

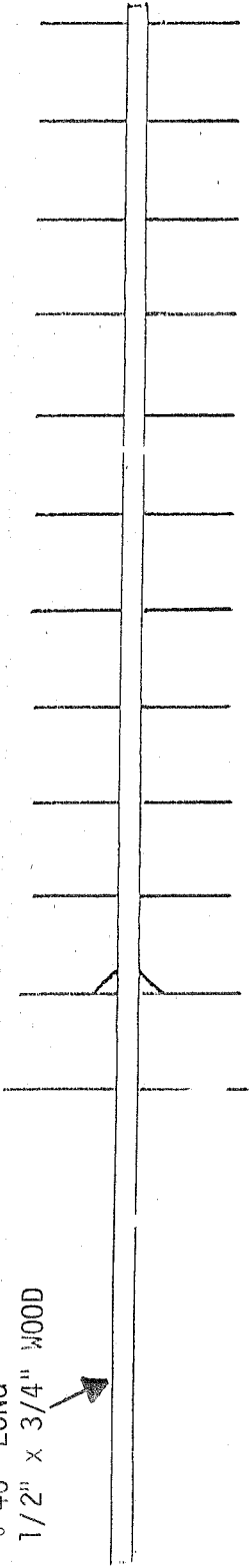
902 MHz NOTES

Donald L. Hilliard - WØPW

29 April 1983

12 ELEMENT 2.2 λ YAGI FOR 902 MHZ.

BOOM
 ~ 40" LONG
 1/2" x 3/4" WOOD



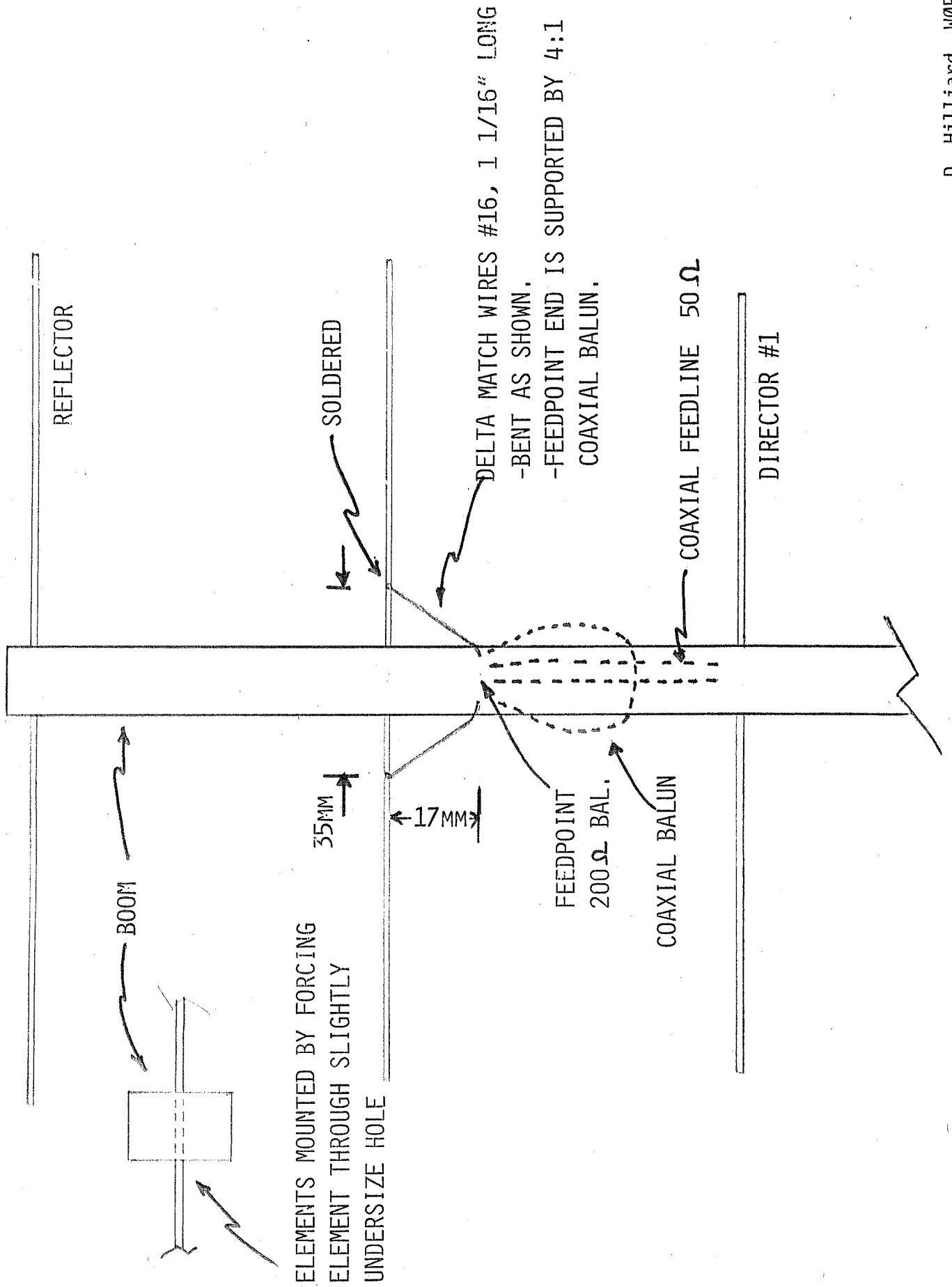
NBS 688 DESIGN GAIN CLAIMED 12.2dbd

STACKING SPACING ~ 20" - 24"

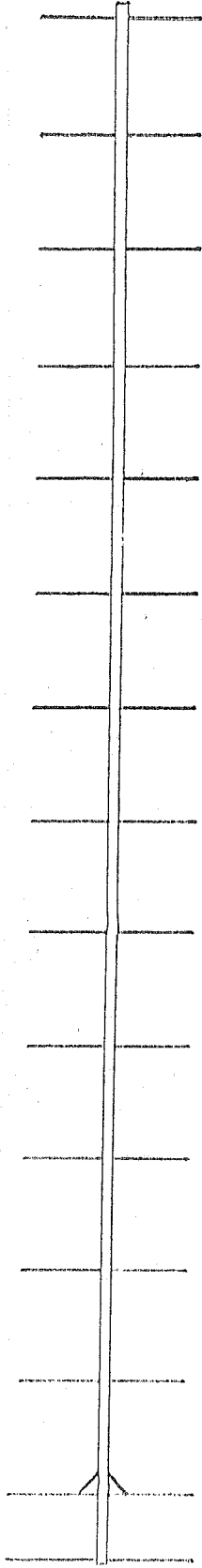
- ELEMENT MATERIAL 1/16" BRASS WELDING ROD OR ALUMINUM ROD
- ELEMENT SPACING; EQUAL, ALL ELEMENTS, .2 λ 2.618" (66.5 mm)
- ELEMENTS ARE HELD IN PLACE BY FRICTION ONLY
- ELEMENT LENGTHS:

	INCHES		mm.
REFLECTOR	6.35	161.3	
DIPOLE	6.12	155.5	
DIR. 1	5.8	147.3	
DIR. 2	5.61	142.6	
DIR. 3, 10	5.52	140.3	
DIR. 4, 9	5.42	137.6	
DIR. 5-8	5.31	135	

12 ELEMENT 2.2 λ 902 MHZ. YAGI FEED DESCRIPTION



4.2 λ YAGI FOR 902 MHz (15 ELEMENTS)



NBS 688 DESIGN GAIN CLAIMED ~ 14 dbd

- BOOM, 5/8" OD ALUMINUM TUBE, 56" LONG (INCLUDES 0.5" ON EACH END)
- ELEMENT MATERIAL: 1/8" ALUMINUM ROD
- DIPOLE MATERIAL: 1/8" BRASS ROD
- REFLECTOR/DIPOLE SPACING = 2.62"
- DIPOLE/DIRECTOR SPACING = 4.032"; ALL DIRECTOR SPACINGS ARE EQUAL (4.032")
- ELEMENT LENGTHS:

	INCHES	MM.
REFLECTOR	6.68	169.6
DIPOLE	6.45	164.0
DIR. 1, 2	5.98	151.97
DIR. 3	5.93	150.64
DIR. 4	5.75	145.99
DIR. 5	5.69	144.65
DIR. 6	5.63	143.00
DIR. 7	5.56	141.32
DIR. 8-13	5.52	140.34

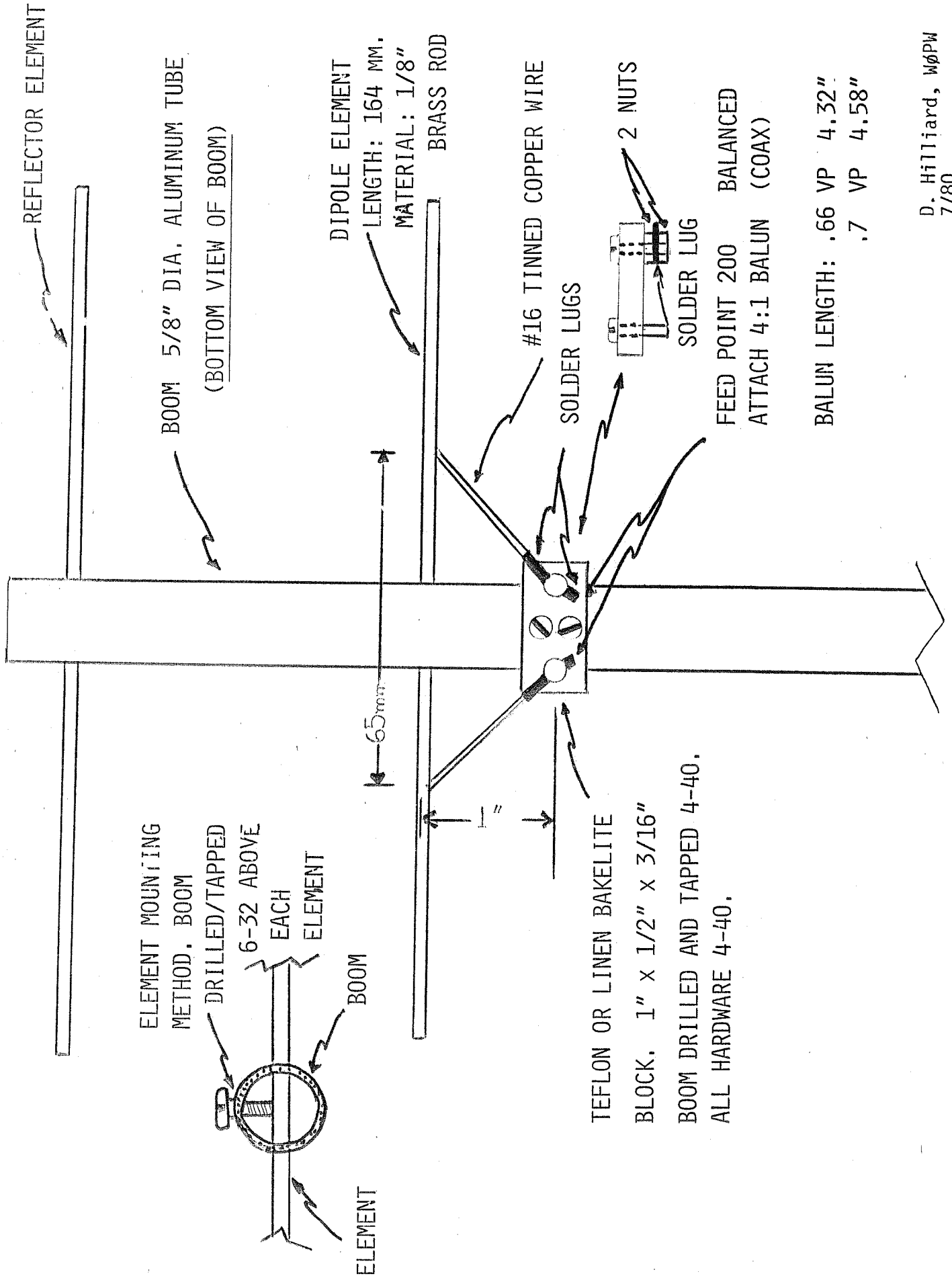
ELEMENTS ARE SECURED IN PLACE BY 6-32 3/8" SCREWS.

BOOM IS DRILLED (#36) AND TAPPED 6-32 DIRECTLY ABOVE EACH ELEMENT

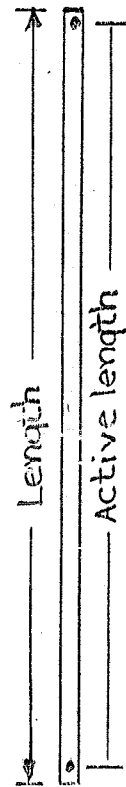
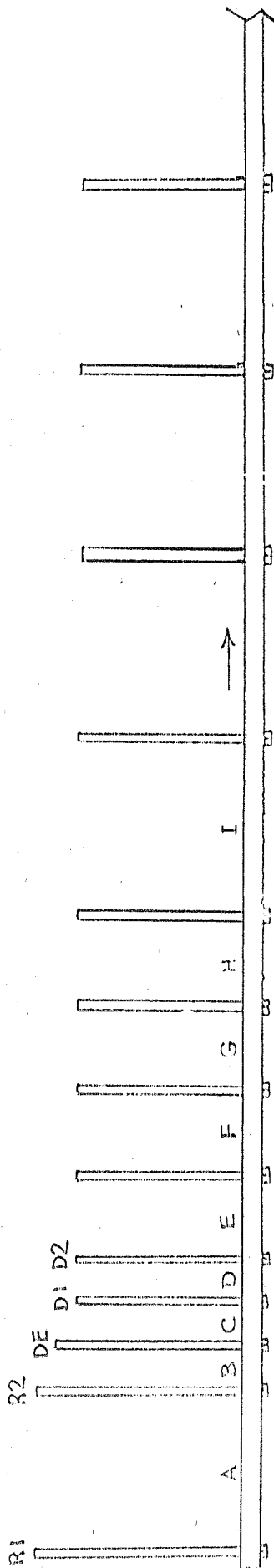
SPACING BETWEEN YAGIS WHEN STACKED SHOULD BE $\sim 24"$ - 26"

D. Hilliard, WOPW
7/80

902 MHZ. 4.2 λ YAGI FEED DESCRIPTION



33 ELEMENT LOOP YAGI FOR 902 MHZ.



ELEMENT	LENGTH
Ref1. 1,2	14.48"
D.E.	13.82"
D 1-11	12.44"
D12-17	12.06"
D18-25	11.35"
D26-30	11.35"

NOTES:

- 1) REFLECTORS AND DIRECTORS ARE ALL 1/32" (.03125) ALUMINUM, 5/16" WIDE.
- 2) BOOM IS ALUMINUM TUBE 1" DIAMETER x 12' LONG.
- 3) ELEMENTS FASTENED TO BOOM WITH 6-32 SCREWS, 1 1/4" LONG.
- 4) ALL POSSIBLE SOURCES ON CONSTRUCTION OF LOOP YAGI ANTENNAS SHOULD BE CONSULTED BEFORE ATTEMPTING TO BUILD THIS ANTENNA.

END MOUNTING HOLES ARE #28 AND ARE .25" FROM EACH END OF ELEMENT STRAP; THEREFORE THE ACTIVE LENGTH IS 1/2" LESS THAN "LENGTH"

- a) VHE/UHF MANUAL, THIRD ED. (RSGB)
- b) RADIO COMMUNICATION, JAN. 1975, p. 24, 25
- c) RADIO COMMUNICATION, JULY 1976, p. 525
- d) RADIO COMMUNICATION, SEPT. 1978, p. 782, 783
- e) COMPILATION OF NOTES ON LOOP YAGIS, WB5LUA

ELEMENT	SPACINGS (INCHES)
A	4.45
B	1.36
C	1.6
D	1.19
E	2.25
F	2.25
G	2.25
H	2.25
I	5.11
REMAINING DIRECTORS	5.11

$3/4" \times 3/4" \times 47 \ 7/8"$
(4)

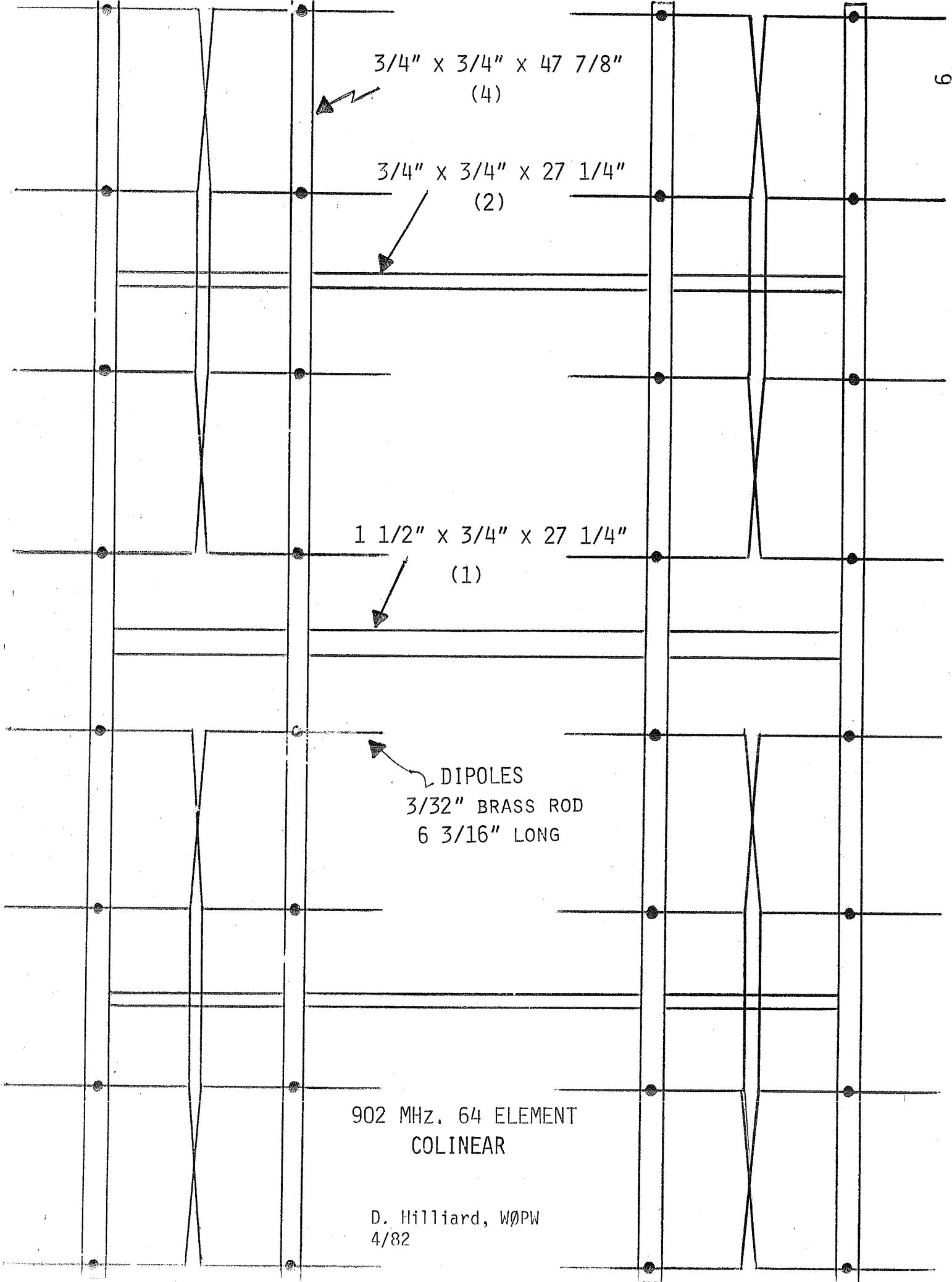
$3/4" \times 3/4" \times 27 \ 1/4"$
(2)

$1 \ 1/2" \times 3/4" \times 27 \ 1/4"$
(1)

DIPOLES
 $3/32"$ BRASS ROD
 $6 \ 3/16"$ LONG

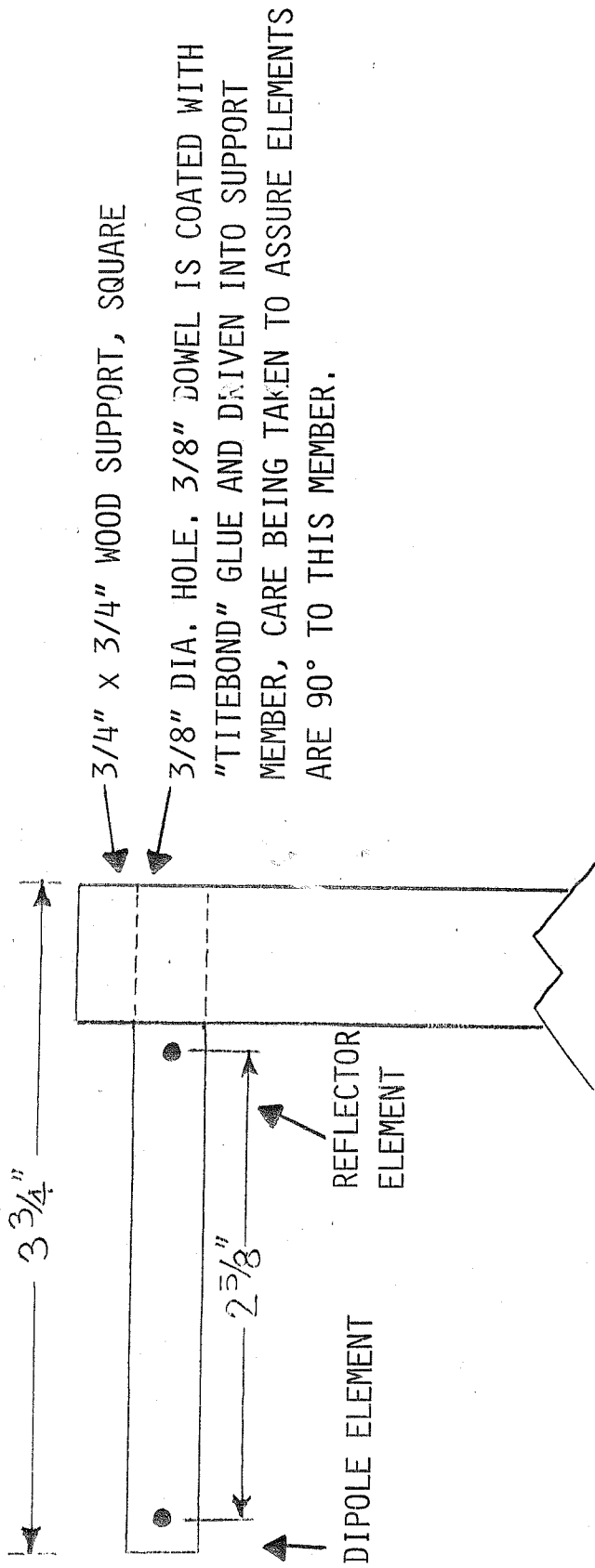
902 MHz. 64 ELEMENT
COLINEAR

D. Hilliard, WØPW
4/82



CONSTRUCTION METHOD FOR DIPOLE/REFLECTOR ANTENNAS

(902 MHz)

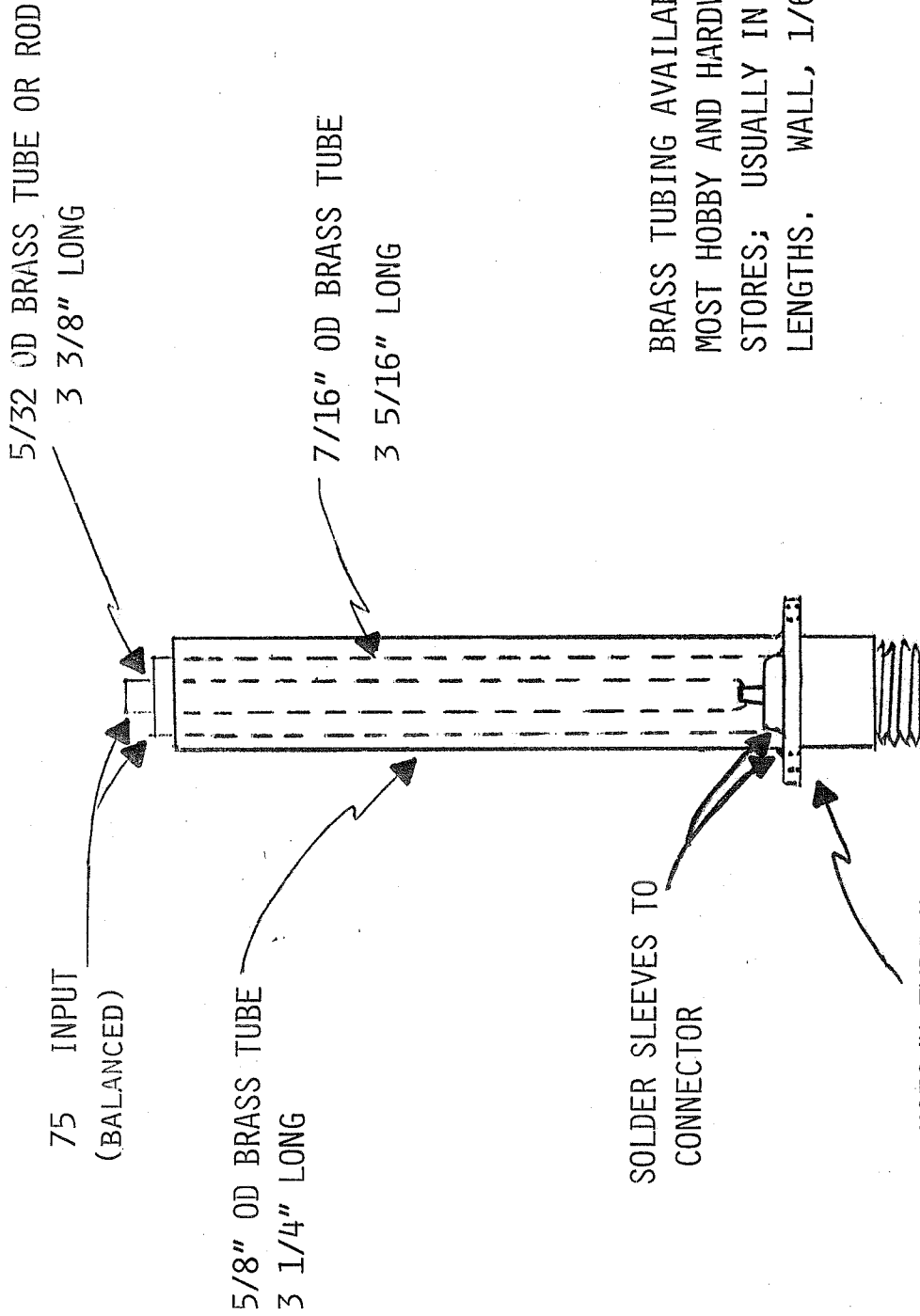


ELEMENTS ARE 3/32" BRASS ROD (WELDING ROD). HOLES ARE DRILLED IN DOWEL USING A NO. 41 DRILL (.096"). TRY ON A SCRAP TO ASSURE A TIGHT FRICTION FIT. ELEMENT SHOULD FIT TIGHTLY.

D. Hilliard, WØPW
4/82

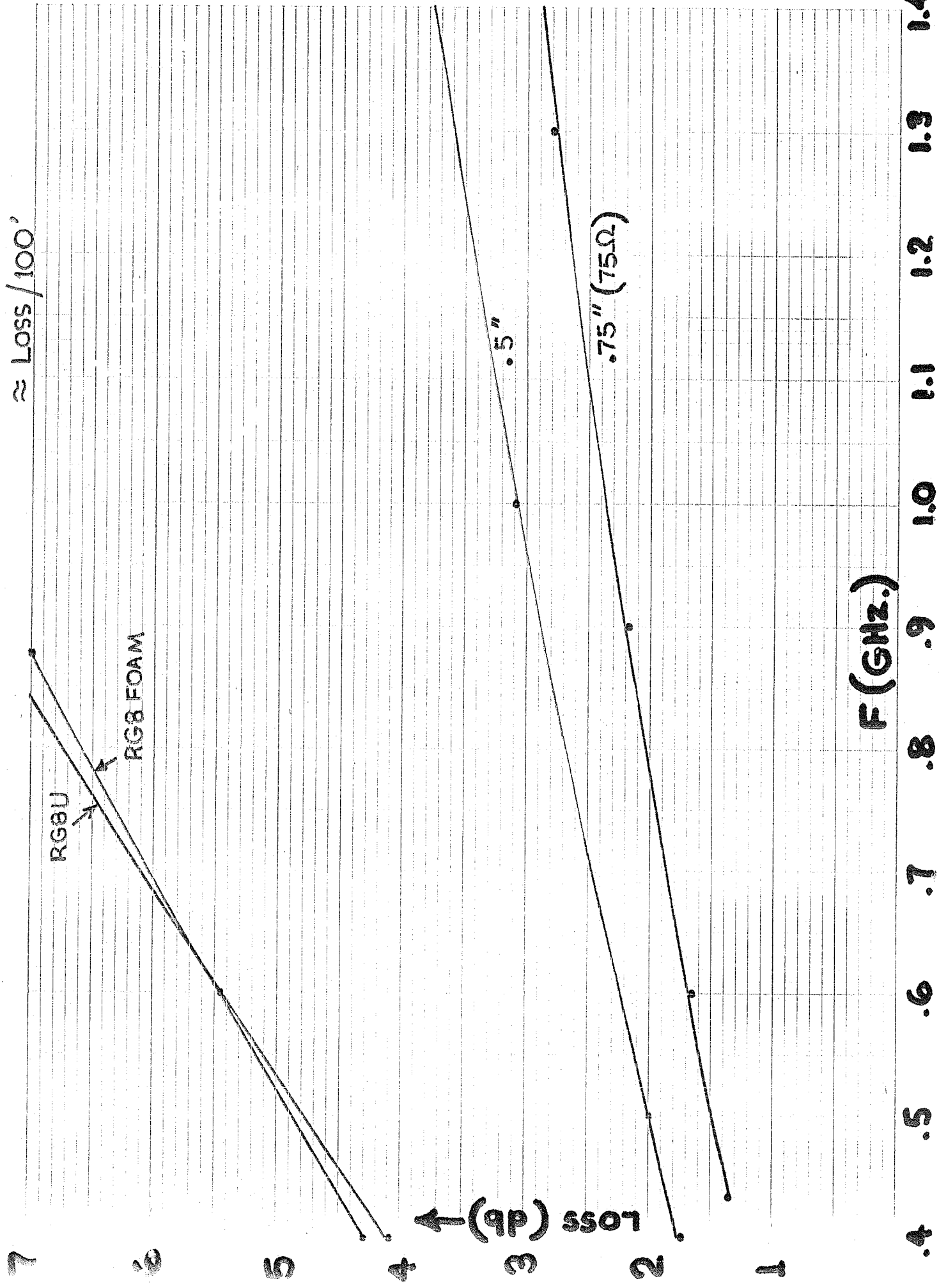
75/50Ω BALUN TRANSFORMER FOR 902 MHZ.

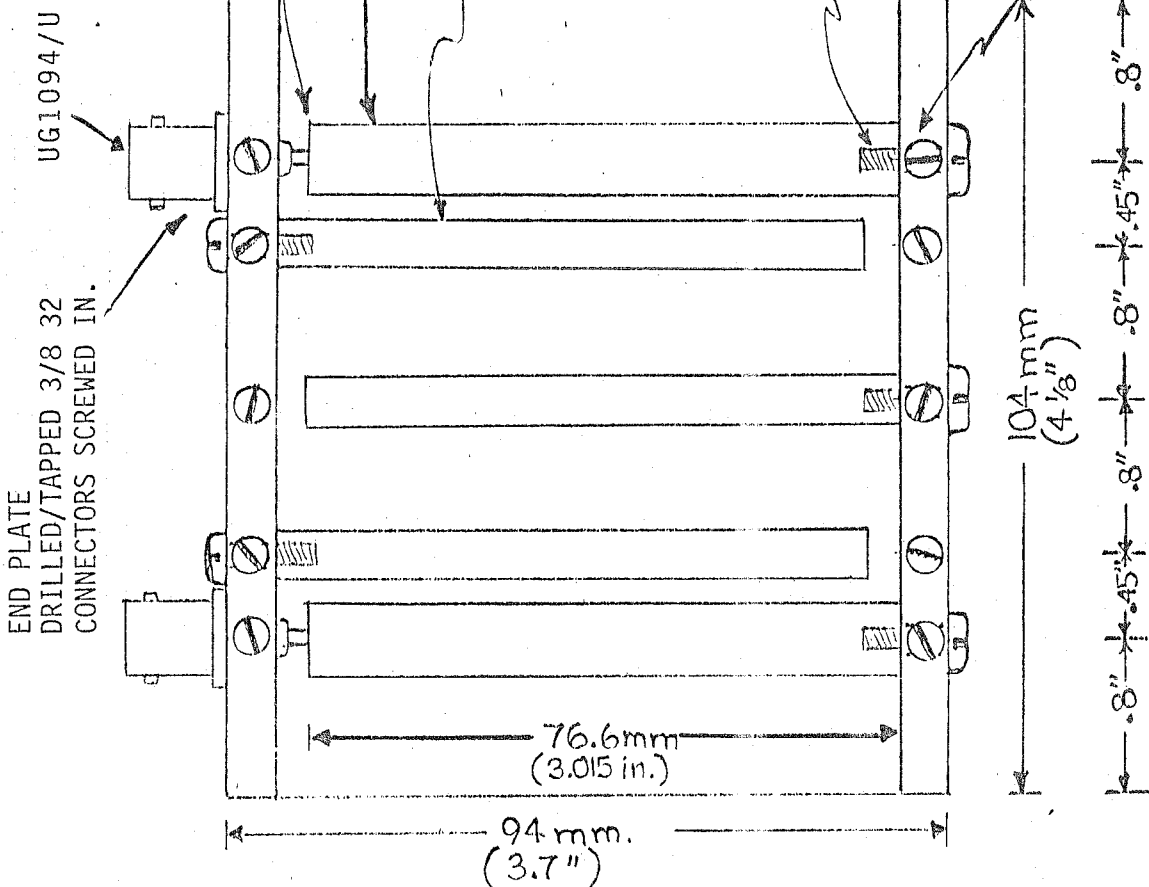
$\lambda/4$ 902 MHZ - 3.27"



BRASS TUBING AVAILABLE AT
MOST HOBBY AND HARDWARE
STORES; USUALLY IN 12"
LENGTHS. WALL, 1/64"

D. Hilliard, WOPW
4/82





END PLATE
DRILLED/TAPPED 3/8 32
CONNECTORS SCREWED IN.

UG1094/U

TOP/BOTTOM PLATES
94 x 104 mm.
1/32" ALUMINUM PLATE

DRILLED TO ACCEPT UG1094
CENTER PIN. SOLDERED.

COUPLING ELEMENT 76.6 mm LONG
3/8" DIAMETER BRASS ROD (2)

RESONATOR ELEMENTS
1/4" BRASS ROD 76.6 mm LONG
(3)

94 mm.
(3.7")

76.6 mm
(3.015 in.)

104 mm
(4 1/8")

.8" .45" .8" .45" .8"

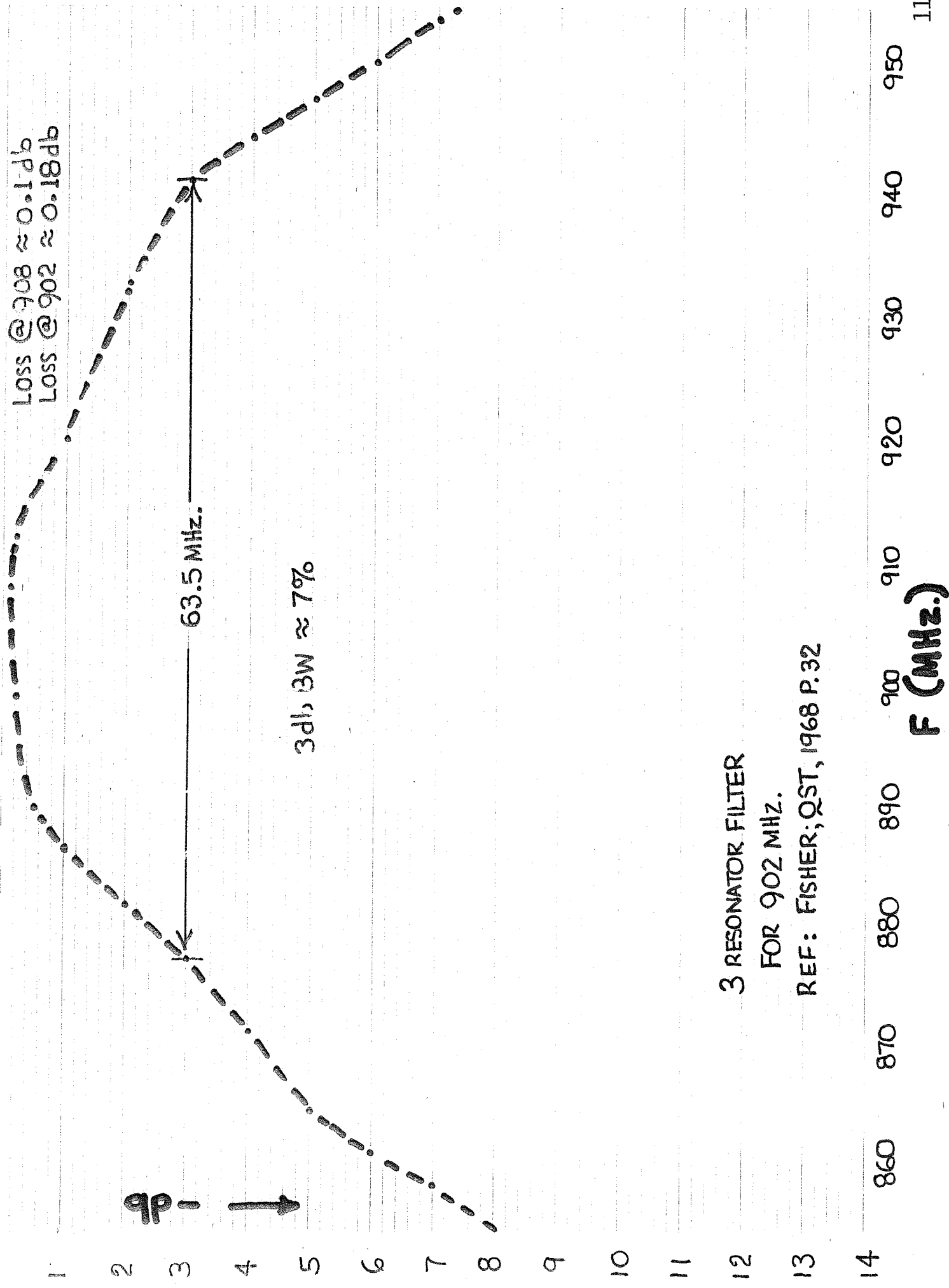
INTERDIGITAL FILTER FOR 902 MHZ.
REF: FISHER, QST 1968, P. 32

RESONATORS ALL DRILLED NO. 28
AND TAPPED 8-32 8-32 SCREW 3/8" LONG

1/4" ALUM. END PLATES DRILLED/TAPPED
4-40 AND 8-32 FOR RESONATOR SCREWS
AND TOP/BOTTOM PLATE SCREWS

4-40 1/8" SCREWS

NOTE: RESONANT FREQUENCY MAY BE LOWERED BY TURNING SCREWS (10-32) on 3 RESONATORS
OR RAISED BY SHORTENING THE 5 RESONATORS.



3 RESONATOR FILTER

FOR 902 MHz.

REF: FISHER, QST, 1968 P.32

DIRECTIONAL COUPLER FOR R.F. POWER METER USE

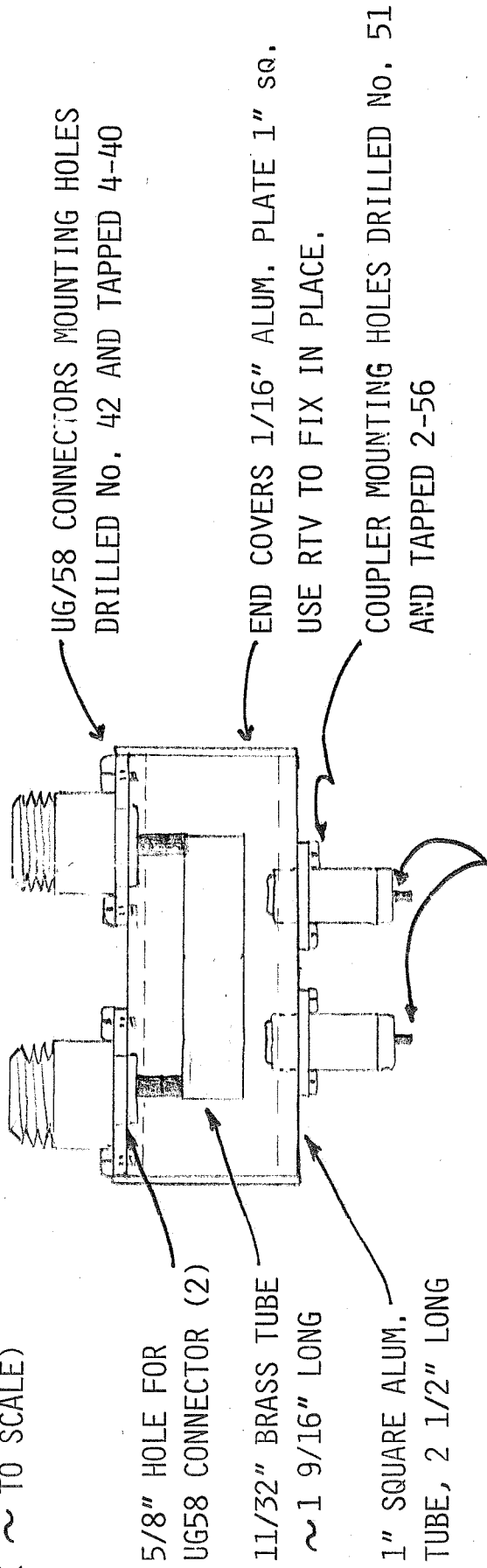
USEFUL TO 1296 MHZ.

MAX. POWER RATING LIMITED BY UG58 CONNECTORS

● DESIRED CONDUCTOR RATIO = 2.14

● ACTUAL, USING THESE DIMENSIONS = $2.18 \approx 51\Omega$

(~ TO SCALE)



COUPLERS (D.C. OUTPUT)

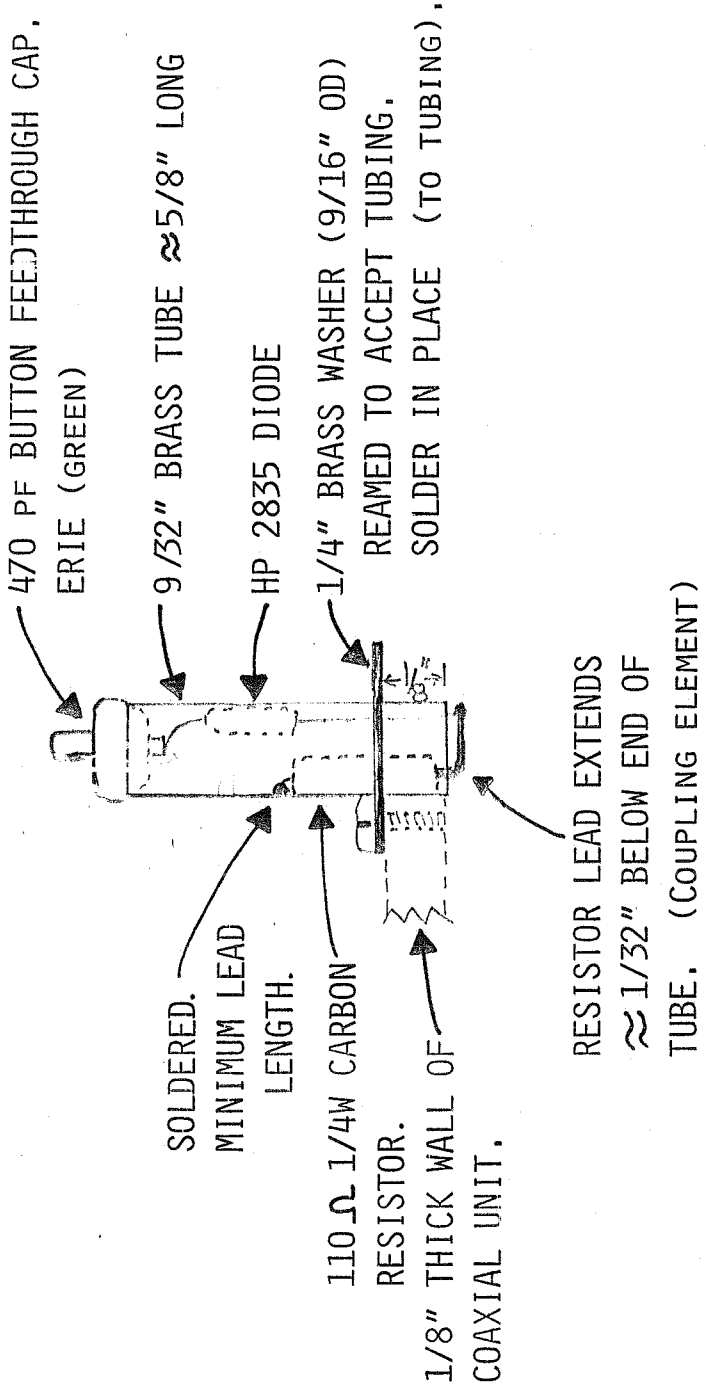
POSITIONED 180° TO EACH OTHER. (COUPLING ELE.)

POSITION AS CLOSE TOGETHER AS THE WASHER MOUNTINGS ALLOW.

DIRECTIONAL COUPLER FOR R.F. POWER METER USE (CONT'D)

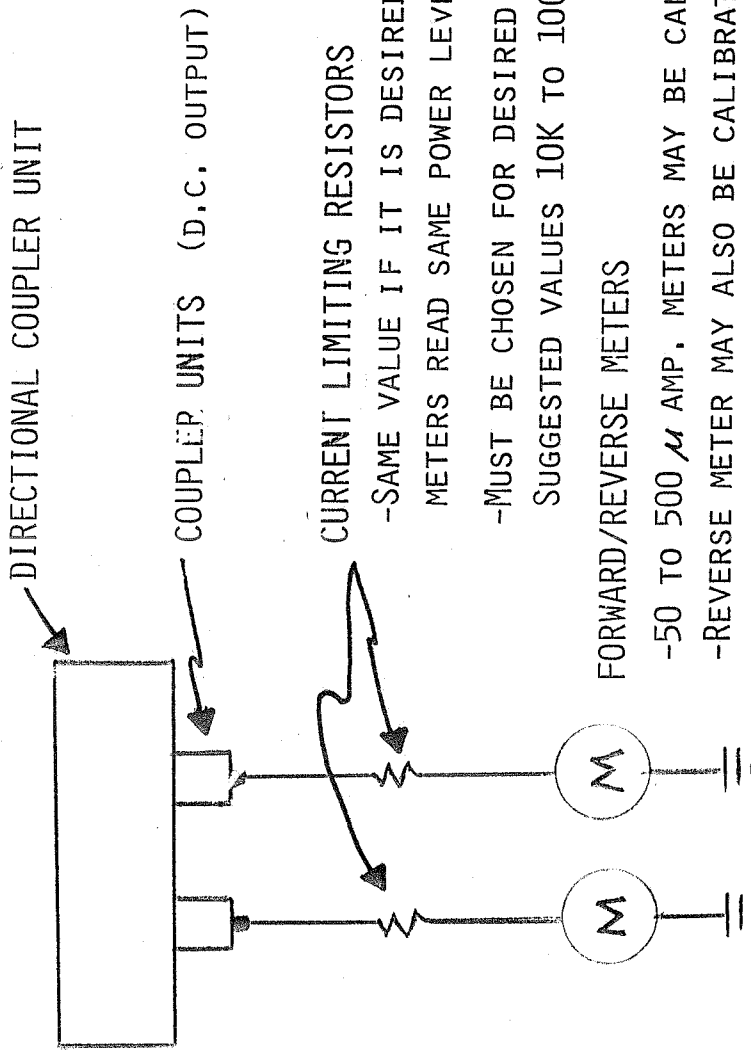
COUPLER UNIT (2)

(NOT TO SCALE)



NOTE: IF IT IS DESIRED TO USE 1/16" WALL, 1" SQUARE TUBE,
AN INNER CONDUCTOR DIAMETER OF 13/32" WILL PRODUCE
A RATIO OF 2.15 OR 50 Ω .

DIRECTIONAL COUPLER FOR R.F. POWER METER USE (CONT'D)

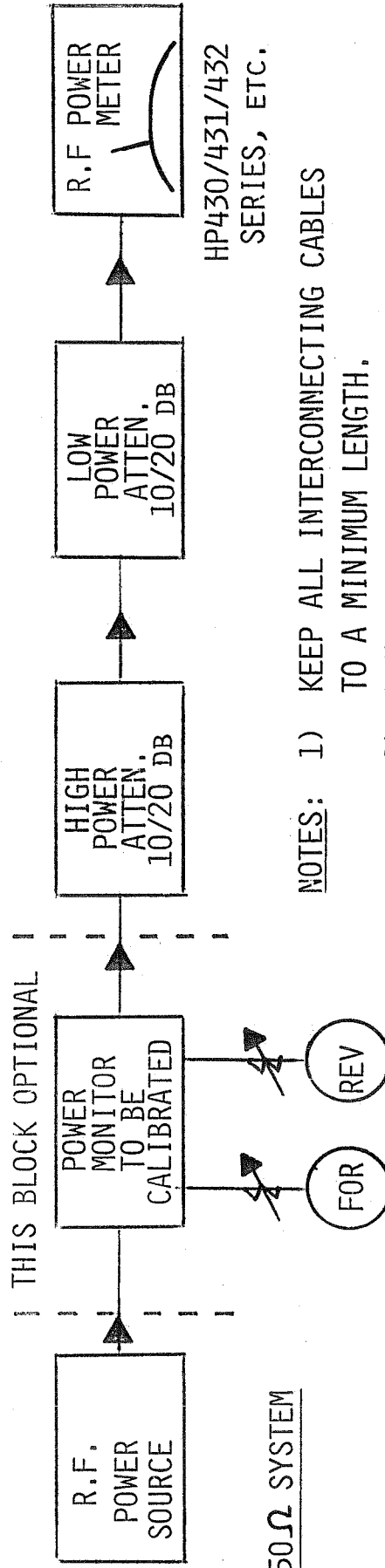


D. Hilliard, WOPW
9/82

POWER MEASUREMENTS AT 902 AND 1296 MHZ

RG8U			RG58U			RG174U			COMMENTS
ATTEN. /db	902	1296	ATTEN. /db	902	1296	ATTEN. /db	902	1296	
3	40.5'	30.65'	3	17.8'	15.2'	3	10.65'	8.6'	1) COAX MAY BE COILED AND PUT IN BOX WITH CONNECTORS INSTALLED 2) BNC CONNECTORS MAY BE USED ON RG58 & 174. USE TYPE N ON RG8. 3) ALWAYS USE NEW COAX CABLE WITH AT LEAST 95% SHIELD.
6	81.0'	61.3'	6	35.6'	30.4'	6	21.3'	17.2'	
10	135.0'	102.0'	10	59.5'	50.8'	10	35.5'	28.6'	
LOSS/FT. (db)	.074	.097		.168	.197		.282	.35	
RF PWR (W)	250	200		85	70		35	30	

NOTE: START WITH AN EXTRA FOOT OR SO OF CABLE. IT IS EASIER TO REDUCE LENGTH THAN TO INCREASE IT!



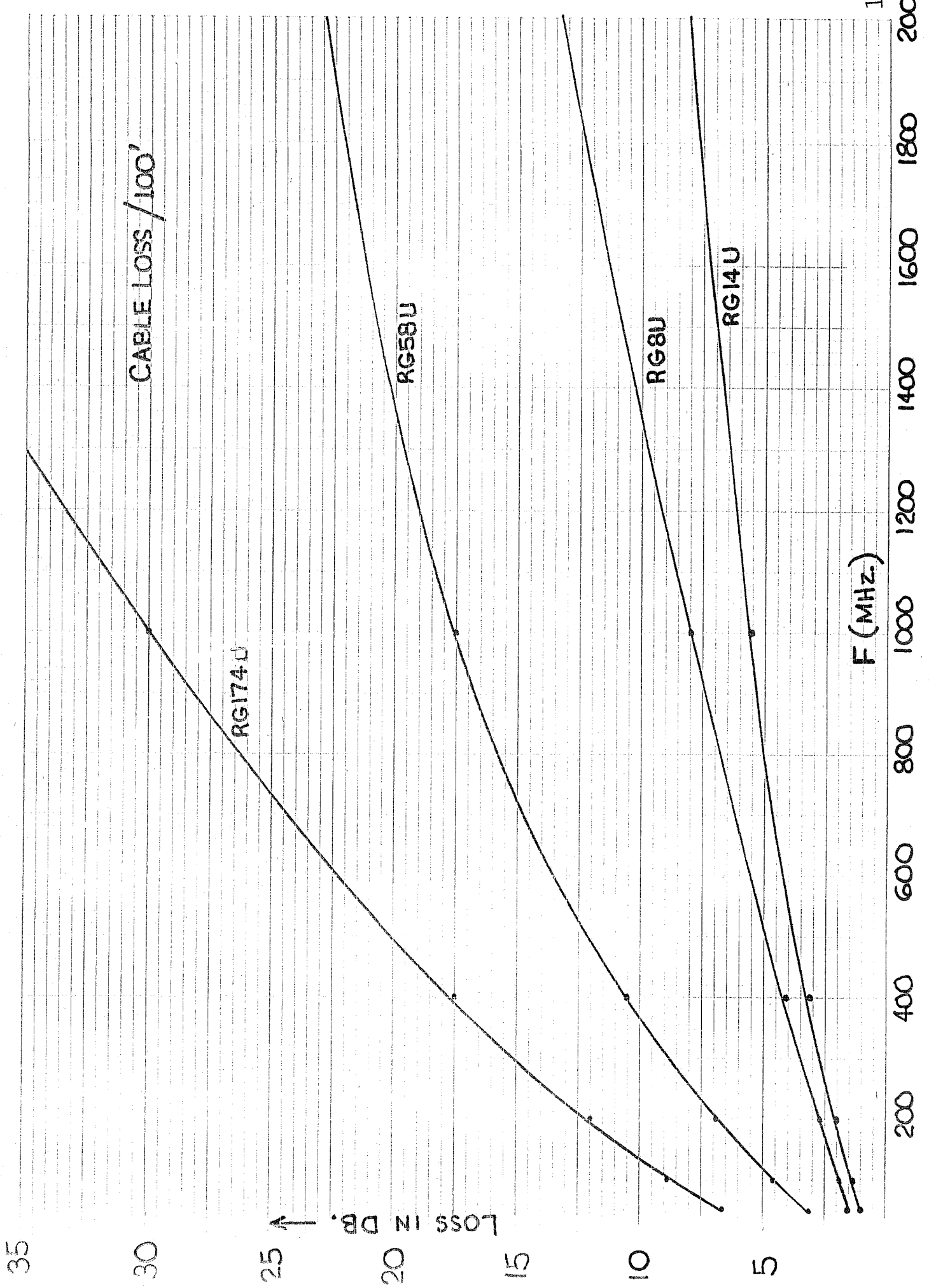
50Ω SYSTEM

NOTES: 1) KEEP ALL INTERCONNECTING CABLES TO A MINIMUM LENGTH.

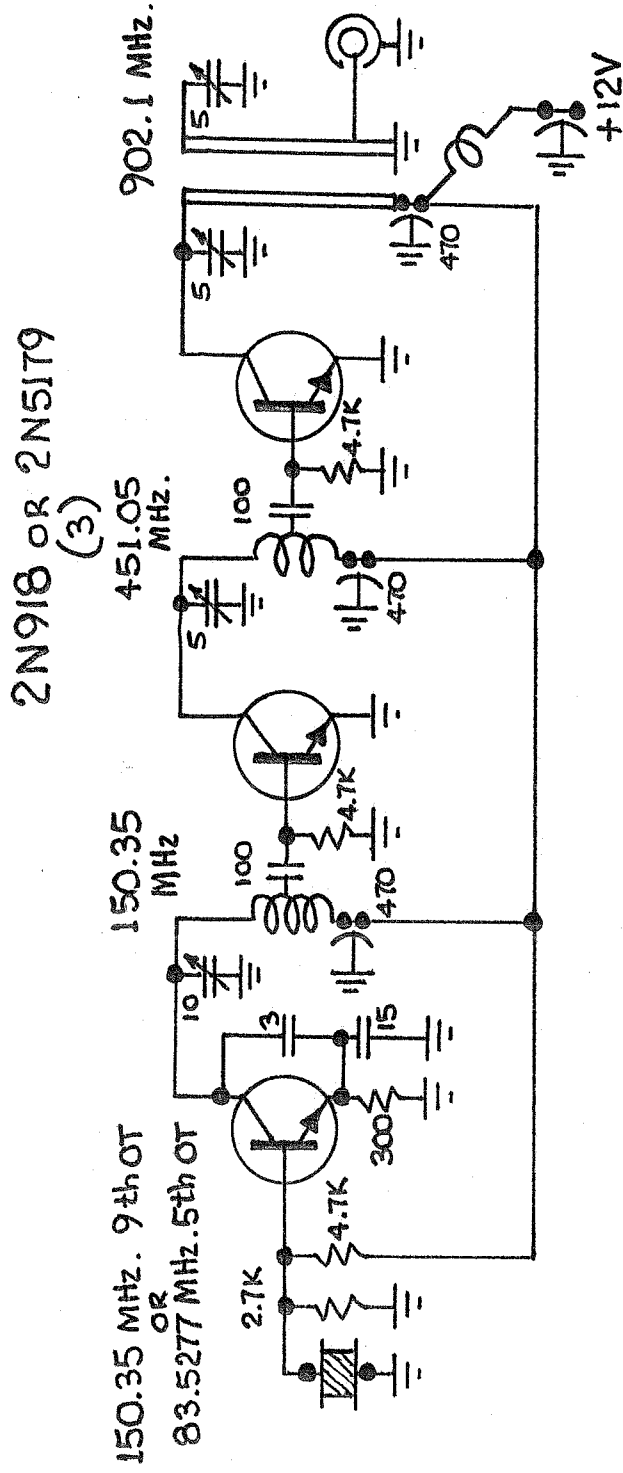
2) MINI-CIRCUITS MAKES DC-1500 MHZ ATTENUATORS RATED AT 2 W. FOR \$11.95 (BNC) \$15.95 (N)

3) RG48/U CABLE IS 53Ω
RG58A/U CABLE IS 50Ω
BOTH RG8U AND RG8A/U ARE LISTED AS 52Ω.

CABLE LOSS / 100'

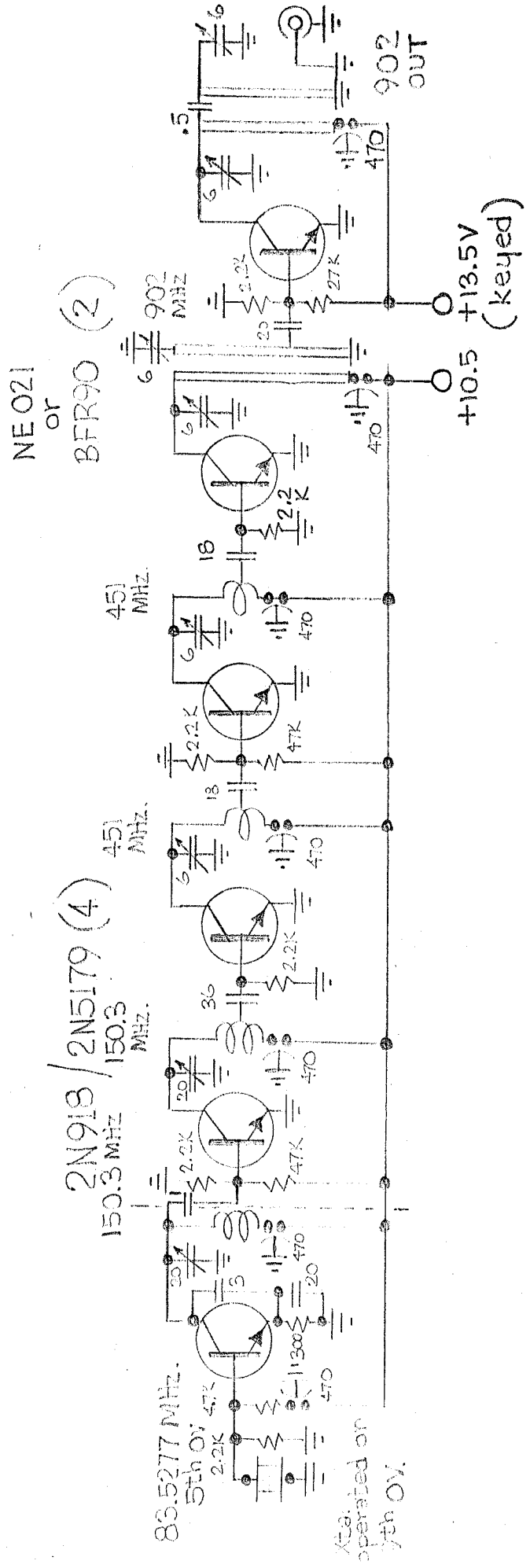


902 MHz. SIGNAL SOURCE



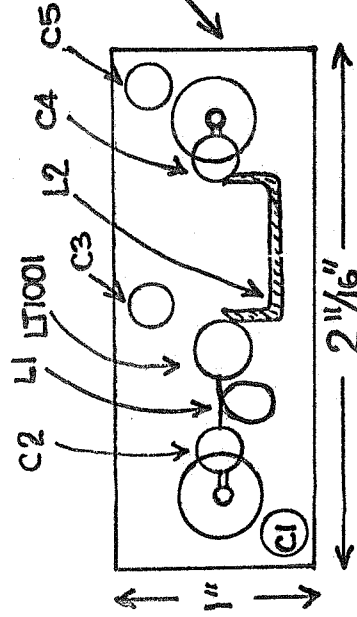
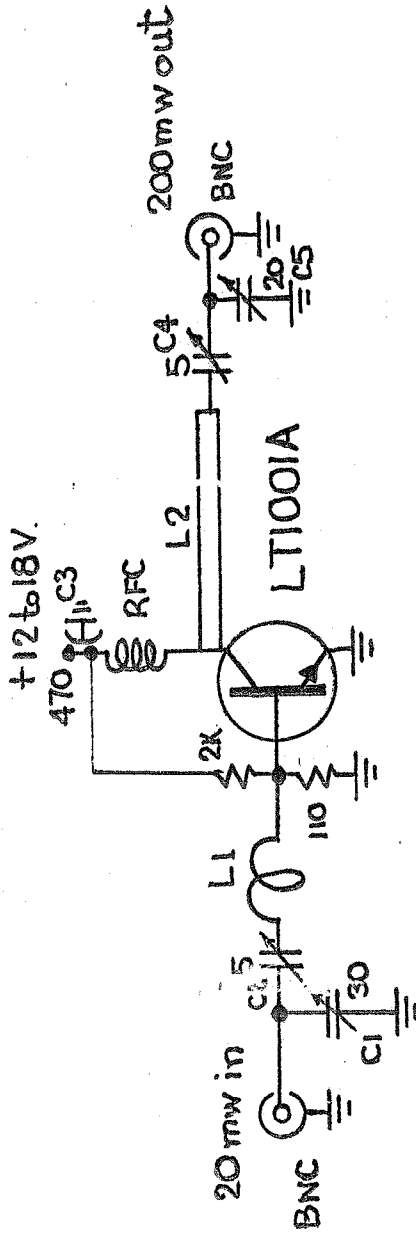
902 MHZ. SIGNAL SOURCE

- OUTPUT \approx 65 MW.
- 902 INDUCTORS \approx 1 3/16" X 3/16" COPPER STRAP



D. Hilliard, W0PW

900 MHZ. POWER AMPLIFIER



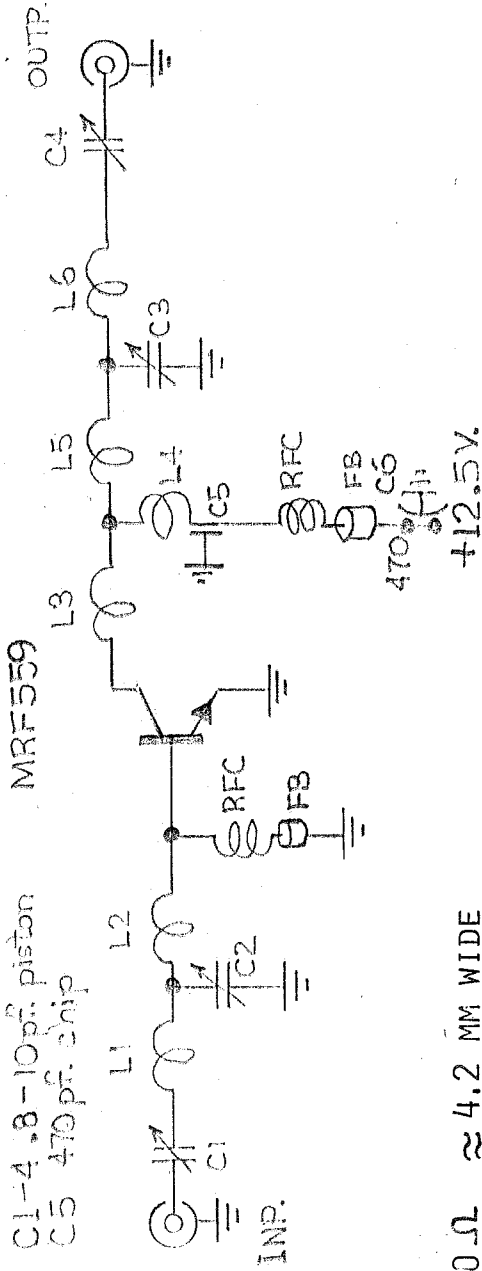
DOUBLE SIDED 1/16" BOARD
 FITS ON LID OF CU 123 BUD ECONOBX

L1 IT. #18 1/4" DIAMETER

L2 COPPER STRAP 1 1/4" LONG; 3/16" WIDE, SHAPED AS SHOWN

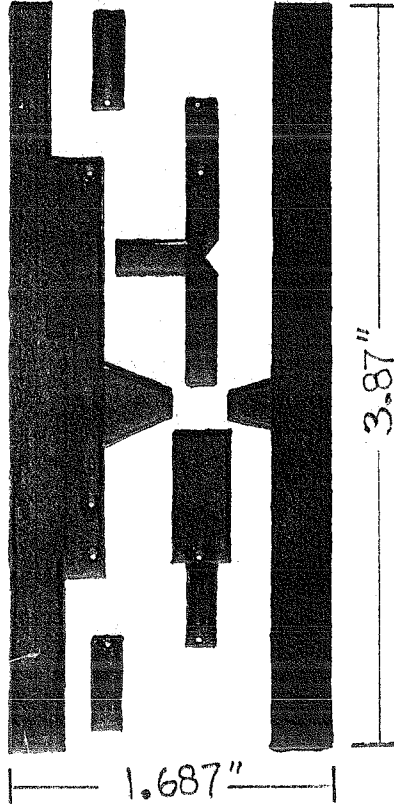
POWER AMPLIFIER FOR 902 MHZ.

- 0.6 WATTS OUTPUT
- GAIN: ≈ 10 DB
- SEE MOTOROLA DATA SHEET ON MRF559



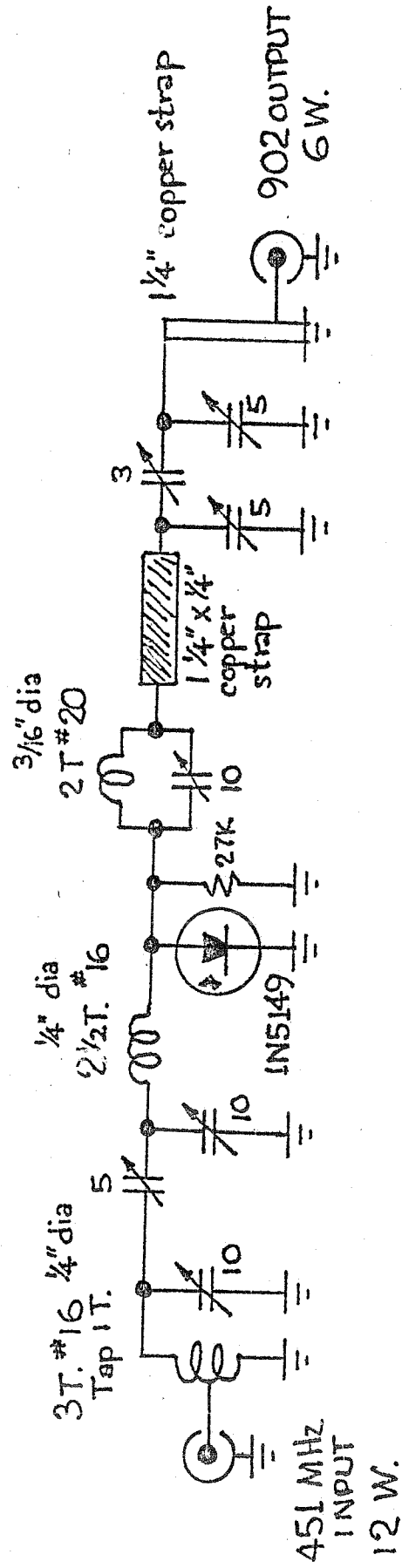
- L1 50Ω ≈ 4.2 MM WIDE
- L2 30Ω ≈ 8.5 MM WIDE
- L3-6 50Ω SAME AS L1

BOARD MATERIAL: TEFLON GLASS, 1/16"



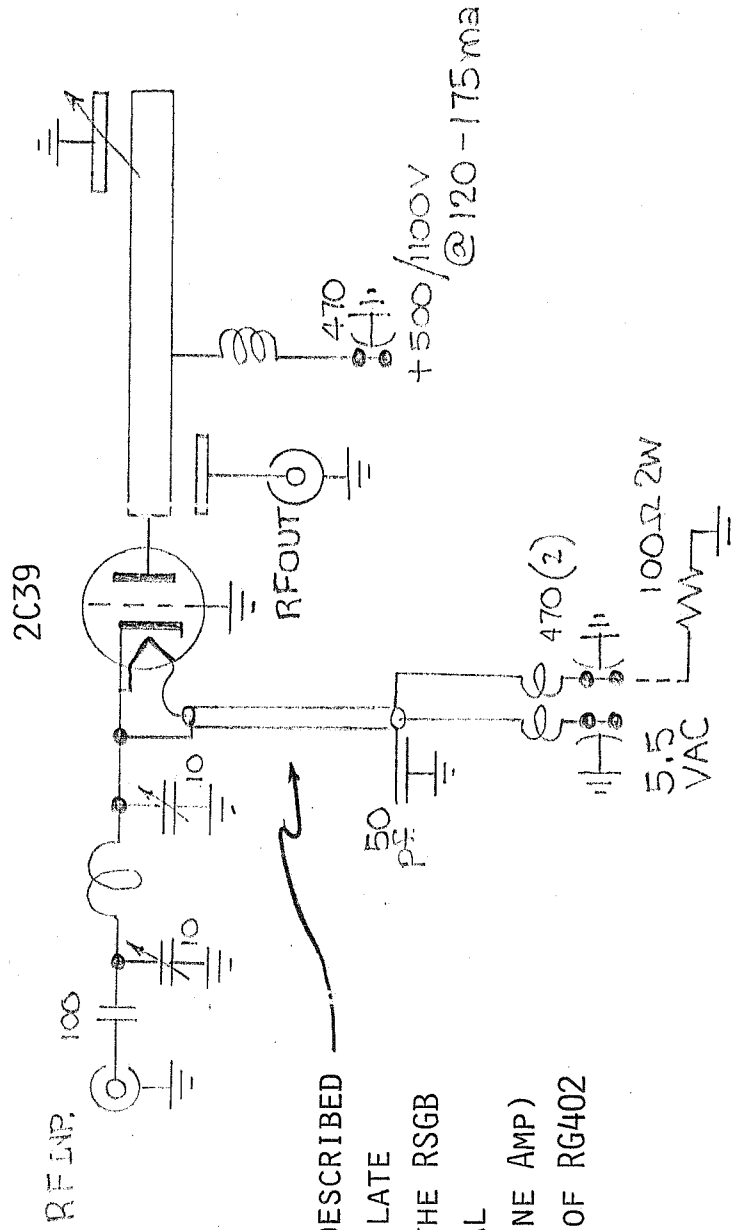
THIS BOARD IS A MODIFICATION OF THE ONE SHOWN IN THE MOTOROLA DATA SHEET FOR THE MRF559. REFER TO DATA SHEET BEFORE ATTEMPTING DUPLICATION.

451/902 MHZ. VARACTOR DOUBLER



902 MHZ. POWER AMPLIFIER

(THIS AMPLIFIER WILL DELIVER \approx 50 WATTS OUTPUT)



\approx 2 1/4" LONG DESCRIBED
 IN DETAIL IN LATE
 EDITIONS OF THE RSGB
 VHF/UHF MANUAL
 (1296 STRIPLINE AMP)
 OR USE 2.25" OF RG402
 (.141) COAX.

DESCRIPTION OF PLATE CIRCUIT, 2C39 AMP.

902 MHZ.

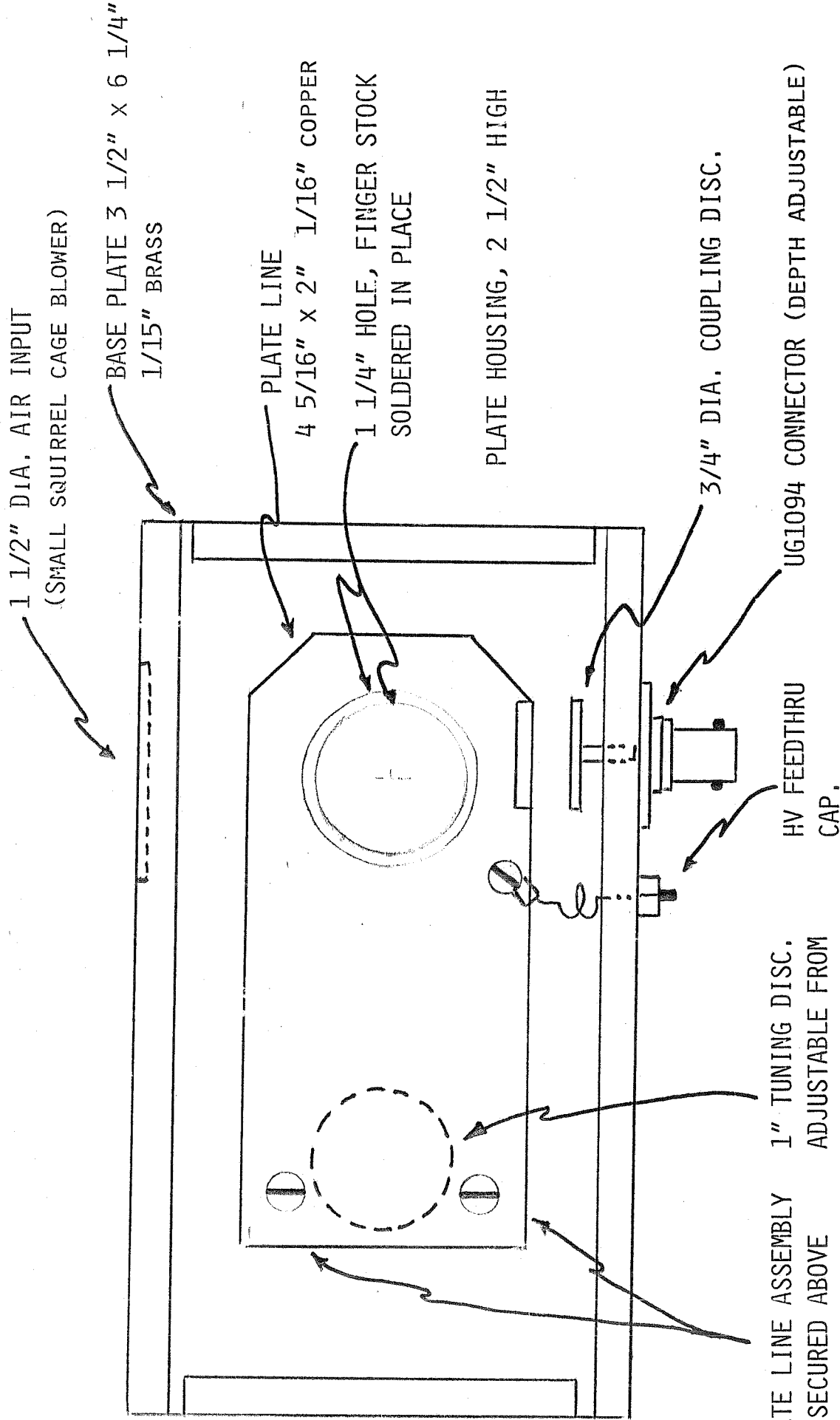
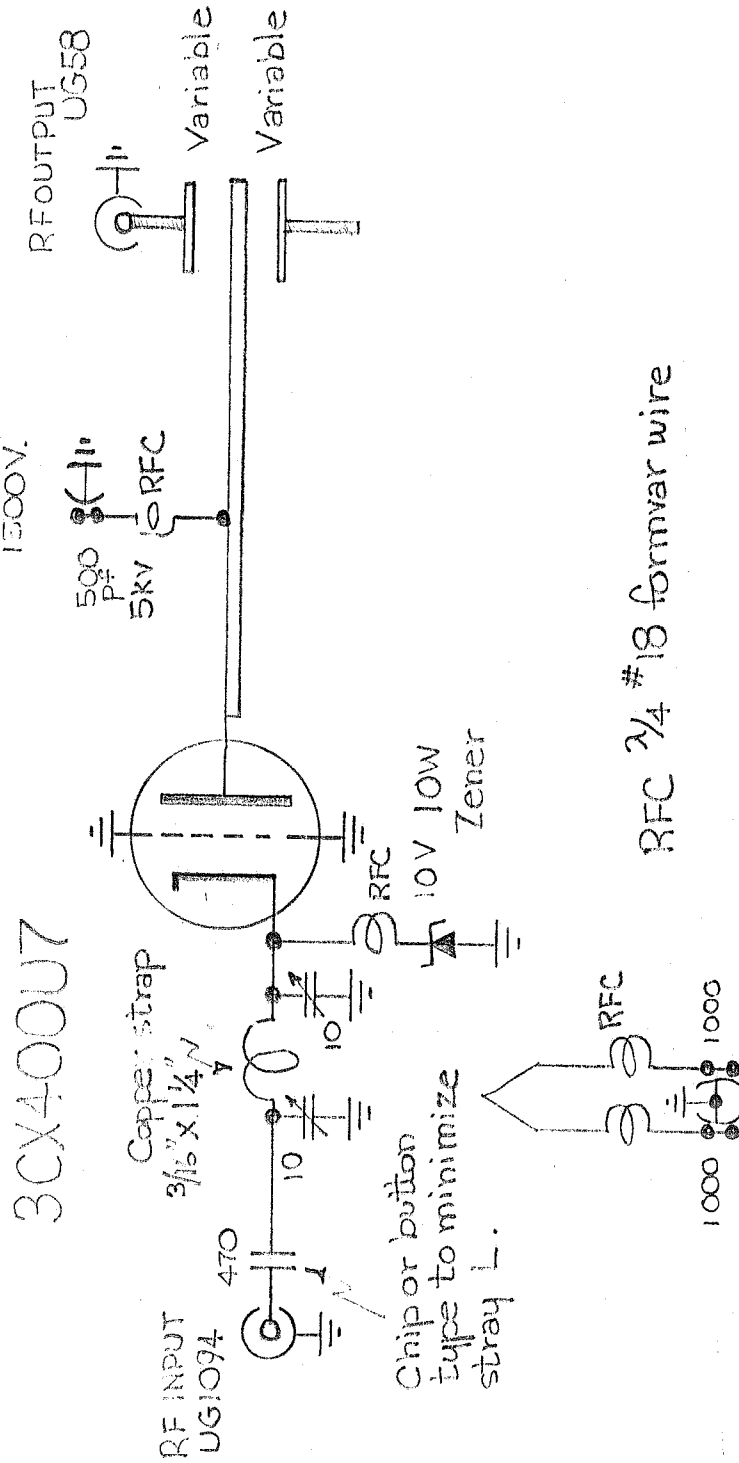


PLATE LINE ASSEMBLY 1" TUNING DISC.
IS SECURED ABOVE ADJUSTABLE FROM
BOTTOM PLATE BY BOTTOM,
3/4" CERAMIC PILLERS
AND BY NYLON WASHERS AT
THE TOP & BOTTOM OF EACH,
TOTAL HEIGHT ABOVE BOTTOM PLATE $\approx 7/8"$.

902 MHZ. POWER AMPLIFIER

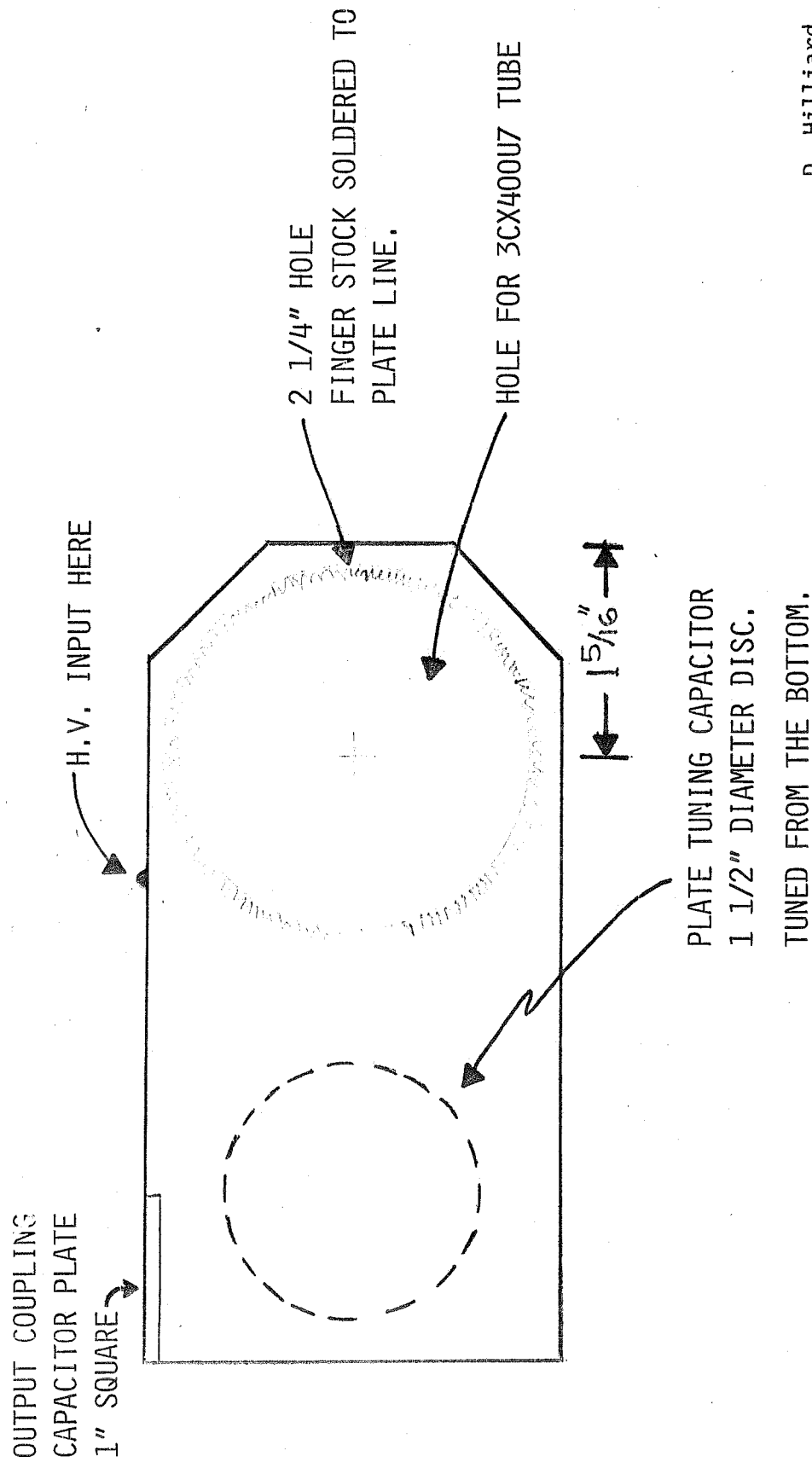


D. Hilliard, W0PW
4/81

PLATE LINE ASSEMBLY FOR 902 MHZ.

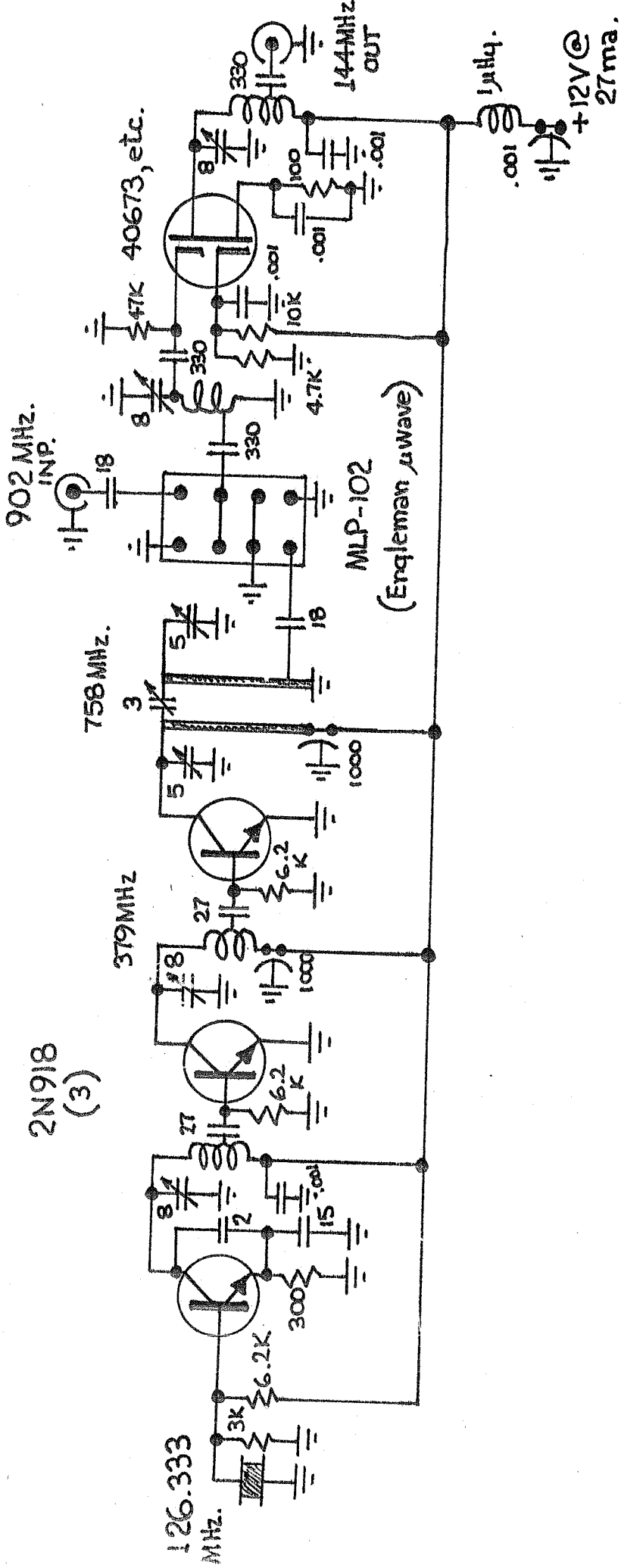
3CX400U7 AMP.

- MATERIAL: 1/16" COPPER OR BRASS
2 1/2" x 5"
- PLATE HOUSING 3" x 4 1/4" D x 7" L

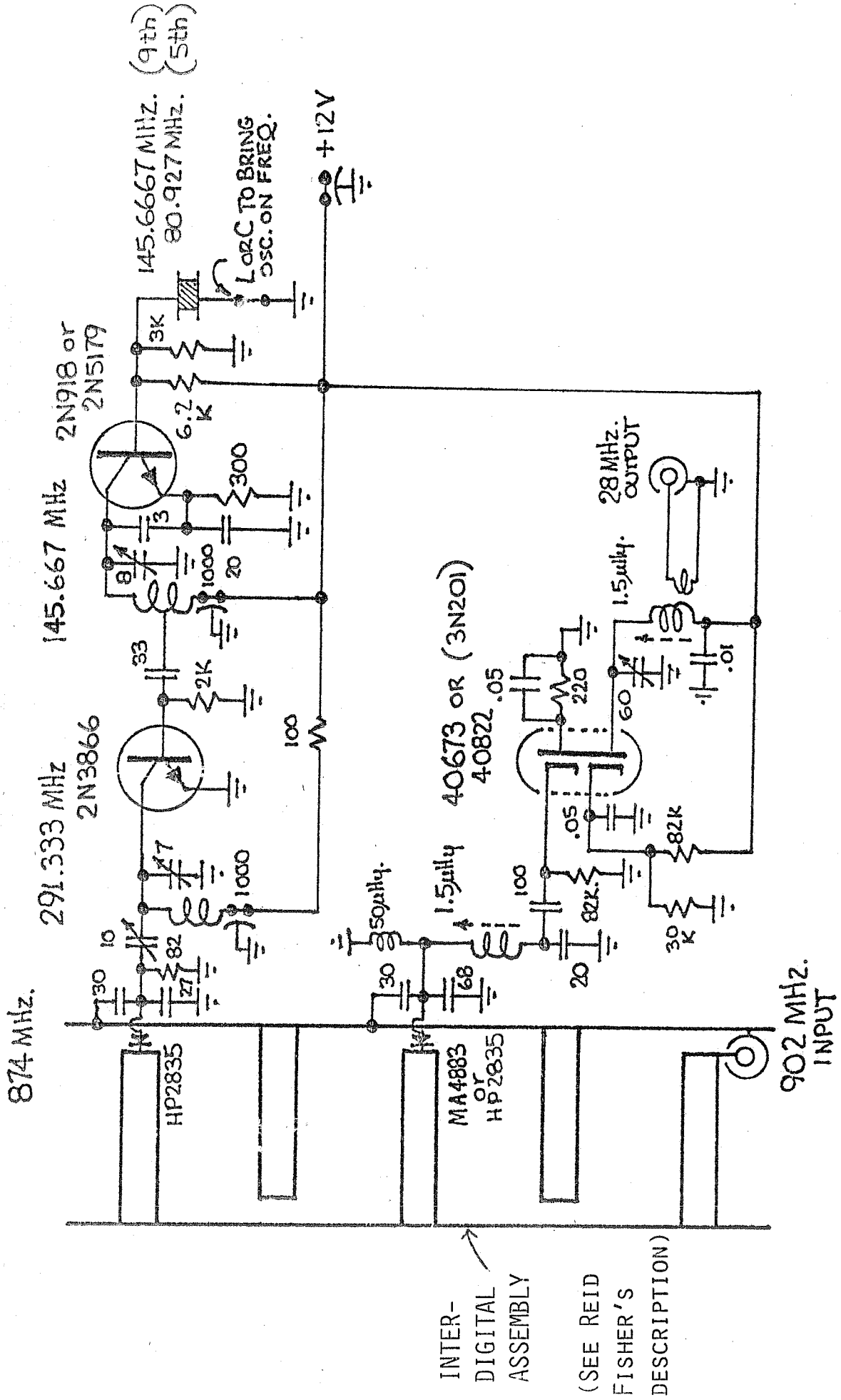


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4/81

902 MHz. CONVERTER

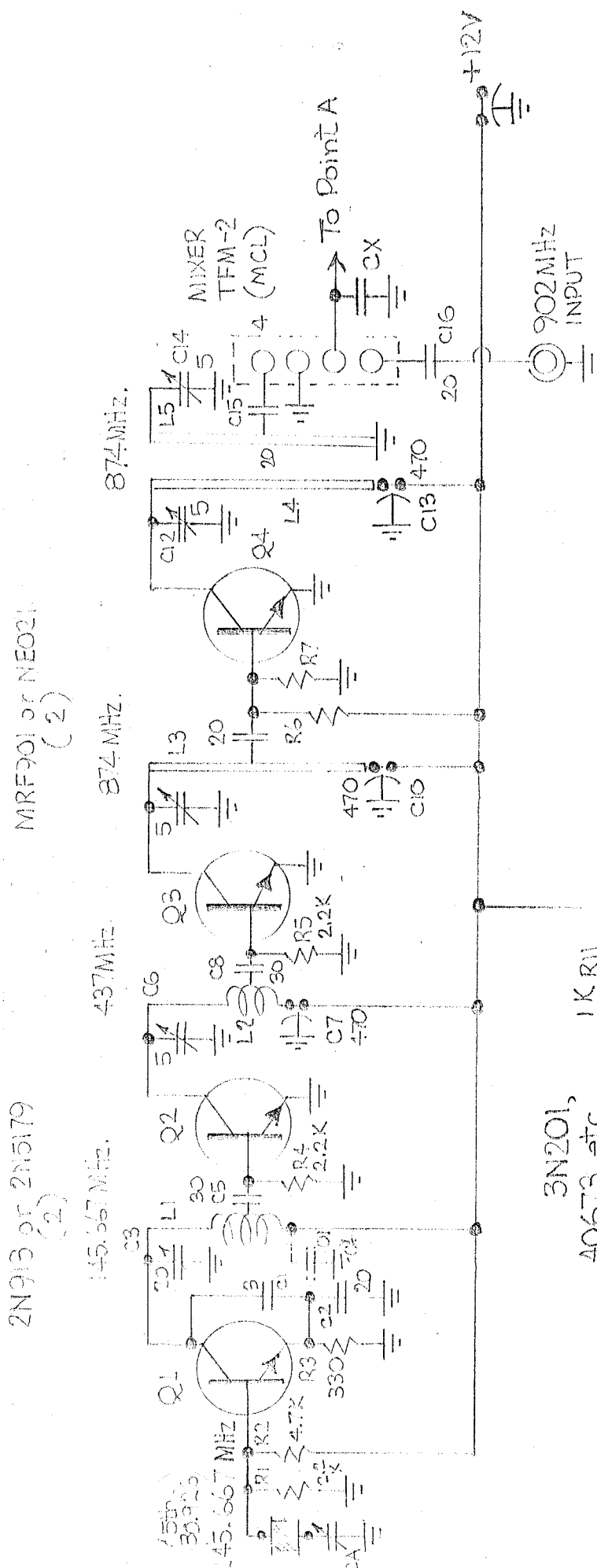


902 MHz CONVERTER



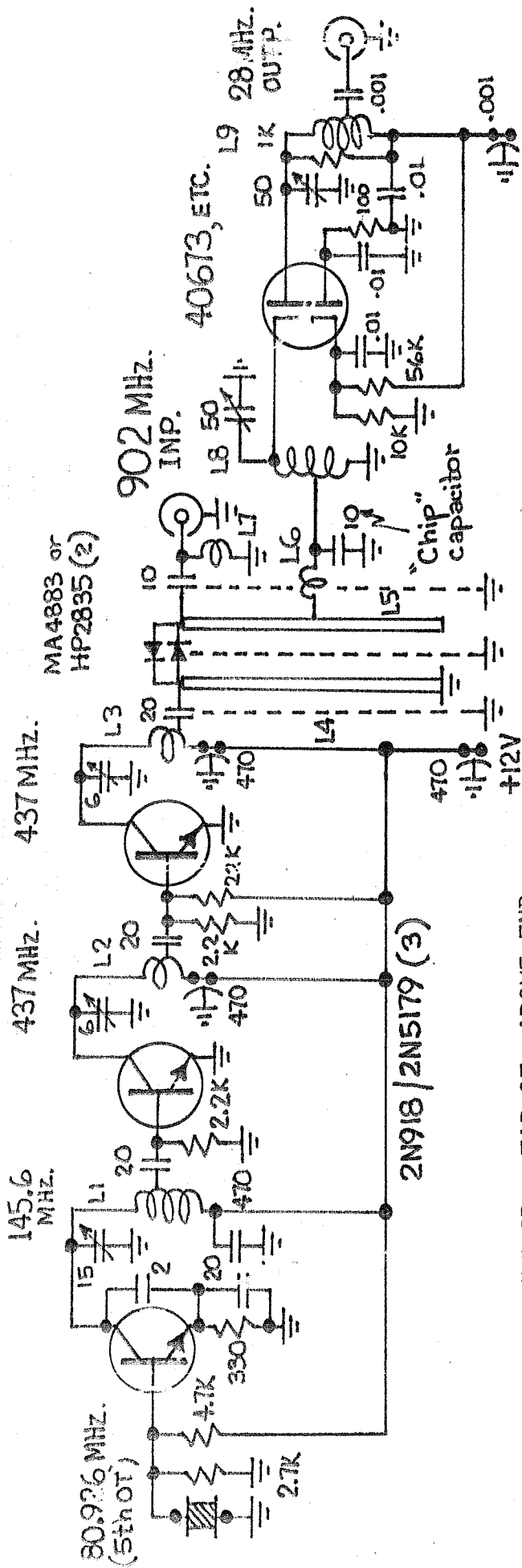
THIS UNIT IS SIMILAR, ONLY INDUCTORS ARE 2 3/4" LONG AND ENCLOSURE IS MADE OF DOUBLE SIDED PC BOARD.

902 MHz. DBM CONVERTER



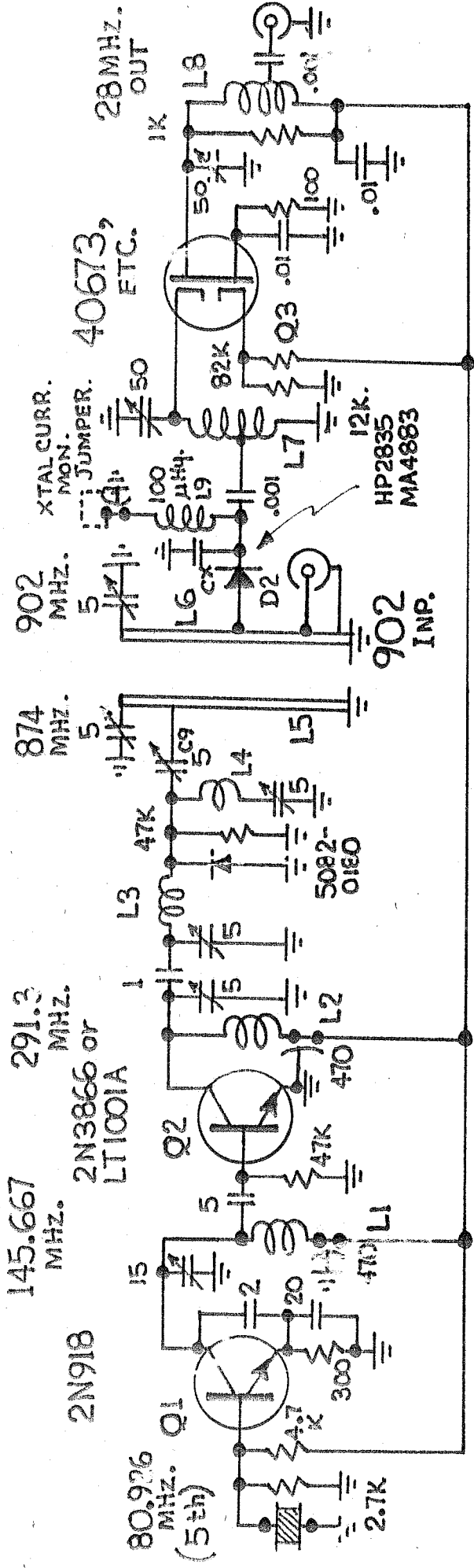
INPUT AND OUTPUT INDUCTORS ARE 24 T. #24 ENAM. 1/4" DIAMETER.
 LINKS ARE 2 T. SMALL HOOKUP WIRE.

902 MHz. CONVERTER (2 DIODE MIXER)



- L1 6T, #18 1/4" ID; TAP 2T, ABOVE END.
- L2,3 2T, #18 1/4" ID; TAP AT 3/4 T, ABOVE GROUND
- L4 3/16" COPPER STRAP, 1/32" THICK, 1/16" ABOVE GROUND PLANE 6.465" LONG.
- L5 SAME AS L4 EXCEPT 6.645" LONG.
- L6 15T, #30 ENAM, 1/16" DIA.
- L7 1 1/2" #28 1/8-3/16" DIA.
- L8,9 25T, #24 ENAM, 1/4" DIA, CW, TAP AT 4T, ABOVE GROUND.
- L4 AND L5 MAY BE SECURED IN PLACE BY USING 3/16" SQUARE PIECES OF 1/16" CIRCUIT BOARD AND "SUPER GLUE".

NOTE: THE MIXER USED IS SIMILAR TO THE ONE DESCRIBED IN OCT. 1978 "HAM RADIO" P. 84-86 BY WÅRDX. THE 2 LINES ARE PARALLEL, SEPARATED BY SHIELDS INSTEAD OF END ON AS DESCRIBED BY DIETRICH. IT IS RECOMMENDED THAT THE ABOVE ARTICLE BE READ BEFORE ATTEMPTING CONSTRUCTION OF THIS TYPE CONVERTER.

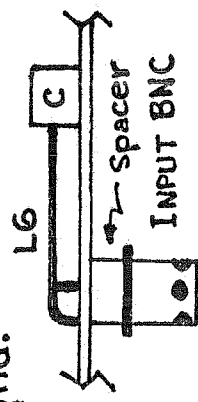


- L1 5T. #18, 1/4" dia.
- L2 2 1/2T. #18, 1/4" dia.
- L3 4T. #20, 1/4" dia.
- L4 1T. #20, 1/4" dia.

All spaced
1 wire dia.

- L5 1/8" copper strap 1/4" long } Spaced 1/8" above
chassis ground plane
- L6 1/8" copper strap 3/16" long.

- L7,8 28T. #24 enam., 1/4" dia. CW.
tapped 5T. above qnd.



902 MHz. CONVERTER

N.F. ≈ 9 db.

CX ≈ 10 pf. ceramic chip
or Teflon / Copper tape.

Chassis 3" X 5" X 3/4" made of 1/16" circuit board.
Approximate components locations shown below.

