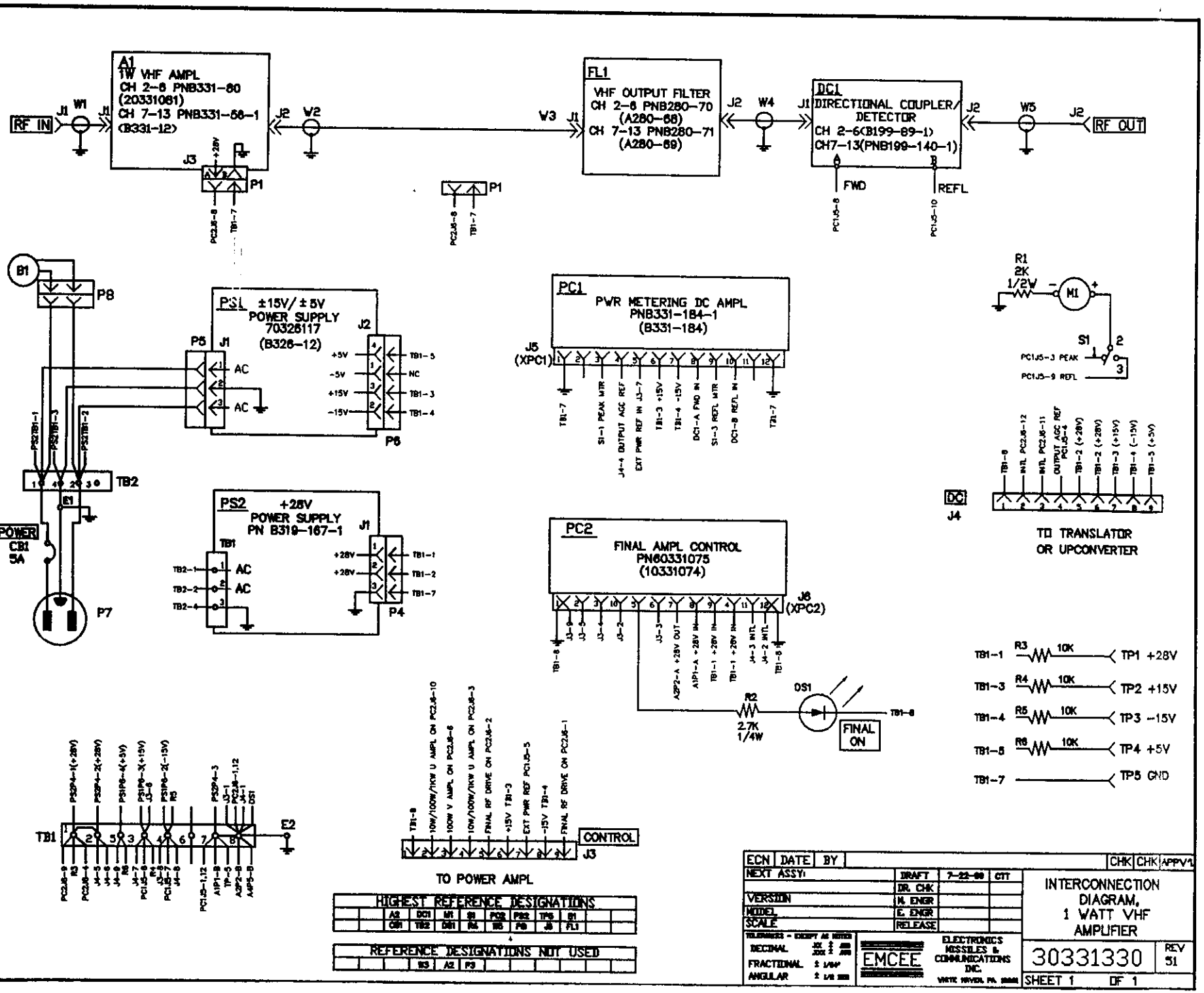
SCHEMATIC DIAGRAMS


RF IN
FL1
VHF FILTER
CH 2-6 PNA280-90-2
(A280-92)
CH 7-13 PNA280-90-1
(A280-89)
A1
DOWNCONVERTER/
PREAMPL
PN B331-47-1
(A331-29)
A2
IF SAW FILTER
AMPL
PN B331-27-1
(B331-21)
AR1
IF AGC AMPLIFIER
PN B331-42-1 (C331-37)
A4
PRECORRECTOR
PN A274-34
(A274-36)
FL2
VHF FILTER
CH 2-6 PNA280-90-2
(A280-92)
CH 7-13 PNA280-90-1
(A280-89)
A7
MIXER
PN A331-188-1
(A331-189)
A5
UPCONVERTER/
AMPL
PNC331-67-1
(20331117)
LO SAMPLE
A3
X2 MULTIPLIER
CH 2-6 PNB280-76
(B280-35)
X4 MULTIPLIER
CH 7-13 PNB331-19-1
(C331-24)
AT1
PWR
ADJUST
50331257
(10331255)
G2
CRYSTAL OSC
A6
X2 MULTIPLIER
CH 2-6 PNB280-76
(B280-35)
X4 MULTIPLIER
CH 7-13 PNB331-19-1
(C331-24)
RF OUT
PC1
LIMITER/OUTPUT AGC
PN B331-36-1 (B331-34)
OUTPUT
AGC
ON/OFF
OUTPUT
AGC
ADJUST
G1
CRYSTAL OSC
PC3
DIGITAL CODE ID UNIT
PN 60258031
(20258029)
CONTROL
J3
E1 GROUND
PC2J7-2 INTLK
PC2J7-3 INTLK
R3 OUTPUT AGC REF IN
TB1-2 +28V
TB1-4 +28V
TB1-7 +15V
TB1-8 -15V
TB1-9 +5V
HIGHEST REFERENCE DESIGNATIONS
FL2 AR1 A7 G2 PC3 R3 TB1 J5 W16 P9 DS1 S2 E1
REFERENCE DESIGNATIONS NOT USED
TB1
PC2 AUTOMATIC ON PN B331-46-1
(B331-44)
J7
A ECN 7-26-99 CTT PN FOR Q2 WAS B167-64 (B167-62)
NEXT ASSY:
VERSION
MODEL
SCALE
DRAFT 2-25-87 W.J.H.
DR. CHK 12-15-89 CTT
M. ENGR
E. ENGR
RELEASE 11-21-90 RN
EMCEE
ELECTRONICS MISSILES & COMMUNICATIONS INC.
INTERCONNECTION DIAGRAM, VHF/VHF TRANSLATOR DRAWER
30331001
REV A
SHEET 1 OF 1


RF IN
FL1
UHF FILTER
PN B284-53-2
(A284-6)
A1
DOWNCONVERTER/
PREAMPL
PN B331-47-1
(A331-29)
A2
IF SAW FILTER
AMPL
PN B331-27-1
(B331-21)
AR1
IF AGC AMPLIFIER
PN B331-42-1 (C331-37)
A4
PRECORRECTOR
PN A274-34
(A274-36)
FL2
VHF FILTER
CH 2-6 PNA280-90-2
(A280-92)
CH 7-13 PNA280-90-1
(A280-89)
A7
MIXER
PN A331-188-1
(A331-189)
A5
UPCONVERTER/
AMPL
PNC331-67-1
(20331117)
FL4 LO BANDPASS
FILTER
PN 60331261-1
(CH 41-69) (10331259)
PN 60331261-2
(CH 14-40) (10331199)
AT1
PWR
ADJUST
50331257
(10331255)
LO SAMPLE
A3
X16 MULTIPLIER
CH 14-45
PN 70367248-1
CH 44-69
PN 70367248-2
CH 68-83
PN 70367248-3
(30367226)
A8
PN50331320-1
PC1
LIMITER/OUTPUT AGC
PN B331-36-1 (B331-34)
G2
CRYSTAL OSC
A6
X2 MULTIPLIER
CH 2-6 PNB280-76
(B280-35)
X4 MULTIPLIER
CH 7-13 PNB331-19-1
(C331-24)
RF OUT
OUTPUT
AGC
ON/OFF
OUTPUT
AGC
ADJUST
CONTROL
J3
E1 GROUND
PC2J7-2 INTLK
PC2J7-3 INTLK
R3 OUTPUT AGC REF IN
TB1-2 +28V
TB1-4 +28V
TB1-7 +15V
TB1-8 -15V
TB1-9 +5V
G1
CRYSTAL OSC
PC3 DIGITAL CODE ID UNIT
PN 60258031
(20258029)
J5
G1-FSK
G2-FSK
TB1-9
TB1-10
TB1
J7
PC2 AUTOMATIC ON PN B331-46-1
(B331-44)
HIGHEST REFERENCE DESIGNATIONS
FL4 AR1 A8 G2 PC3 R3 TB1 J5 W16 P9 DS1 S2 E1
REFERENCE DESIGNATIONS NOT USED
FL3 W17
C 7-25-96 CTT PN OF G2 WAS B187-64, (B187-62) CTT RGN RGN
B 3/30/94 VN ADDED A8 RGN RGN
A 12/14/91 TAB ADDED FL4 AND W18 CHK CHK APPV'L
ECN DATE BY RELEASED AT REV 53
NEXT ASSY: DRAFT 3-25-97 W.J.H.
VERSION DR. CHK 12-15-89 CTT
MODEL M. ENGR
SCALE E. ENGR
RELEASE 11-21-90 RGN
TOLERANCES - EXCEPT AS NOTED
DECIMAL
FRACTIONAL
ANGULAR
EMCEE
ELECTRONICS MISSILES & COMMUNICATIONS INC.
INTERCONNECTION DIAGRAM, UHF/VHF TRANSLATOR DRAWER
30331173
REV C
SHEET 1 OF 1


HIGHEST REFERENCE DESIGNATIONS
FL2 AR1 A6 MX1 PC3 R3 TB1 J7 W16 P9 DS1 S2 E1
REFERENCE DESIGNATIONS NOT USED
W14 W7 W8 W15 J4
RF IN
W1
J1
FL1
VHF FILTER
CH 2-6 PNA280-90-2
(A280-92)
CH 7-13 PNA280-90-1
(A280-89)
TB1-6
J2
W2
A1
DOWNCONVERTER/
PREAMPL
PN B331-47-1
(A331-29)
W4
A2
IF SAW FILTER
AMPL
PN B331-27-1
(B331-21)
W5
AR1
IF AGC AMPLIFIER
PN B331-42-1 (C331-37)
W6
A4
PRECORRECTOR
PN A274-36
(A274-36)
FL2
VHF FILTER
CH 2-6 PNA280-90-2
(A280-92)
CH 7-13 PNA280-90-1
(A280-89)
W11
W12
MX1
MIXER
PN A331-188-1
(A331-189)
A5
UPCONVERTER/
AMPL
PNC331-67-1
(20331117)
W16
W13
W9
W3
P1
P2
P3
P6
P9
TB1-1
TB1-10
TB1-4
TB1-6
TB1-12
J2
RF
OUT
OPERATE
ALIGN
S1
R2
180,1/4W
PC2J7-6
(NC)
TB1-9
AT1
PWR
ADJUST
50331257
(10331255)
W10
TB1-5
A3
VHF SYNTHESIZER
PN 60362045-1 (BAND III)
PN 60362045-2 (BAND I)
A1
VHF SYNTHESIZER
BAND I
PN 60367103-3
(30362427)
BAND III
PN 60367103-2
(30362003)
+15V
+28V
+5V
GND
SYNTH LOCK
NC
A2
REF
OSCILLATOR
PN 60368055-1
(10368037)
P4
P5
PC1
LIMITER/OUTPUT AGC
PN B331-36-1 (B331-34)
AGC IN
AGC OUT
LIMITER REF OUT
OUTPUT AGC
LIMIT ENABLE
-15V
+15V
CARRIER LED
NC
PWR REF
J6
OUTPUT AGC ON/OFF
S2
OUTPUT AGC ADJUST
1/2W
R1
2.7K,1/4W
DS1
J3-4
TB1-3
PC3
DIGITAL CODE ID UNIT
PN 60258031
(20258029)
FSK
+5V
GND
J5
TB1-9
TB1-10
CONTROL
J3
E1 GROUND
PC2J7-2 INTLK
PC2J7-3 INTLK
R3 OUTPUT AGC REF IN
TB1-2 +28V
TB1-4 +28V
TB1-7 +15V
TB1-8 -15V
TB1-9 +5V
A6 VHF SYNTHESIZER
PN 60362045-1
(BAND III)
PN 60362045-2
(BAND I)
A1
VHF SYNTHESIZER
BAND I
PN 60367103-3
(30362427)
BAND III
PN 60367103-2
(30362003)
A2
REF
OSCILLATOR
PN 60368055-1
(10368037)
P8
P7
TB1-6
TB1-4
TB1-9
TB1-12
TB1-9
TB1-11
TB1
E1
J3-1
J7
PC2 AUTOMATIC ON PN B331-46-1
(B331-44)
52 6/18/98 TAB MX1 WAS A7.
ECN DATE BY
CHK CHK APPV'L
NEXT ASSY:
VERSION
MODEL
SCALE
DRAFT 9/23/97 TAB
DR. CHK 9/29/97 CTT
M. ENGR
E. ENGR
RELEASE
TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010 .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG
EMCEE
EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA. 18661
INTERCONNECTION DIAGRAM, VHF/VHF TRANSLATOR DRAWER (SYNTH)
30331324
REV 52
SHEET 1 OF 1

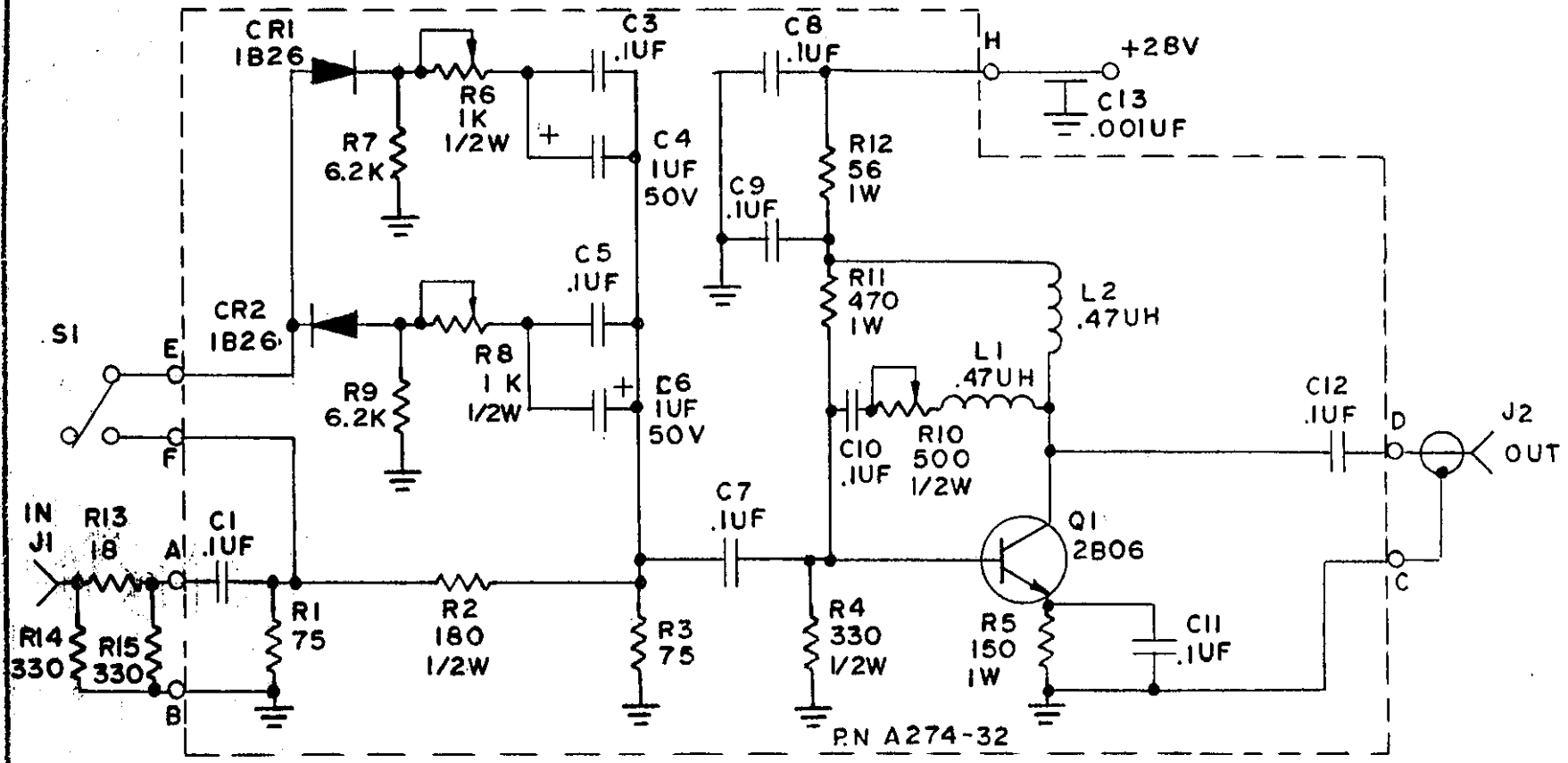

HIGHEST REFERENCE DESIGNATIONS
W16 AR1 A8 MX1 PC3 R3 TB1 J8 P9 DS1 S2 E1
REFERENCE DESIGNATIONS NOT USED
W14 W15 W7 W8
RF IN
FL1
UHF FILTER
PN B284-53-2
(A284-6)
FL2
VHF FILTER
CH 2-6 PNA280-90-2
(A280-92)
CH 7-13 PNA280-90-1
(A280-89)
A1
DOWNCONVERTER/
PREAMPL
PN B331-47-1
(A331-29)
A2
IF SAW FILTER
AMPL
PN B331-27-1
(B331-21)
AR1
IF AGC AMPLIFIER
PN B331-42-1 (C331-37)
A4
PRECORRECTOR
PN A274-34
(A274-36)
MX1
MIXER
PN A331-188-1
(A331-189)
A5
UPCONVERTER/
AMPL
PNC331-67-1
(20331117)
A3
UHF SYNTHESIZER
PN 60367106-1
A1
UHF SYNTHESIZER
PN 60367103-1
(30367094)
A2
REF
OSCILLATOR
PN 60368055-1
(10368037)
PC1
LIMITER/OUTPUT AGC
PN B331-36-1 (B331-34)
PC3
DIGITAL CODE ID UNIT
PN 60258031
(20258029)
AT1
PWR
ADJUST
50331257
(10331255)
S1
OPERATE
ALIGN
S2
OUTPUT
AGC
ON/OFF
OUTPUT
AGC
ADJUST
CONTROL
A6 VHF SYNTHESIZER
PN 60362045-1
(BAND III)
PN 60362045-2
(BAND I)
A1
VHF SYNTHESIZER
BAND I
PN 60367103-3
(30362427)
BAND III
PN 60367103-2
(30362003)
A2
REF
OSCILLATOR
PN 60368055-1
(10368037)
PC2 AUTOMATIC ON PN B331-46-1
(B331-44)
RF
OUT
INTERCONNECTION
DIAGRAM,
UHF/VHF TRANSLATOR
DRAWER
(SYNTH)
30331328
REV
52
SHEET 1 OF 1
EMCEE
ELECTRONICS
MISSILES &
COMMUNICATIONS
INC.
WHITE HAVEN, PA. 18661
52 6/18/98 TAB MX1 WAS A7.
ECN DATE BY
CHK CHK APPV'L
NEXT ASSY
DRAFT 9/24/97 TAB
DR. CHK
VERSION
M. ENGR
MODEL
E. ENGR
SCALE
RELEASE


A1
1W VHF AMPL
CH 2-6 PNB331-60
(20331061)
CH 7-13 PNB331-56-1
(B331-12)
RF IN
RF OUT
FL1
VHF OUTPUT FILTER
CH 2-6 PNB280-70
(A280-66)
CH 7-13 PNB280-71
(A280-69)
DC1
DIRECTIONAL COUPLER/
DETECTOR
CH 2-6(B199-89-1)
CH7-13(PNB199-140-1)
FWD
REFL
PS1 ±15V/±5V
POWER SUPPLY
70326117
(B326-12)
PS2 +28V
POWER SUPPLY
PN B319-167-1
PC1
PWR METERING DC AMPL
PNB331-184-1
(B331-184)
PC2
FINAL AMPL CONTROL
PN60331075
(10331074)
TB2
POWER
CB1
5A
P7
P8
R1
2K
1/2W
M1
S1
R2
2.7K
1/4W
DS1
FINAL
ON
TO TRANSLATOR
OR UPCONVERTER
TB1-1 R3 10K TP1 +28V
TB1-3 R4 10K TP2 +15V
TB1-4 R5 10K TP3 -15V
TB1-5 R6 10K TP4 +5V
TB1-7 TP5 GND
TB1
E2
CONTROL
J3
TO POWER AMPL
HIGHEST REFERENCE DESIGNATIONS
REFERENCE DESIGNATIONS NOT USED
INTERCONNECTION
DIAGRAM,
1 WATT VHF
AMPLIFIER
30331330
REV
51
SHEET 1 OF 1
EMCEE
ELECTRONICS
MISSILES &
COMMUNICATIONS
INC.

MODULE SCHEMATICS

ARE LISTED IN

ALPHANUMERICAL SEQUENCE



NOTES: UNLESS OTHERWISE SPECIFIED

1- ALL RESISTOR VALUES NOT MARKED ARE $\frac{1}{4}$ W, 5%.

2- COMPONENTS J1, R13, R14, R15, C13, J1 & J2 ARE NOT LOCATED ON P.C. BOARD.

E	8054	6-12-90	TAB	+28V WAS +25 V28V	C.J.
	6995	6-20-88	MJM	CHANGED TITLE FROM "IF LOW BAND UHF PREDISTORTION NETWORK"	C.J.
	6773G	12-3-86	21/N	C4 & C6 WERE 25V	C.J.
	A	5-11-81	P.A.B.	S1 WAS SHOWN INCORRECTLY SEE OBS. ISSUE 1	RCH
	ECN	DATE	BY		CHECK APP'VL

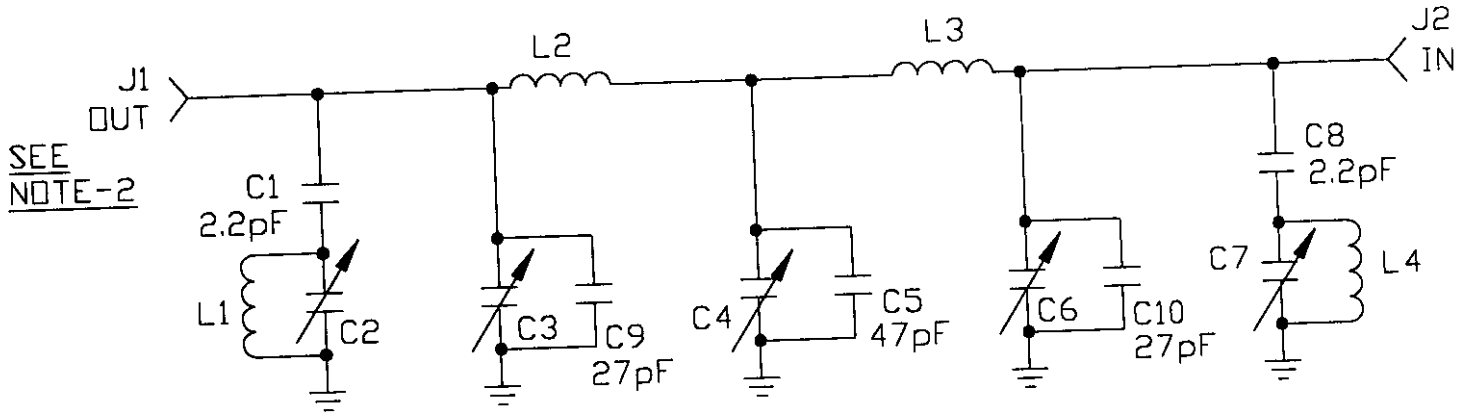
NEXT ASSY	PL/A 274-34	DRAFT	3-24-80 C.J.
MATERIAL	N/A	GROUP	
FINISH	N/A	SYMBOL	
WEIGHT	N/A	APPD	5-15-81

TOLERANCES – EXCEPT AS NOTED
DECIMAL– .XX ±
.XXX ±
FRACTIONAL ±
ANGULAR ±

ELECTRONICS, MISSILES, & COMMUNICATIONS

SCHEMATIC DIAGRAM IF PRECORRECTOR

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.

ECN	DATE	BY				
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.
				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 ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

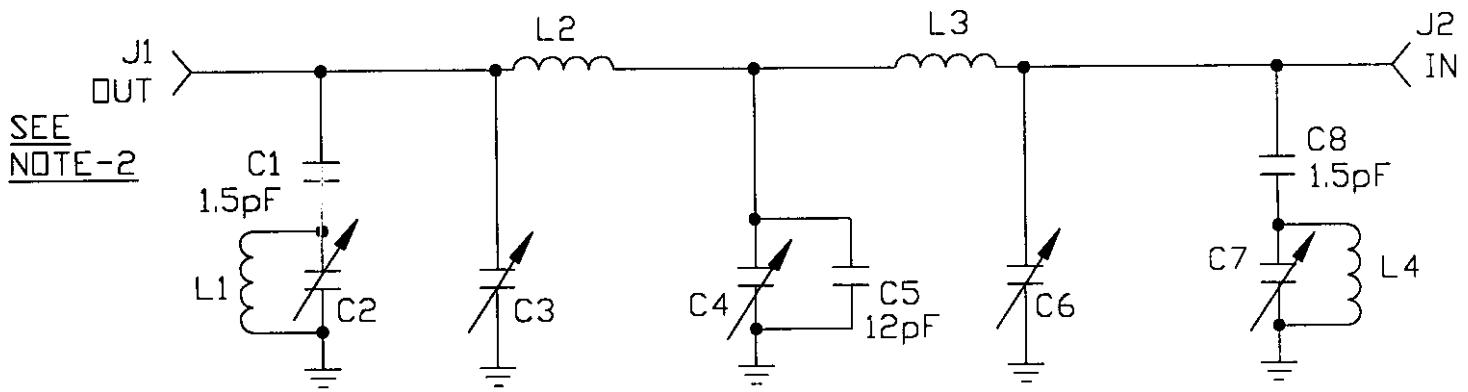
EMCEE
ELECTRONICS MISSILES & COMMUNICATIONS INC.
WHITE HAVEN, PA. 18661

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.

ECN	DATE	BY		CHK	CHK	APPV'L
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.

NEXT ASSY: P/L B280-71	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 ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

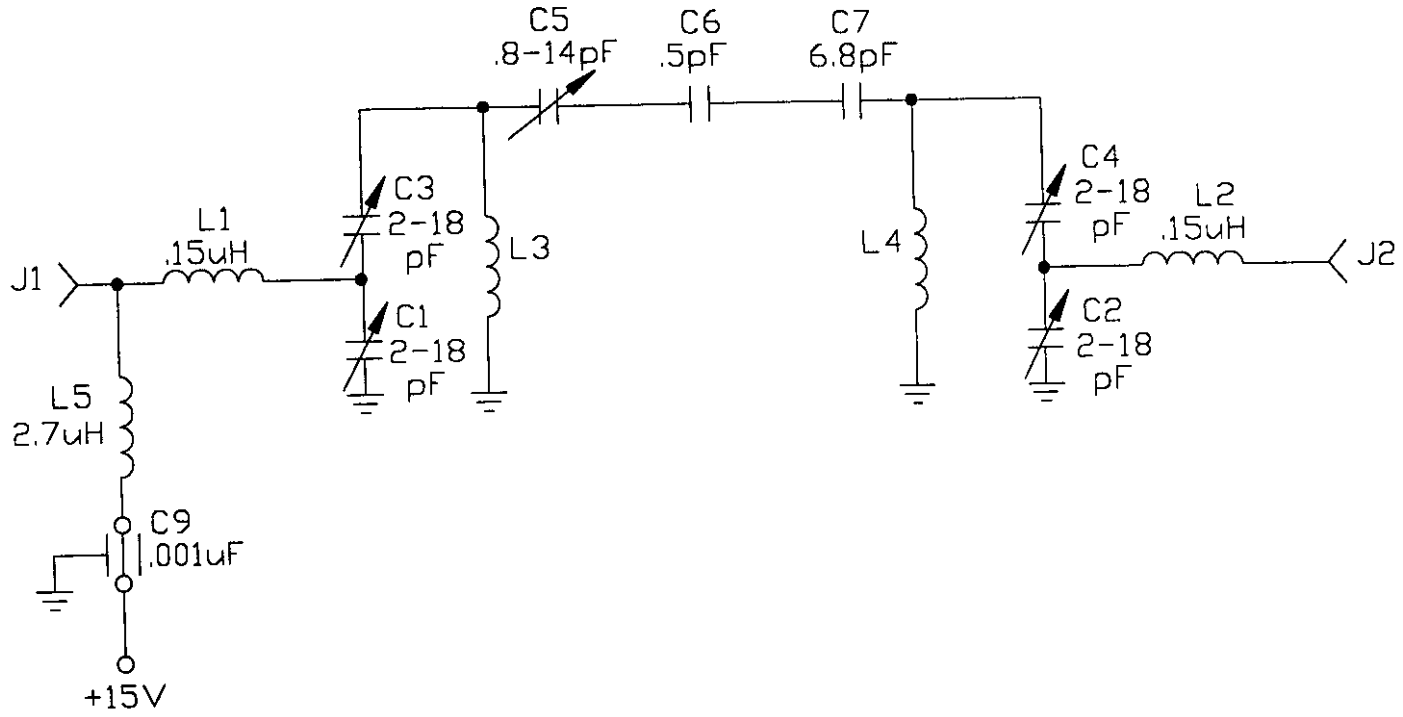
EMCEE
ELECTRONICS MISSILES & COMMUNICATIONS INC.
WHITE HAVEN, PA. 18661

CAD DWG 9-29-93

SCHEMATIC DIAGRAM, VHF OUTPUT FILTER HIGH BAND (CH 7-13)

A280-69 REV 1B

SHEET 1 OF 1



ECN	DATE	BY				CHK	CHK	APPV'L
NEXT ASSY: P/L A280-90-1			DRAFT	5-16-79	C.T.T.	SCHEMATIC DIAGRAM, VHF BANDPASS FILTER (CH 7-13)		
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.			

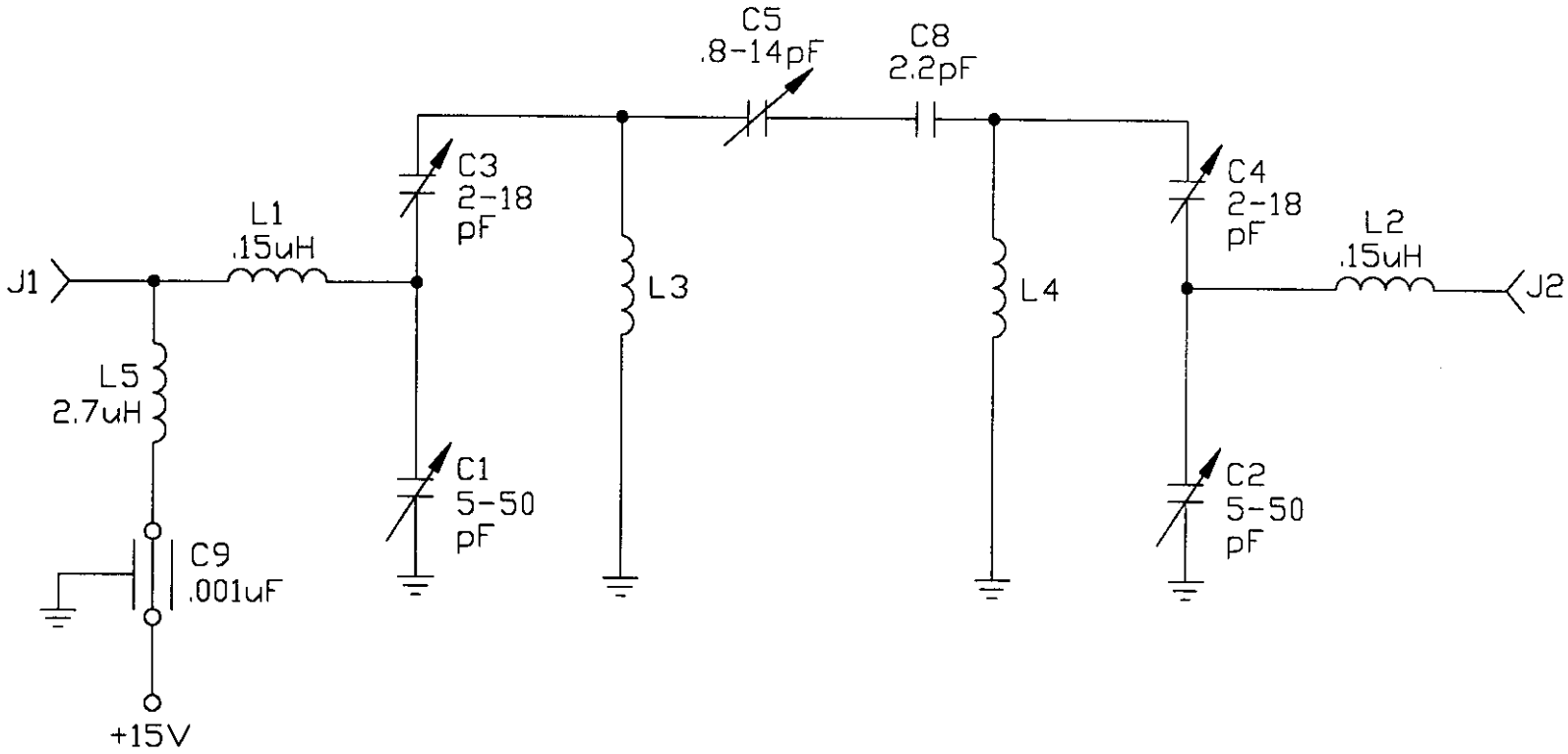
TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

A280-89 REV 1

SHEET 1 OF 1

CAD DWG 6-1-94



ECN	DATE	BY			CHK	CHK	APPV'L
NEXT ASSY: P/L A280-90		DRAFT	5-16-79	C.T.T.			
P/L A280-91		DR. CHK	6-4-79	W.J.H.			
VERSION		M. ENGR					
MODEL		E. ENGR					
SCALE NONE		RELEASE	9-3-93	R.H.N.			

TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010, .XXX ± .005
FRACTIONAL ± 1/64°
ANGULAR ± 1/2 DEG

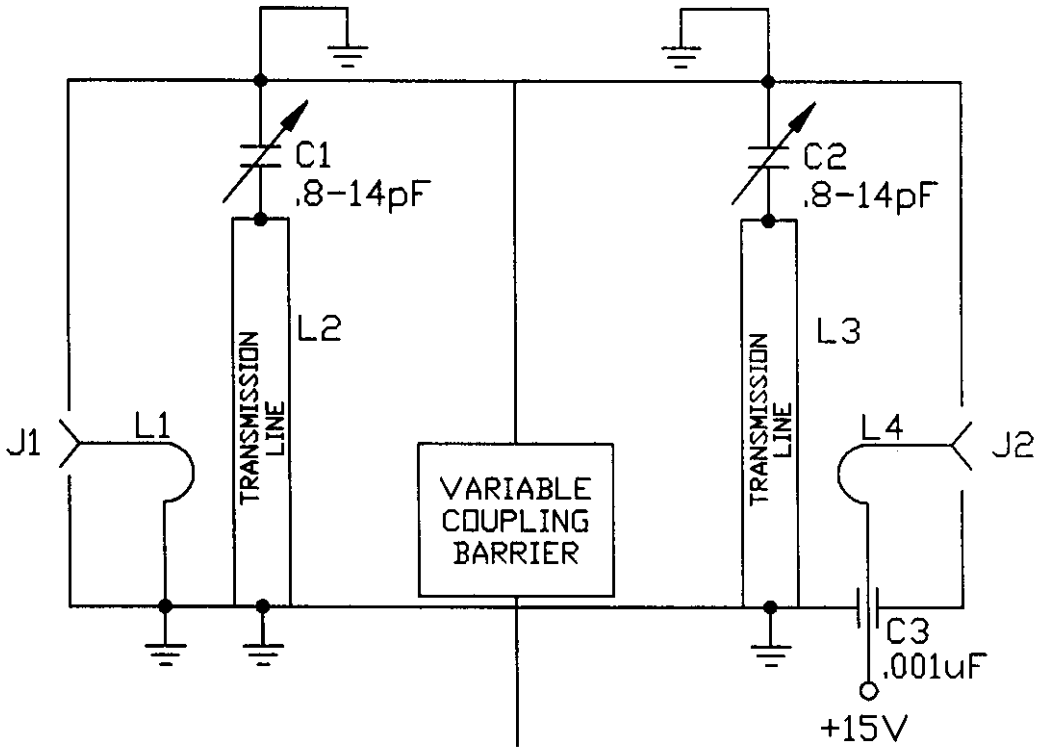
EMCEE
ELECTRONICS MISSILES & COMMUNICATIONS INC.
WHITE HAVEN, PA. 18661

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

A280-92 REV 1

SHEET 1 OF 1

CAD DWG 9-29-93



ECN	DATE	BY		CHK	CHK	APPV'L
B	12-29-89	T.B.	VALUES OF C1 & C2 WERE .8-10pF	C.T.T.		R.G.N.

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
DECIMAL .XX ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

SCHMATIC DIAGRAM, UHF BANDPASS FILTER

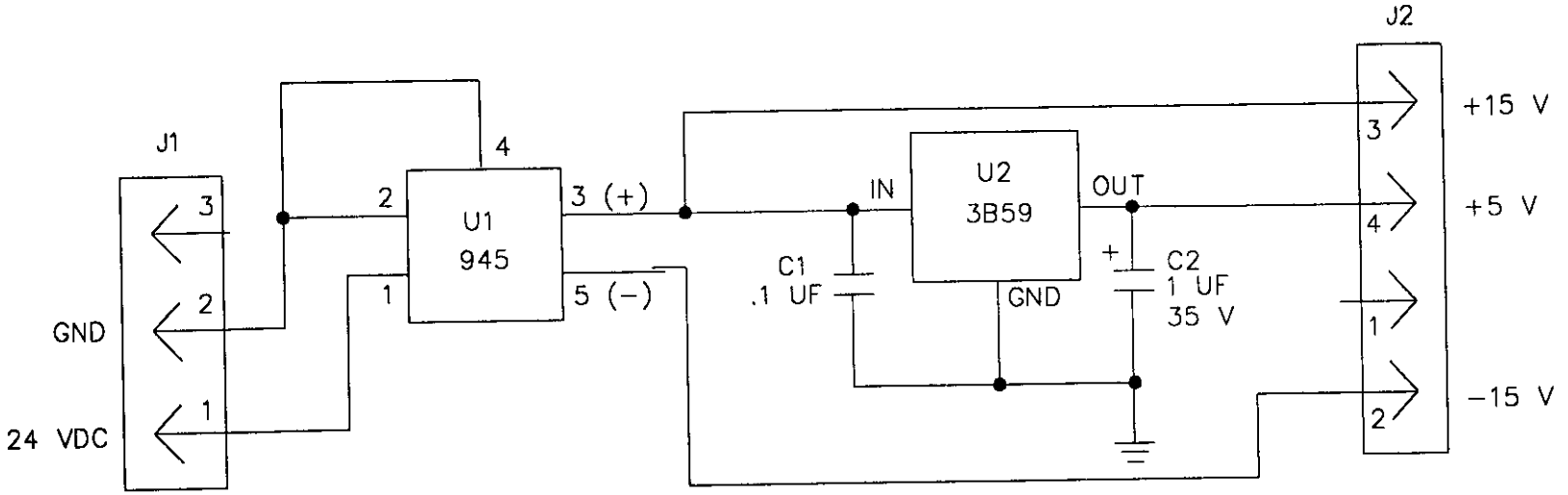
A284-6 REV B

SHEET 1 OF 1

CAD DWG 6-1-94

HIGHEST REFERENCE DESIGNATIONS											
C2	J2	U2									

REFERENCE DESIGNATIONS NOT USED											



ECN	DATE	BY		CHK	CHK	APPV'L
NEXT ASSY:			DRAFT	9-21-87	JC	
			DR. CHK			
VERSION			M. ENGR			
MODEL			E. ENGR			
SCALE NONE			RELEASE	5-16-88	B.N.	

SCHEMATIC DIAGRAM,
DC/DC CONVERTER

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

EMCEE

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

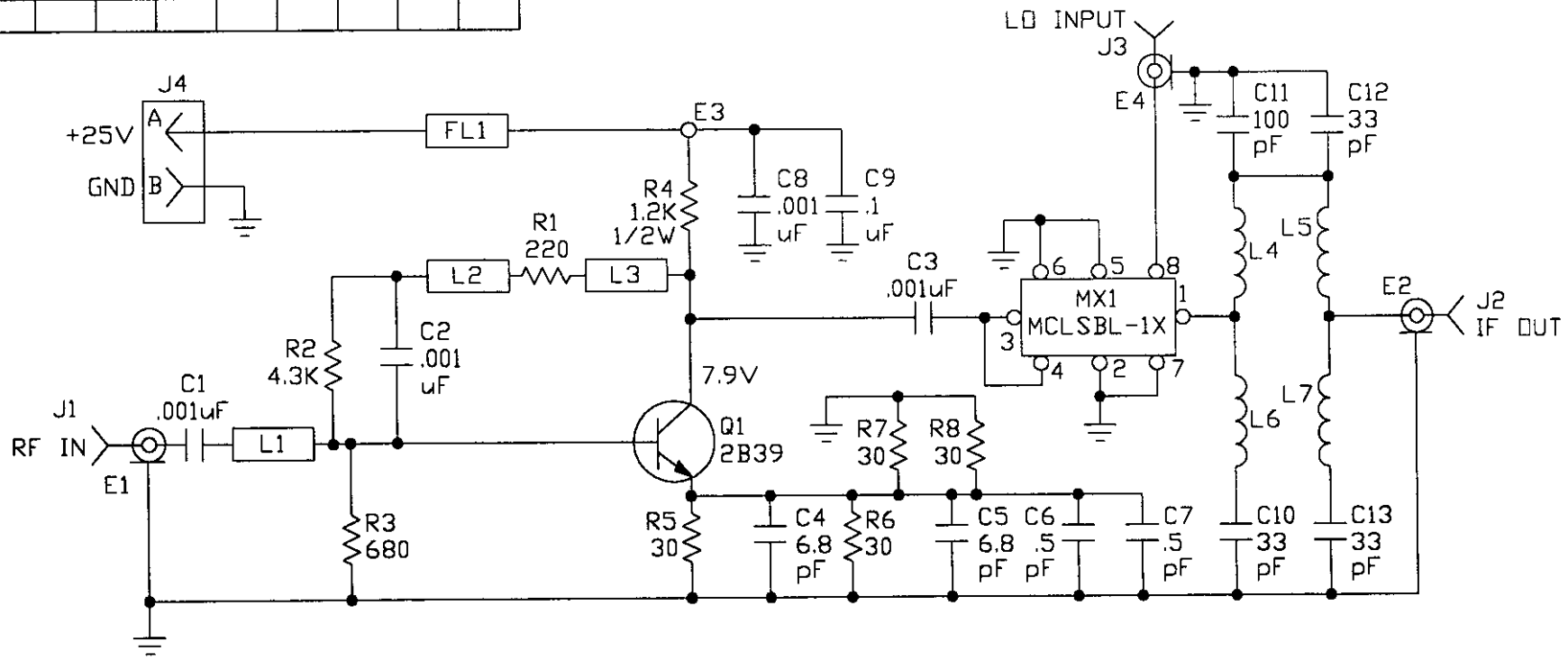
10326129

REV A

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.

CAD DWG 7-14-94

ECN	DATE	BY		CHK	CHK	APPV'L
B	12-29-89	TAB	ADDED J4 TO NOTE 2 ; ADDED 7.9V TO Q1	C.T.T.		R.G.N.

NEXT ASSY: P/L B331-30-1	DRAFT	9-7-84	C.T.T.
	DR. CHK		
VERSION	M. ENGR		
MODEL	E. ENGR	4-25-86	J.M.J
SCALE NONE	RELEASE	4-25-86	J.M.J

TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

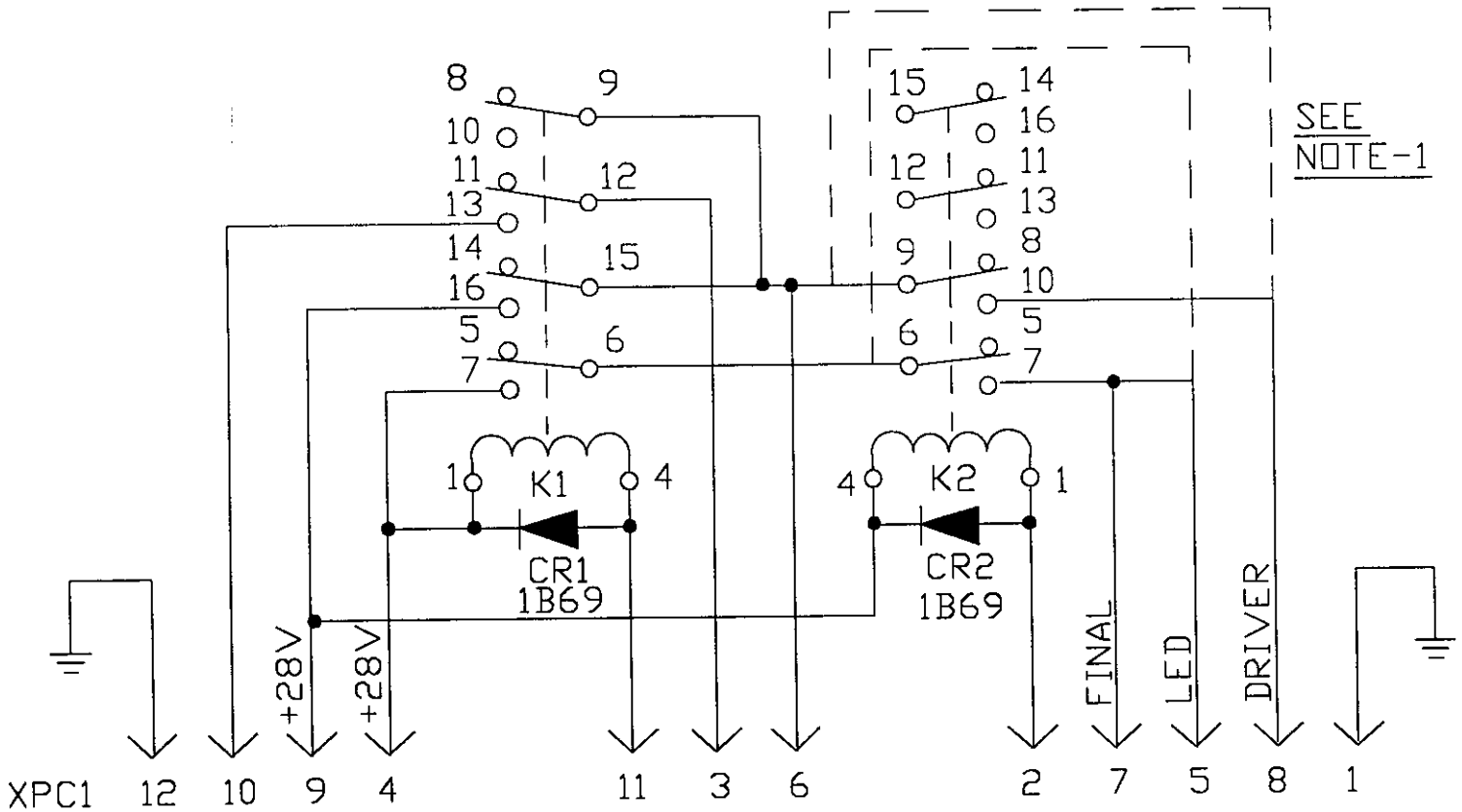
SCHEMATIC DIAGRAM, DOWNCONVERTER/ PREAMPLIFIER

A	331-29	REV B

SHEET 1 OF 1

NOTES : UNLESS OTHERWISE SPECIFIED

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.



ECN	DATE	BY		CHK	CHK	APPV'L
7065	7-6-89	T.M.	CHANGED NOTE-1 SEE ECN	CTT		RN

NEXT ASSY:	DRAFT	3-4-87	C.T.T
	DR. CHK		
VERSION	M. ENGR		
MODEL	E. ENGR	8-21-87	R.N.
SCALE	RELEASE	8-21-87	R.N.

TOLERANCES - EXCEPT AS NOTED

DECIMAL .XX ± .010, .XXX ± .005

FRACTIONAL ± 1/64"

ANGULAR ± 1/2 DEG

EMCEE

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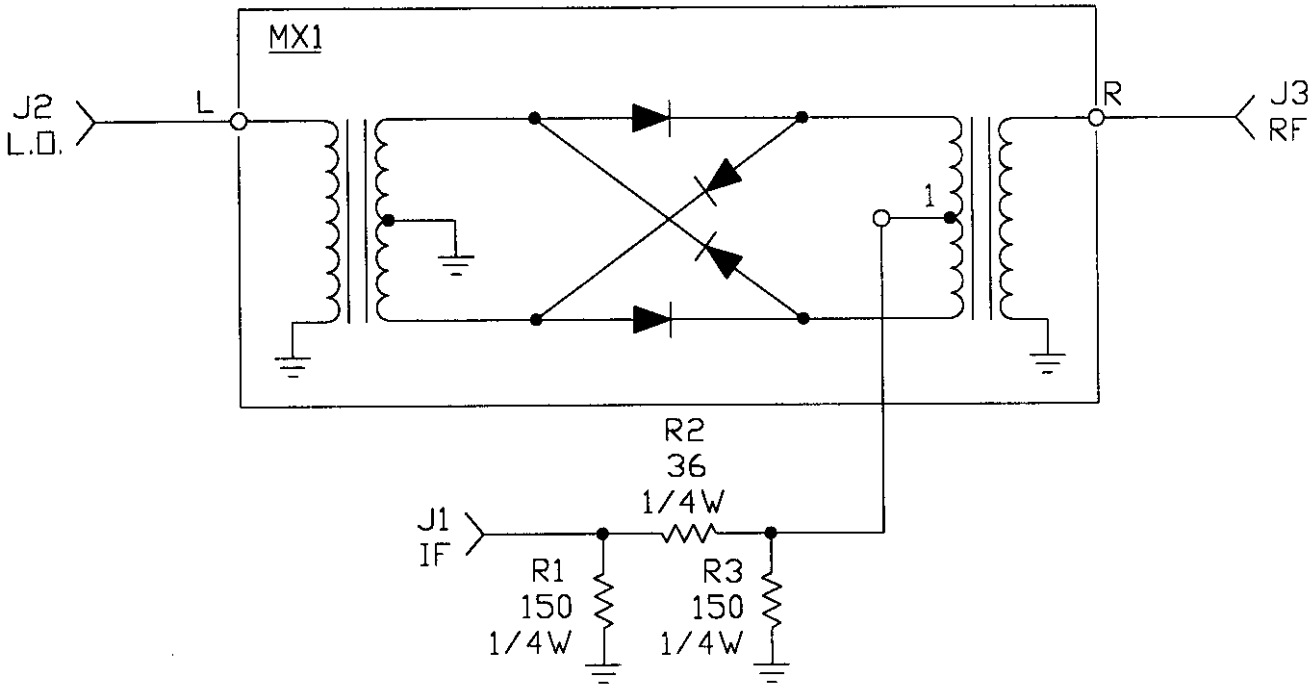
WHITE HAVEN, PA. 18661

SCHEMATIC DIAGRAM, FINAL AMPL CONTROL

10331074 REV B

SHEET 1 OF 1



ECN	DATE	BY			CHK	CHK	APPV'L
NEXT ASSY: P/L A331-188-1			DRAFT	5-26-87	W.J.H.		
			DR. CHK	7-7-87	C.T.T.		
VERSION			M. ENGR				
MODEL			E. ENGR				
SCALE			RELEASE	6-21-87	R.G.N.		

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

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

SCHEMATIC DIAGRAM, MIXER

A331-189 REV A

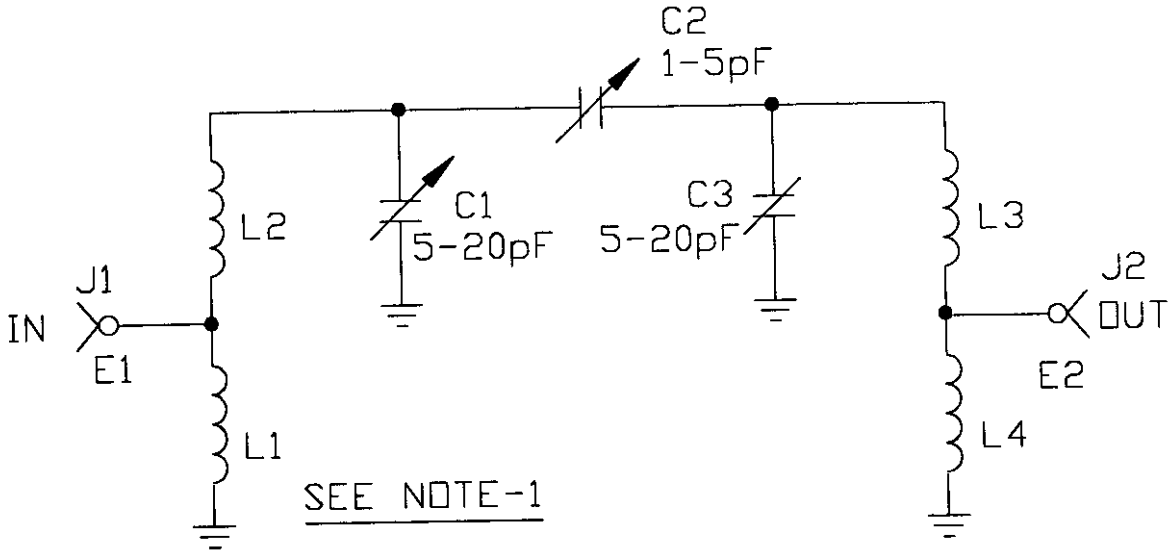
SHEET 1 OF 1

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.



ECN	DATE	BY		CHK	CHK	APPV'L
A	7-11-89	C.T.T.	CHANGES CHANNELS FROM CH 46-69			R.N.

NEXT ASSY:	DRAFT	6-30-87	C.T.T.
	DR. CHK	7-16-87	W.H.
VERSION	M. ENGR	7-23-87	J.C.
MODEL	E. ENGR		
SCALE	RELEASE	8-21-87	R.N.

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

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

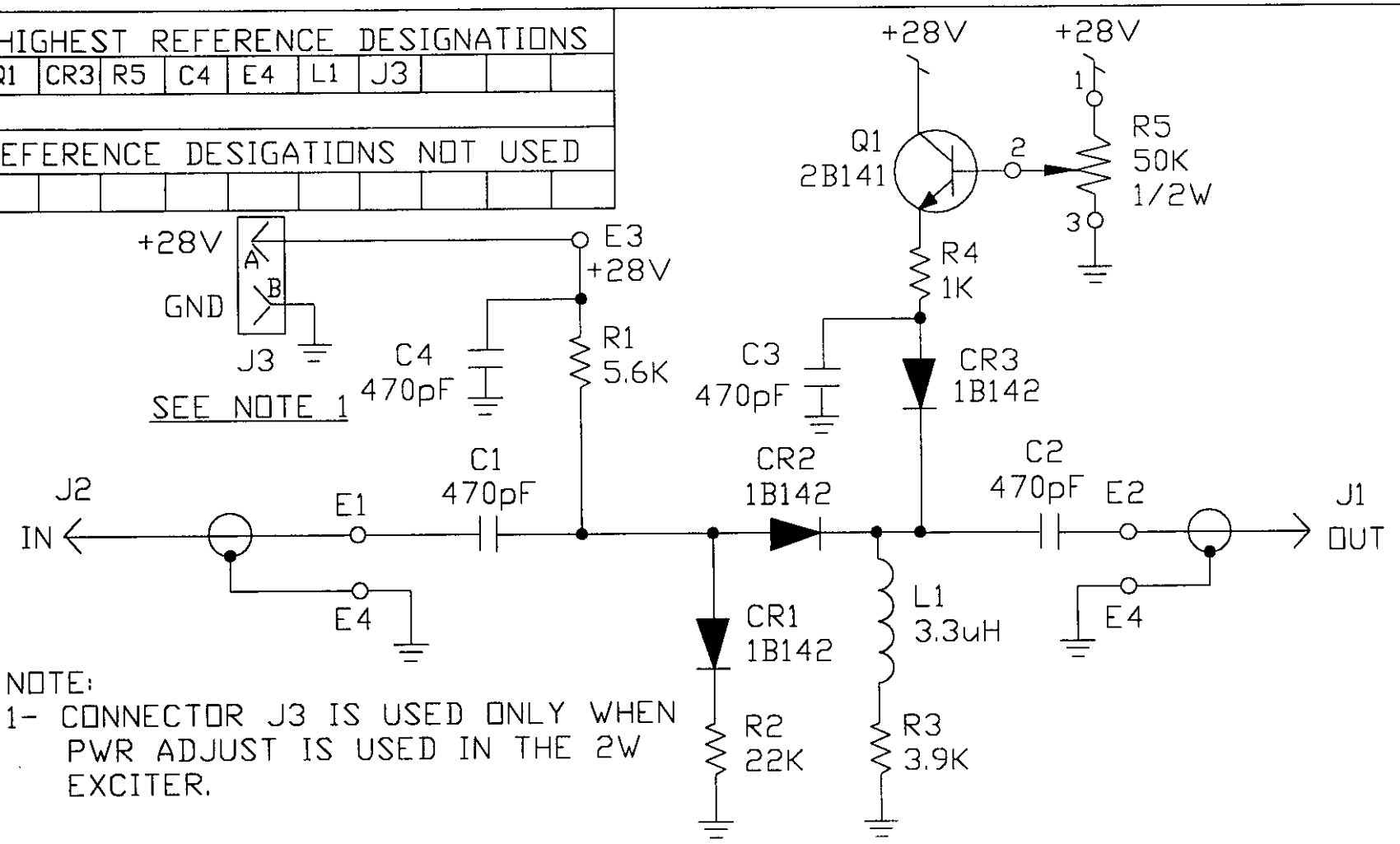
SCHEMATIC DIAGRAM, UHF L.O. BANDPASS FILTER (CH 14-40)

10331199 REV B

SHEET 1 OF 1

HIGHEST REFERENCE DESIGNATIONS									
Q1	CR3	R5	C4	E4	L1	J3			

REFERENCE DESIGATIONS NOT USED									



NOTE:
1- CONNECTOR J3 IS USED ONLY WHEN PWR ADJUST IS USED IN THE 2W EXCITER.

ECN	DATE	BY	COMP		C.T.T.	CHK	C.T.T. APPV'L
A	7/1/91	TAB	ADDED J3 & NOTE-1.	RELEASED AT REV 53			

NEXT ASSY: 503311257	DRAFT	4-1-88	C.T.T.
	DR. CHK		
VERSION	M. ENGR		
MODEL	E. ENGR		
SCALE	RELEASE	5-27-89	R.N.

TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

SCHEMATIC DIAGRAM, POWER ADJUST

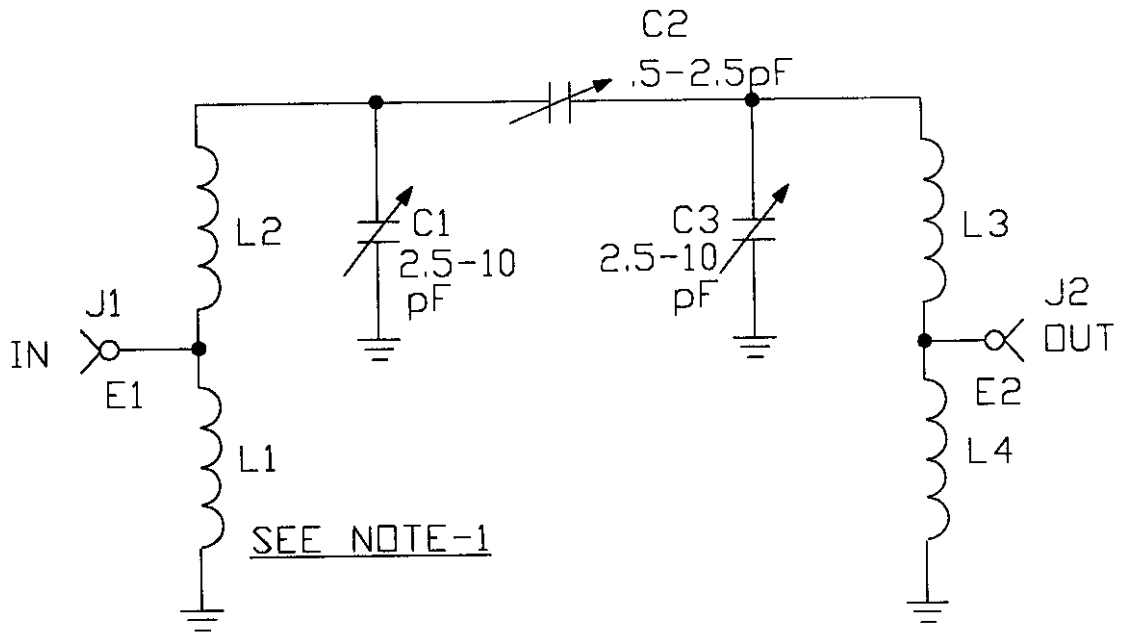
10331255 REV A

SHEET 1 OF 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.T.T
	DR. CHK		
VERSION	M. ENGR		
MODEL	E. ENGR		
SCALE	RELEASE	5-27-89	R.N.

TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

SCHEMATIC DIAGRAM, UHF L.O. BANDPASS FILTER (CH41-69)

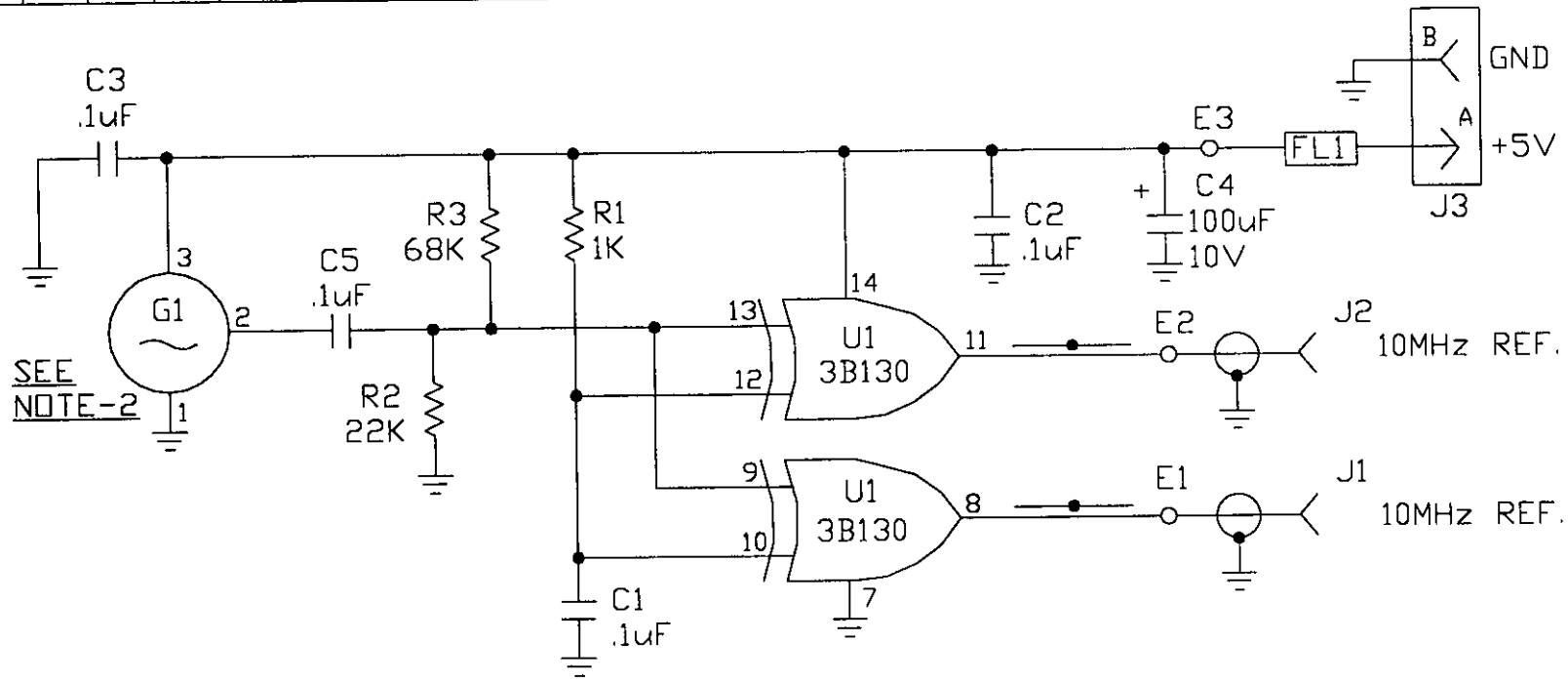
10331259 REV 52

SHEET 1 OF 1

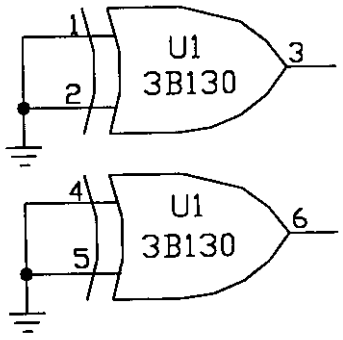
HIGHEST REFERENCE DESIGNATIONS									
C5	R3	U1	G1	E3	J3	FL1			

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.



SPARE



ECN	DATE	BY	
B	12/10/98	TAB	ADDED NOTE-2.
A 293	8-10-95	VN	ADDED C5, R3; R2 VALUE WAS 4.7K
			RELEASED AT REV 57

				CTT	CTT
				CTT DB	DB
				CHK CHK	APPV'L

NEXT ASSY:	DRAFT	7-03-90	SMP
	DR. CHK	10-4-90	CTT
VERSION	M. ENGR		
MODEL	E. ENGR	11-8-90	JL
SCALE	RELEASE	6-14-95	BN

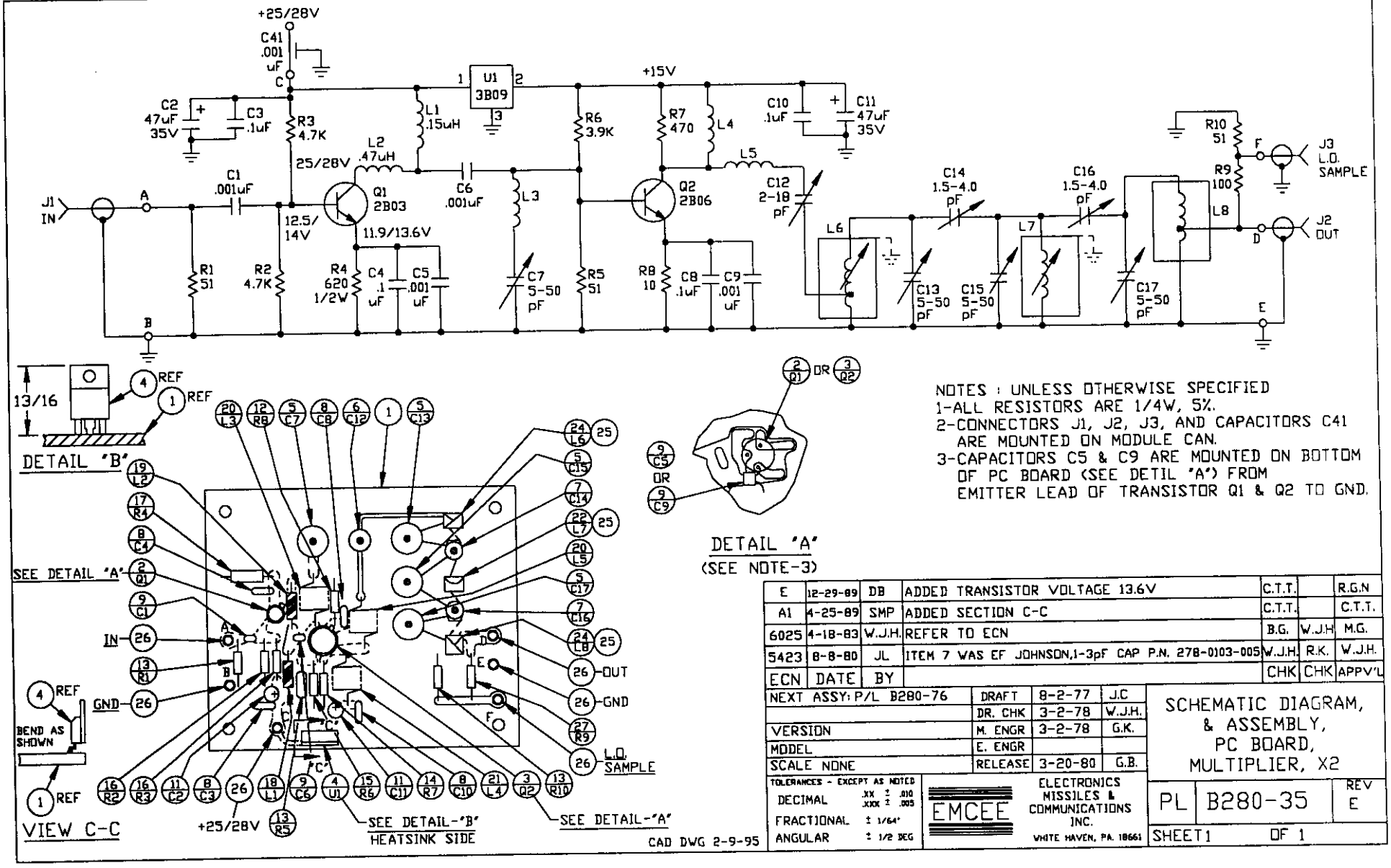
TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010 .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

SCHEMATIC DIAGRAM, REF. OSCILLATOR

10368037 REV B

SHEET 1 OF 1



NOTES : UNLESS OTHERWISE SPECIFIED
1-ALL RESISTORS ARE 1/4W, 5%.
2-CONNECTORS J1, J2, J3, AND CAPACITORS C41 ARE MOUNTED ON MODULE CAN.
3-CAPACITORS C5 & C9 ARE MOUNTED ON BOTTOM OF PC BOARD (SEE DETIL 'A') FROM EMITTER LEAD OF TRANSISTOR Q1 & Q2 TO GND.

ECN	DATE	BY		CHK	CHK	APPV'L
E	12-29-89	DB	ADDED TRANSISTOR VOLTAGE 13.6V	C.T.T.		R.G.N
A1	4-25-89	SMP	ADDED SECTION C-C	C.T.T.		C.T.T.
6025	4-18-83	W.J.H.	REFER TO ECN	B.G.	W.J.H	M.G.
5423	8-8-80	JL	ITEM 7 WAS EF JOHNSON,1-3pF CAP P.N. 278-0103-005	W.J.H.	R.K.	W.J.H.

NEXT ASSY: P/L B280-76	DRAFT	8-2-77	J.C
	DR. CHK	3-2-78	W.J.H.
VERSION	M. ENGR	3-2-78	G.K.
MODEL	E. ENGR		
SCALE NONE	RELEASE	3-20-80	G.B.

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

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

SCHEMATIC DIAGRAM, & ASSEMBLY, PC BOARD, MULTIPLIER, X2

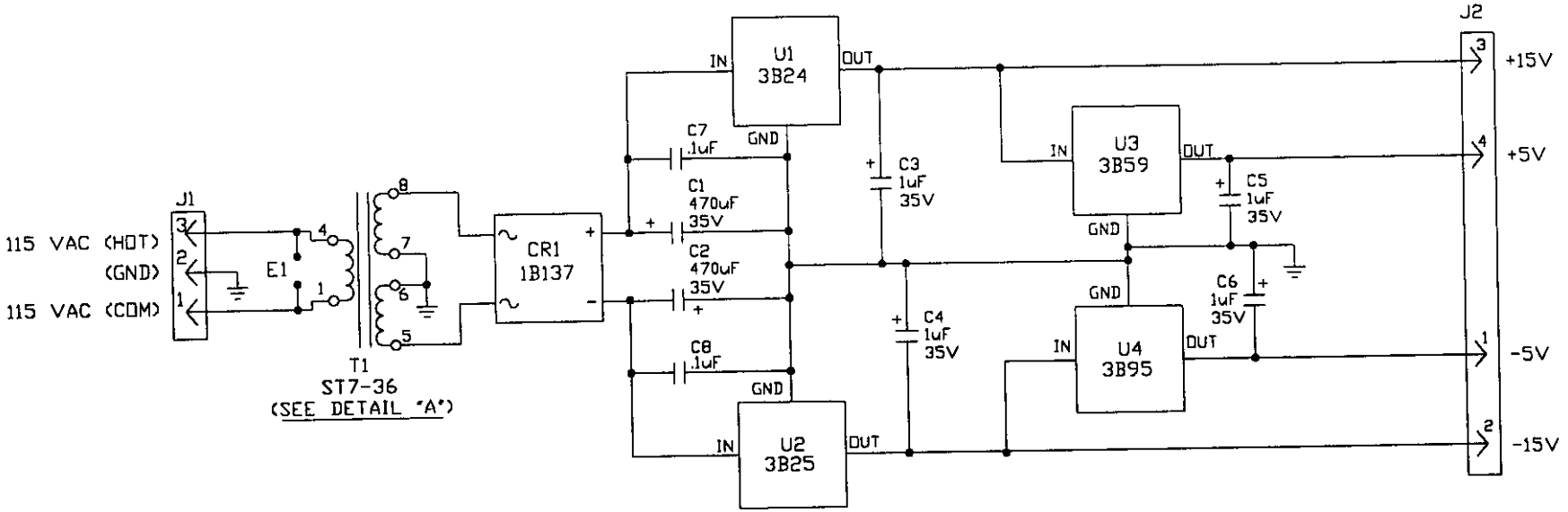
PL B280-35 REV E

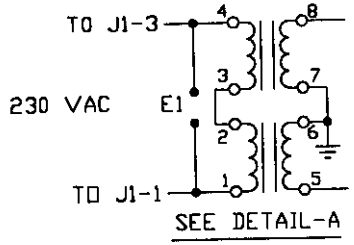
SHEET 1 OF 1

CAD DWG 2-9-95

HIGHEST REFERENCE DESIGNATIONS									
J2	CR1	U4	C8	E1	T1				

REFERENCE DESIGNATIONS NOT USED									





ECN	DATE	BY		CHK	CHK	APPV'L
A1	3-20-89	SMP	1B137 WAS 1B33	C.T.T.		R.N.
6607	11-6-85	C.T.T.	ADDED DETAIL "A" AND E1 WAS RV1	W.J.H.		J.M.J.
6385	10-11-84	C.T.T.	ADDED C7,C8	W.J.H.	J.C.	R.N.

NEXT ASSY: 70326117	DRAFT	2-23-84	C.T.T.
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
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

SCHEMATIC DIAGRAM, ±15V/±5V POWER SUPPLY

B	326-12	REV D

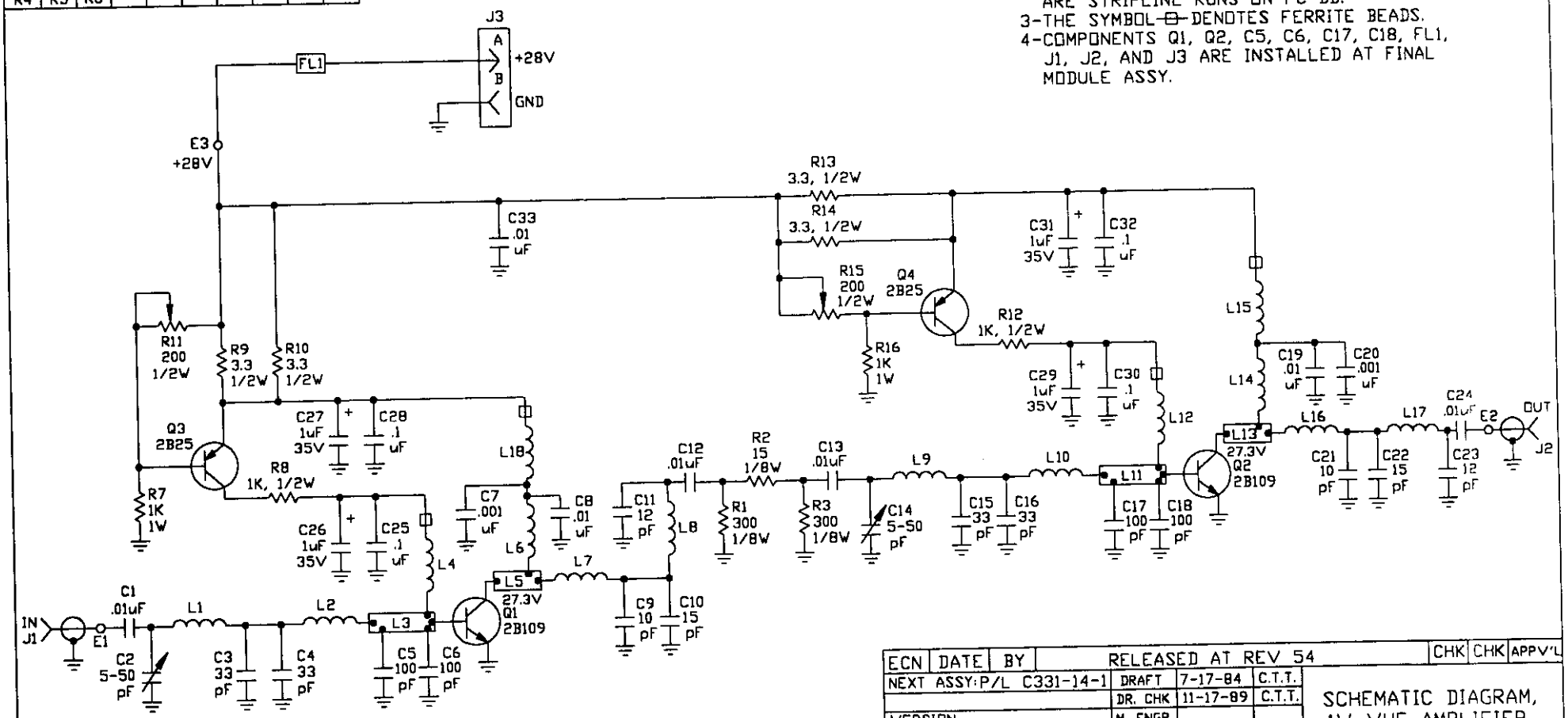
SHEET 1 OF 1

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.



CAD DWG 5-28-96

ECN	DATE	BY	RELEASED AT REV 54		CHK	CHK	APPV'L
NEXT ASSY: P/L C331-14-1			DRAFT	7-17-84	C.T.T.		
			DR. CHK	11-17-89	C.T.T.		
VERSION			M. ENGR				
MODEL			E. ENGR	2-9-90	J.M.J.		
SCALE NONE			RELEASE	11-21-90	RGN		

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

EMCEE
EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA. 18661

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

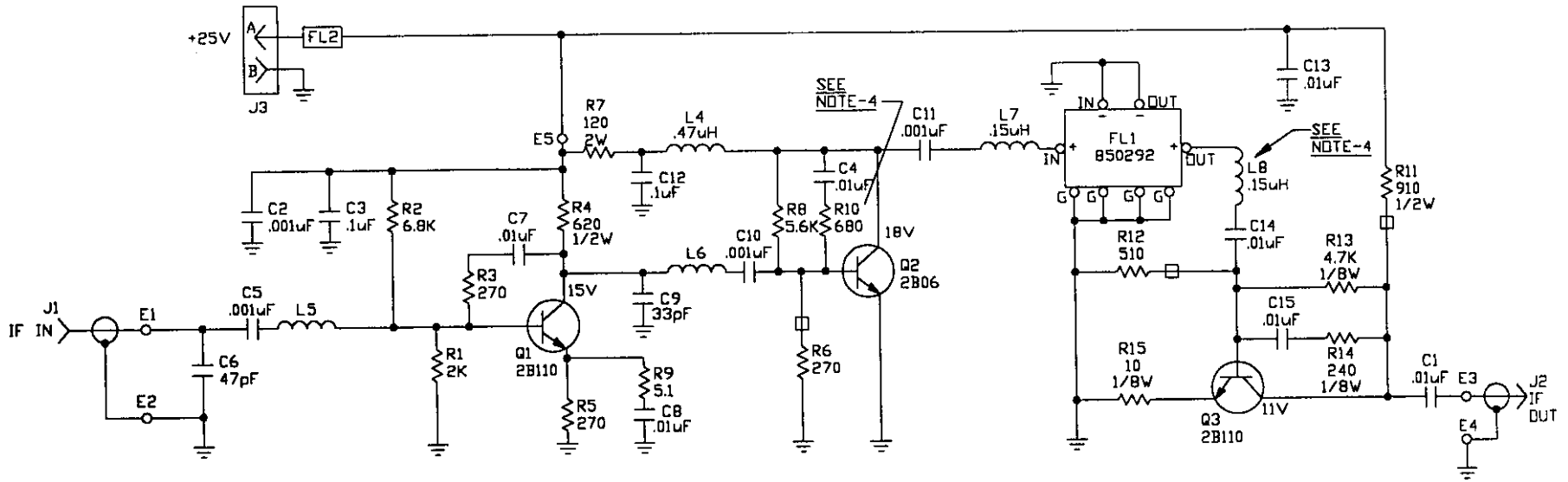
B	331-12	REV 54

SHEET 1 OF 1

HIGHEST REFERENCE DESIGNATIONS									
E5	R15	C15	L8	J3	FL2	Q3			

REFERENCE DESIGNATIONS NOT USED									
L3	L2	L1							

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



ECN	DATE	BY		CHK	CHK	APPV'L
464	9/3/98	TAB	VALUE OF R10 WAS 470.	C.T.T.		
C	12-29-89	TAB	ADDED TRANSISTOR VOLTAGE, ADDED J3 TO NOTE2	C.T.T.		RGN
A	8-31-88	SMP	ADDED NOTE 4	C.T.T.		RGN

NEXT ASSY: P/L B331-23-1	DRAFT	8-29-84	C.T.T.
	DR. CHK		
VERSION	M. ENGR		
MODEL	E. ENGR	4-25-86	JMJ
SCALE NONE	RELEASE	4-25-86	JMJ

TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010, .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

CAD DWG 4-8-96

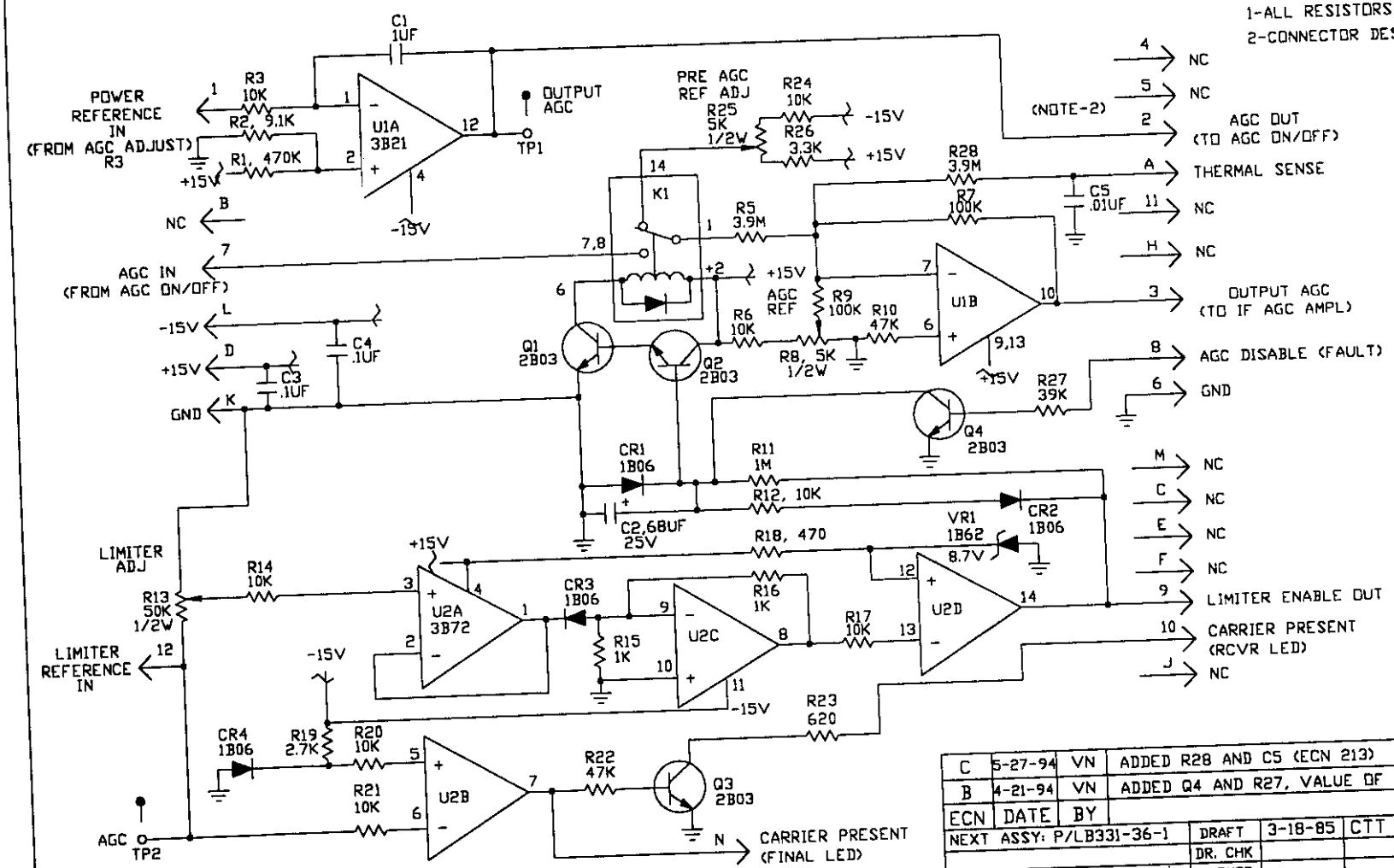
EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA. 18661

SCHEMATIC DIAGRAM, IF AMPLIFIER W/SAW FILTER

B 331-21 REV D

SHEET 1 OF 1

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



HIGHEST REFERENCE DESIGNATIONS									
U2	Q4	R28	C5	CR4	VR1	K1	TP2		

REFERENCE DESIGNATIONS NOT USED									
R4									

CAD DWG.4-21-94

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

NEXT ASSY: P/LB331-36-1	DRAFT	3-18-85	CTT
	DR. CHK		
VERSION	M. ENGR		
MODEL	E. ENGR	4-25-86	JMJ
SCALE NONE	RELEASE	4-25-86	JMJ

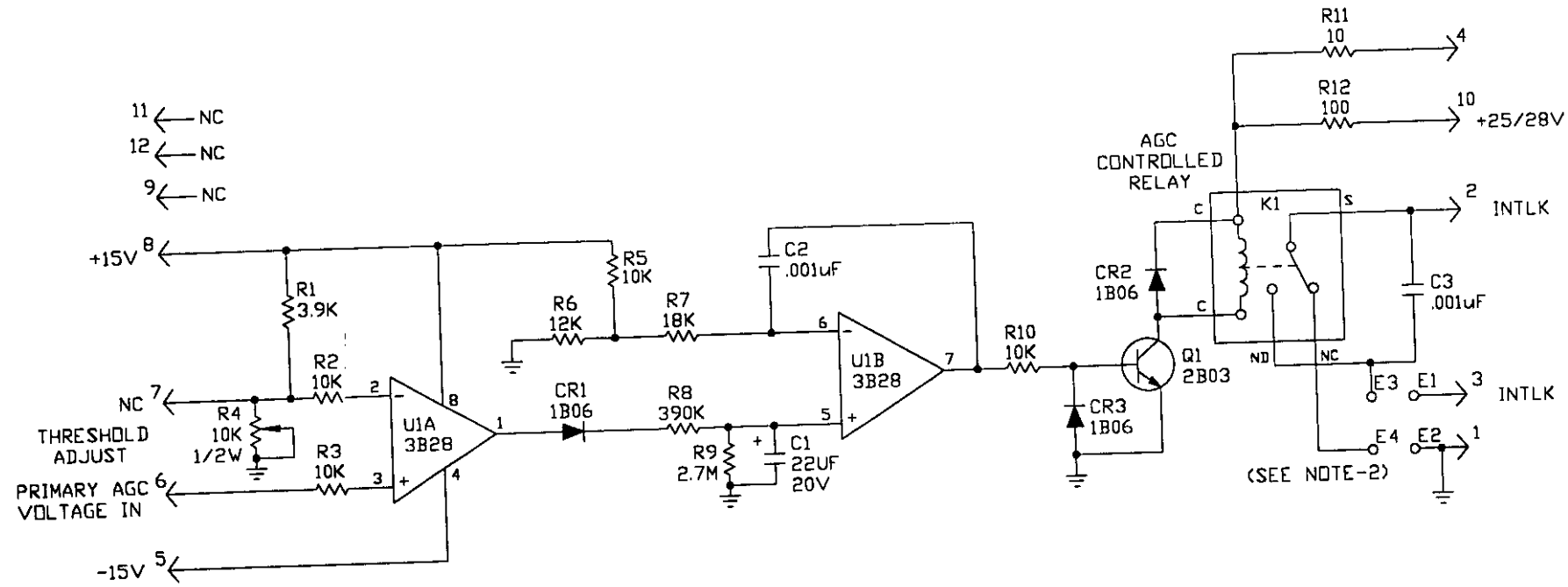
TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010 .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

SCHEMATIC DIAGRAM, LIMITER/OUTPUT AGC CONTROL

SIZE	DRAWING NO.	REV
B	331-34	C

SHEET 1 OF 1



ECN	DATE	BY	
371	11/13/96	TAB	SEE PCR\ECN.
8069	7-23-90	C.M.	SEE PCR\ENC

C.T.T. | R.G.N.
CHK | CHK | APPV'L

NOTES : UNLESS OTHERWISE SPECIFIED
1-ALL RESISTORS VALUED AT 1/4W, 5%.
2-FOR CONTACT CLOSURE JUMPER E1 TO E3,
FOR GROUND JUMPER E2 TO E3 AND FOR
TTU20F JUMPER E1 TO E3 AND E4 TO E2.

HIGHEST REFERENCE DESIGNATIONS									
Q1	U1	R12	CR3	K1	E3	C3			

REFERENCE DESIGNATIONS NOT USED									

CAD DWG 10-17-95

NEXT ASSY: P/L B331-46-1	DRAFT	9-4-85	C.T.T.
	DR. CHK		
VERSION UHF	M. ENGR		
MODEL E	E. ENGR	4-25-86	J.M.J.
SCALE NONE	RELEASE	4-25-86	J.M.J.

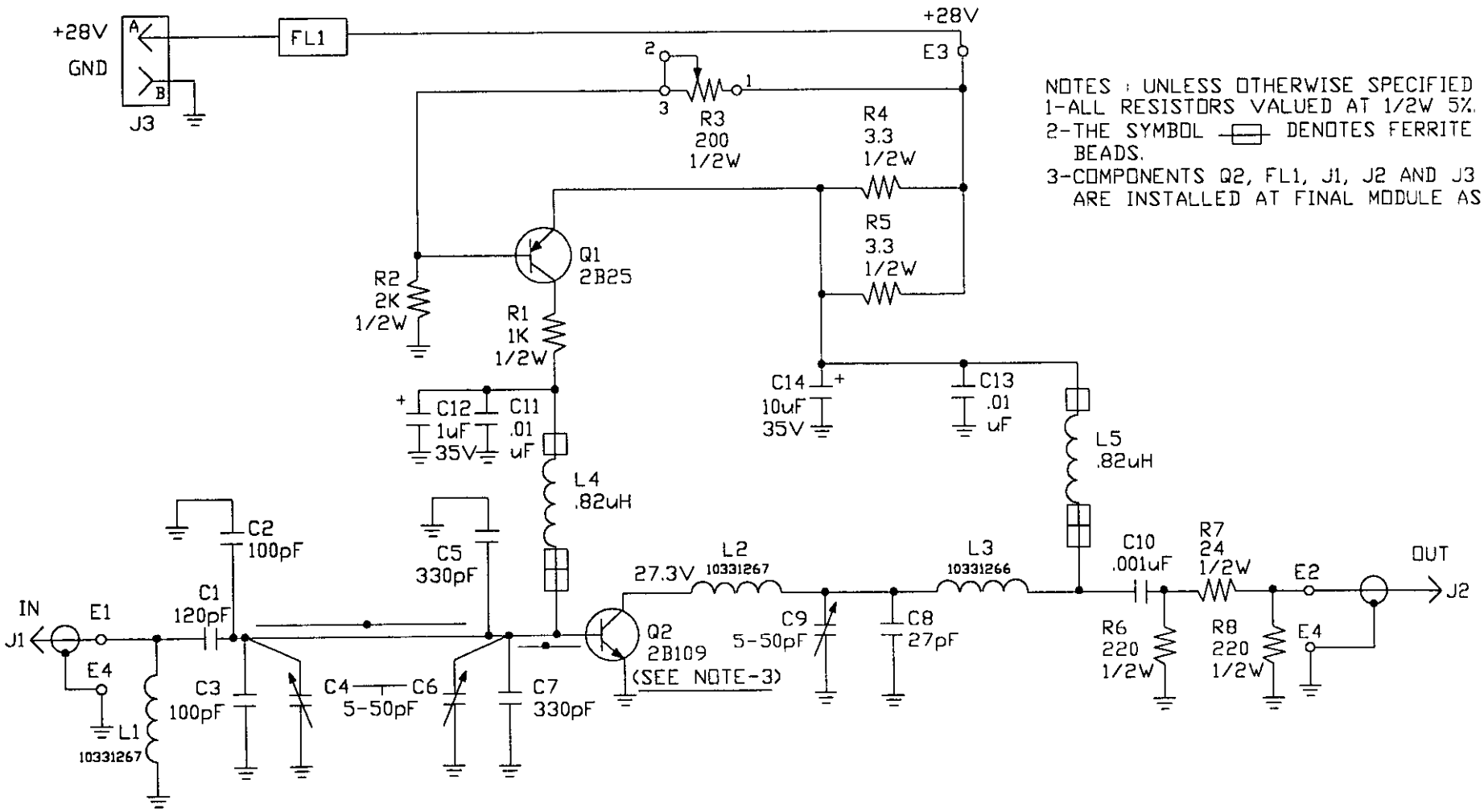
TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .02, .XXX ± .010
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

SCHEMATIC DIAGRAM, AUTO-ON

B 331-44 REV C

SHEET 1 OF 1



NOTES : UNLESS OTHERWISE SPECIFIED
1-ALL RESISTORS VALUED AT 1/2W 5%.
2-THE SYMBOL —▭— DENOTES FERRITE BEADS.
3-COMPONENTS Q2, FL1, J1, J2 AND J3 ARE INSTALLED AT FINAL MODULE ASSY.

ECN	DATE	BY	RELEASED AT REV 58	CHK	CHK	APPV'L
NEXT ASSY:		DRAFT	1-9-87	C.T.T		
		DR. CHK	11-20-89	C.T.T		
VERSION		M. ENGR				
MODEL		E. ENGR	2-9-90	JMJ		
SCALE		RELEASE	11-21-90	RN		

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

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

SCHEMATIC DIAGRAM, 1W VHF AMPLIFIER (CH 2-6)

20331081 REV 58

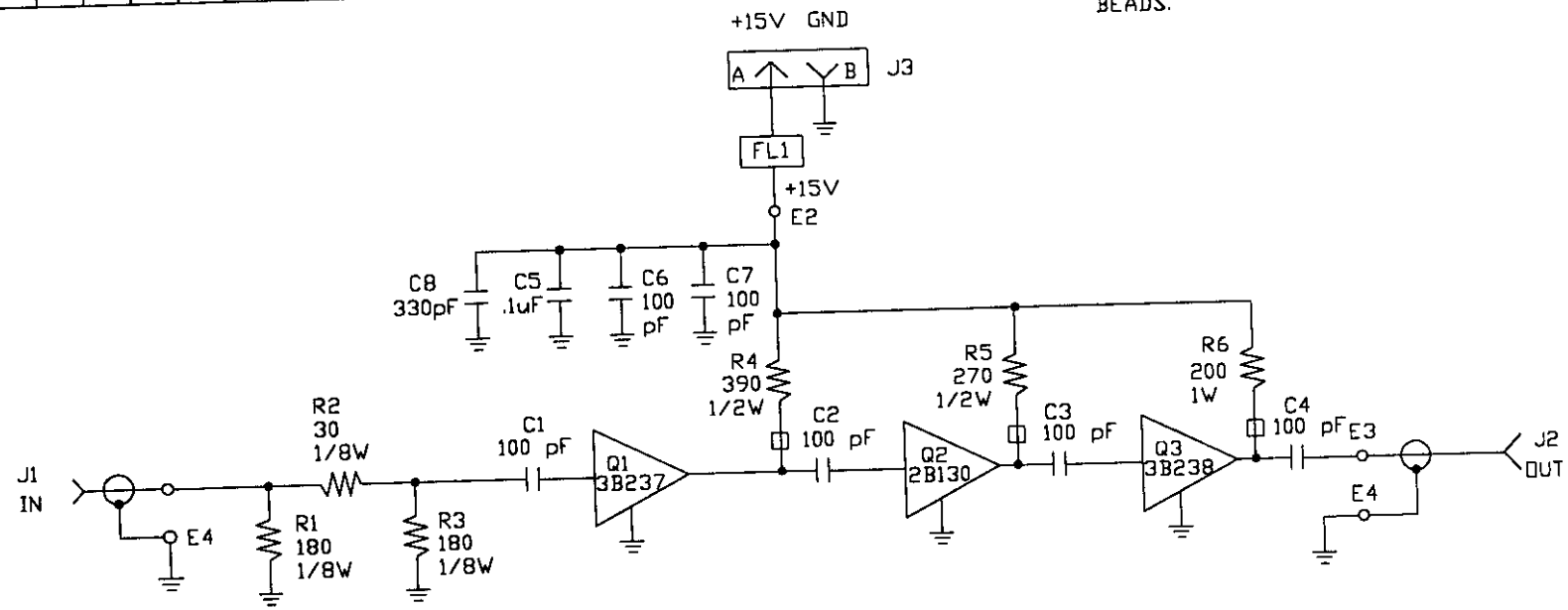
SHEET 1 OF 1

HIGHEST REFERENCE DESIGNATIONS											
L5	Q2	J3	E4	R8	C14	FL1					

REFERENCE DESIGNATIONS NOT USED

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.



ECN	DATE	BY		CHK	CHK	APPV'L
A 362	8/12/96	CMG	Q1 WAS 2B129, Q3 WAS 2B131. RELEASED AT REV 54			

NEXT ASSY:	DRAFT	2-9-87	C.T.T
	DR. CHK	7-10-89	CTT
VERSION	M. ENGR		
MODEL	E. ENGR		
SCALE	RELEASE	11-11-89	RN

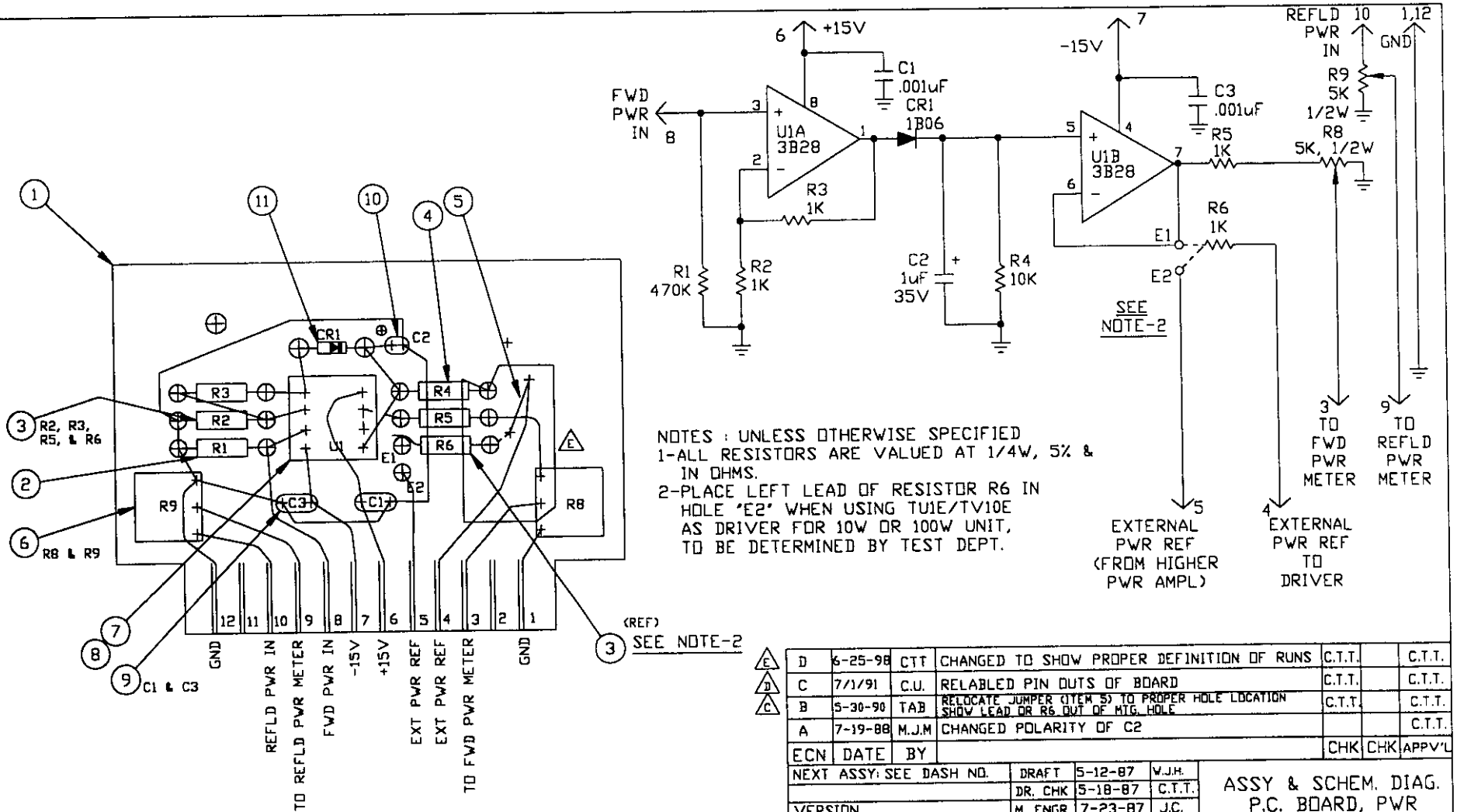
TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010 .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

EMCEE
EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA. 18661

SCHEMATIC DIAGRAM, UPCONVERTER AMPLIFIER

20331117 REV A

SHEET 1 OF 1



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.

(-1) PCB ASSY & SD, PWR METERING DC AMPL

CAD DWG 9-7-94

ECN	DATE	BY		CHK	CHK	APPV'L
E	6-25-98	CTT	CHANGED TO SHOW PROPER DEFINITION OF RUNS	C.T.T.		C.T.T.
D	7/1/91	C.U.	RELABLED PIN OUTS OF BOARD	C.T.T.		C.T.T.
C	5-30-90	TAB	RELOCATE JUMPER (ITEM 5) TO PROPER HOLE LOCATION SHOW LEAD OR R6 OUT OF MTG. HOLE	C.T.T.		C.T.T.
B	7-19-88	M.J.M	CHANGED POLARITY OF C2			C.T.T.
A						

NEXT ASSY: SEE DASH NO.	DRAFT	5-12-87	V.J.H.
	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.

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

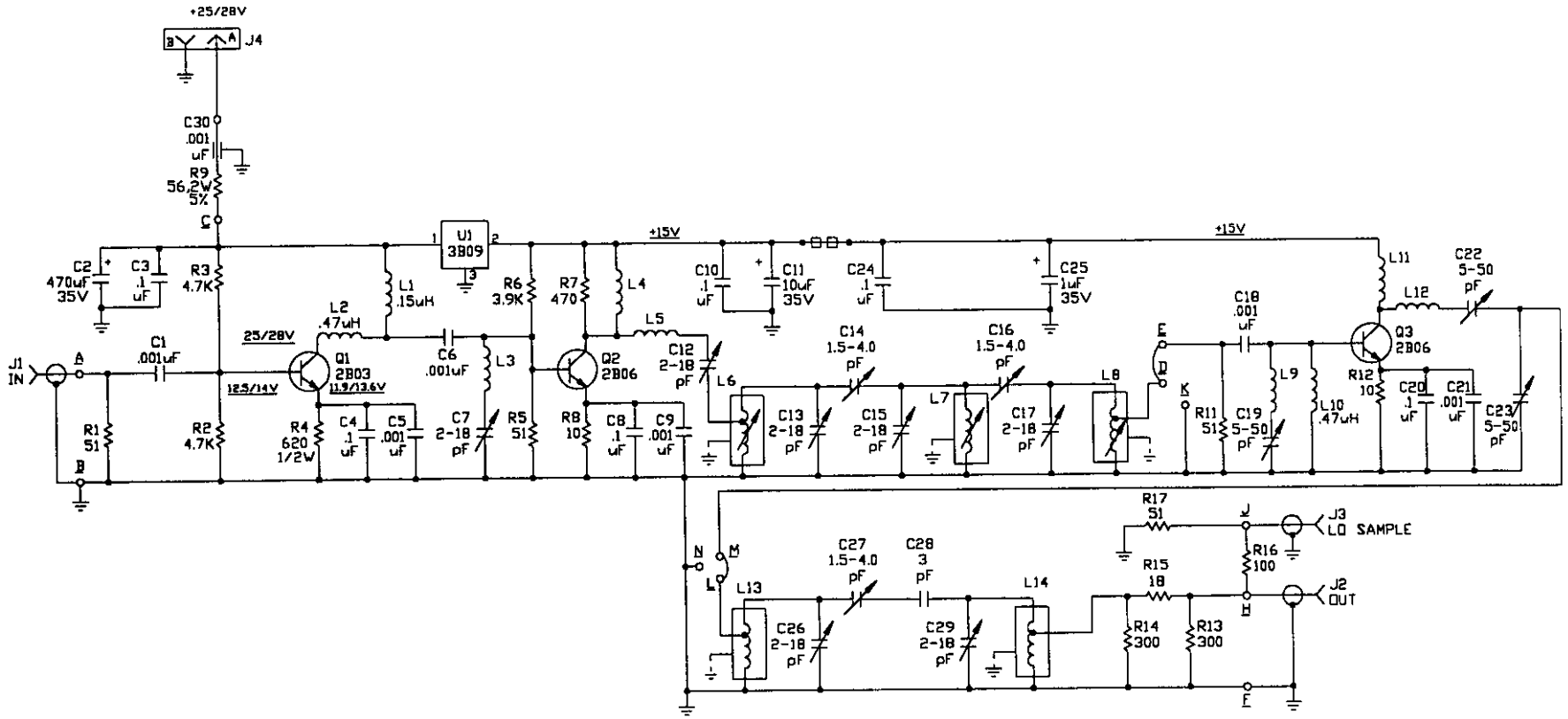
EMCEE
ELECTRONICS MISSILES & COMMUNICATIONS INC.
WHITE HAVEN, PA. 18661

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

PL B331-184 REV E

SHEET 1 OF 1

NOTES : UNLESS OTHERWISE SPECIFIED
1-THE SYMBOL -⊟- 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.



ECN	DATE	BY			
D	3-16-94	VN	C11 WAS 47uF	C.T.T.	RGN	RGN
C	1-2-90	TAB	CHANGED TRANSISTORS VOLTAGES, ADDED J3,J4-R9 TO NOTE 3	C.T.T.	RGN	RGN
6796	7-5-89	CAB	ADDED RESISTOR R9	C.T.T.	RGN	RGN
				CHK	CHK	APPV'L

NEXT ASSY: SEE DASH No.	DRAFT	8-30-84	W.J.H.	SCHEMATIC DIAGRAM, X4 MULTIPLIER
PL C331-16-1,PL B331-19-1	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	

TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010 .XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2° BCS

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

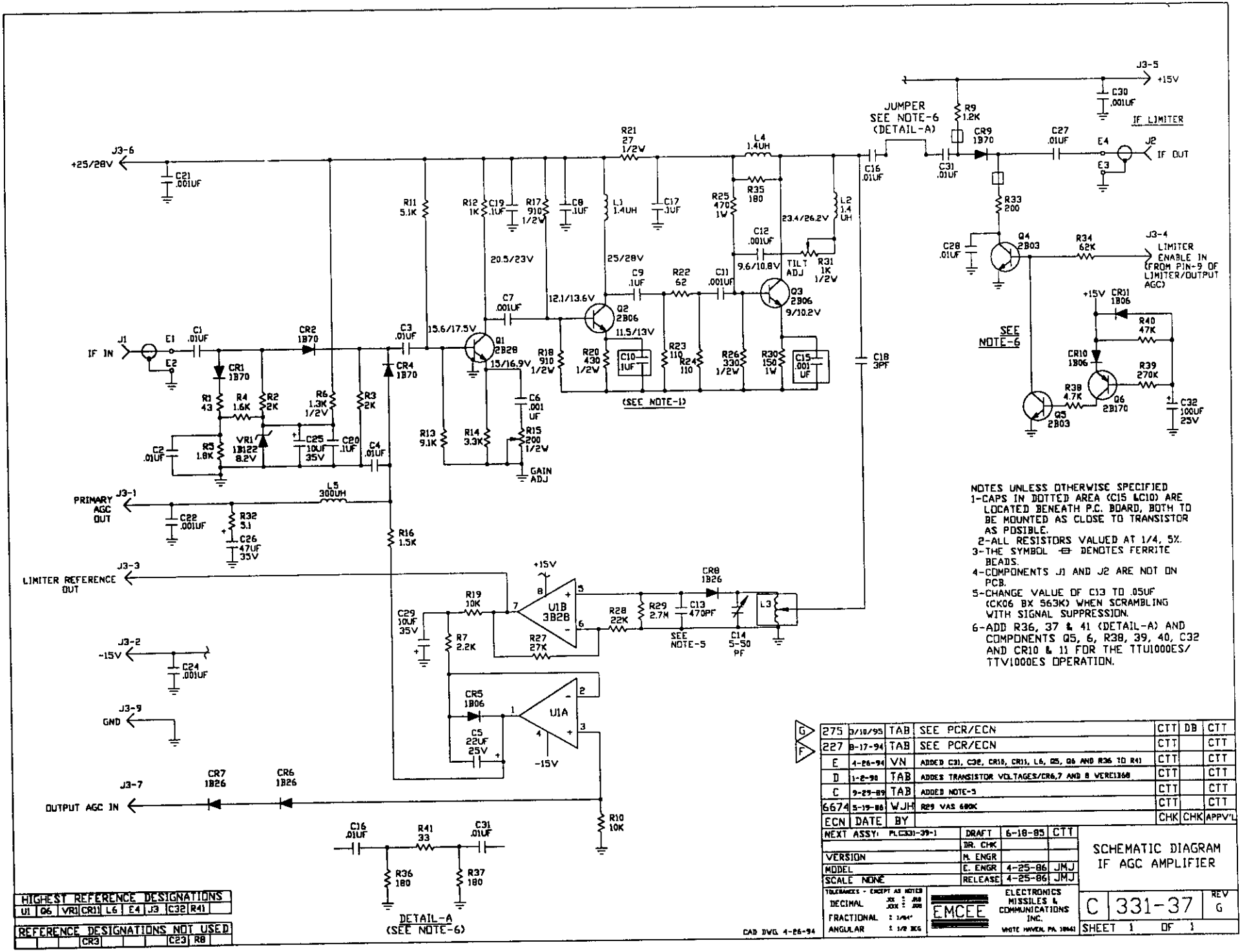
C 331-24 REV D

SHEET 1 OF 1

CAD DWG 10-9-95

HIGHEST REFERENCE DESIGNATIONS
C30 L14 R17 J4 Q3 U1

REFERENCE DESIGNATIONS NOT USED
R10



NOTES UNLESS OTHERWISE SPECIFIED
1-CAPS IN DOTTED AREA (C15 &C10) ARE LOCATED BENEATH P.C. BOARD, BOTH TO BE MOUNTED AS CLOSE TO TRANSISTOR AS POSIBLE.
2-ALL RESISTORS VALUED AT 1/4, 5%.
3-THE SYMBOL ⊣⊢ DENOTES FERRITE BEADS.
4-COMPONENTS J1 AND J2 ARE NOT ON PCB.
5-CHANGE VALUE OF C13 TO .05UF (CK06 BX 563K) WHEN SCRAMBLING WITH SIGNAL SUPPRESSION.
6-ADD R36, 37 & 41 (DETAIL-A) AND COMPONENTS Q5, 6, R38, 39, 40, C32 AND CR10 & 11 FOR THE TTU1000ES/ TTV1000ES OPERATION.

ECN	DATE	BY		CHK	CHK	APPV'L
275	5/10/95	TAB	SEE PCR/ECN	CTT	DB	CTT
227	8-17-94	TAB	SEE PCR/ECN	CTT		CTT
E	4-26-94	VN	ADDED C31, C32, CR10, CR11, L6, Q5, Q6 AND R36 TO R41	CTT		CTT
D	1-2-90	TAB	ADDED TRANSISTOR VOLTAGES/CR6,7 AND 8 VERE1368	CTT		CTT
C	9-29-89	TAB	ADDED NOTE-5	CTT		CTT
6674	5-19-86	WJH	R29 WAS 680K	CTT		CTT

NEXT ASSY: PLC331-39-1	DRAFT	6-18-85	CTT	SCHEMATIC DIAGRAM IF AGC AMPLIFIER
	DR. CHK			
VERSION	M. ENGR			
MODEL	E. ENGR	4-25-86	JMJ	
SCALE NONE	RELEASE	4-25-86	JMJ	

TOLERANCES - EXCEPT AS NOTED
DECIMAL XX ± .03 XXX ± .005
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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

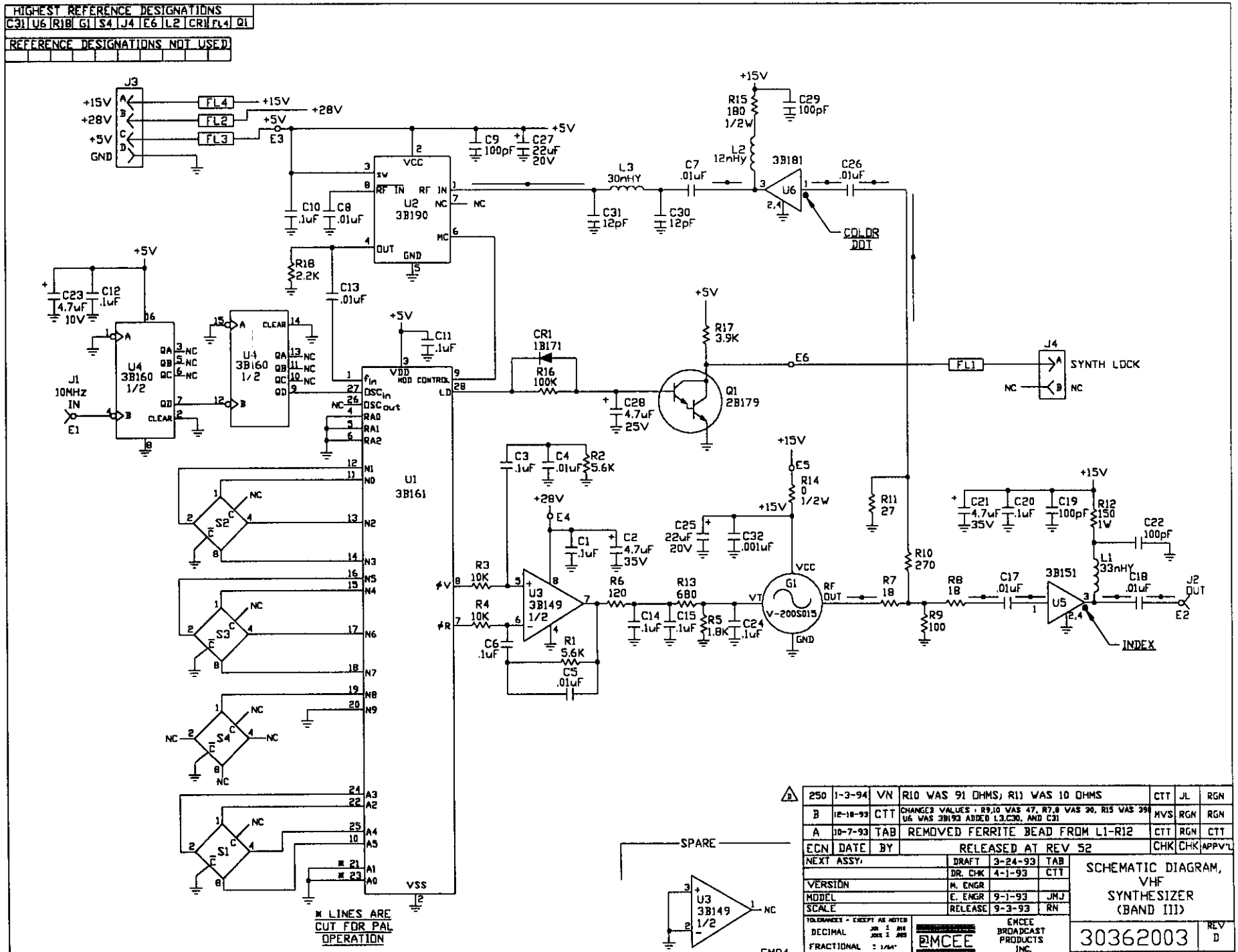
C | 331-37 | REV G

SHEET 1 OF 1

CAD DWG. 4-26-94

HIGHEST REFERENCE DESIGNATIONS								
U1	Q6	VR1	CR11	L6	E4	J3	C32	R41

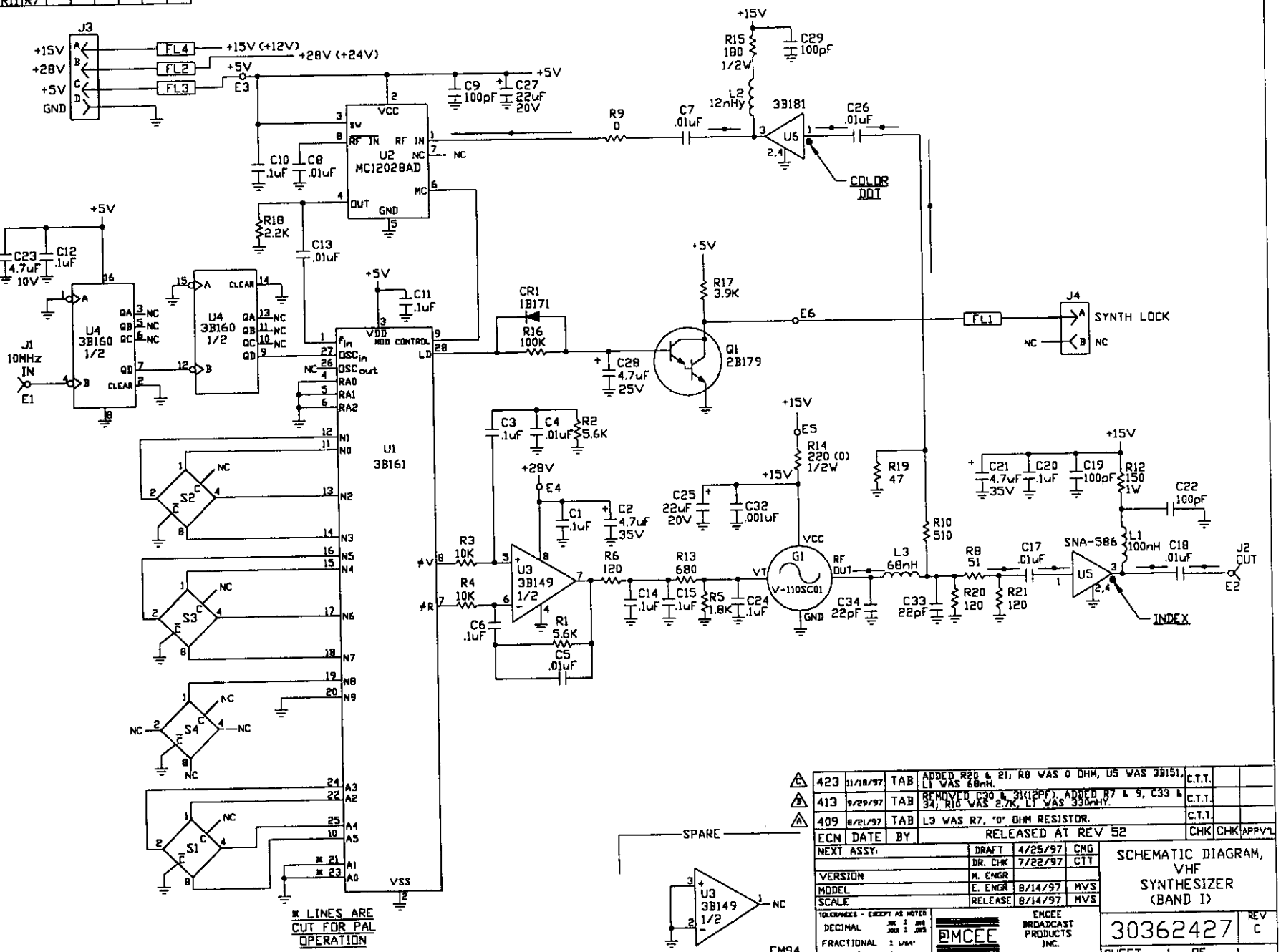
REFERENCE DESIGNATIONS NOT USED								
			CR3			C23	R8	


HIGHEST REFERENCE DESIGNATIONS
C31 U6 R18 G1 S4 J4 E6 L2 CR1 FL4 Q1
REFERENCE DESIGNATIONS NOT USED
J3
+15V
+28V
+5V
GND
FL4
FL2
FL3
E3
U2
3B190
RF IN
RF IN
NC
NC
OUT
GND
VCC
SW
MC
C9 100pF
C27 22uF 20V
C10 .1uF
C8 .01uF
L3 30nHY
C31 12pF
C30 12pF
C7 .01uF
L2 12nHy
R15 180 1/2W
C29 100pF
3B181
U6
C26 .01uF
COLOR DOT
R18 2.2K
C13 .01uF
C23 4.7uF 10V
C12 .1uF
U4 3B160 1/2
U4 3B160 1/2
J1 10MHz IN
E1
C11 .1uF
VDD
MOD CONTROL
LD
CR1 1B171
R16 100K
R17 3.9K
E6
Q1 2B179
C28 4.7uF 25V
FL1
J4
SYNTH LOCK
NC
NC
U1 3B161
C3 .1uF
C4 .01uF
R2 5.6K
E5
R14 0 1/2W
E4
C1 .1uF
C2 4.7uF 35V
C25 22uF 20V
C32 .001uF
R11 27
C21 4.7uF 35V
C20 .1uF
C19 100pF
R12 150 1W
C22 100pF
L1 33nHY
R3 10K
R4 10K
U3 3B149 1/2
R6 120
R13 680
R5 1.8K
C14 .1uF
C15 .1uF
C24 .1uF
C6 .1uF
R1 5.6K
C5 .01uF
G1 V-200S015
VT
RF OUT
GND
R7 18
R8 18
R9 100
R10 270
C17 .01uF
3B151
U5
C18 .01uF
J2 OUT
E2
INDEX
S1
S2
S3
S4
N1
N0
N2
N3
N5
N4
N6
N7
N8
N9
A3
A2
A4
A5
A1
A0
VSS
* 21
* 23
* LINES ARE CUT FOR PAL OPERATION
SPARE
U3 3B149 1/2
NC
EM94
250 1-3-94 VN R10 WAS 91 OHMS; R11 WAS 10 OHMS CTT JL RGN
B 12-10-93 CTT CHANGED VALUES : R9,10 WAS 47, R7,8 WAS 30, R15 WAS 390 U6 WAS 3B193 ADDED L3,C30, AND C31 MVS RGN RGN
A 10-7-93 TAB REMOVED FERRITE BEAD FROM L1-R12 CTT RGN CTT
ECN DATE BY RELEASED AT REV 52 CHK CHK APPV'L
NEXT ASSY.
VERSION
MODEL
SCALE
DRAFT 3-24-93 TAB
DR. CHK 4-1-93 CTT
M. ENGR
E. ENGR 9-1-93 JMJ
RELEASE 9-3-93 RN
TOLERANCES - EXCEPT AS NOTED
DECIMAL
FRACTIONAL
ANGULAR
EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA
SCHEMATIC DIAGRAM, VHF SYNTHESIZER (BAND III)
30362003
REV D
SHEET 1 OF 1

HIGHEST REFERENCE DESIGNATIONS								
C34	U6	R21	G1	S4	J4	E6	L3	CR1	FL4	Q1

REFERENCE DESIGNATIONS NOT USED							
C30	C31	R11	R7				

NOTE:
1-VALUES IN PARENTHESIS ARE FOR RSVA2 OPERATION.



ECN	DATE	BY	
423	11/18/97	TAB	ADDED R20 & 21; R8 WAS 0 OHM, U5 WAS 3B151, L1 WAS 68nH.
413	9/29/97	TAB	REMOVED C30 & 31(12PF), ADDED R7 & 9, C33 & 34, R10 WAS 2.7K, L1 WAS 330nHY.
409	8/21/97	TAB	L3 WAS R7, "0" OHM RESISTOR.
			RELEASED AT REV 52

NEXT ASSY:		DRAFT	4/25/97	CMG
		DR. CHK	7/22/97	CTT
VERSION		M. ENGR		
MODEL		E. ENGR	8/14/97	MVS
SCALE		RELEASE	8/14/97	MVS

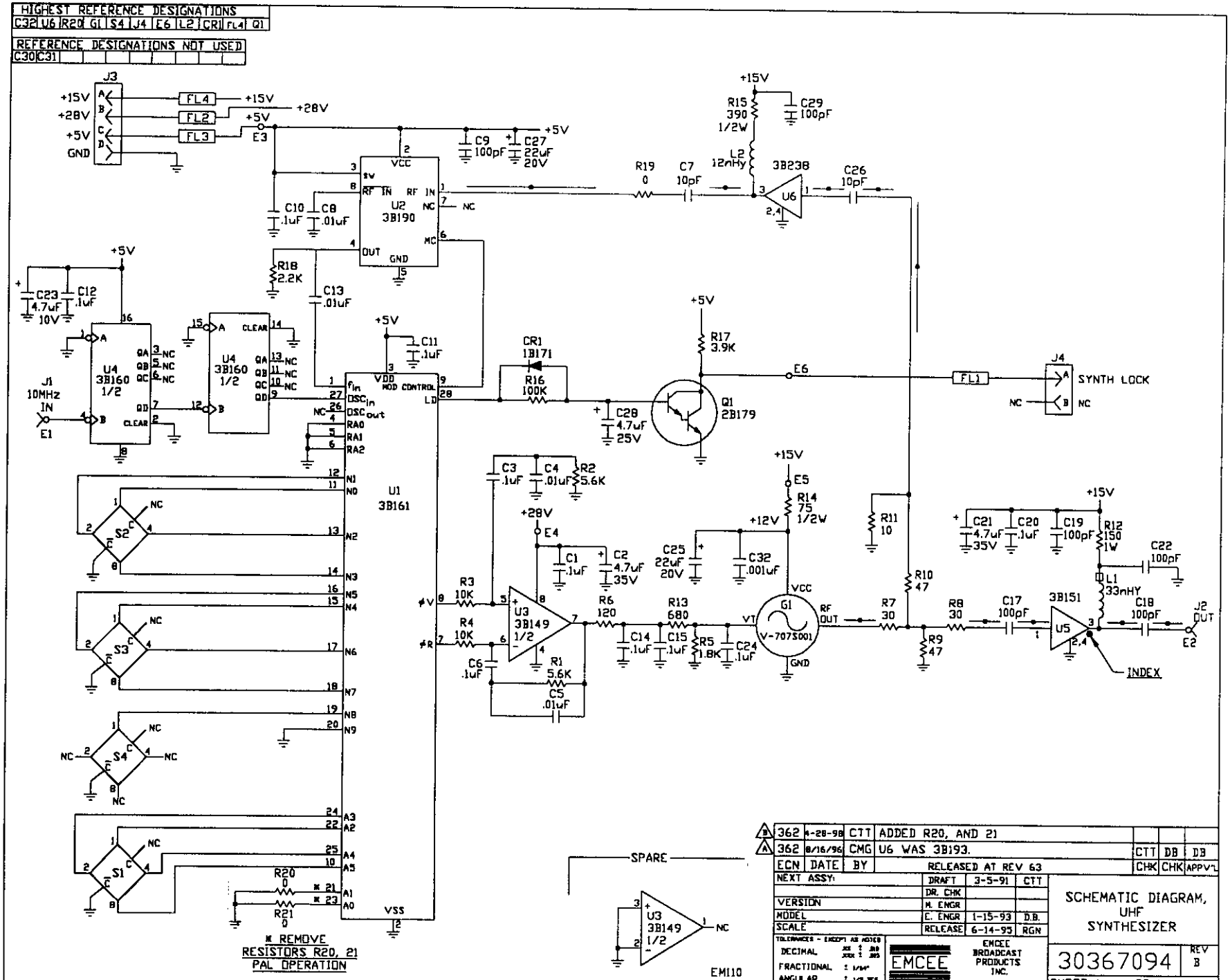
TOLERANCES - EXCEPT AS NOTED
DECIMAL
FRACTIONAL
ANGULAR

EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA 18661

SCHEMATIC DIAGRAM, VHF SYNTHESIZER (BAND I)

30362427 REV C

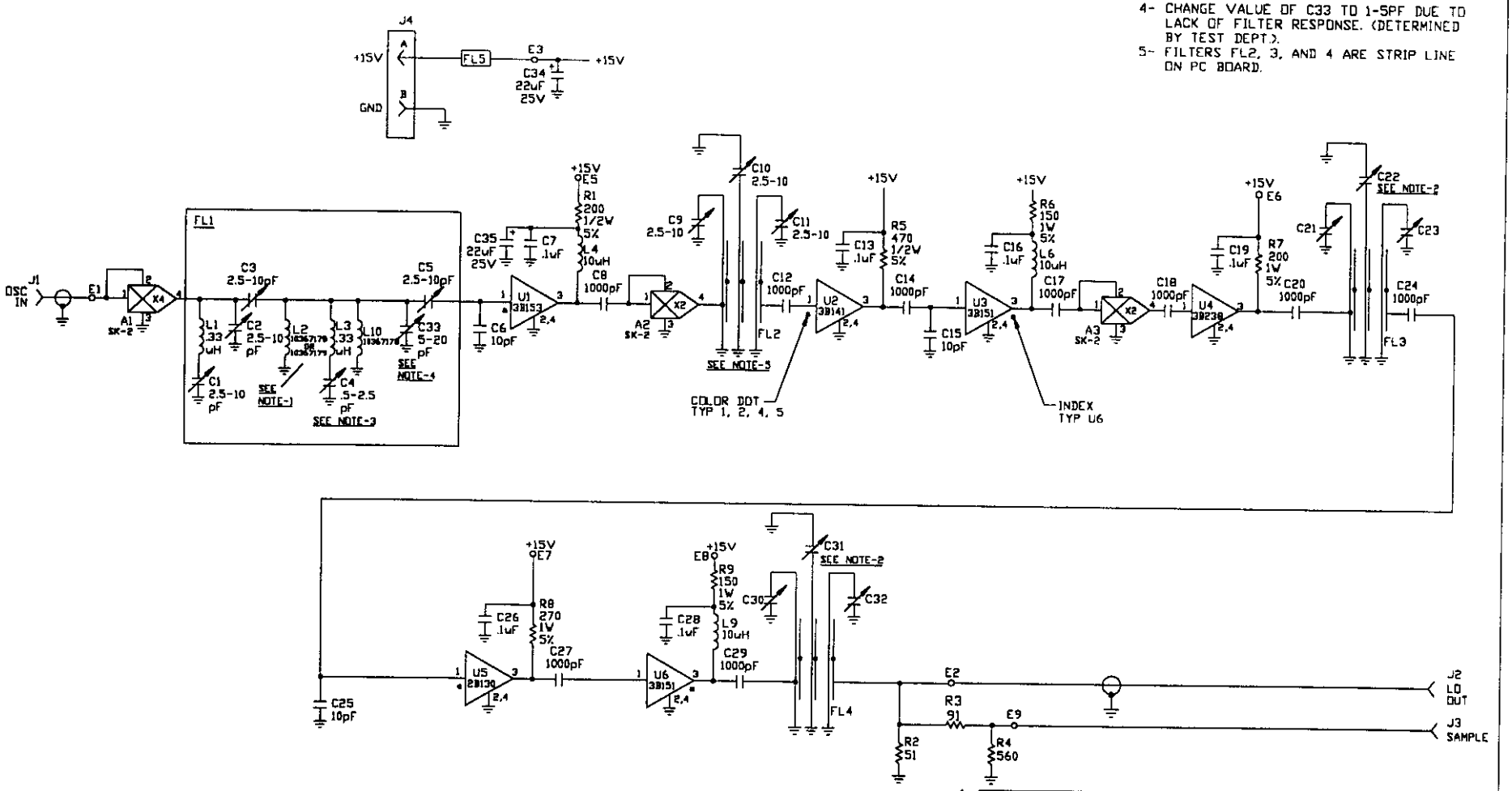
SHEET 1 OF 1


HIGHEST REFERENCE DESIGNATIONS
C32 U6 R20 G1 S4 J4 E6 L2 CR1 FL4 Q1
REFERENCE DESIGNATIONS NOT USED
C30 C31
J3
+15V
+28V
+5V
GND
FL4
FL2
FL3
E3
C9 100pF
C27 22uF 20V
U2 3B190
C10 .1uF
C8 .01uF
R19 0
C7 10pF
R15 390 1/2W
C29 100pF
L2 12nHy
3B238
U6
C26 10pF
R18 2.2K
C13 .01uF
C23 4.7uF 10V
C12 .1uF
U4 3B160 1/2
J1 10MHz IN
E1
C11 .1uF
CR1 1B171
R16 100K
R17 3.9K
Q1 2B179
C28 4.7uF 25V
E6
FL1
J4
SYNTH LOCK
U1 3B161
C3 .1uF
C4 .01uF
R2 5.6K
E4
E5
R14 75 1/2W
+12V
C25 22uF 20V
C32 .001uF
R11 10
C21 4.7uF 35V
C20 .1uF
C19 100pF
R12 150 1W
C22 100pF
L1 33nHY
R3 10K
R4 10K
U3 3B149 1/2
C1 .1uF
C2 4.7uF 35V
R6 120
R13 680
C14 .1uF
C15 .1uF
R5 1.8K
C24 .1uF
C6 .1uF
R1 5.6K
C5 .01uF
G1 V-707S001
R7 30
R10 47
R9 47
R8 30
C17 100pF
3B151
U5
C18 100pF
J2 OUT
INDEX
S1
S2
S3
S4
R20 0
R21 0
* REMOVE RESISTORS R20, 21 PAL OPERATION
SPARE
EMI10
B 362 4-28-98 CTT ADDED R20, AND 21
A 362 8/16/96 CMG U6 WAS 3B193.
ECN DATE BY RELEASED AT REV 63
NEXT ASSY:
DRAFT 3-5-91 CTT
DR. CHK
VERSION
M. ENGR
MODEL
E. ENGR 1-15-93 D.B.
SCALE
RELEASE 6-14-93 RGN
DECIMAL
FRACTIONAL
ANGULAR
EMCEE
EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA. 18661
SCHEMATIC DIAGRAM, UHF SYNTHESIZER
30367094
REV 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 1-5PF FOR CHANNELS 44-83.
3- FOR CHANNELS 69-83 CHANGE C4 (.5-2.5PF) CAPACITOR TO 1-5PF VARIABLE CAPACITOR AND ADD L10.
4- CHANGE VALUE OF C33 TO 1-5PF DUE TO LACK OF FILTER RESPONSE. (DETERMINED BY TEST DEPT.).
5- FILTERS FL2, 3, AND 4 ARE STRIP LINE ON PC BOARD.



ECN	DATE	BY		CHK	CHK	APPV'L
362	8/19/96	CMG	U4 WAS 2B131.			
			RELEASED AT REV 51			

NEXT ASSY:	DRAFT	10-5-93	TAB
	DR. CHK	10-22-93	CTT
VERSION	M. ENGR		
MODEL	E. ENGR	6-14-95	RGN
SCALE	RELEASE	6-14-95	RGN

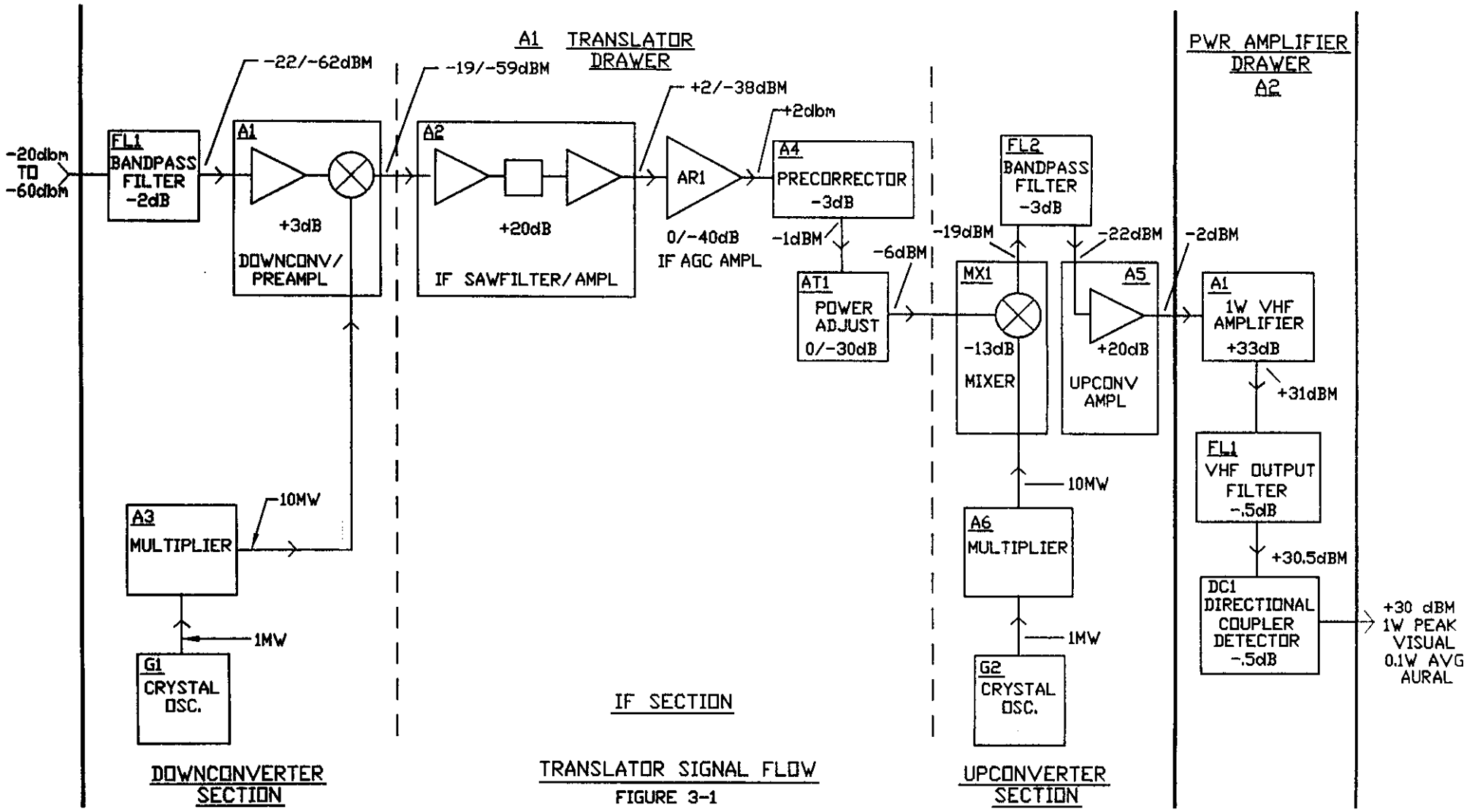
TOLERANCES - EXCEPT AS NOTED
DECIMAL
FRACTIONAL
ANGULAR

EMCEE BROADCAST PRODUCTS INC.
WHITE HAVEN, PA 18661

SCHEMATIC DIAGRAM, X16 MULTIPLIER

30367226 REV A

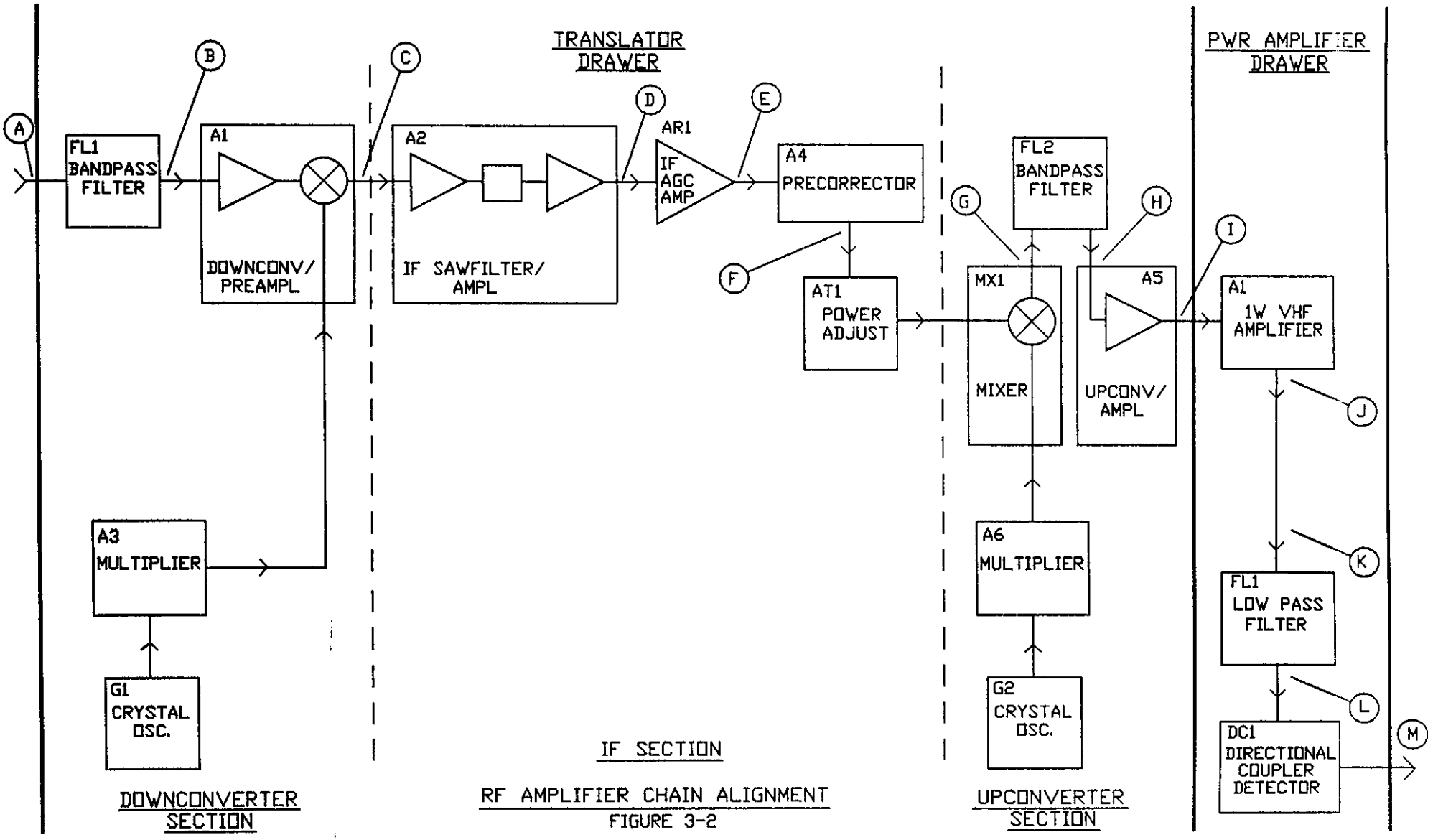
SHEET 1 OF 1



TRANSLATOR SIGNAL FLOW

FIGURE 3-1

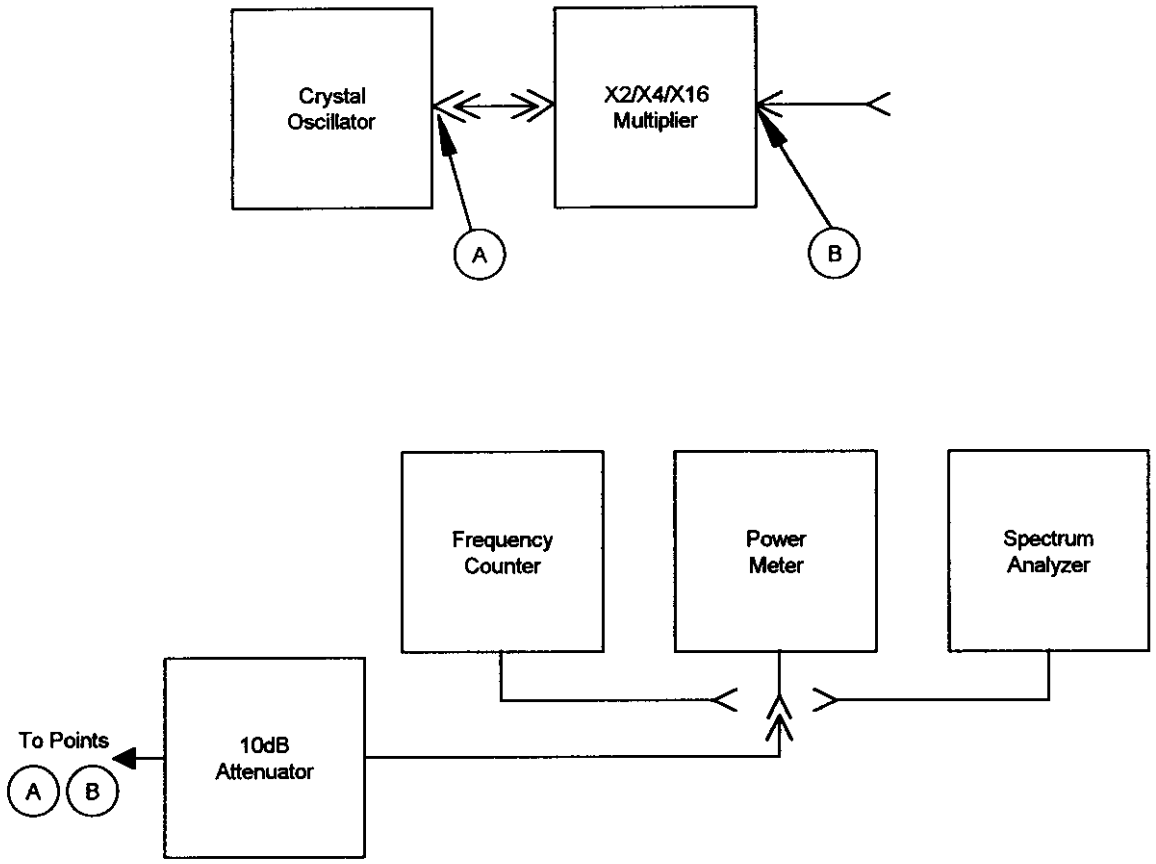
00894



RF AMPLIFIER CHAIN ALIGNMENT

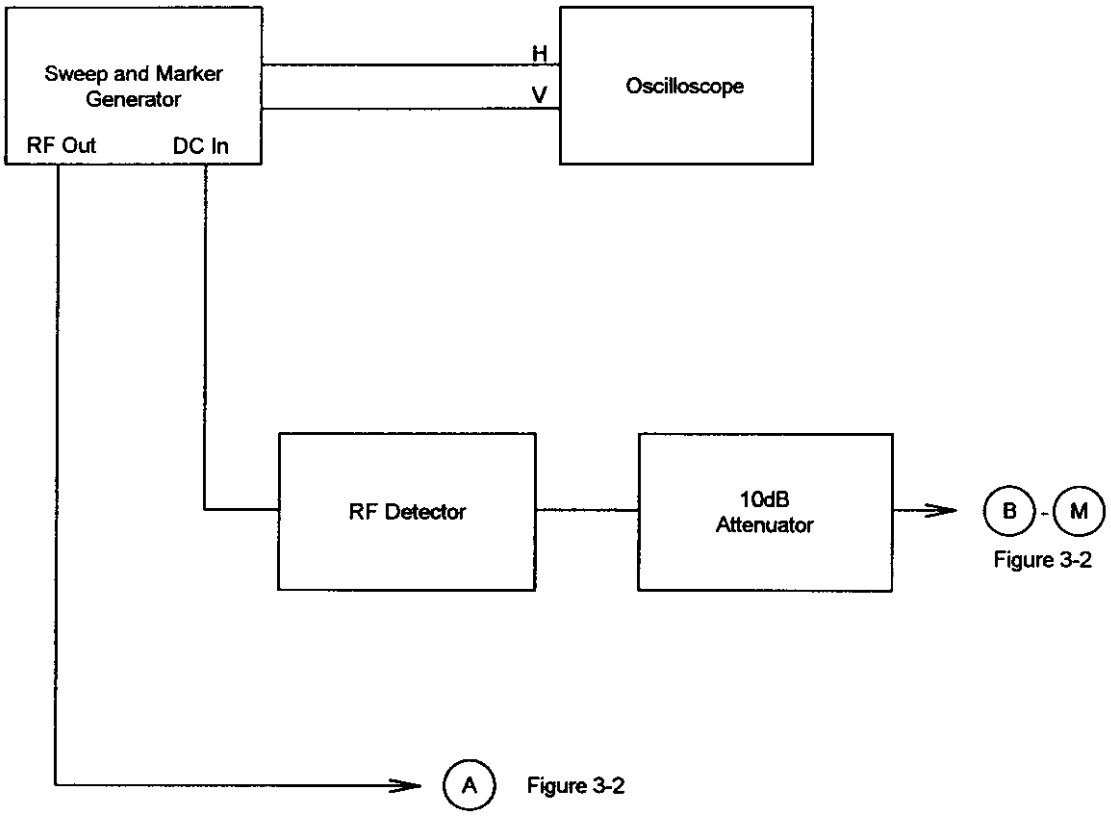
FIGURE 3-2

00293



LOCAL OSCILLATOR CHAIN ALIGNMENT
FIGURE 3-3

0011cam



TEST EQUIPMENT SETUP
FIGURE 3-4

0012cam

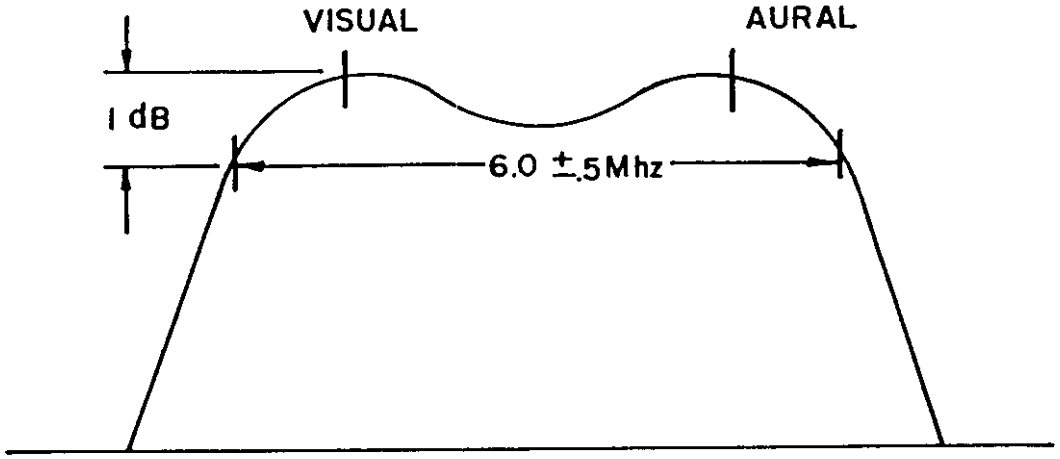


FIGURE 3-5A

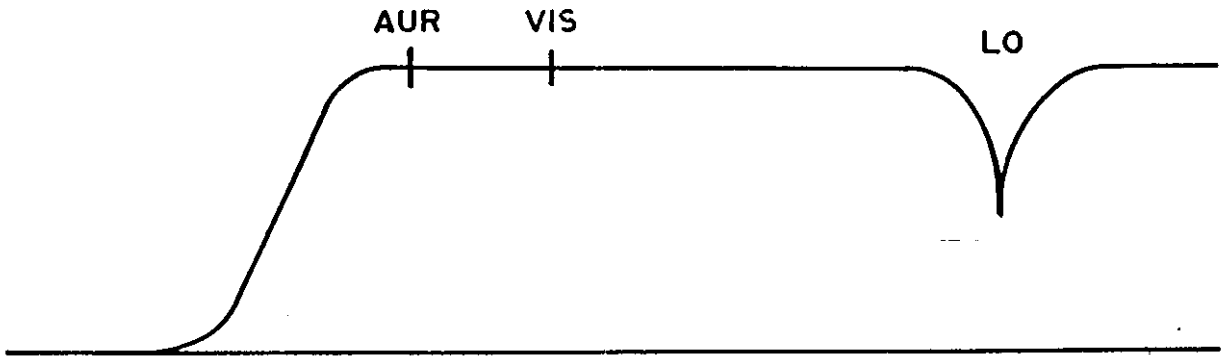


FIGURE 3-5B

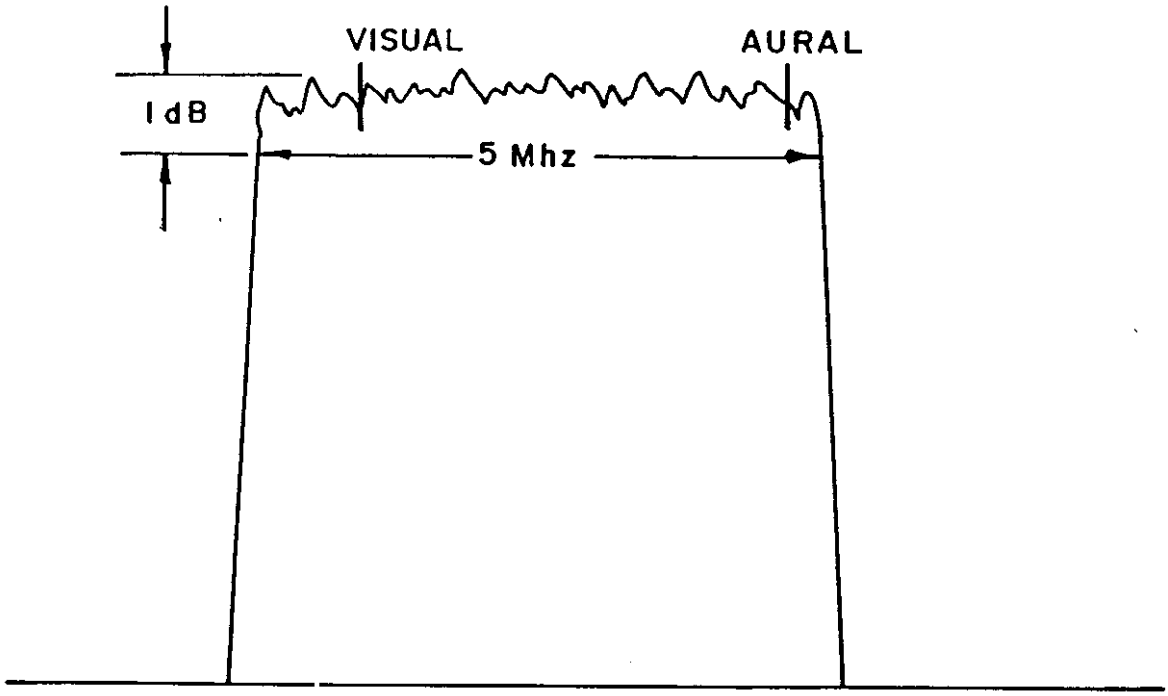


FIGURE 3-5C

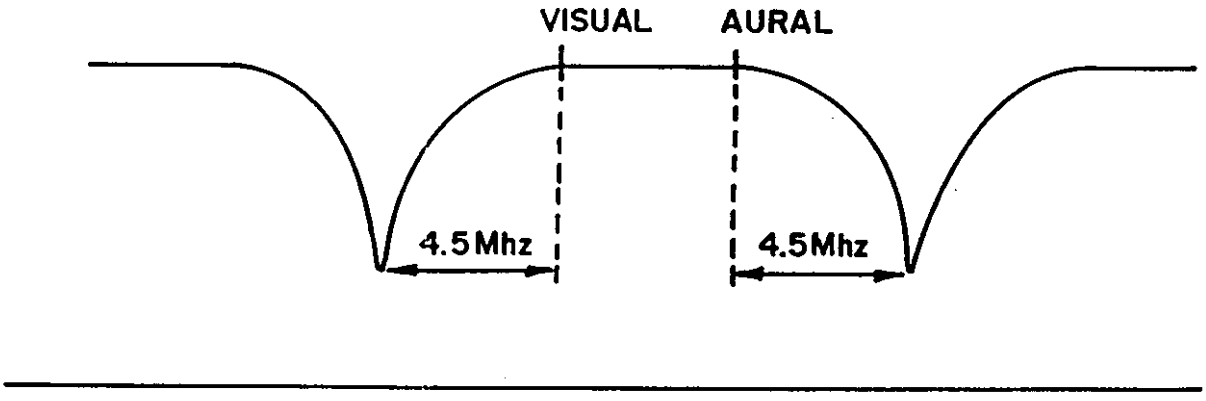
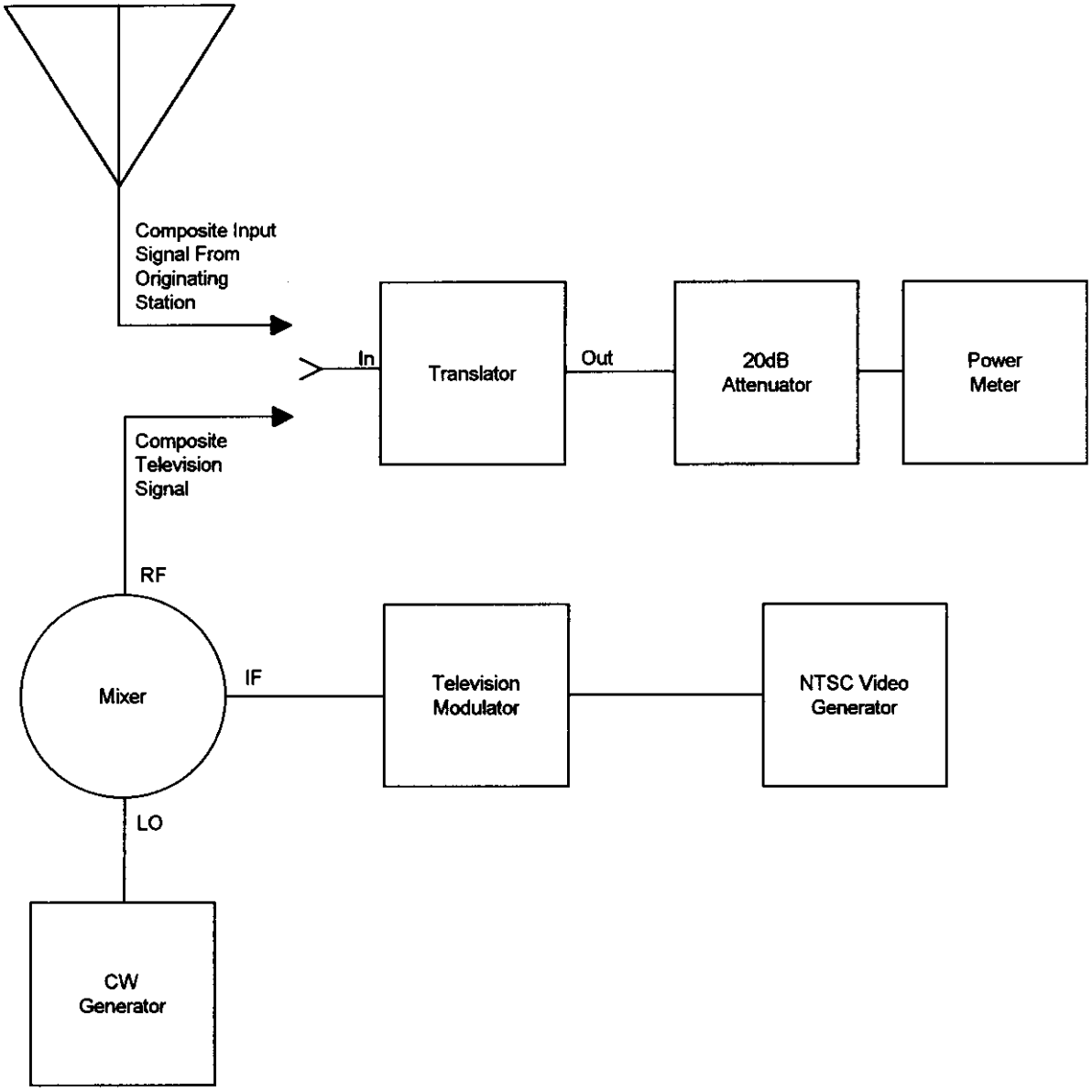


FIGURE 3-5D



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

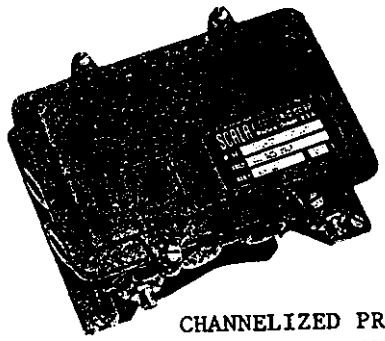
SECTION IV

DATA PAK

SCALA
ELECTRONIC CORPORATION
POST OFFICE BOX 4580
MEDFORD, OREGON 97501
(503) 779-6500
TELEX: 151681

SUPER LOW-NOISE PREAMPLIFIERS

- **VHF-TV**
- **FM**
- **UHF-TV**



CHANNELIZED PREAMPS AVAILABLE
WITH SIMILAR SPECS SEE PRICE LIST

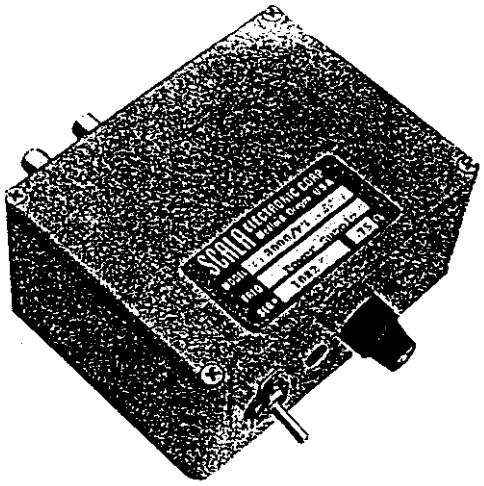
Scala/Triax 8000-series preamplifiers are designed for critical professional applications requiring high gain, very low noise figures, high output level, wide bandwidth with flat response, tight RF shielding and rugged mechanical design for high reliability. These state-of-the-art preamps are manufactured 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.

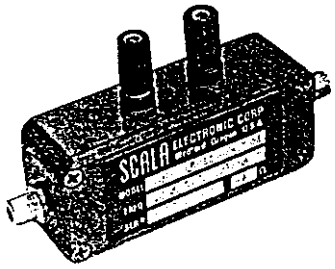


8000/PS DUAL POWER SUPPLY

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.

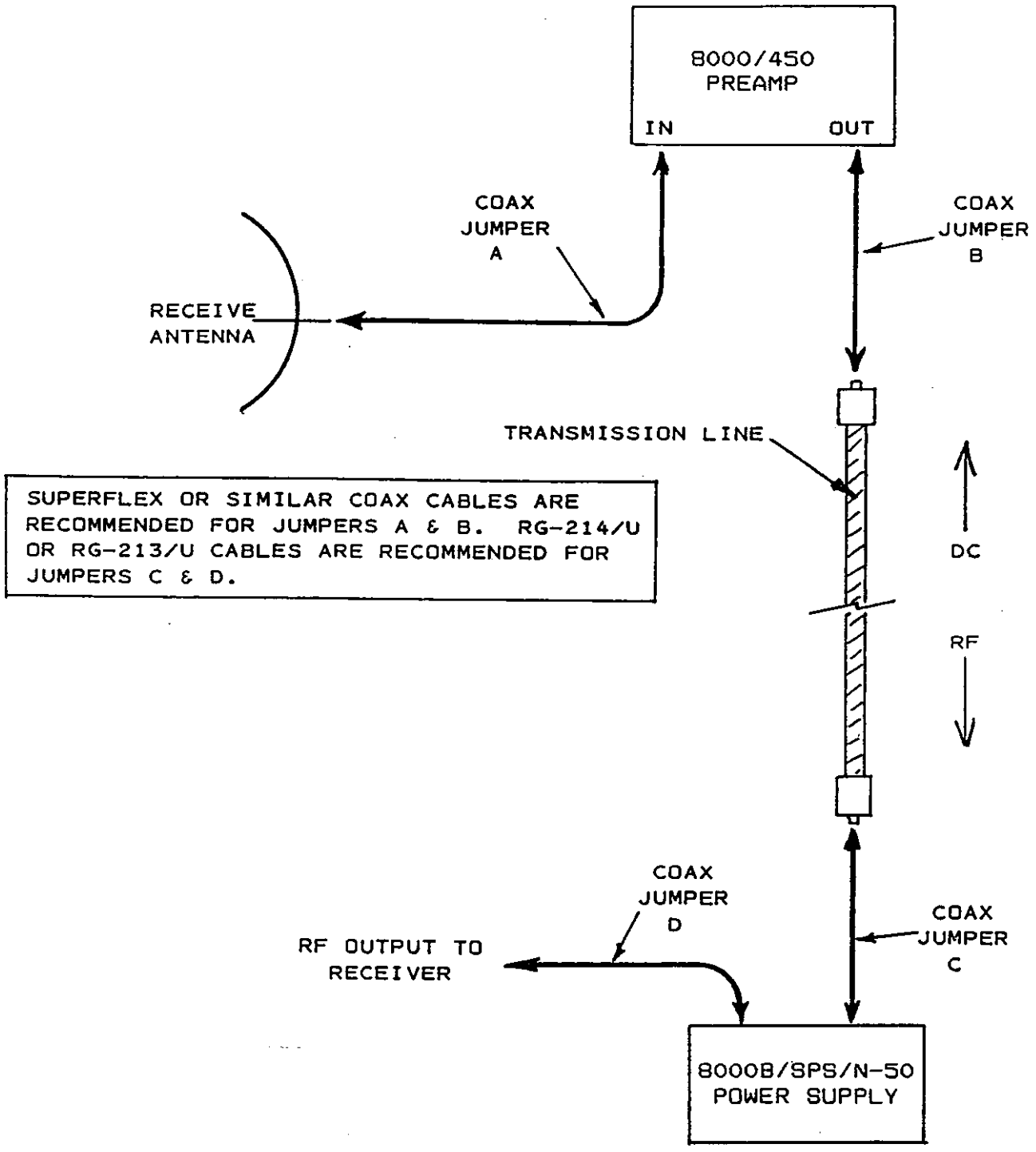


ORDERING INFORMATION

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)

SCALA
ELECTRONIC CORPORATION
POST OFFICE BOX 4580
MEDFORD, OREGON 97501
(503) 779-6500
TELEX: 151681

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.)



SUPERFLEX OR SIMILAR COAX CABLES ARE RECOMMENDED FOR JUMPERS A & B. RG-214/U OR RG-213/U CABLES ARE RECOMMENDED FOR JUMPERS C & D.

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 140 MHz
STABILITY Temperature (Temp. Range A) +15°C to +35°C:	CO-252A17: ±1 x 10⁻⁷ CO-252A58: ±5 x 10⁻⁸	CO-254A57: ±5 x 10⁻⁷ CO-254A17: ±1 x 10⁻⁷
(Temp. Range B) 0°C to +50°C:	CO-252B57: ±5 x 10⁻⁷ CO-252B27: ±2 x 10⁻⁷ CO-252B17: ±1 x 10⁻⁷	CO-254B16: ±1 x 10⁻⁶ CO-254B57: ±5 x 10⁻⁷ CO-254B27: ±2 x 10⁻⁷
(Temp. Range C) 0°C to +70°C:	CO-252C16: ±1 x 10⁻⁶ CO-252C57: ±5 x 10⁻⁷ CO-252C37: ±3 x 10⁻⁷	CO-254C36: ±3 x 10⁻⁶ CO-254C16: ±1 x 10⁻⁶ CO-254C37: ±3 x 10⁻⁷
(Temp. Range D) –20°C to +70°C:	CO-252D16: ±1 x 10⁻⁶ CO-252D57: ±5 x 10⁻⁷	CO-254D56: ±5 x 10⁻⁶ CO-254D16: ±1 x 10⁻⁶ CO-254D57: ±5 x 10⁻⁷
(Temp. Range E) –40°C to +75°C:	CO-252E56: ±5 x 10⁻⁶ CO-252E26: ±2 x 10⁻⁶ CO-252E16: ±1 x 10⁻⁶	CO-254E56: ±5 x 10⁻⁶ CO-254E26: ±2 x 10⁻⁶ CO-254E16: ±1 x 10⁻⁶
(Temp. Range F) –55°C to +85°C:	CO-252F56: ±5 x 10⁻⁶ CO-252F26: ±2 x 10⁻⁶ CO-252F16: ±1 x 10⁻⁶	CO-254F56: ±5 x 10⁻⁶ CO-254F26: ±2 x 10⁻⁶ CO-254F16: ±1 x 10⁻⁶
(Temp. Range G) –55°C to +105°C:	CO-252G56: ±5 x 10⁻⁶	CO-254G56: ±5 x 10⁻⁶
(Temp. Range H) –55°C to +125°C:	CO-252H15: ±1 x 10⁻⁵	CO-254H15: ±1 x 10⁻⁶
Aging Rate	≤5 MHz: 5 x 10⁻⁷/year (3 x 10⁻⁹/day avg) >5 MHz: 1 x 10⁻⁶/year (5 x 10⁻⁹/day avg)	
Short Term (Allan Variance)	1 x 10⁻⁹/second under constant conditions	
Frequency vs Supply	2 x 10⁻⁸ per percent in supply with 10 to 28 Vdc input; 1 x 10⁻⁷ per percent change in supply for 5 to 9 Vdc input	

OUTPUT / SUPPLY

	Output level	*Supply ±5%	Output level	*Supply ±5%
Standard	>1 Vrms/1kΩ (1-20 MHz)	+15 Vdc, 4-15mA	>0.5 Vrms/50Ω	+15 Vdc, 20mA
Option "R"	>1 Vrms/50Ω (+13 dBm), 1-20 MHz	+15 Vdc, <30 mA	>1 Vrms/50Ω (+13 dBm)	+15 Vdc, <35 mA
**Option "J"	TTL	+15 Vdc, <10 mA & +5 Vdc, 10-50 mA	TTL (to 100 MHz)	+15 Vdc, <10 mA & +5 Vdc, <30 mA
**Option "K"	TTL	+5 Vdc, 15-60 mA	TTL (to 70 MHz)	+5 Vdc, <35 mA
**Option "M"			ECL	+15 Vdc, 35 mA & -5.2 Vdc, 30-60 mA
Option "E"			ECL (to 70 MHz)	-5.2 Vdc, <60 mA
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 x 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 x 10⁻⁶ 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" x 2" x ¾" (51 x 51 x 19mm); pins on base for pc board mounting. Most models available with reduced height, to ½". For smaller models, with height as low as 0.2" (5.1 mm), see our TCXOs on preceding pages.
Options	Option "SW": 2" x 2¼" x ¾" (51 x 57 x 19 mm) SMA output connector on side, pins for pc board mounting on base. Option "W": 2" x 2" x ¾" (51 x 51 x 19 mm) SMA output connector, solder header and mounting studs on base. Option "U": 2" x 2" x ¾" (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 MULTIPOINT 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		
				Type of Dielectric		
				Air	Foam	Solid
	MDS-1	2150-2156	2154.75	2.74	2.19	1.81
	MDS-2	2156-2162	2160.75	2.73	2.18	1.80
Low Band	2	54-60	55.25	106.8	85.50	70.50
Low Band	3	60-66	61.25	96.39	77.11	63.61
Low Band	4	66.72	67.25	87.79	70.23	57.94
Low Band	5	76-82	77.25	76.42	61.14	50.44
Low Band	6	82-88	83.25	70.91	56.73	46.80
	FM	88-108	(100.00)	59.04	47.23	38.96
Mid Band	A	120-126	121.25	48.69	38.95	32.13
Mid Band	B	126-132	127.25	46.39	37.11	30.62
Mid Band	C	132-128	133.25	44.30	35.44	29.24
Mid Band	D	138-144	139.25	42.39	33.91	27.98
Mid Band	E	144-150	145.25	40.64	32.51	26.82
Mid Band	F	150-156	151.25	39.03	31.22	25.76
Mid Band	G	156-162	157.25	37.54	30.03	24.77
Mid Band	H	162-168	163.25	36.16	28.93	23.86
Mid Band	I	168-174	169.25	34.88	27.90	23.02
High Band	7	174-180	175.25	33.68	26.95	22.23
High Band	8	180-186	181.25	32.57	26.05	21.49
High Band	9	186-192	187.25	31.53	25.22	20.80
High Band	10	192-198	193.25	30.55	24.44	20.16
High Band	11	198-204	199.25	29.63	23.70	19.55
High Band	12	204-210	205.25	28.76	23.01	18.98
High Band	13	210-216	211.25	27.94	22.35	18.44
Super Band	J	216-222	217.25	27.17	21.74	17.93
Super Band	K	222-228	223.25	26.44	21.15	17.45
Super Band	L	228-234	229.25	25.75	20.60	16.99
Super Band	M	234-240	235.25	25.09	20.07	16.56
Super Band	N	240-246	241.25	24.47	19.57	16.15
Super Band	O	246-252	247.25	23.87	19.10	15.75
Super Band	P	252-258	253.25	23.31	18.65	15.38
Super Band	Q	258-264	259.25	22.77	18.21	15.03
Super Band	R	264-270	265.25	22.25	17.80	14.69
Super Band	S	270-276	271.25	21.76	17.41	14.36
Super Band	T	276-282	277.25	21.29	17.03	14.05
Super Band	U	282-288	283.25	20.84	16.67	13.75
Super Band	V	288-294	289.25	20.41	16.32	13.47
Super Band	W	294-300	295.25	19.99	15.99	13.19
U.H.F.	14	470-476	471.25	12.52	10.02	8.26
U.H.F.	15	476-482	477.25	12.37	9.89	8.16
U.H.F.	16	482-488	483.25	12.21	9.77	8.06
U.H.F.	17	488-494	489.25	12.06	9.65	7.96
U.H.F.	18	494-500	495.25	11.92	9.53	7.86
U.H.F.	19	500-506	501.25	11.77	9.42	7.77
U.H.F.	20	506-512	507.25	11.63	9.31	7.68
U.H.F.	21	512-518	513.25	11.50	9.20	7.59
U.H.F.	22	518-524	519.25	11.37	9.09	7.50
U.H.F.	23	524-530	525.25	11.24	8.99	7.41
U.H.F.	24	530-536	531.25	11.11	8.89	7.33
U.H.F.	25	536-542	537.25	10.98	8.79	7.25
U.H.F.	26	542-548	543.25	10.86	8.69	7.17
U.H.F.	27	548-554	549.25	10.74	8.59	7.09
U.H.F.	28	554-560	555.25	10.63	8.50	7.01
U.H.F.	29	560-566	561.25	10.51	8.41	6.94
U.H.F.	30	566-572	567.25	10.40	8.32	6.86
U.H.F.	31	572-578	573.25	10.29	8.23	6.79
U.H.F.	32	578-584	579.25	10.19	8.15	6.72
U.H.F.	33	584-590	585.25	10.08	8.07	6.65
U.H.F.	34	590-596	591.25	9.98	7.98	6.59
U.H.F.	35	596-602	597.25	9.88	7.90	6.92
U.H.F.	36	602-608	603.25	9.78	7.82	6.45
U.H.F.	37	608-614	609.25	9.69	7.75	6.39
U.H.F.	38	614-620	615.25	9.59	7.67	6.33
U.H.F.	39	620-626	621.25	9.50	7.60	6.27
U.H.F.	40	626-632	627.25	9.41	7.52	6.21
U.H.F.	41	632-638	633.25	9.32	7.45	6.15
U.H.F.	42	638-644	639.25	9.23	7.38	6.09
U.H.F.	43	644-650	645.25	9.14	7.31	6.03
U.H.F.	44	650-656	651.25	9.06	7.25	5.98
U.H.F.	45	656-662	657.25	8.98	7.18	5.92
U.H.F.	46	662-668	663.25	8.90	7.12	5.87
U.H.F.	47	668-674	669.25	8.82	7.05	5.82
U.H.F.	48	674-680	675.25	8.74	6.99	5.77
U.H.F.	49	680-686	681.25	8.66	6.93	5.71
U.H.F.	50	686-692	687.25	8.59	6.87	5.66
U.H.F.	51	692-698	693.25	8.51	6.81	5.62
U.H.F.	52	698-704	699.25	8.44	6.75	5.57
U.H.F.	53	704-710	705.25	8.37	6.69	5.52
U.H.F.	54	710-716	711.25	8.30	6.64	5.47
U.H.F.	55	716-722	717.25	8.23	6.58	5.43
U.H.F.	56	722-728	723.25	8.16	6.53	5.30
U.H.F.	57	728-734	729.25	8.09	6.47	5.34
U.H.F.	58	734-740	735.25	8.02	6.42	5.29
U.H.F.	59	740-746	741.25	7.96	6.36	5.25
U.H.F.	60	746-752	747.25	7.90	6.32	5.21
U.H.F.	61	752-758	753.25	7.83	6.27	5.17
U.H.F.	62	758-764	759.25	7.77	6.22	5.13
U.H.F.	63	764-770	765.25	7.71	6.17	5.09
U.H.F.	64	770-776	771.25	7.65	6.12	5.05
U.H.F.	65	776-782	777.25	7.59	6.07	5.01
U.H.F.	66	782-788	783.25	7.53	6.03	4.97
U.H.F.	67	788-794	789.25	7.48	5.98	4.93
U.H.F.	68	794-800	795.25	7.42	5.93	4.89
U.H.F.	69	800-806	801.25	7.36	5.89	4.86

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					
			Standard		HRC		IRC/ICC	
NCTA	Standard	Your Converter	Video	Sound	Video	Sound	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		55.25	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

Continued

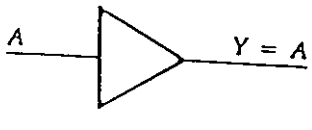
TV Channel Frequencies (MHz)

Channel Labeling Schemes			Headend Type					
			Standard		HRC		IRC/ICC	
NCTA	Standard	Your Converter	Video	Sound	Video	Sound	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	181.75
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

Continued

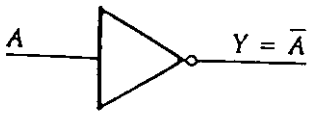
TV Channel Frequencies (MHz)

Channel Labeling Schemes			Headend Type					
			Standard		HRC		IRC/ICC	
NCTA	Standard	Your Converter	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	Y
0	0
1	1

(a) Buffer



A	Y
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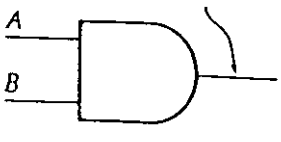
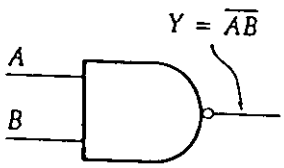
1	0

(b) Inverter



A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(c) AND



A	B	Y
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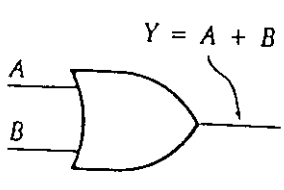
0	1	1
1	0	1
1	1	0

(d) NAND



A	B	Y
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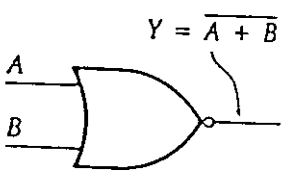
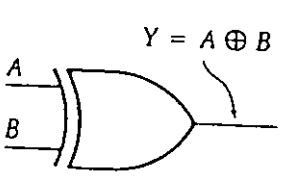
0	1	1
1	0	1
1	1	1

(e) OR



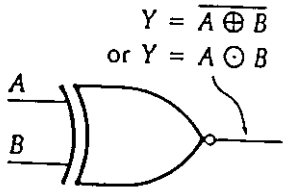
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(f) NOR



A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

(g) XOR



A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

(h) XNOR (or equivalence)

	BUFFER	INVERTER	AND	NAND
TTL	7417	7404	7408	7400
ECL	MC10188	MC10189	MC10104	MC10121
CMOS	MM74HC125	MM74HC04	MM74HC08	MM74HC00

	OR	NOR	XOR	XNOR
TTL	7432	7402	7486	74266
ELL	MC10103	MC10102	MC10113	MC10107
CMOS	MM74HC32	MM74HC02	MM74HC86	MM74HC266

Note: This summary is based on positive logic.

CONIFER®

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
-108.75	13.33 fw	0.82	1.00	-60
-107.75	16.78 fw	0.92	1.12	-59
-106.75	21.13 fw	1.03	1.26	-58
-105.75	26.60 fw	1.15	1.41	-57
-104.75	33.49 fw	1.29	1.58	-56
-103.75	42.16 fw	1.45	1.78	-55
-102.75	53.08 fw	1.63	2.00	-54
-101.75	66.82 fw	1.83	2.24	-53
-100.75	84.12 fw	2.05	2.51	-52
-99.75	105.90 fw	2.30	2.82	-51
-98.75	133.32 fw	2.58	3.16	-50
-97.75	167.84 fw	2.90	3.55	-49
-96.75	211.30 fw	3.25	3.98	-48
-95.75	266.01 fw	3.65	4.47	-47
-94.75	334.89 fw	4.09	5.01	-46
-93.75	421.60 fw	4.59	5.62	-45
-92.75	530.76 fw	5.15	6.31	-44
-91.75	668.19 fw	5.78	7.08	-43
-90.75	841.20 fw	6.49	7.94	-42
-89.75	1.06 pw	7.28	8.91	-41
-88.75	1.33 pw	8.16	10.00	-40
-87.75	1.68 pw	9.16	11.22	-39
-86.75	2.11 pw	10.28	12.59	-38
-85.75	2.66 pw	11.53	14.13	-37
-84.75	3.35 pw	12.94	15.85	-36
-83.75	4.22 pw	14.52	17.78	-35
-82.75	5.31 pw	16.29	19.95	-34
-81.75	6.68 pw	18.28	22.39	-33
-80.75	8.41 pw	20.51	25.12	-32
-79.75	10.59 pw	23.01	28.18	-31
-78.75	13.33 pw	25.82	31.62	-30
-77.75	16.78 pw	28.97	35.48	-29
-76.75	21.13 pw	32.50	39.81	-28
-75.75	26.60 pw	36.47	44.67	-27
-74.75	33.49 pw	40.92	50.12	-26
-73.75	42.16 pw	45.91	56.23	-25
-72.75	53.08 pw	51.52	63.10	-24
-71.75	66.82 pw	57.80	70.79	-23
-70.75	84.12 pw	64.85	79.43	-22
-69.75	105.90 pw	72.77	89.13	-21
-68.75	133.32 pw	81.65	100.00	-20
-67.75	167.84 pw	91.61	112.20	-19
-66.75	211.30 pw	102.79	125.89	-18
-65.75	266.01 pw	115.33	141.25	-17
-64.75	334.89 pw	129.40	158.49	-16
-63.75	421.60 pw	145.19	177.83	-15
-62.75	530.76 pw	162.91	199.53	-14
-61.75	668.19 pw	182.78	223.87	-13
-60.75	841.20 pw	205.09	251.19	-12
-59.75	1.06 nw	230.11	281.84	-11
-58.75	1.33 nw	258.19	316.23	-10
-57.75	1.68 nw	289.69	354.81	-9
-56.75	2.11 nw	325.04	398.11	-8
-55.75	2.66 nw	364.70	446.68	-7
-54.75	3.35 nw	409.20	501.19	-6
-53.75	4.22 nw	459.13	562.34	-5
-52.75	5.31 nw	515.15	630.96	-4
-51.75	6.68 nw	578.01	707.95	-3
-50.75	8.41 nw	648.54	794.33	-2
-49.75	10.59 nw	727.67	891.25	-1
-48.75	13.33 nw	816.46	1000	0

Power dbm	Power Watts	Microvolts 50 Ohms	Microvolts 75 Ohms	Power dbmv
-48.75	13.33 nw	816.46	1000	0
-47.75	16.78 nw	916.08	1122	1
-46.75	21.13 nw	1028	1259	2
-45.75	26.60 nw	1153	1413	3
-44.75	33.49 nw	1294	1585	4
-43.75	42.16 nw	1452	1778	5
-42.75	53.08 nw	1629	1995	6
-41.75	66.82 nw	1828	2239	7
-40.75	84.12 nw	2051	2512	8
-39.75	105.90 nw	2301	2818	9
-38.75	133.32 nw	2582	3162	10
-37.75	167.84 nw	2897	3548	11
-36.75	211.30 nw	3250	3981	12
-35.75	266.01 nw	3647	4467	13
-34.75	334.89 nw	4092	5012	14
-33.75	421.60 nw	4591	5623	15
-32.75	530.76 nw	5152	6310	16
-31.75	668.19 nw	5780	7079	17
-30.75	841.20 nw	6485	7943	18
-29.75	1.06 uw	7277	8913	19
-28.75	1.33 uw	8165	10000	20
-27.75	1.68 uw	9161	11220	21
-26.75	2.11 uw	10279	12589	22
-25.75	2.66 uw	11533	14125	23
-24.75	3.35 uw	12940	15849	24
-23.75	4.22 uw	14519	17783	25
-22.75	5.31 uw	16291	19953	26
-21.75	6.68 uw	18278	22387	27
-20.75	8.41 uw	20509	25119	28
-19.75	10.59 uw	23011	28184	29
-18.75	13.33 uw	25819	31623	30
-17.75	16.78 uw	28969	35481	31
-16.75	21.13 uw	32504	39811	32
-15.75	26.60 uw	36470	44668	33
-14.75	33.49 uw	40920	50119	34
-13.75	42.16 uw	45913	56234	35
-12.75	53.08 uw	51515	63096	36
-11.75	66.82 uw	57801	70795	37
-10.75	84.12 uw	64854	79433	38
-9.75	105.90 uw	72767	89125	39
-8.75	133.32 uw	81646	100000	40
-7.75	167.84 uw	91608	112202	41
-6.75	211.30 uw	102786	125893	42
-5.75	266.01 uw	115328	141254	43
-4.75	334.89 uw	129400	158489	44
-3.75	421.60 uw	145189	177828	45
-2.75	530.76 uw	162905	199526	46
-1.75	668.19 uw	182783	223872	47
-0.75	841.20 uw	205086	251189	48
0.00	1.00 mw	223607	273873	48.75
0.25	1.06 mw	230110	281838	49
1.25	1.33 mw	258187	316228	50
2.25	1.68 mw	289691	354813	51
3.25	2.11 mw	325039	398107	52
4.25	2.66 mw	364699	446684	53
5.25	3.35 mw	409199	501187	54
6.25	4.22 mw	459129	562341	55
7.25	5.31 mw	515152	630957	56
8.25	6.68 mw	578010	707946	57
9.25	8.41 mw	648537	794328	58
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

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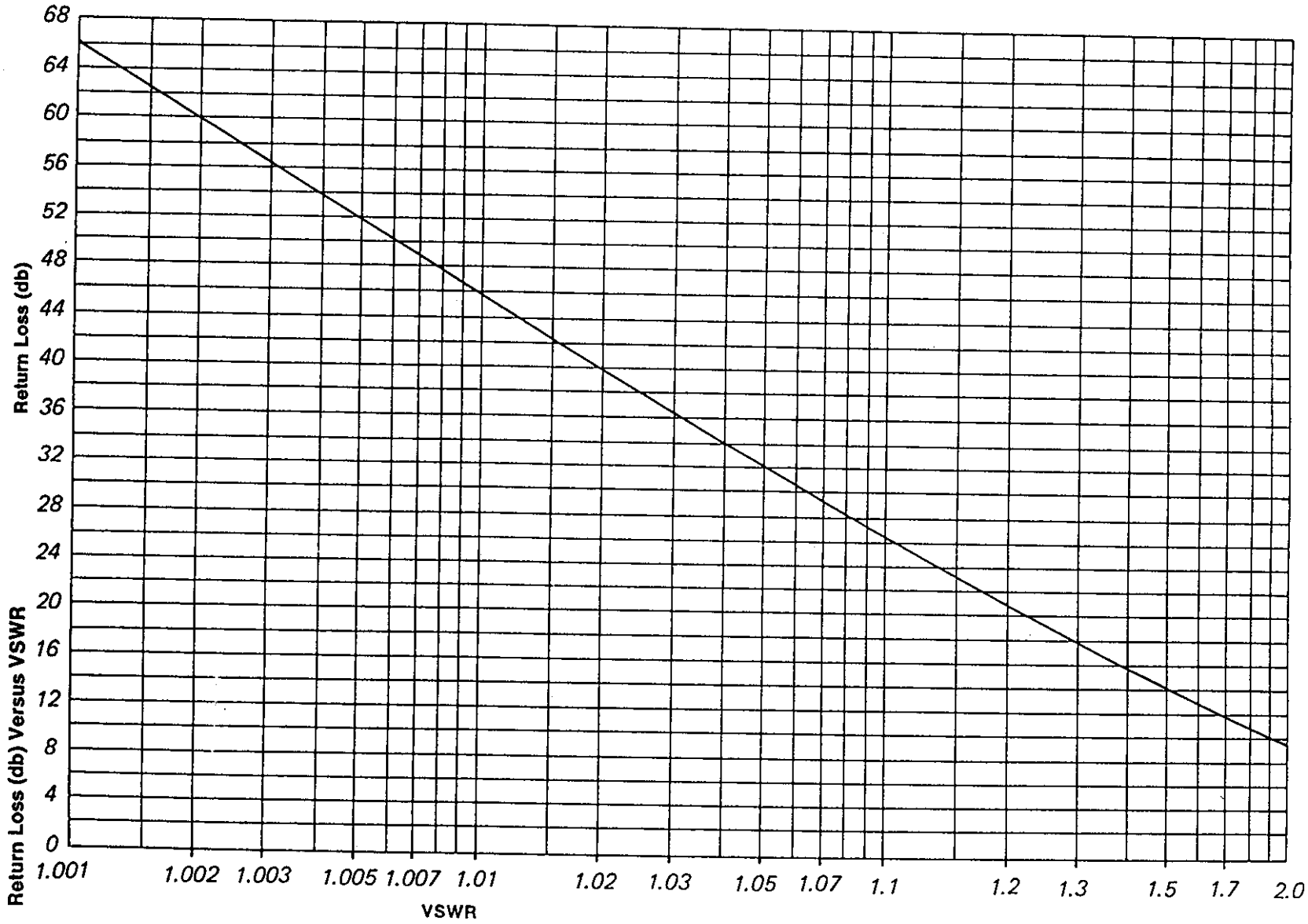
Voltage and Power Ratios to Decibels

The basic chart below indicates the number of decibels (dB) corresponding to the listed ratios of voltage or power over the range of −20 to +20 dB. For voltage or power ratios greater than those included in the chart, the ratio can be broken down into a product of two numbers, the value in dB for each found separately, and the two results added. Example: 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	1.216	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	.246	.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		10^5	50		10^5
.468	.219	6.6	2.138	4.571	.209	.0437	13.6	4.786	22.91	10^3	10^6	60	10^3	10^6
.462	.214	6.7	2.163	4.677	.207	.0427	13.7	4.842	23.44		10^7	70		10^7
.457	.209	6.8	2.188	4.786	.204	.0417	13.8	4.898	23.99	10^4	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 Hectrowatt (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


Return Loss (db) Versus VSWR
Return Loss (db)
68
64
60
56
52
48
44
40
36
32
28
24
20
16
12
8
4
0
1.001
1.002
1.003
1.005
1.007
1.01
1.02
1.03
1.05
1.07
1.1
1.2
1.3
1.5
1.7
2.0
VSWR

Temperature

$32 + \frac{9}{5}\,°C = °F$ $\qquad$ $\frac{5}{9}\,(°F - 32) = °C$

°C	°F	°C	°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

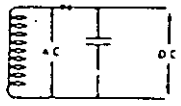
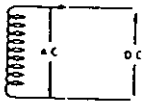
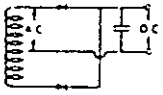
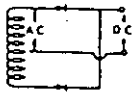
Fractions of an Inch to Decimal and Millimeter

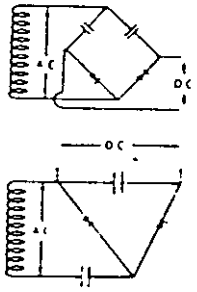
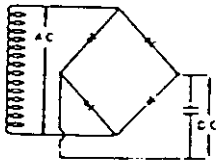
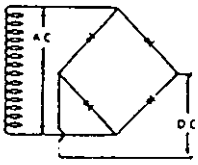
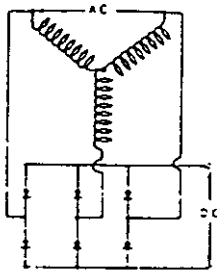
1 Inch = 25.4 mm

Inch	Decimal Inch	Millimeter	Inch	Decimal Inch	Millimeter
1/64	0.0156	0.397	33/64	0.5156	13.097
1/32	0.0313	0.794	17/32	0.5313	13.494
3/64	0.0469	1.191	35/64	0.5469	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.0781	1.984	37/64	0.5781	14.684
3/32	0.0938	2.381	19/32	0.5938	15.081
7/64	0.1094	2.778	39/64	0.6094	15.478
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.1406	3.572	41/64	0.6406	16.272
5/32	0.1563	3.969	21/32	0.6563	16.689
11/64	0.1719	4.366	43/64	0.6719	17.066
3/16	0.1875	4.763	11/16	0.6875	17.463
13/64	0.2031	5.159	45/64	0.7031	17.859
7/32	0.2188	5.556	23/32	0.7188	18.256
15/64	0.2344	5.953	47/64	0.7344	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.2656	6.747	49/64	0.7656	19.447
9/32	0.2813	7.144	25/32	0.7813	19.844
19/64	0.2969	7.541	51/64	0.7969	20.241
5/16	0.3125	7.938	13/16	0.8125	20.638
21/64	0.3281	8.334	53/64	0.8281	21.034
11/32	0.3438	8.731	27/32	0.8438	21.431
23/64	0.3594	9.128	55/64	0.8594	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.3906	9.922	57/64	0.8906	22.622
13/32	0.4063	10.319	29/32	0.9063	23.019
27/64	0.4219	10.716	59/64	0.9219	23.416
7/16	0.4375	11.113	15/16	0.9375	23.813
29/64	0.4531	11.509	61/64	0.9531	24.209
15/32	0.4688	11.906	31/32	0.9688	24.606
31/64	0.4844	12.303	63/64	0.9844	25.003
1/2	0.5000	12.700	1	1.0000	25.400

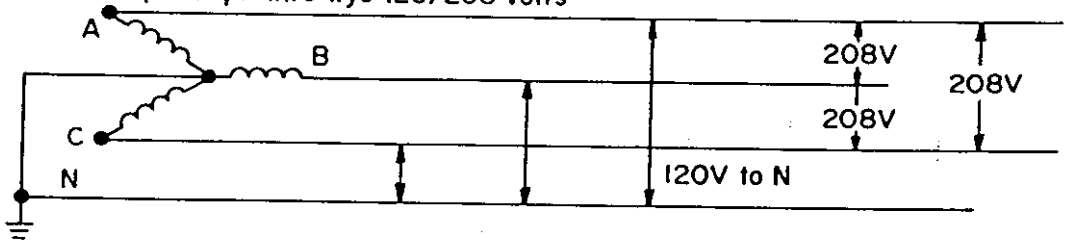
Inch and Millimeter

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

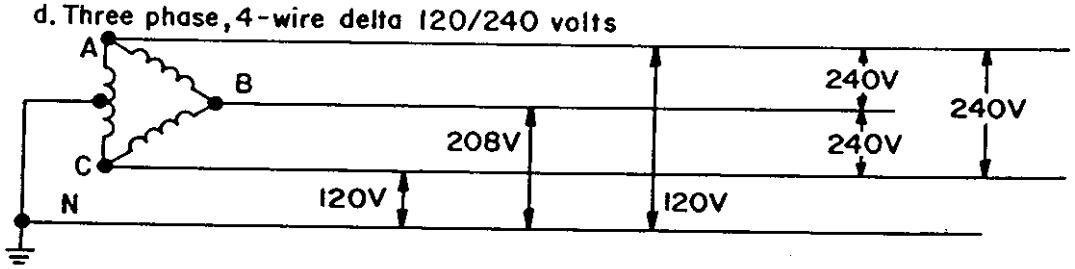
CIRCUIT		SINGLE PHASE HALF WAVE		SINGLE PHASE CENTER TAP	
SCHEMATIC		 CAPACITIVE LOAD	 RESISTIVE INDUCTIVE LOAD	 CAPACITIVE LOAD	 RESISTIVE INDUCTIVE LOAD
A.C. INPUT VOLTAGE	PEAK	1.0 x DC	3.14 x DC	1.0 x DC	1.57 x DC
	RMS	0.7 x DC	2.22 x DC	0.7 x DC	1.11 x DC
ACTUAL P.I.V.		2.0 x DC	3.14 x DC	2.0 x DC	3.14 x 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 x DC	1.0 x DC	1.57 x DC	1.05 x DC
	RMS	0.35 x DC	0.7 x DC	1.11 x DC	.735 x DC
ACTUAL P.I.V.		1.0 x DC	1.0 x DC	1.57 x DC	1.05 x DC

c. Three phase, 4-wire wye 120/208 volts

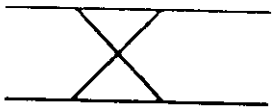


d. Three phase, 4-wire delta 120/240 volts



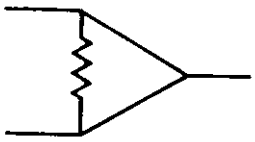
AC DISTRIBUTION - 600 VOLTS OR LESS

DIRECTIONAL COUPLER



90° HYBRID

POWER DIVIDER

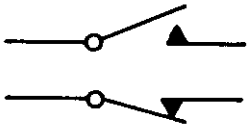


BALANCED STRIPLINE

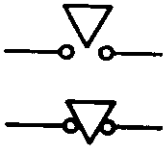
UNBALANCED STRIPLINE

PRESSURE ACTUATED SWITCH

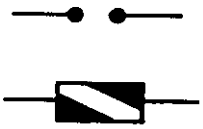
MOMENTARY TOGGLE SWITCH



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.

Power-one

INTERNATIONAL SERIES
DC POWER SUPPLIES

DRAWING NO. 51281 REV. H

SPECIFICATIONS AND APPLICATION DATA

VOLTAGE/CURRENT RATING CHART MODEL	+2V	+5V	+12V	+15V	+18-20V	+24V	+28V	-5V	-12V	-15V	-18-20V	-24V	CASE
SINGLE OUTPUT													
HA5-1.5/OVP-A		1.5											B
HA15-0.9-A			0.9 or 0.9										B
HA24-0.5-A						0.5 or 0.5							B
HB2-3-A	3.0												B
HB5-3/OVP-A		3.0											B
HB12-1.7-A			1.7										B
HB15-1.5-A				1.5									B
HB24-1.2-A						1.2							B
HB28-1-A							1.0						B
HC2-6-A	6.0												C
HC5-6/OVP-A		6.0											C
HC12-3.4-A			3.4										C
HC15-3-A				3.0									C
HC24-2.4-A						2.4							C
HC28-2-A							2.0						C
HD2-12-A	12.0												D
HD5-12/OVP-A		12.0											D
HD12-6.8-A			6.8										D
HD15-6-A				6.0									D
HD24-4.8-A						4.8							D
HD28-4-A							4.0						D
HE2-18-A	18.0												E
HE5-18/OVP-A		18.0											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													
HAA5-1.5/OVP-A		1.5						1.5					AA
HAA15-0.8-A			1.0 or 0.8					*0.4 or 1.0 or 0.8					AA
HAA24-0.6-A					0.4 or 0.6						0.4 or 0.6		AA
HAA512-A		2.0	0.5 or 0.5										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						3.0					BB
HBB15-1.5-A			1.7 or 1.5					*0.7 or 1.7 or 1.5					BB
HBB24-1.2-A					0.9 or 1.2						0.9 or 1.2		BB
HBB512-A		3.0	▽1.25 or 1.25										BB
HCC5-6/OVP-A		6.0						6.0					CC
HCC15-3-A			3.4 or 3.0						3.4 or 3.0				CC
HCC24-2.4-A					1.8 or 2.4						1.8 or 2.4		CC
HCC512-A		6.0	▽2.5 or 2.5										CC
HDD15-5-A †			5.0 or 5.0						5.0 or 5.0				E
TRIPLE OUTPUTS													
HTAA-10W-A		2.0	0.4 or 0.4					*0.4 or 0.4 or 0.4					AA
HBAA-40W-A		3.0	1.0 or 0.8					*0.4 or 1.0 or 0.8					BAA
HCAA-60W-A		6.0	1.0 or 1.0					*0.4 or 1.0 or 1.0					D
HCBB-75W-A		6.0	1.7 or 1.5					*0.7 or 1.7 or 1.5					CBB
HDBB-105W-A		12.0	1.7 or 1.5					*0.7 or 1.7 or 1.5					DBB
CP131-A		8.0	1.7 or 1.5					*0.7 or 1.7 or 1.5					131

HIGH VOLTAGE MODEL	+48	+120	+180	+200	+250	CASE
HB48-0.5-A	0.5					B
HC48-1-A	1					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
- -±.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: ±.05% for a 10% line change.

LOAD REGULATION: ±.05% for a 50% load change.

OUTPUT RIPPLE: 2V to 15V units: 5.0mV PK-PK maximum
20V to 200V units: .02% PK-PK maximum.

TRANSIENT RESPONSE: ≤50useconds 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: ±.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 CAT.G-1

SHOCK: Per MIL-STD-810C, Method 516, Procedure V

**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.
   740 Calle Plano
   Camarillo, CA 93010
   USA

   PHONE: (805) 987-8741
   (805) 987-3891
   (800) 235-5943
   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

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.

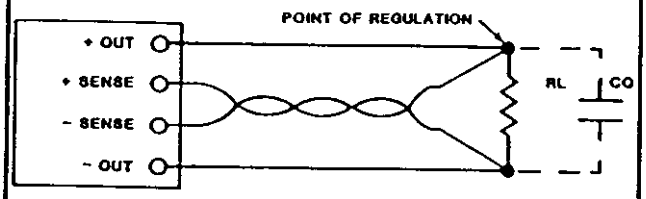


FIGURE 1

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 10uFd) 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 Co will reduce output impedance and provide stability. The recommended value of Co is 100uFd per ampere or 50uFd 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 susceptability.

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, ECMA-57, 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.

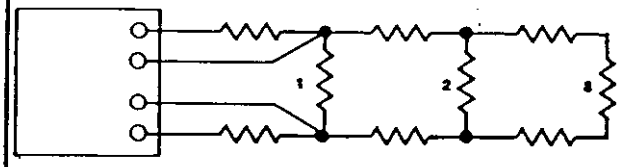


FIGURE 2

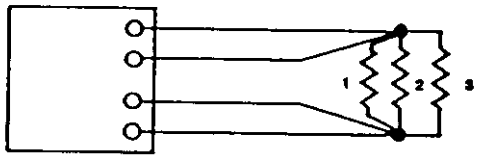


FIGURE 3

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.

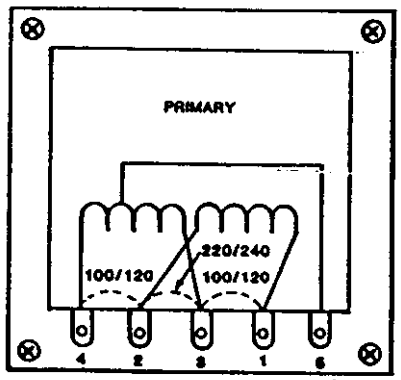
AC INPUT CONSIDERATIONS

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

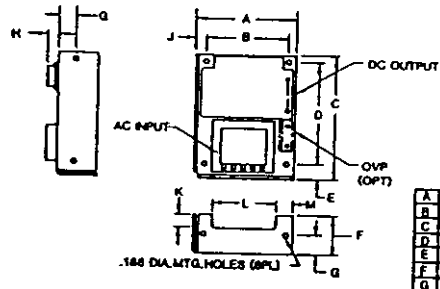


AC INPUT, 47-63 HZ				
FOR USE AT	100 VAC	120 VAC	220 VAC	230/240 VAC
JUMPER	1&3 2&4	1&3 2&4	2&3	2&3
APPLY AC	1&5	4&1	1&5	4&1

*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

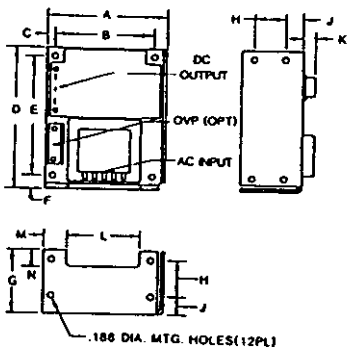
B CASE
WT. 2LBS.



	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.62	41.15
G	0.75	19.06
H	0.450	11.43
J	0.58	8.65
K	0.57	14.48
L	2.60	66.04
M	0.794	20.17

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

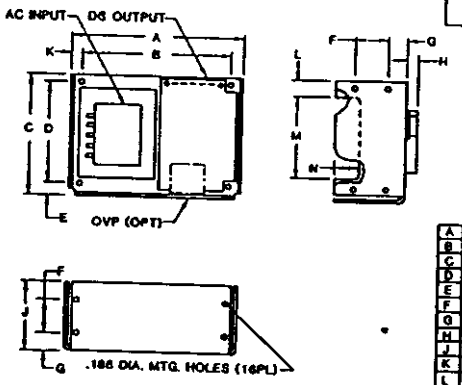
C CASE
WT. 4LBS.



	INCH.	mm.
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	5.62	142.75
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

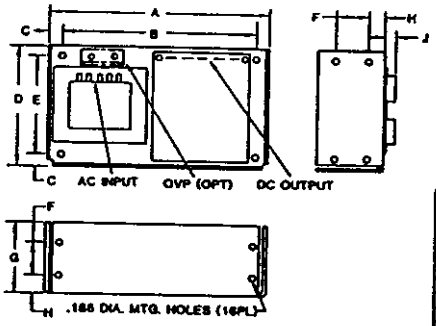
N CASE
WT. 6LBS.



	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	8.34
J	2.75	69.85
K	0.36	9.65
L	0.640	16.26
M	3.35	85.09
N	1.00	25.40

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

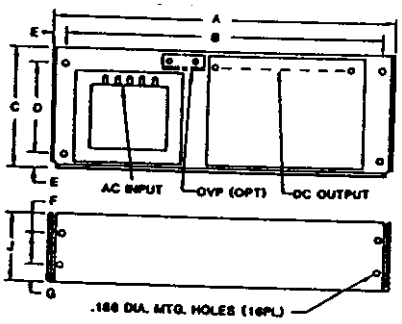
D CASE
WT. 7.5LBS.



	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	0.76	19.05
J	0.525	13.34

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

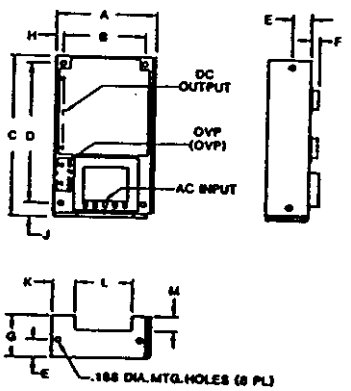
E CASE
WT. 10LBS.



	INCH	mm.
A	14.00	355.60
B	13.000	330.20
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.

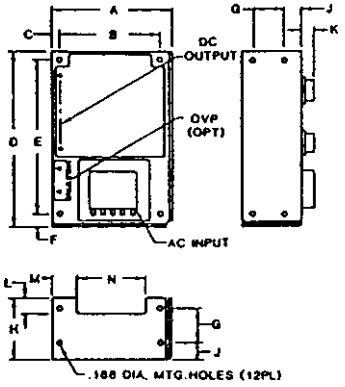


	INCH	mm.
A	4.00	101.60
B	3.375	85.73
C	6.50	165.10
D	5.750	146.05
E	0.75	19.05
F	0.450	11.43
G	1.62	41.15
H	0.25	6.35
J	0.50	12.70
K	0.956	24.28
L	2.37	60.20
M	0.57	14.48

FUSE AT: 0.5/0.25 AMPS FOR 100-120/220-240 VAC
HAA1: 0.75/0.375 AMPS FOR 100-120/220-240VAC

OUTLINE AND MOUNTING DRAWINGS

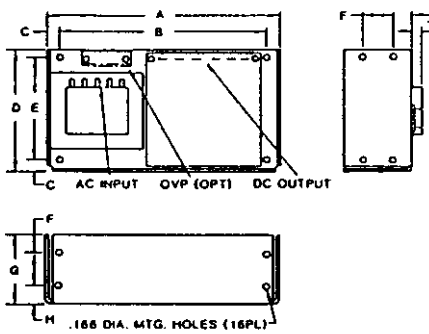
B8 CASE
WT. 4LBS.



	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

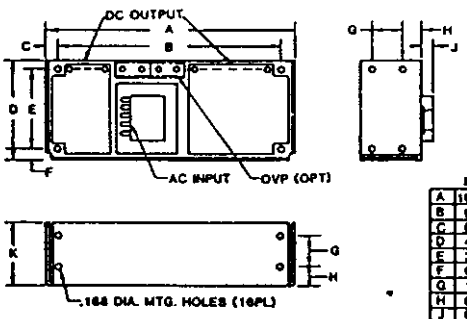
CC CASE
WT. 7LBS.



	INCH.	mm.
A	9.36	236.25
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 VAC

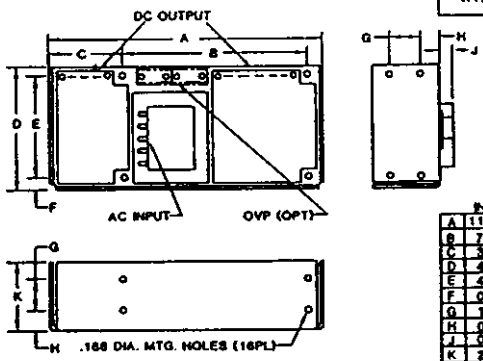
BAA CASE
WT. 5LBS.



	INCH.	mm.
A	10.25	260.35
B	9.250	234.95
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

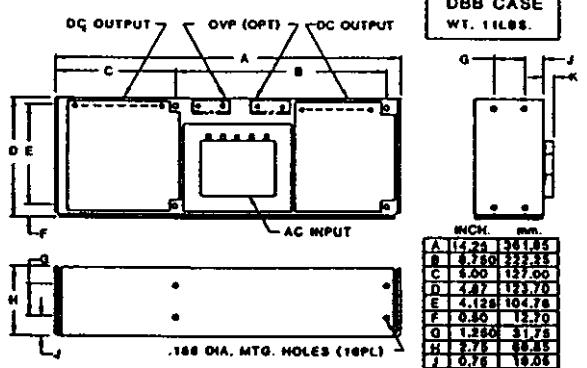
CBB CASE
WT. 8LBS.



	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

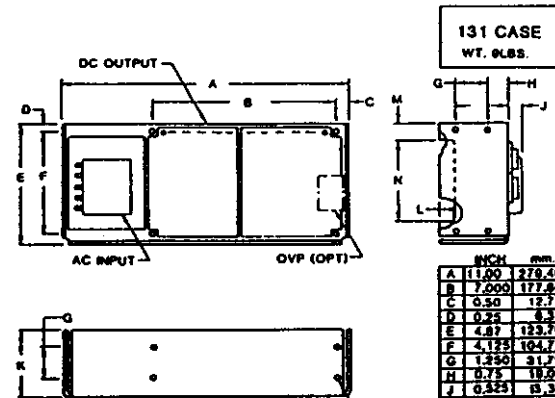
D88 CASE
WT. 11LBS.



	INCH.	mm.
A	14.25	361.85
B	8.750	222.25
C	5.00	127.00
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	0.625	15.88

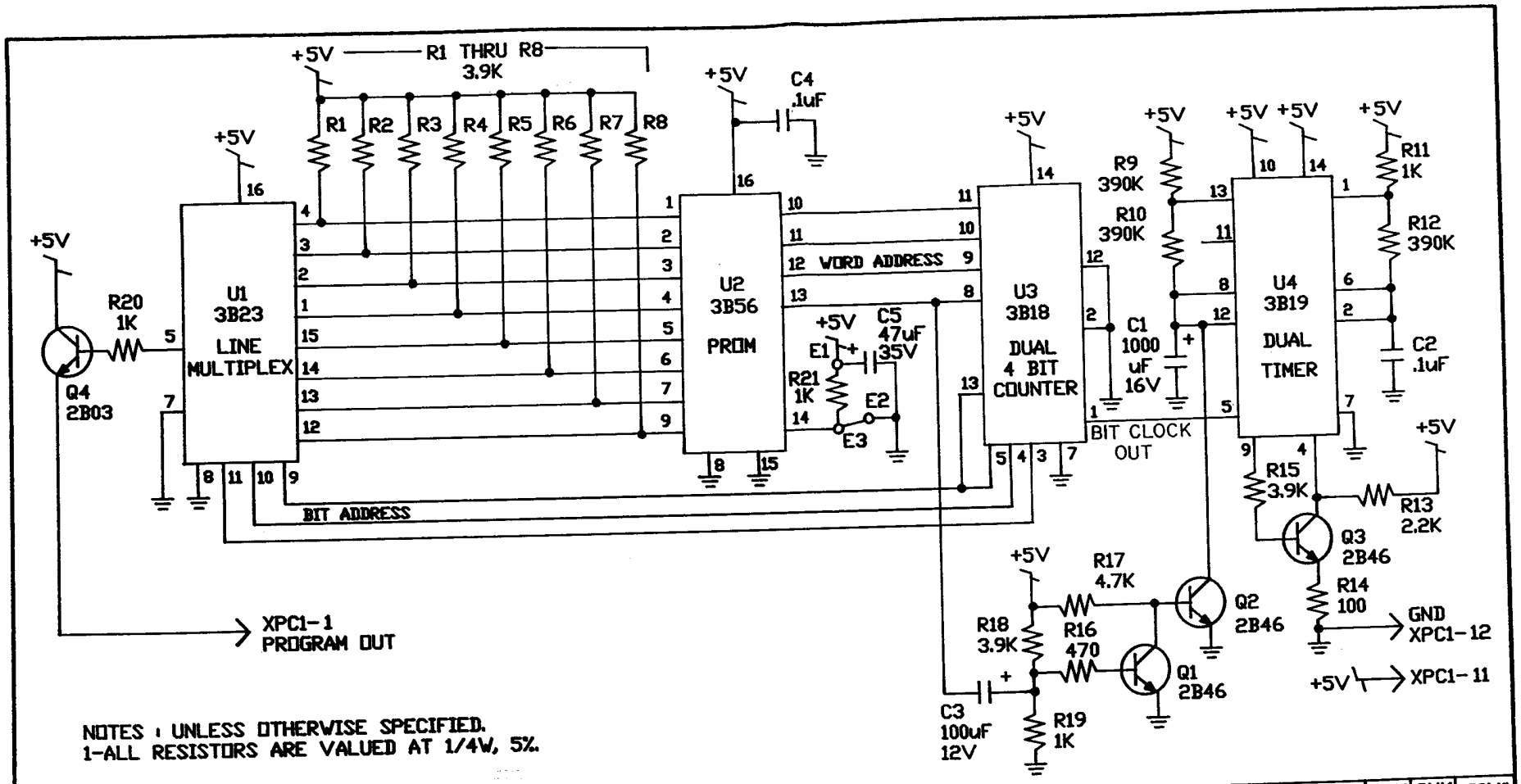
FUSE AT: 3.0/1.5 AMPS FOR 100-120/220-240 VAC

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	0.540	13.58
N	3.25	82.09

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



NOTES : UNLESS OTHERWISE SPECIFIED.
1-ALL RESISTORS ARE VALUED AT 1/4W, 5%.

ECN	DATE	BY		CHK	CHK	APPV'L
NEXT ASSY:			DRAFT	4-7-87	C.T.T	
			DR. CHK	5-22-87		
VERSION			M. ENGR	7-23-87		
MODEL			E. ENGR			
SCALE			RELEASE	8-21-87		

TOLERANCES - EXCEPT AS NOTED
DECIMAL .XX ± .010 .XXX ± .005
FRACTIONAL ± 1/64
ANGULAR ± 1/2 DEG

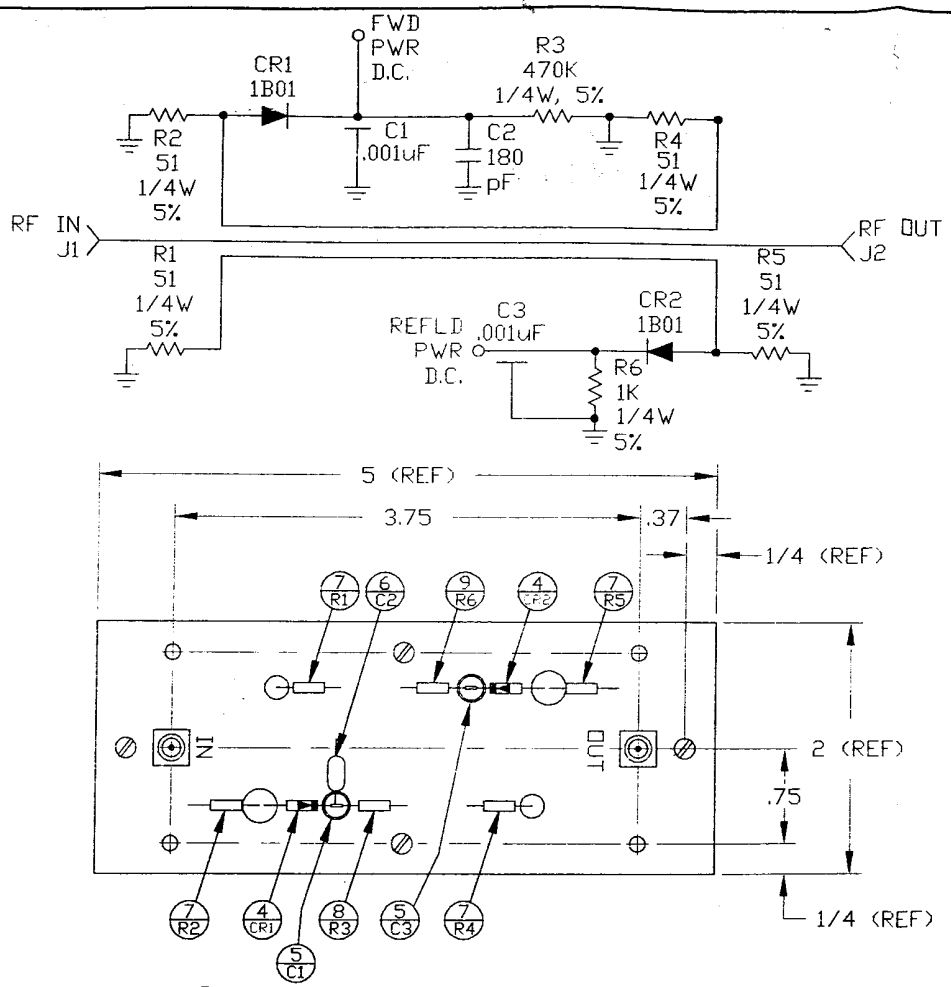
EMCEE
ELECTRONICS MISSILES & COMMUNICATIONS INC.
WHITE HAVEN, PA. 18661

SCHEMATIC DIAGRAM, DIGITAL CODE IDENTIFICATION UNIT

20258029 REV A

SHEET 1 OF 1

HIGHEST REFERENCE DESIGNATIONS										
U4	Q4	C5	R21							XPC1
REFERENCE DESIGNATIONS NOT USED										



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 CONNECTORS.
2-CONNECTORS J1 & J2 ARE TO BE SOLDERED ALL AROUND BASE OF CONNECTORS, AND IN RELATION SHIP SQUARE TO PC BOARD, AS SHOWN.

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

ECN	DATE	BY		C.T.T. CHK	C.T.T. CHK	C.T.T. APPV'L
B	7-1-91	T.M.	IN SD, FWD WAS PEAK			

NEXT ASSY:	DRAFT	5-12-87	W.J.H.
	DR. CHK	5-18-87	C.T.T.
VERSION	M. ENGR	7-23-87	J.C.
MODEL	E. ENGR	8-21-87	R.G.N.
SCALE	RELEASE	8-21-87	R.G.N.

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

EMCEE
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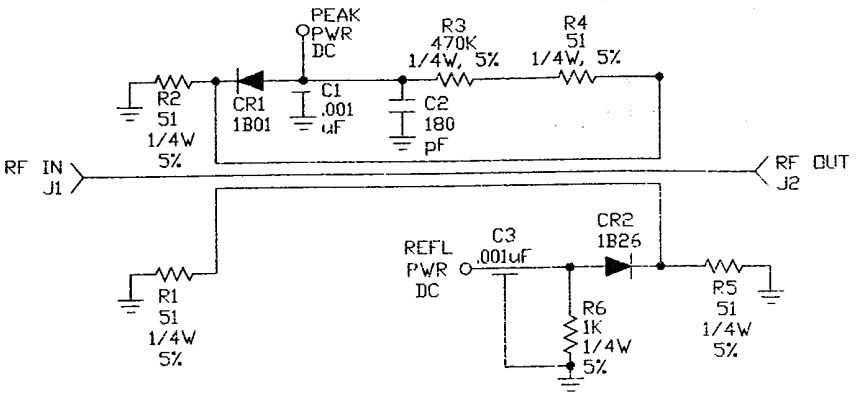
WHITE HAVEN, PA 18661

FA & SCHEM DIAGRAM, DIRECTIONAL COUPLER, 16 db UHF & 26 db VHF (HIGH BAND)

P/L B199-140 REV B

SHEET 1 OF 1

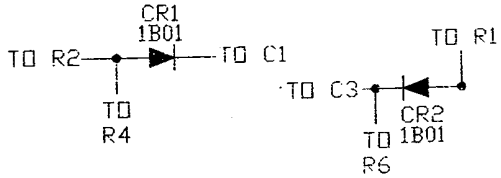


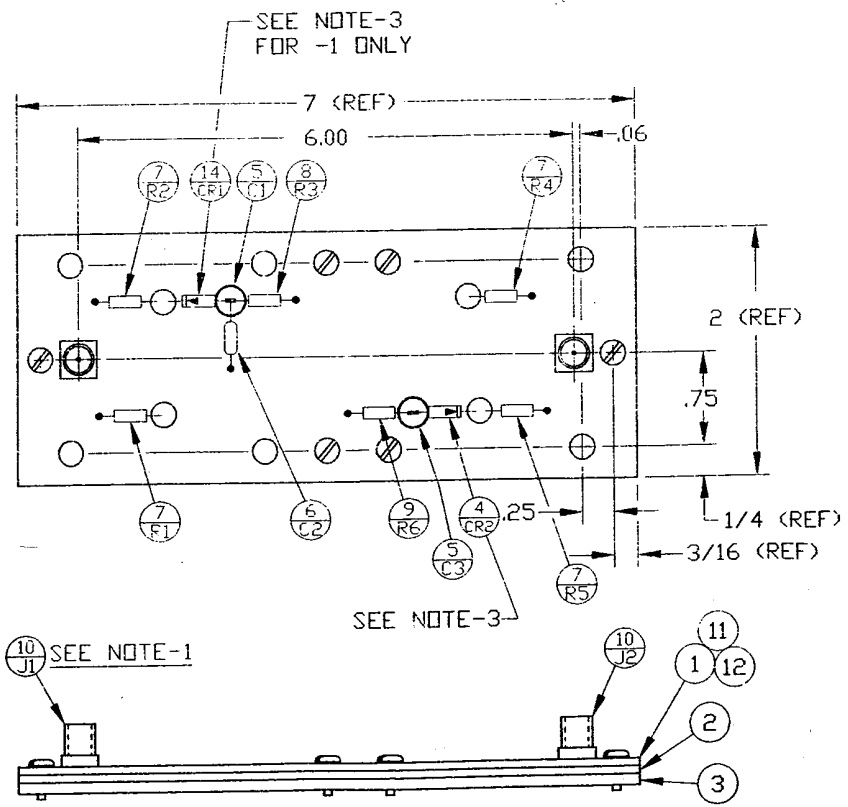
NOTES : UNLESS OTHERWISE SPECIFIED

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





CAD DWG 1-12-96

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

ECN	DATE	BY		CHK	CHK	APPV
7043	2-9-89	SMP	ITEM 4 WAS CALLED OUT AS MSCH-101 AND ON DWG CR2 WAS 1B68	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.

NEXT ASSY: P/L D280-136, 140, 143, 145, 162	DRAFT	10-23-81	J.A.L.
	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, .XXX ± .010
FRACTIONAL ± 1/64"
ANGULAR ± 1/2 DEG

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ASSEMBLY, & SCHEMATIC DIAGRAM, COUPLER, LOW BAND 30DB, VHF

PL B199-89 REV C

SHEET 1 OF 1