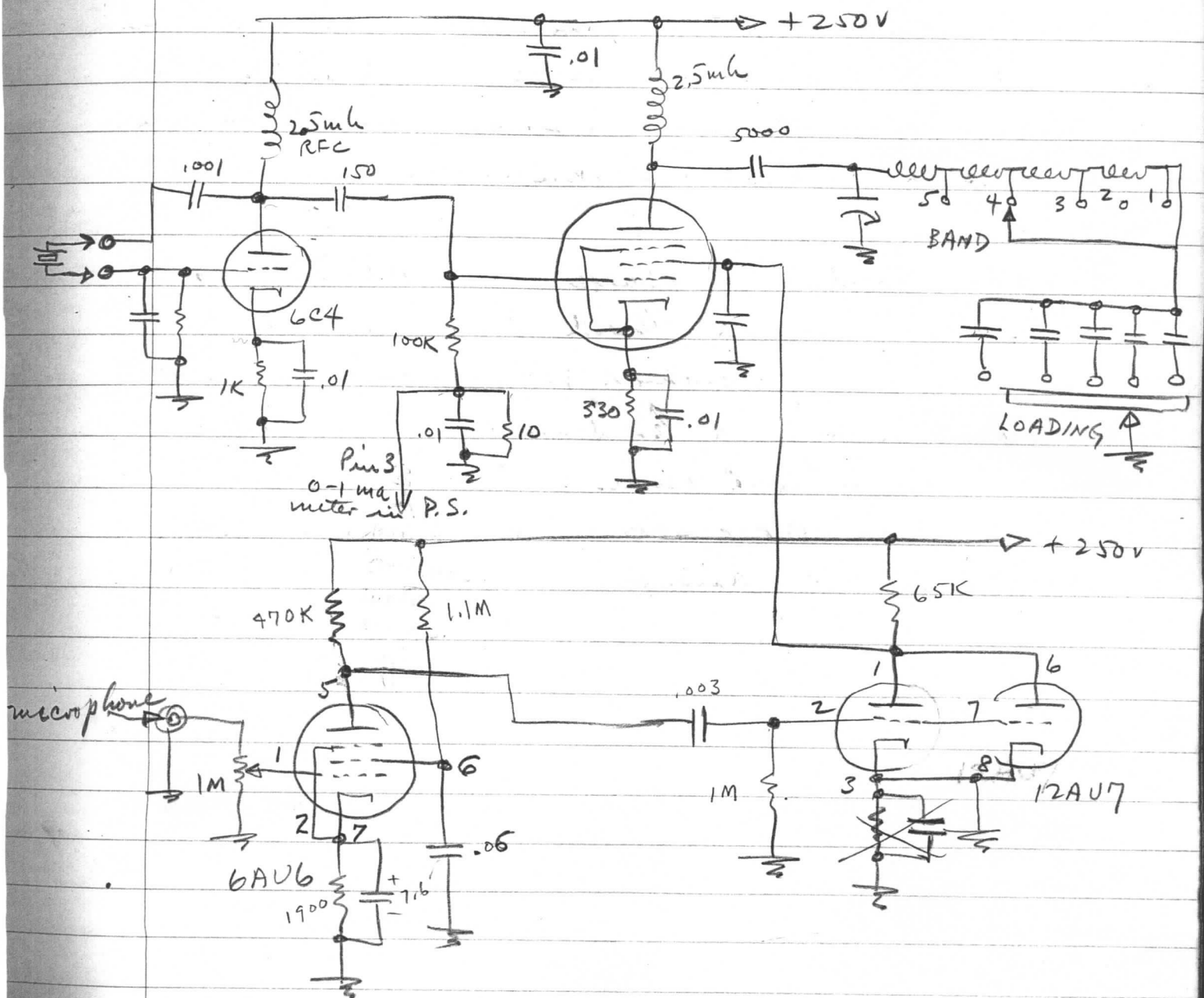
6/19/65 Modulator for RF signal source (p74 of previous volume)



7/1/65 Bought Cornell Dubilier Electronics Model AR-22 rotator and 4-10' lengths of steel television antenna mast yesterday.

The rotator is not the transistor driver type and it is an in-line rotator. I had intended to buy an Alliance C225. This one seems to be of heavier construction. It is "conservatively rated ... 150 pounds."

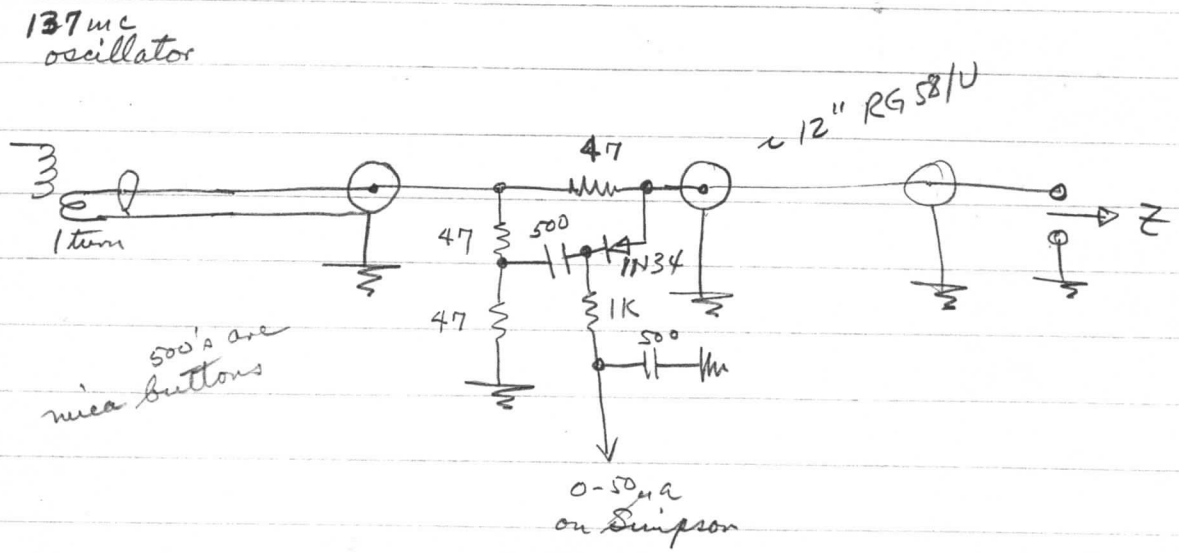
The position feedback on the AR-22 is a leaf-switch closed by a cam in the gear train. 60 closures per revolution of 360°; 1 revolution in 46 seconds. This feedback has no inherent "sense". The dial is spring loaded to allow a solenoid to operate an escapement. Solenoid is driven from the leaf switch.

The best approach seems to be a Tiny Atom motor and gear train drive to the control shaft. This will permit normal operation of the position indicator. I should be able to use the complementary symmetry transistor amplifier.

The Tiny Atom motor should be allowed to slip at the 360° stop. The drive should have enough backlash to allow the detent in the ARR to operate.

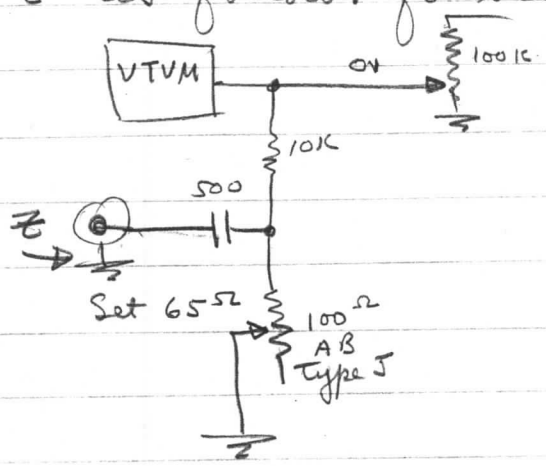
Setting the unit normally with the rotation stop at north should be satisfactory. Especially good for north-going passes.

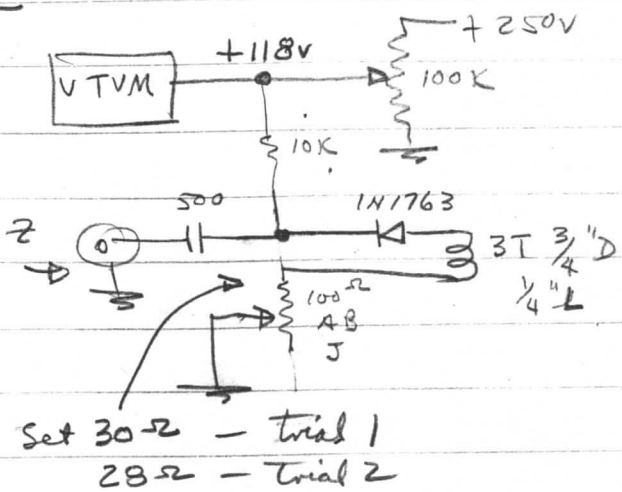
7/24/65 Reworked impedance bridge

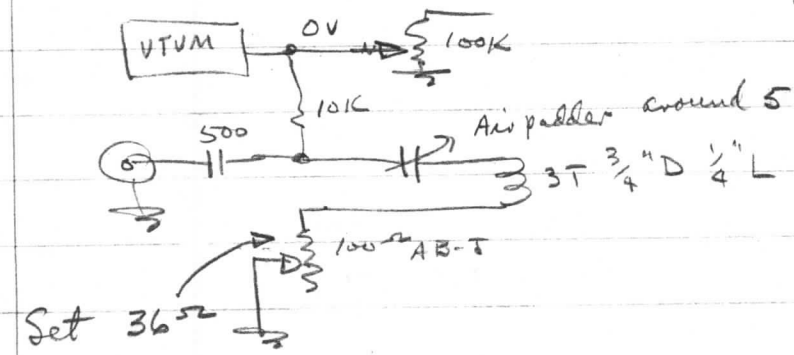


TEST OF IN1763 FOR VARACTOR USE

Z as follows for balance





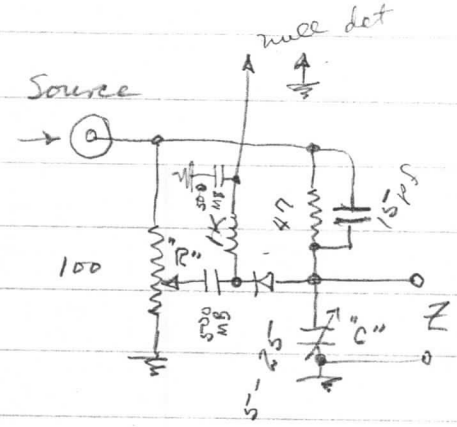


From this test, the spreading resistance seems to be of the order of 6 to 8Ω for 118v back voltage.

7/25/65 To be able to make routine measurements of antenna, lines, varactors, inductors, phasing networks - I need a bridge covering a fairly wide range of impedance containing a fairly large reactive component.

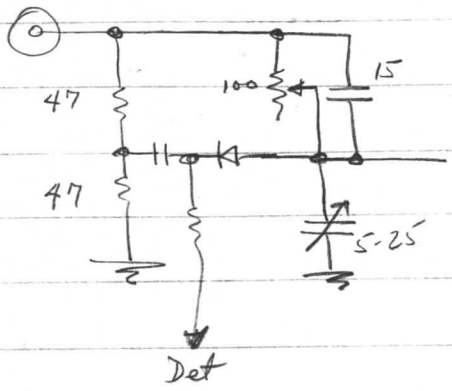
With single tube oscillator built for initial NIMBUS alignment at 137 mc, the bridge of p83 gives a maximum deflection of about 50μa on Simpson.

If I add a modulated amplifier to the oscillator output, I could then use an audio amplifier for more sensitivity. (If this were capable of being operated remotely it might also serve for antenna pattern measurements.)

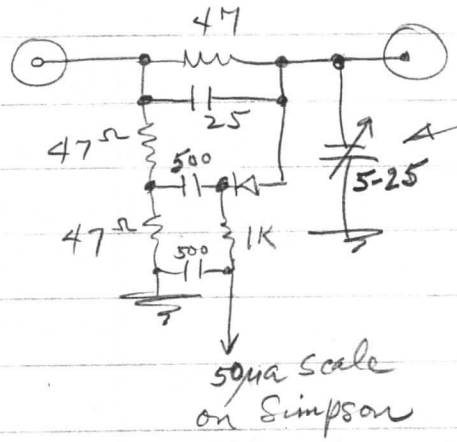


"R" would determine ratio against 47Ω but the "C" would have to be changed to provide the proper ratio against the 15 pf. — no longer 1:1 at balance

Perhaps better — no! — pot does not check — RF resistance seems to be 40% greater than DC.



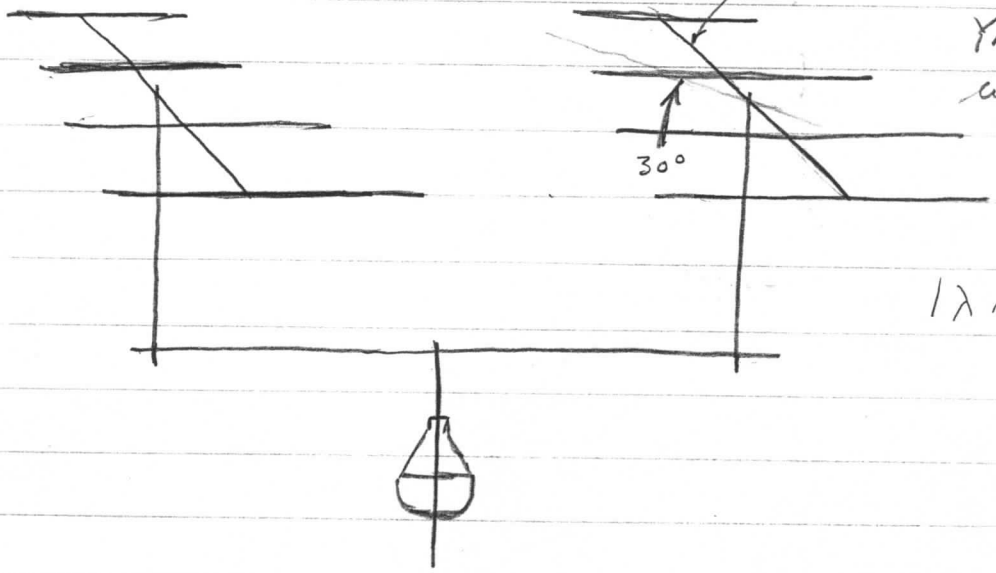
Back to:



This can accomodate about ±10 pf

8/1/65 Bought Craftsman Model 150 Drill press yesterday — Finished setup today - Very Fine Business Indeed - The threads on the Jacobs chuck locking screw were damaged, causing the chuck to run out of true - I filed them back to the original outline - Quite true now -

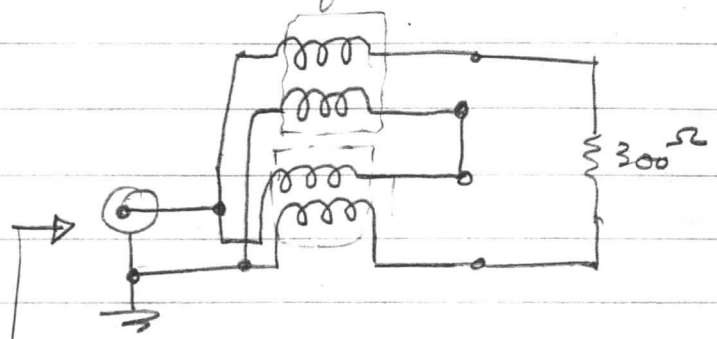
After much paper study of alternate impedance bridges, phase measurement techniques, and phasing networks - plus possible arrays — I come up with the following approach. [See p 97]



Two 3 or 4-element YAGIS pointed up 30 degrees - Single apis

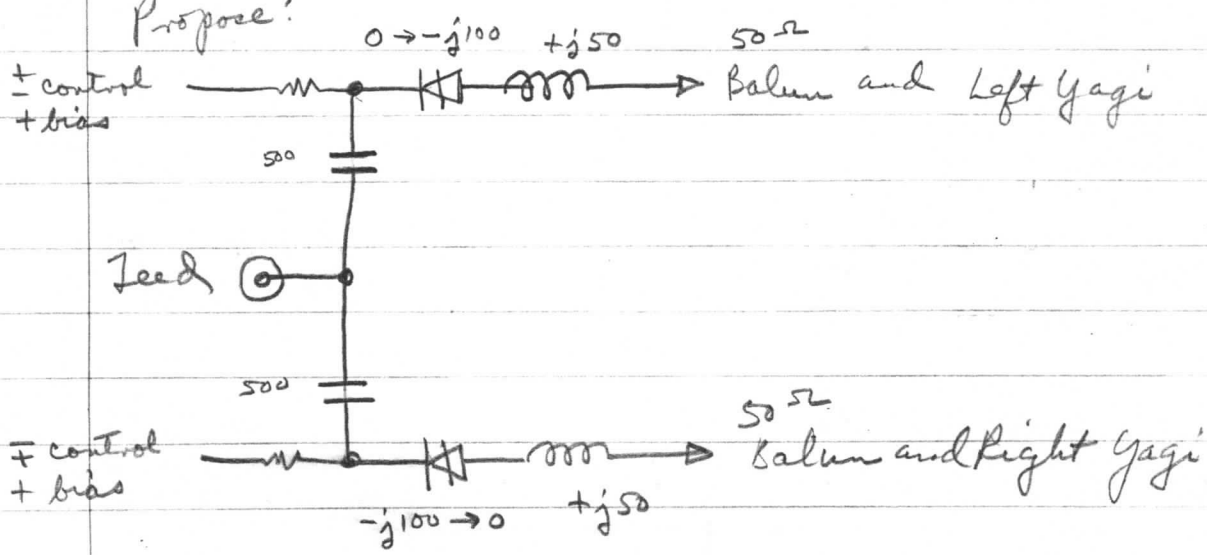
1 λ separation

Used the bridge (p 86) to check the receiving-type balun coils that were originally in the RCA MI-6969 boxes that I use for coax switching.

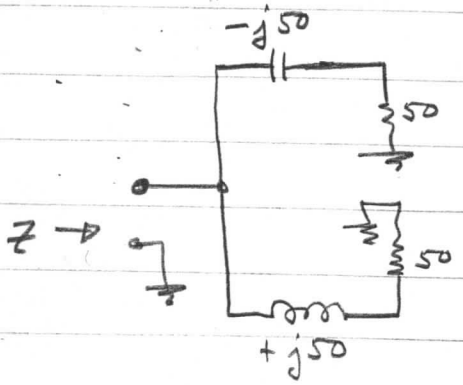


Very good match to 50Ω.

Propose:



Equivalent ckt

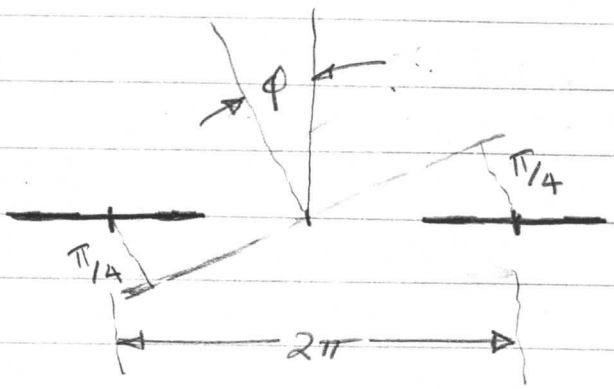


$$Z = \frac{(50 - j50)(50 + j50)}{50 - j50 + 50 + j50} = \frac{2500 + 2500}{50 + 50}$$

$$= 50\ \Omega$$

+ and − 45° ∫ phase shift.

with 1λ separation



$$\phi = \sin^{-1} \frac{\pi/4}{\pi} = \sin^{-1} 0.25$$

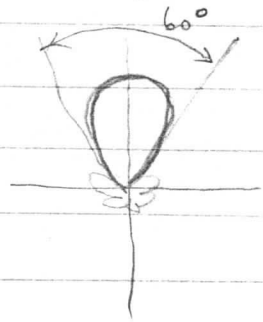
$$= 14.5°$$

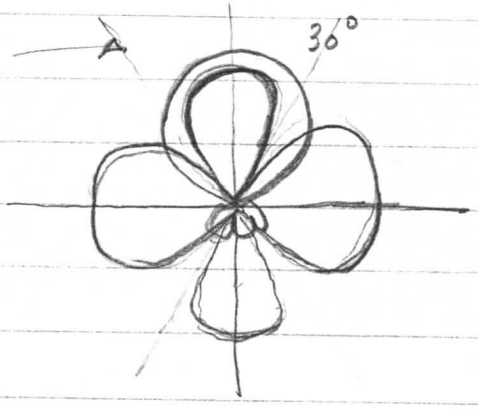
Peak to Peak nutation

$= 29°$

This is appropriate for a beamwidth ∫ 58°

1λ spacing gives nulls





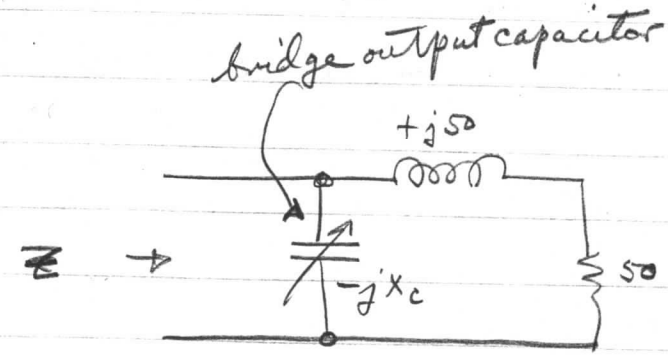
The vertical beamwidth of the YAGI is greater than the azimuth because of the omnidirectional elements (in lieu of dipole's cos θ pattern in azimuth).

Tilting up 30° combined with the closer range associated with the overhead operation should be worth a try.

I have arranged a tiny Atom motor and gear train to drive the AR22 ~~rotator~~ control box — Seems to work ok as a unit despite hand drill construction. I had to add an outboard gear reduction stage to slow it down, I also mounted a 2nd Tiny Atom motor 1:1 with the driving motor to use for tach feedback to overcome stiction at low drive speeds.

I have taken no precautions against RFI as yet.

To set up: Varactor and coil phase shift network:



$$Z = \frac{(50+j50)(-jX_c)}{50+j50-jX_c} = \frac{(-j50X_c+50X_c)}{[50+j(50-X_c)]} \frac{[50-j(50-X_c)]}{[50-j(50-X_c)]}$$

$$= \frac{-j2500X_c + 2500X_c - 50X_c(50-X_c) - j50X_c(50-X_c)}{2500+(50-X_c)^2}$$

$$= \frac{-j2500X_c + \cancel{2500X_c} - \cancel{2500X_c} + 50X_c^2 - j2500X_c + j50X_c^2}{2500+(50-X_c)^2}$$

$$= \frac{50X_c^2 - j5000X_c + j50X_c^2}{2500+2500-100X_c+X_c^2}$$

$$= \frac{50X_c(X_c - j100 + jX_c)}{5000-100X_c+X_c^2}$$

make $X_c = 100$

$$\underline{Z_{100}} = \frac{5000(100 - \cancel{j100} + \cancel{j100})}{5000 - \cancel{10000} + \cancel{10000}} = 100$$

This says that 100 Ω reactance in the output capacitor with an $R_S = 100\ \Omega$ will check the components — The $-j50$ Ω phasing reactance can also be checked by going the other side of normal balance on the bridge.

Indeed it works very ff — The leads of the 1N1763 are just right for the coil and 21 volts back bias matches for the other condition ($-j50$) —

Checked a second 1N1763 — same results.

8/21/65 Jet Propulsion Lab made first picture (8/20/65 (A)) of Marvin Harper's tape of selected nimbus pictures and test patterns. Recordings are on Left channel of side 1. 1800 ft of 1 mil Mylar 7½ ips.

Tape Frame	Orbit	Counter	Time from Start of Tape	
Start tape		000	4:40:00	
1	Test Pattern	000	4:40:00	
	End	082	4:44: +	
2	Start 166	95	4:44:45	has white bar for about 10 sec
	End	168		
	Start 254	173	4:48:35	
3 (3/20/65 (A) →)		177		frame 3 start
4 (8/21/65 (A) →)		250	4:52:10	frame 4 start
	End	328	4:55:32	End of frame & orbit
5	Start 006	332	4:55:50	Start of frame & orbit
	End	415	4:59:13	End of frame
	Start 034	420	4:59:30	
6		422	4:59:35	
7		508	5:03:58	
	End	598	5:06:25	
	108	603	5:06:37	
8		613	07:05	
	End	710	5:10:23	

(cont'd 2)

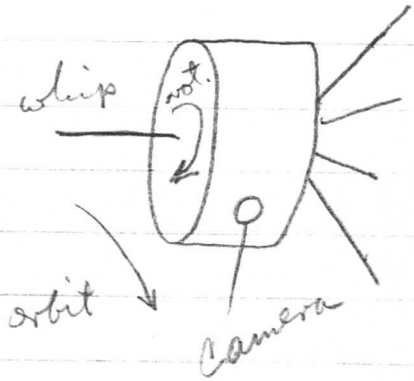
Tape Frame	Orbit	Counter	Time from Start
	122	716	5:10:25
9		723	5:10:50
10		828	5:14:15
	End	943	5:17:40
	137	948	5:17:50
11		953	5:18:00
12		(1) 081	5:21:27
	End	(1) 227	5:25:50
	near tape end	(1) 372	5:27:40

white bar 5:11:25-35

5:27:40
4:40:00
47:40 (package says 45 min)

8/22/65 On 8/21/65 : Changed from AR3 to Sylvania Glow Tube - Added 30K series resistor at plate-screen of 6AG5 driver since the current pinned the 10 ma meter. Current was then lower than AR3 operation, running about 2 ma or so on peak levels. Took 8/21/65 (A) of Frame 4. Exposure is low but resolution is tremendous. The individual raster lines are beautifully distinct. Apparently the optical efficiency is about the same as the AR-3 so I should change the 30K to give 6 ma with 7½ v p-p at the monitor point.

AED is proposing to change the TOS transmitter to 1 watt (instead of the Nimbus 5w) and to use the whip instead of the circular-polarized set of 4



36 / 15 / 0 / 18 / 36 / 54 0 / 37 / 16 | 600 / 48 / 120 / 112 / 8

Also, since the orbit is to be 750 n m and the pictures would overlap too much, Abe Schnapf is proposing 300 sec as the picture interval — still making a frame in .208 sec — shutting the transmitter and everything OFF in the 92 sec interval. 8 sec wait for phasing on frame

1680 / 10 20 / 6,60 / 60

8/23/65 Bought at Matlack's 8/20/65

- 1 – 16' – 1" x 1" x 1/8" al angle – $6 — 37½ ¢/ft — $5,40
- 3 – 12' – ½" OD al tubing @ 15¢/ft — $4,8
- 1 – 1' x 2' 32 oz (per ft²) .043" Cu sheet @ $1.20/lb
- 1 – 2' – 2" x 2" x ¼" iron angle @ $.10/lb 60

Matlacks closes Aug 30 and reopens in Nov at new location near W. Jersey Hospital.

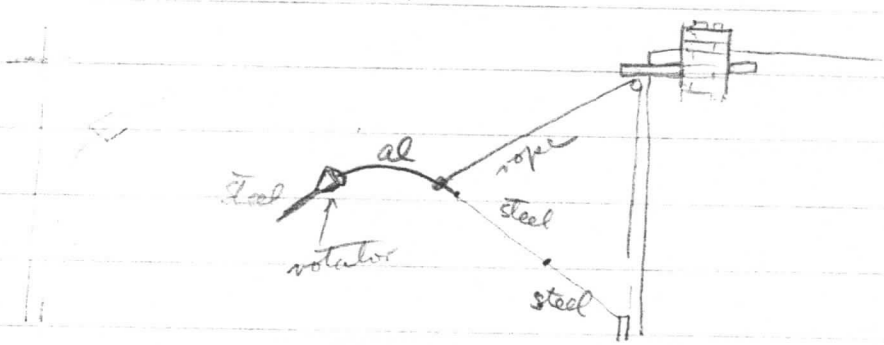
Already on hand from Radio Electric

4 – 10' x 1¼" OD steel tubing with oversize end for telescoping joint. @ $2.

4 – 10' x 1¼" OD al tubing @ $2.25

8/24/65 Nimbus apparently had horizontal polarization like the proposed TOS's. With a non-rotating horizontal dipole pointing N-S I would not have seen the effect of cross polarization — The approach of p 87 has the problem when the satellite is east or west of the station it will pass through the cross polarized condition.

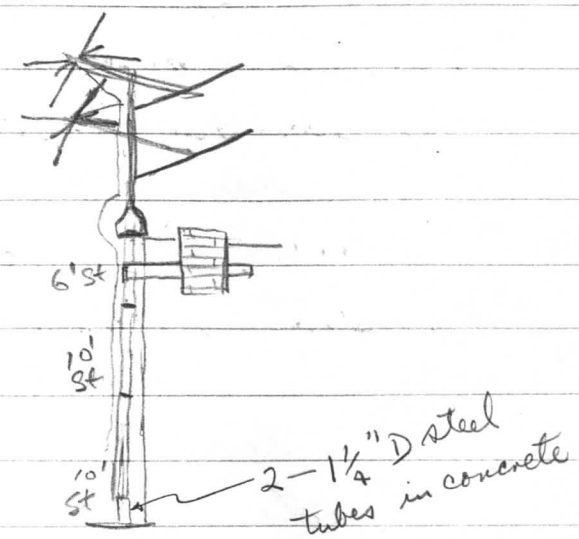
8/29/65 ~~Yesterday~~ changed the Baake's 2 bay TV antenna from the chimney to the new mast — Unexpected difficulty — I tried 2-10ft sections of steel tubing plus 1-10ft al tubing below the rotator with about 6 ft of steel tube above the rotator.

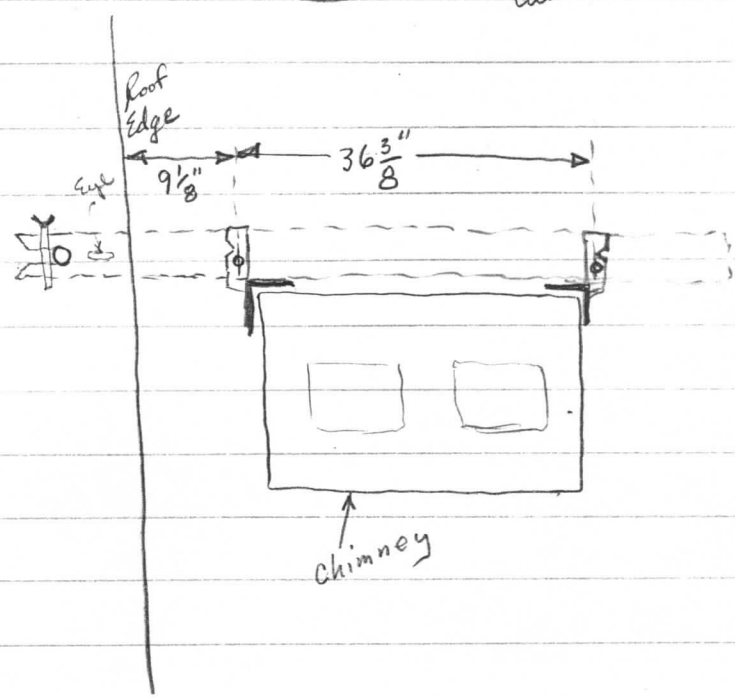


The al tubing bent very badly and took a permanent set.

This was changed to all steel below the rotator, shortened from 30 ft to about 25 ft. The antenna mast was put directly into the rotator, all wired and used on the TV set in the recreation room.

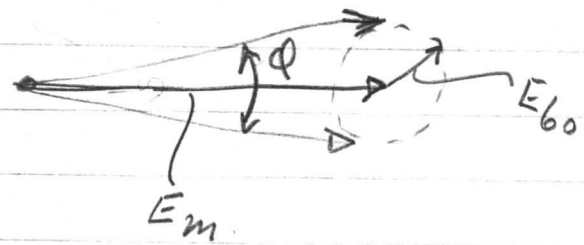
It rode out a fairly strong wind last night.





9/6/65 I had attributed the irregularity of the fiducials in the pictures to a beat between 60~ and

the motor drive frequency, — it is about the right frequency and the amplitude seemed correct. The 60~ motor drive also had a pretty poor waveform. I wound up removing the T19M14 which was being used as an audio interstage to drive the 807's in the power amplifiers.



The amplitude of the drive varies from 141V to 144V, making 3V p-p swing or 1.5V for E_{60} which is about 1.05%. Wave shape is good.

$$\frac{\Phi}{2} = 0.6°$$

$$\Phi = 1.2°$$

For the 6" picture $\frac{1}{4}$ sec = 15~ of 60cps

$$\text{p-p wiggle} = \frac{1.2°}{360°/\sim \times 15\sim/\text{line}} \; 6"/\text{line} = \frac{1}{750} \text{ inch, which should be}$$

all ok.

To get this result, also added another 0.5 μf to filter giving 1.5 μf total now.

9/27/65 Rebuilding the video electronics on a 10x17x3 al Chassis. Note discrepancies in circuits sent to QST.

Second stage of subcarrier amplifier (p 47) with Γ correction - 2.7K shown unbypassed Bbd has 2 μf bypass.

Magnetic head trigger clst (p 71) 6AG5 plate coupling condenser shown as 0.02 μf. Bbd has 0.22 μf.

10/1/65 2nd half of 6SN7 subcarrier amplifier plate load resistor actually 65K instead of 47K.

Demodulator output voltage divider - top resistor 75K instead of 56K.

With rebuilt chassis

Point (A) V-p-p AC (Eico VTVM) & Scope	Demod V-DC out (Simpson)	6AG5 plate current to neon bulb Series R Shorted ma
0	+0.4	0
0.07	+1	0
0.14	+2	
0.18	+3	
0.25	+4	
0.31	+5	
0.38	+6	0.1
0.43	+7	0.15
0.48	+8	0.2
Turned Off & on → 0.68 0.58	+10	0.3
0.62	11	0.4
0.75	14.2	0.8
1.1	18.5	1.6
1.5	25	3.2
2.5	39	4.8
1.3	21	2.4
1.0	17	1.2