

SERVICING 326-G DIGITAL VFO

PRELIMINARY- Before attempting to diagnose any difficulties, first check the +5 volt and +15 volt power supplies and ascertain they are within plus or minus 5% of their values. The AC ripple on either voltage should be less than .002 AC volts.

Physically check for loose hardware, broken wires or improper solder joints. Also check that the plug-in board in the bottom is properly inserted and secured.

Occasionally a loss of count is attributed to one of the slide switches "MULTIPLIER", or "DISPLAY" not pushed to its proper position but half way in between.

The 326-G is self-checking inasmuch as it will display any abnormalities.

NORMAL OPERATION- With power on, and "STANDBY" switch on, the display should show 5 digits indicating a frequency. When the "STANDBY" switch is off, the display should show all zeros if the "PRESET" switches have not been programmed.

If the display does not show all zeros when the "STANDBY" switch is off, program the presets to "ON" for all 5 switches, so display indicates all zeros for the following tests.

Turn "STANDBY" switch on, set "MULTIPLIER" to X1 and "DISPLAY" to "MC". The display should show some frequency. Example: 13.718.

Put display switch to "KC" and note display moves to left by one digit and the decimal place moves. Example: 3718.0.

Switch "MULTIPLIER" from "X1" to "X2". Display should almost double.

When HI/LO switch is switched from LO to HI, display should increase approximately 400 KHZ.

Turn coarse control from extreme counter-clockwise position to extreme clockwise position (10 revolutions). Frequency should increase approximately 500 KHZ. Similarly turn fine frequency control and note a frequency change of at least 5 KHZ.

Rotate band switch from position #1 thru position #6, frequency should consistently increase by several MHZ on each succeeding position.

Next turn "STANDBY" switch off and check out each "PRESET" block #1 thru #5 and note that the proper programmed digit is displayed on the switch that is operated. Do this for each of the digits 1

.C-9 n
se to pi

(contin

For A 1 - set 4 off
" 2 - set 2 off
" 3 - set 2, 4 off
" 4 - set 3 off
" 5 - set 3, 4 off

For A 6 - set 2, 3 off
" 7 - set 2, 3, 4 off
" 8 - set 1 off
" 9 - set 1, 4 off
" 0 - set 1, 2, 3, 4 on

NOTE: If the "PRESETS" have been set to some value and calibrated for a display of megacycles, the "PRESETS" will have to be shifted to the left one digit to maintain calibration when the "DISPLAY" is shifted to the kilocycle position.

Due to the gate action in the time base, the maximum accuracy of any counter is plus or minus one count. The last digit on the right (LED-1) can be expected to jump back and forth occasionally to the next lowest or highest digit. This does not mean that the frequency being measured is changing back and forth, only that the gate has closed or opened on half a cycle causing the display to indicate a single digit higher or lower.

SYMPTONS

PROBABLE CAUSE

- 1- No display, all lights are dark.
Blown fuse, defective voltage regulator IC-21, defective diodes D2, D3, D4, D5 in power supply. Possible short on +5 volt bus.
- 2- Display does not indicate proper PRESET digits when first turned on, and switching STANDBY switch to on does not cause the digits to change. Some digits will show missing segments.
Time base or gate section quit. Check IC-1, 2, 3, 4, 5, 6, 7, 8 and 9. If pin #1 of IC-6 has a waveform of 3 V.P.P., then check IC-7 and 8. DISPLAY or MULTIPLIER switch may be in mid position.
- 3- A segment in one of the digits does not light up.
Defective LED display or decoder. To test a segment of the LED, connect one end of a 100 ohm resistor to the ground strip on the top board and successively touch pins 1, 2, 4, 6, 7, 9, 10 with the other end of the resistor, each segment touched should brighten if it is OK.
- 4- One of the displays indicates an E or P or L or goes off occasionally, or a digit can not be PRESET.
Check LED segments as in 3 above, if OK then check associated decoder and counter IC and PRESET switch. Best method is to program PRESET for a zero. Pins 3, 4, 10, 11 on the counter IC should then measure zero volts if the switch is OK. Pins 2, 5, 6, 9, 12 on the counter IC will measure zero volts if the counter is OK.
- 5- One of the displays skips a count, or jumps several digits while counting.
Check counter IC associated with the display, if OK then check preceding counter IC as it may be passing extra counts.
- 6- Display blinks on and off rapidly.
Pin #3 of all the decoder IC's is grounded, or IC-9 the hold off timer is not functioning. Place a scope on Pin #3 of IC-9 to ascertain presence of waveform as shown in figure #108. If a section of IC-8 is defective, then IC-9 may not be receiving a trigger pulse to pin #2 of IC-9.

(continued)

SYMPTOMS

- 7- Count does not go thru all 5 displays but stops on one of them.
- 8- After running for a period of time, display goes back to the PRESET value, or begins to display erratically. Turning STANDBY off, presets are OK.
- 9- Display will only indicate the PRESETS and will not count, and VFO output appears normal.
- 10- Display with PRESETS to zero, reading VFO output only, does not display accurately.
- 11- Display will not show PRESETS for the first 30 seconds of warm-up.
- 12- VFO output frequency unstable and varies by several hundred cycles or more.
- 13- Touching VFO base causes frequency to change when the VFO output cable is unplugged.
- 14- Mobile VFO blows fuses or sparks when connected in a vehicle, or the VFO cable is plugged in.

PROBABLE CAUSE

- Check the counter IC where the count stops, and the one preceding it.
- Insufficient drive from IC-20 most likely. Possibly a weak amplifier Q1 or Q2.
- IC-8, Q1 or Q2 is defective.
- Confirm this by reading VFO output with a frequency counter. Defective crystal XC on top board.
- Weak crystal XC or weak IC-1.
- Oscillator transistor Q3, varicap diode V1. First check voltage across Z1 zener diode, and +5 volt bus to see that they are stable and have no ripple on them. If the unit is a DC model, check transistor Q5 for stable operation.
- The common ground in the VFO is touching the case. This is only prevalent in the mobile models only. Most likely to occur at the voltage regulator IC-21 or the shield on the mini-coax at the back of the connector on the HI/LO switch. The mobile unit is full floating and the resistance from the circuit board common is at least 10,000 ohms.
- One of the power leads is touching the case and is not floating. See diagnosis in (13).

(continued)

SYMPTOMS

PROBABLE CAUSE

- 15- Warble or gravelly sound coming out of receiver or transmitter when using VFO.
- 16- VFO drifts in excess of 5KHZ after 30 minutes of warm-up.
- 17- Insufficient drive from VFO to run receiver at normal volume or transmitter at normal power level.
- 18- Transmitter power is OK in middle of band but falls off on either end.
- Feedback condensor in oscillator circuit of receiver or transmitter is free running and causing secondary frequencies to be generated. See fig. #3 or #4 for hook-up. If VFO is an AC unit, low line voltage will cause the zener diode Z1 to pass AC ripple, a larger condensor of at least 200 MSD at 25 volts may be put across C31 (to MS/25V) to minimize this.
- Normally, 100 hours are required for all parts to thermally stabilize to minimize drift to a token value. This relieves stresses due to lead bending, soldering, thermal expansion, etc. However, the drift may be eliminated almost completely by juggling the temperature coefficients of C18 and C17. Example: VFO drifts up to 10 KC; change C17 to 30 PF N750 and C18 to 40 PF NPO. If VFO drifts down to 10 KC change C18 to 20 PF N750. In other words, for upward drift use less N750 and more NPO to compensate for it, and for downward drift, use more N750 and less NPO. But maintain a total value of 70 PF (20+50), (30+40), etc.
- If the radio is a tube type set, an amplifier kit will be required to boost the drive to an acceptable level to drive the tubes. For transistor radios, IC-20 may be weak, or the balun coil may be open. Check that plug is properly inserted in VFO, and that the cable is not shorted, and solder connections to balun are good and clean. If an RF voltmeter is put at the output leads (yellow and red) it should measure a minimum of .7 volts RMS (2 volts peak to peak)
- Possibly insufficient drive but more than likely transmitter needs a little peaking to broaden the spread to match the VFO.

(continued)

SYMPTONS

19- Receiver is receiving the desired frequency and another frequency but weaker.

20- Receiver appears to be receiving many stations at once.

21- Transmitter puts out undesirable frequencies.

22- After programming the VFO and connecting to transceiver, the receiver functions but has a few "S" units loss and the transmitter doesn't put out any power.

23- VFO has a tendency to jump frequency by several KC or more when case is tapped or from vibration such as in a mobile.

PROBABLE CAUSE

This normally occurs when operating out of the band at a higher frequency than normal. If the receiver has 455 KC IFs this will be more pronounced. It is the image of the IF frequency.

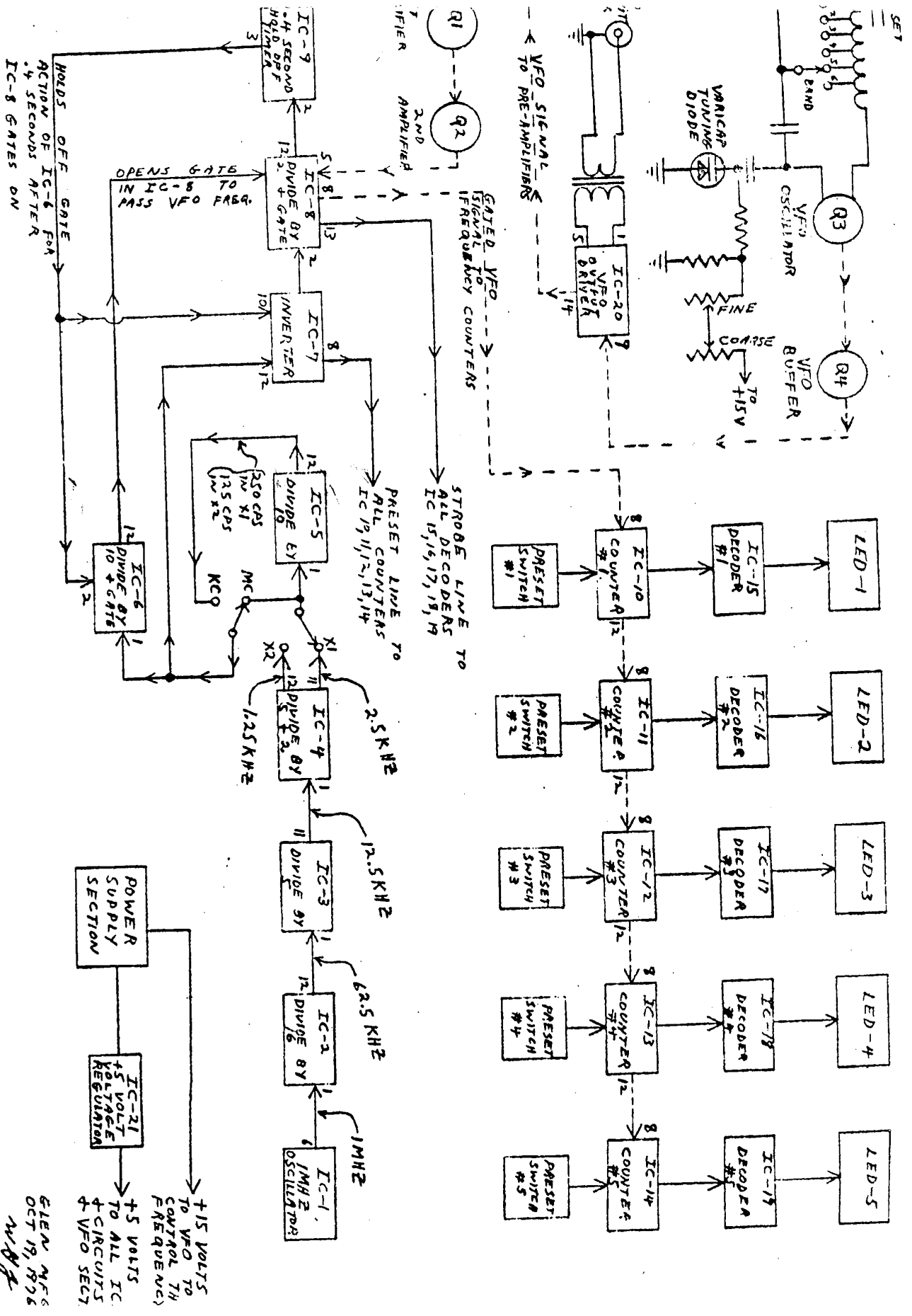
Mixer stage of radio is overloading from too many signals at once. It is also possible that too much injection is present from the VFO. If this is the case, a resistor of typically 100 ohms may be inserted in series with the balun output leads to attenuate it. A larger resistor may be used but will probably cut down on the sensitivity.

Possibly due to overdrive from the VFO. This can be determined by inserting a resistor of 100 to 500 ohms in series with the balun leads. Too large a resistor will significantly reduce output power. The problem may be attributed also to operating out of the band and generating a lower product of a weaker mixing frequency. This will be more pronounced if mixing frequencies are present of less than 6 megacycles.

Re-check the frequency leaving the VFO, and the program settings along with the MULTIPLIER, DISPLAY switches. Next check the VFO output cable and balun for shorts and opens. Measure the frequency leaving the VFO and ascertain it is correct, and check the RF output level leaving the balun for .7 volts RF. Make doubly sure that balun is connected to the proper circuit in the radio. It is possible to connect to a circuit that will only receive and not transmit or vice versa.

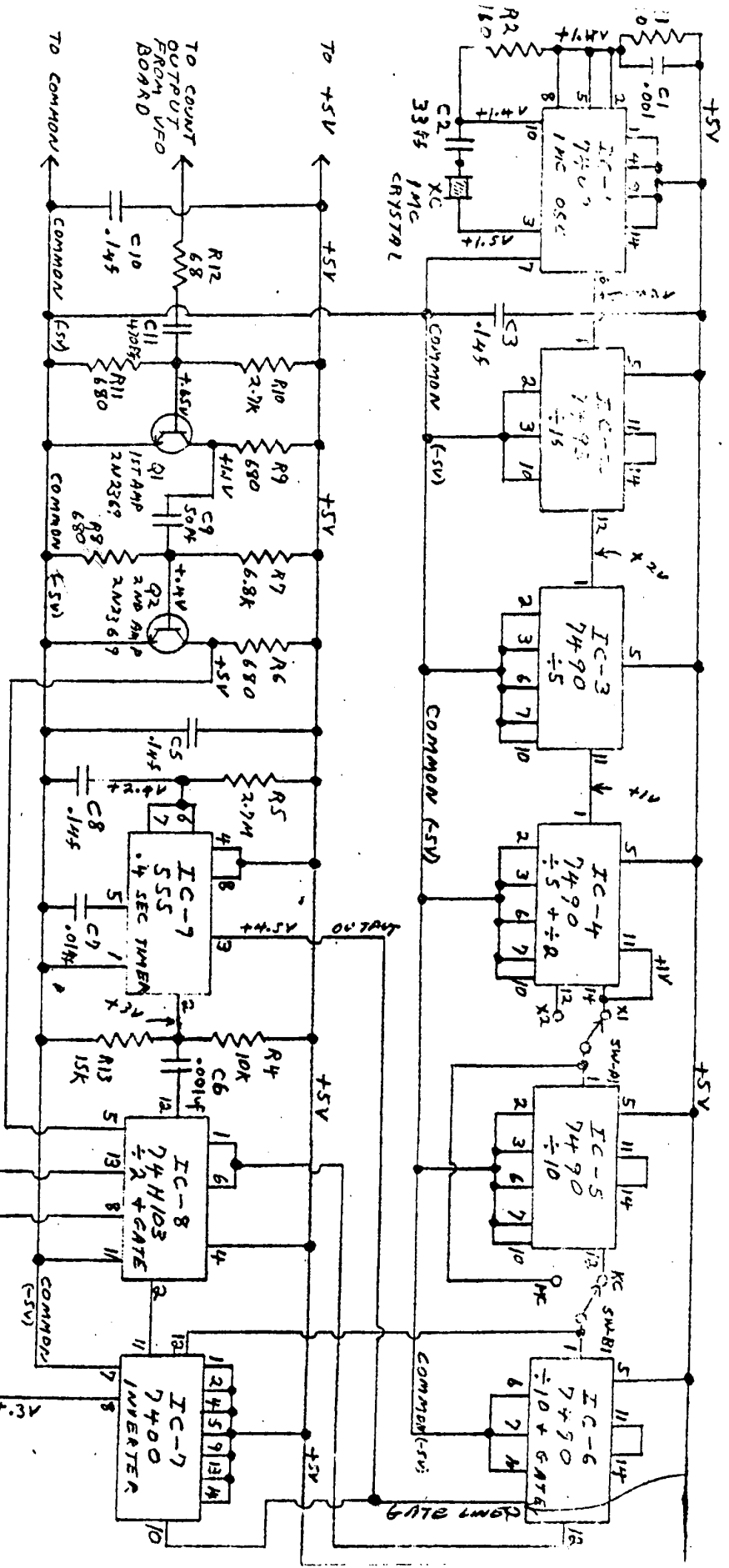
Check coil on back of VFO chassis that slug is tight, a small dab of finger nail polish on the threads where it enters the coil will eliminate this problem.

FUNCTIONAL BLOCK DIAGRAM OF 3405



GLEN MFG
OCT 19, 1976
WAG

COUNTER FOR AMPLIFIER, TIME BASE, GATE LOGIC + HOLD DEF FOR 326G



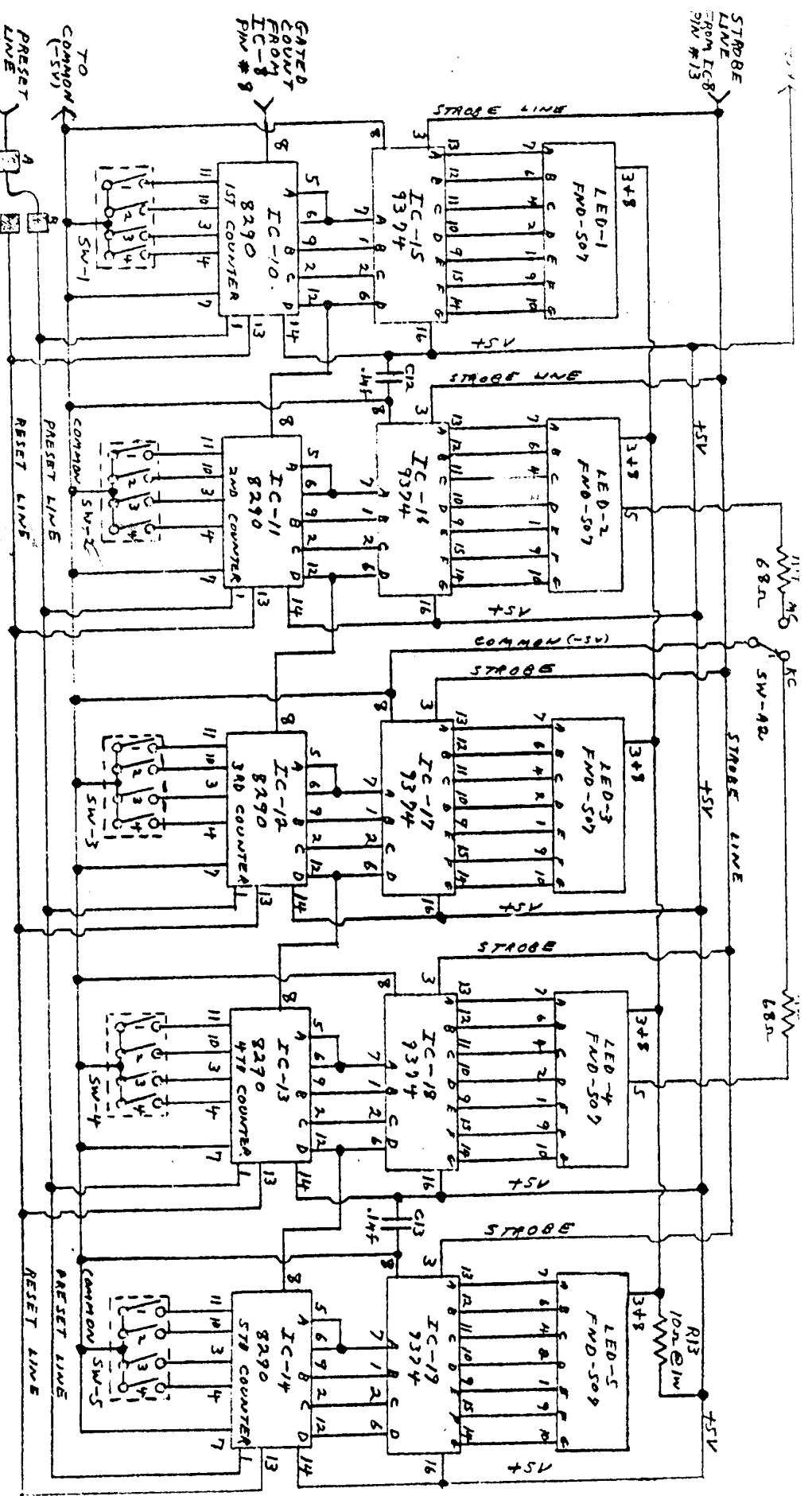
NOTE: WHEN SWITCH SW-A1 IS IN X1 POSITION, FREQUENCY INPUT FROM VFO BOARD IS UN-AFFECTED. IN X2 POSITION, FREQUENCY WILL BE DOUBLED BY MULTIPLYING GATE TIME ON LENGTH BY 2. SIMULTANEOUSLY, THE RANGE OF THE COARSE CONTROL WILL BE CUT IN HALF. BY SWITCH SW-A2.

KC, MC SWITCH SW-B1 DIVIDES TIME BASE BY 10 TO DISPLAY KC OR MC WITH AN ACCURACY OF EITHER .1KC IN KC POSITION OR 1KC IN MC POSITION. SIMULTANEOUSLY THE DECIMAL IS SHIFTED.

PRESET LINE TO ALL COUNT IC-10, 11, 12, PIN #1

GATED COUNT TO IC-10 PIN #1

STROBE LINE TO ALL DECODE AS IC-15, 14, 17, 18, 19 PIN #3

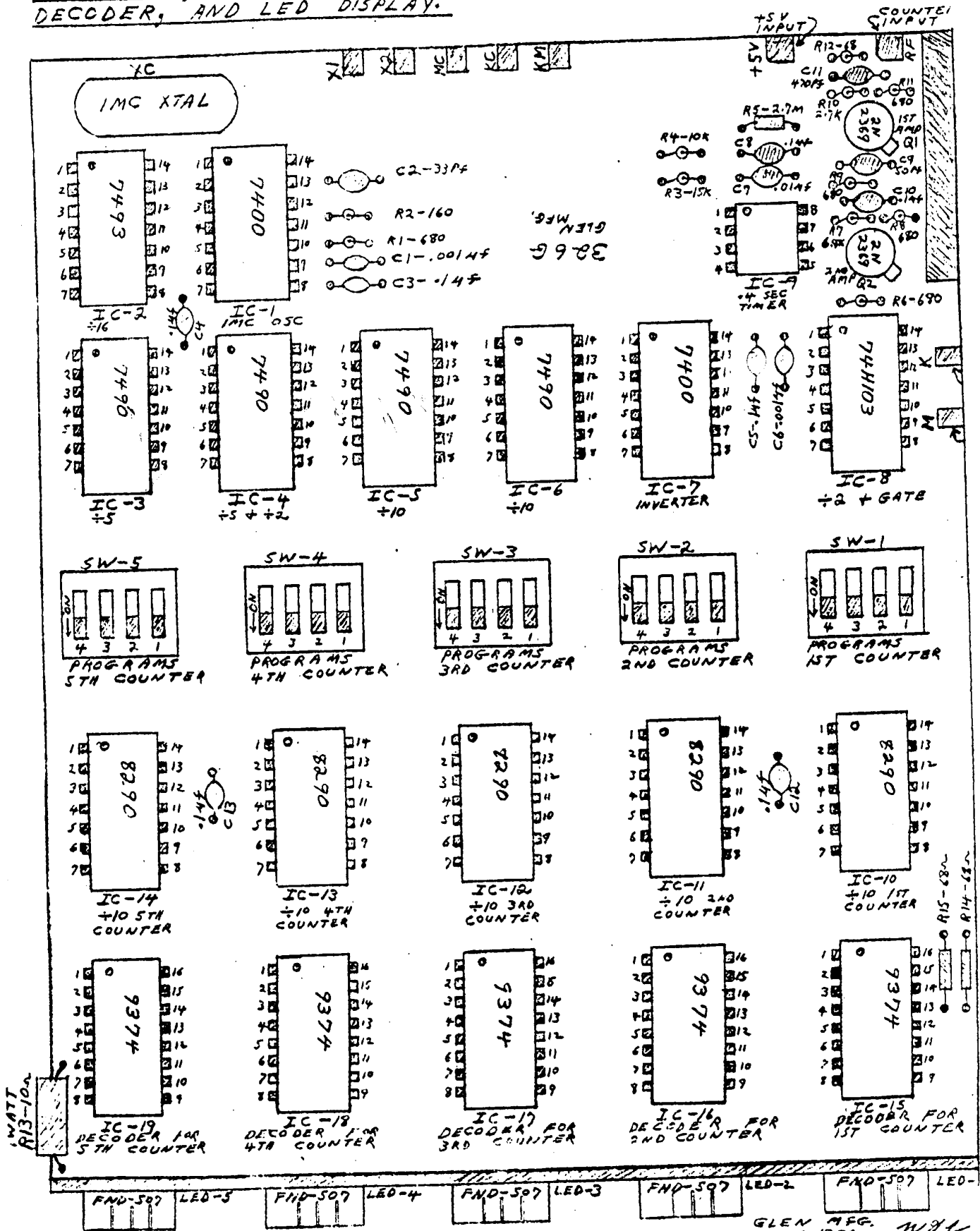


NOTE: 'A's CONNECTED TO 'B' WHICH CAUSES THE COUNTER TO BE PRESET TO THE DIGITS SET BY THE SWITCHES.
 IF THE CONNECTION BETWEEN 'A' + 'B' IS BROKEN, + 'A' IS THEN CONNECTED TO 'C', THE SWITCHES ARE BYPASSED + THE COUNTERS WILL THEN RESET TO ZERO.

PROGRAMMING DISPLAYED DIGIT	SWITCHES ON (CLOSED)	SWITCHES OFF (OPEN)	PROGRAMMING DISPLAYED DIGIT	SWITCHES ON (CLOSED)	SWITCHES OFF (OPEN)
0	1 2 3 4	NONE	8	2 3 4	1
1	1 2 3	4	9	NONE	1 2 3 4
2	1 3 4	2	E	3	1 2 4
3	1 3 4	2 4	L	2	1 3 4
4	1 2 4	3	H	2 4	1 3
5	1 2	3 4	P	4	1 2 3
6	1 4	2 3	-	3 4	1 2
7	1	2 3 4			

GLEN M.
 OCT 3, 1964
 NWB

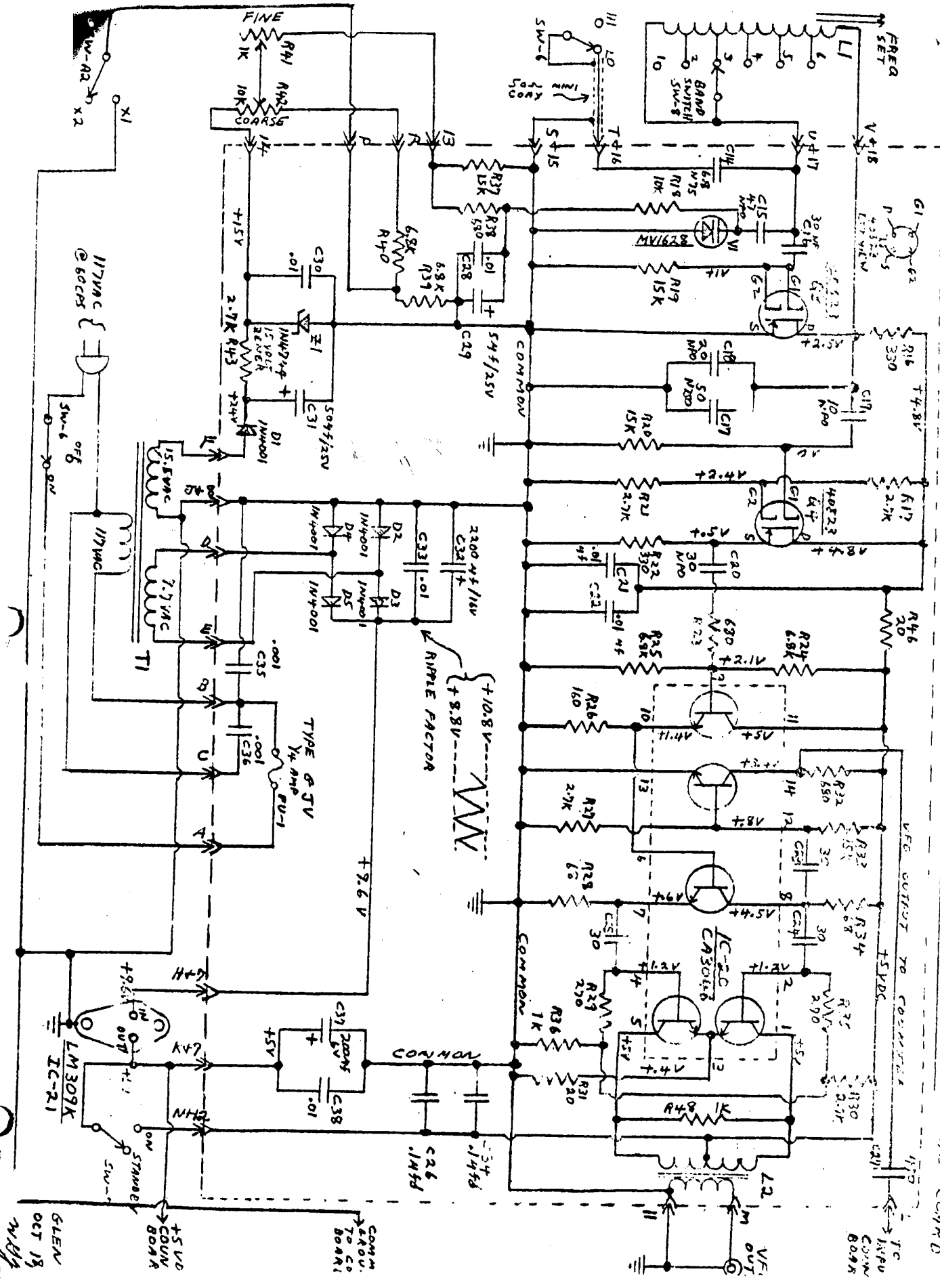
COMPONENT LAYOUT OF TOP BOARD - CONTAINS TIME BASE, GATE LOGIC, COUNTER PREAMPLIFIER, PROGRAMMABLE 50 MHZ COUNTER, DECODER, AND LED DISPLAY.



SCALE = 1.8 X ACTUAL SIZE

GLEN MFG. W97
OCT 6-1976

AC POWER SUPPLY, VFO OSCILLATOR + COUNTER DRIVE FOR 3266 AC 80940

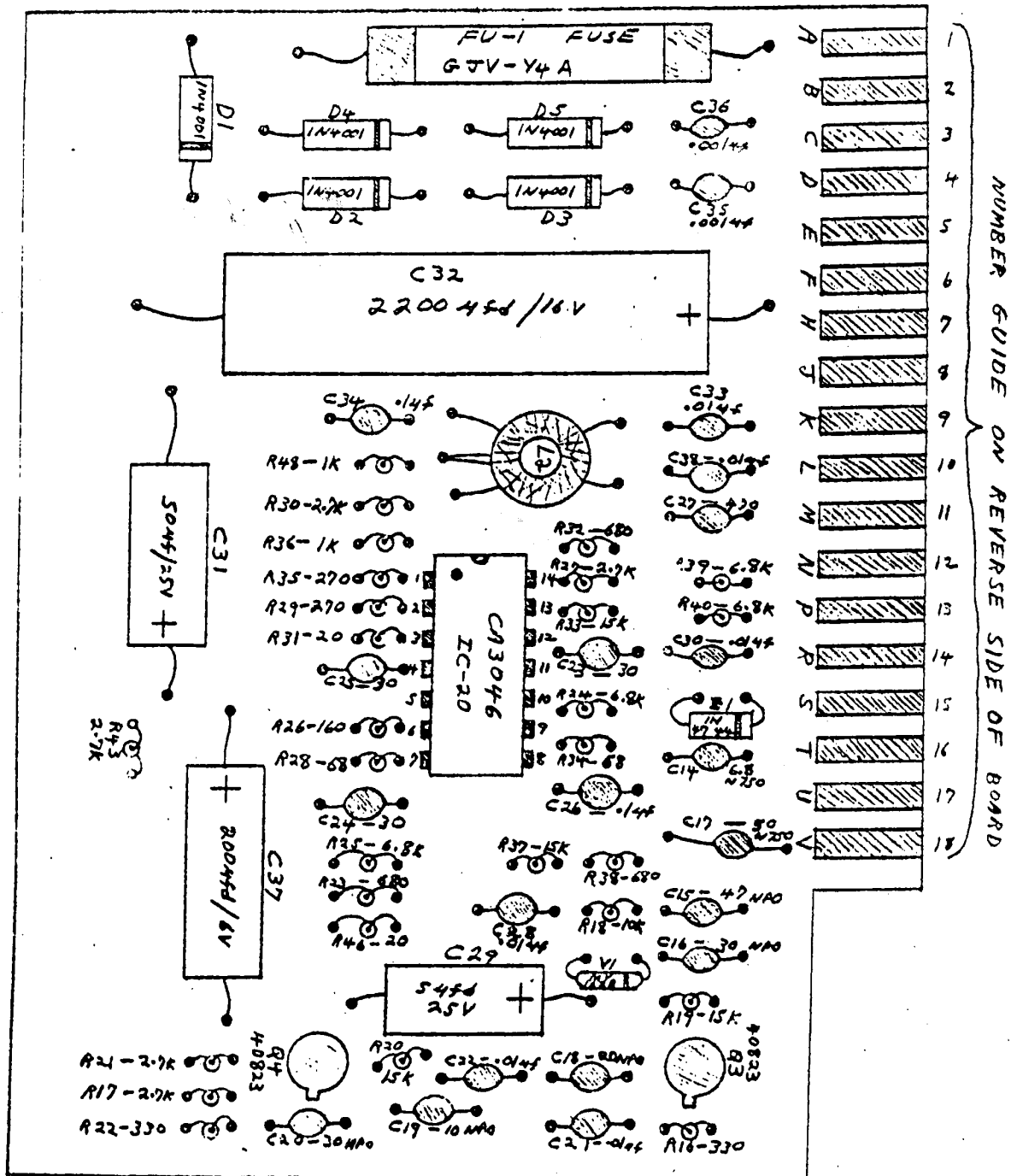


GLEN
OCT 19
W89

FIG #105

COMPONENT LAYOUT OF BOTTOM BOARD
AC POWER SUPPLY, VFO OSCILLATOR + COUNTER
DRIVE FOR 326 G.

326G-2A
AC BOARD

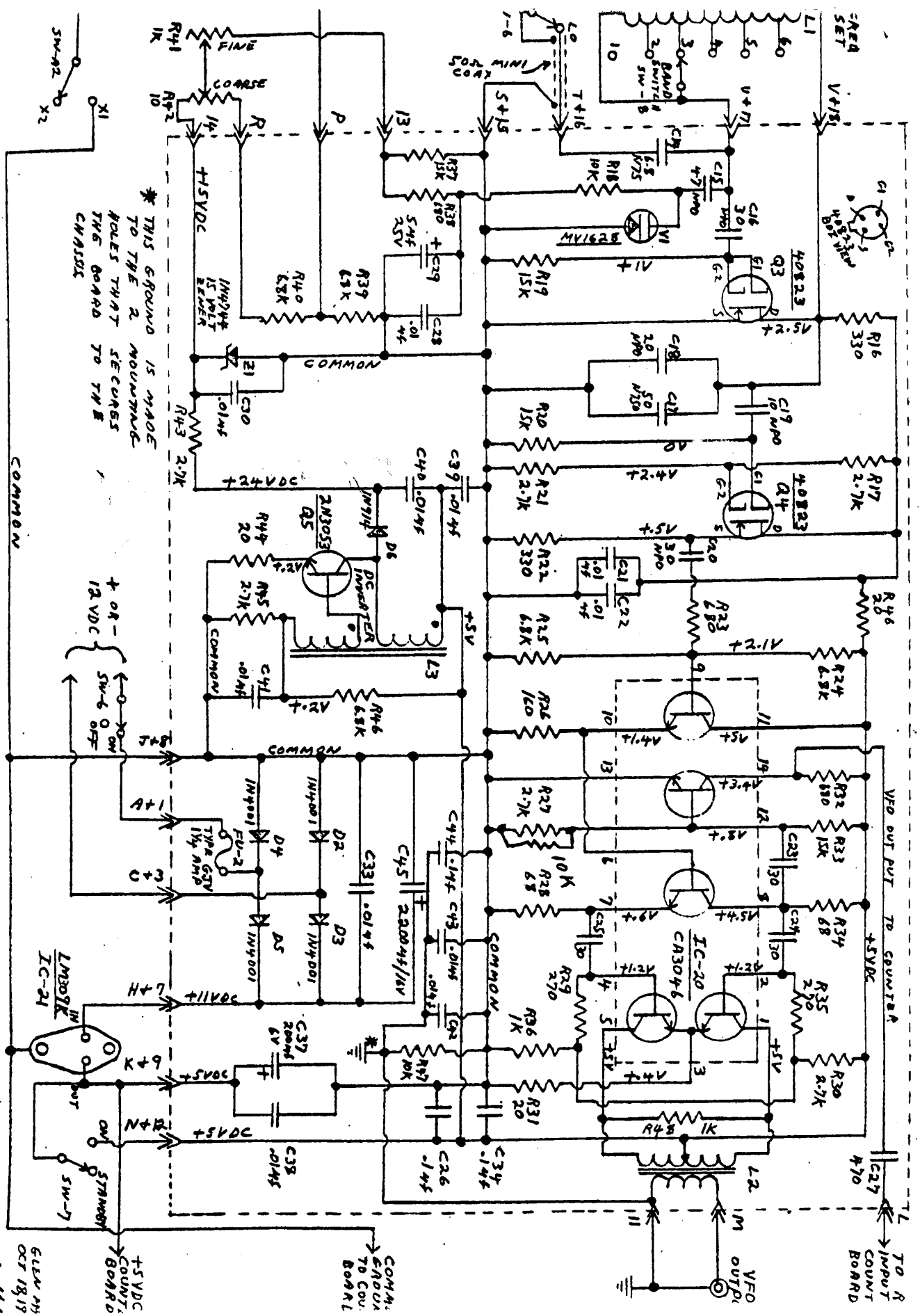


TOP VIEW
2 X ACTUAL SIZE

GLEN MFG
OCT 18, 1972

DC POWER SUPPLY, VFO OSCILLATOR & COUNTER DRIVE FOR 3266

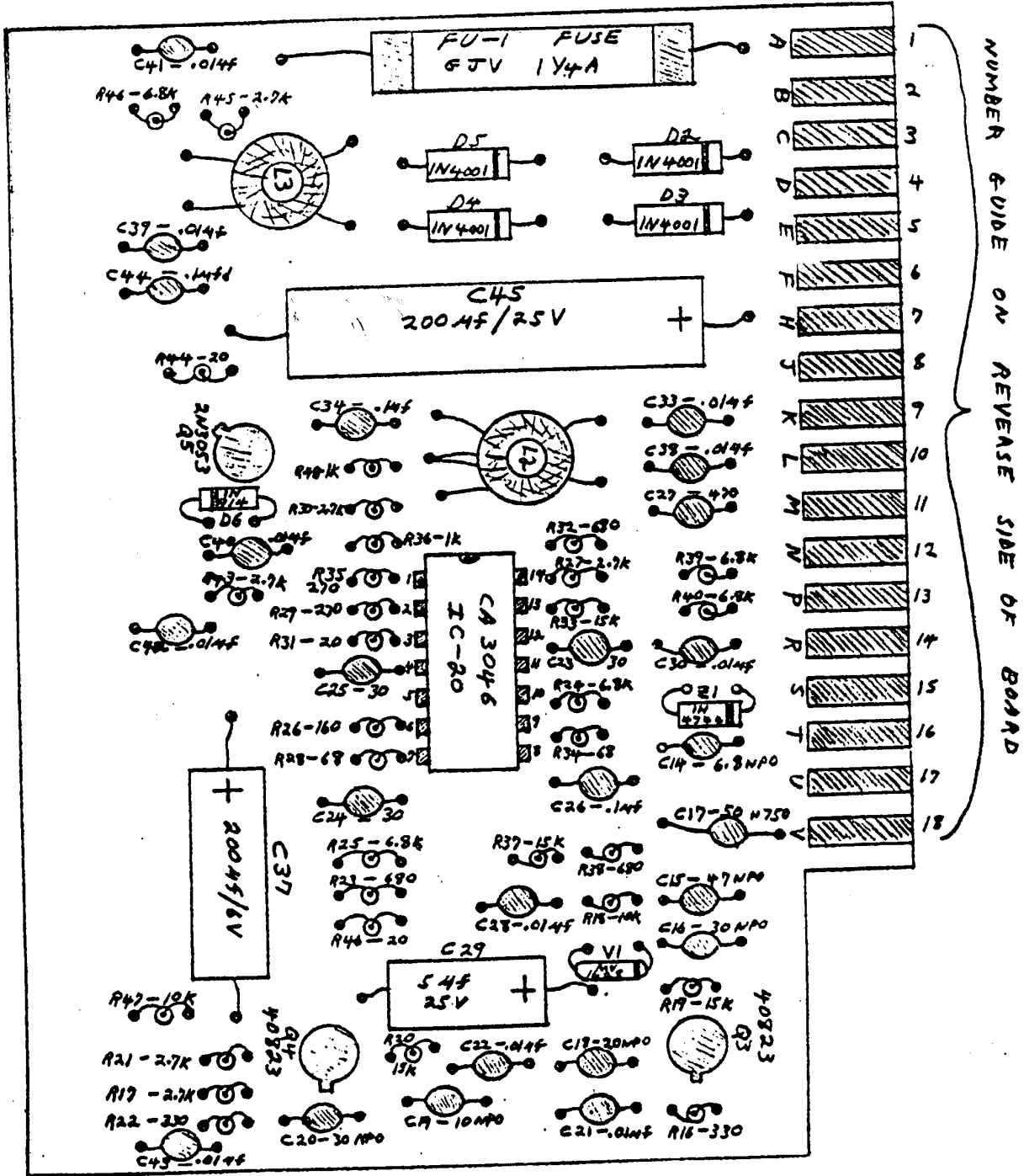
3265-1A



* THIS GROUND IS MADE TO THE 2 MOUNTING HOLES THAT SECURES THE BOARD TO THE CHASSIS

GLENN M.
OCT 18, 1971
M.H.

COMPONENT LAYOUT OF BOTTOM BOARD
DC POWER SUPPLY, VFO OSCILLATOR + COUNTER
DRIVE FOR 326G.

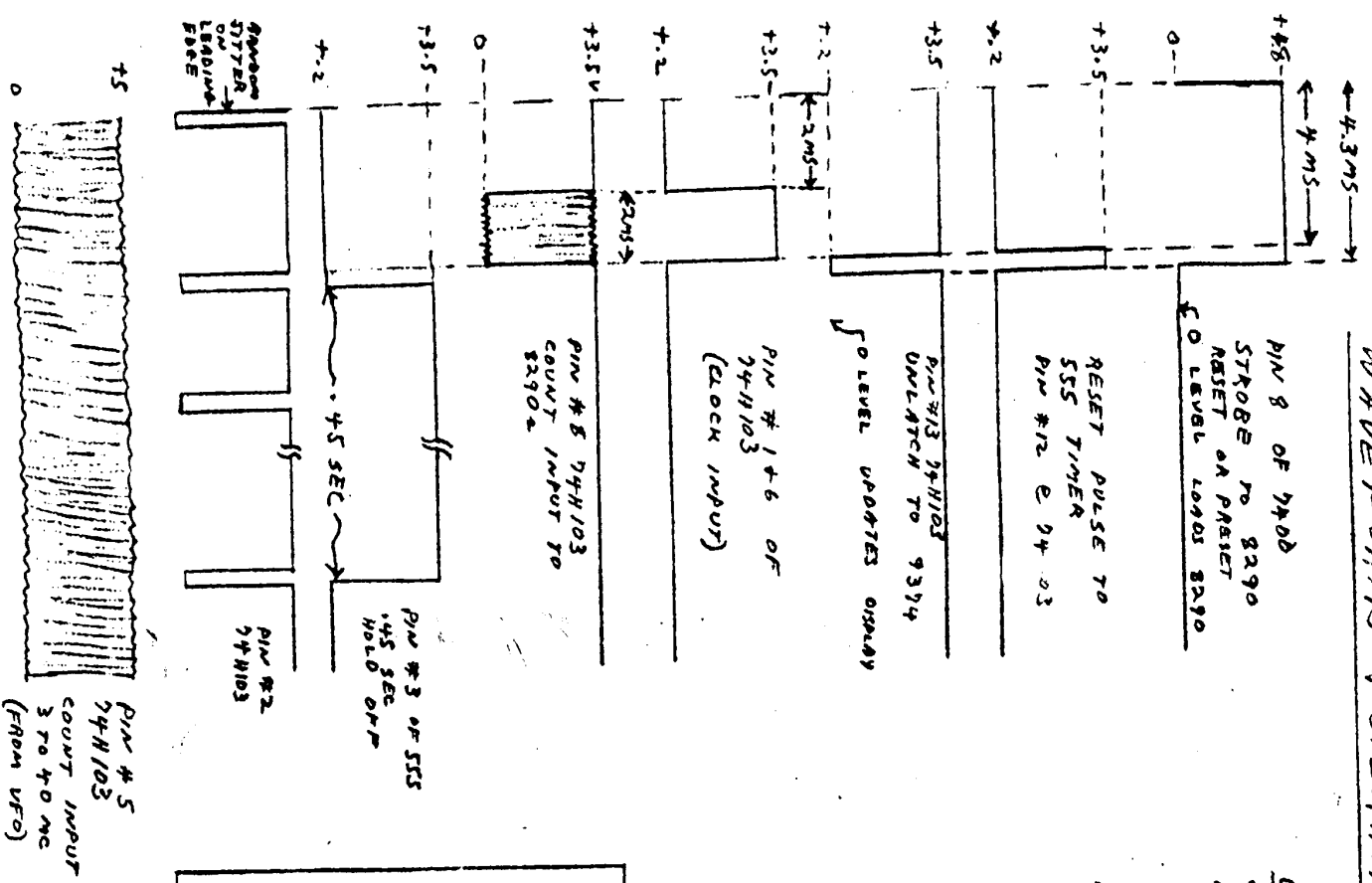


TOP VIEW
2 X ACTUAL SIZE

GLEN M
OCT 18, 1972

WJF

WAVEFORMS + OPERATIONS OF ONE CYCLE

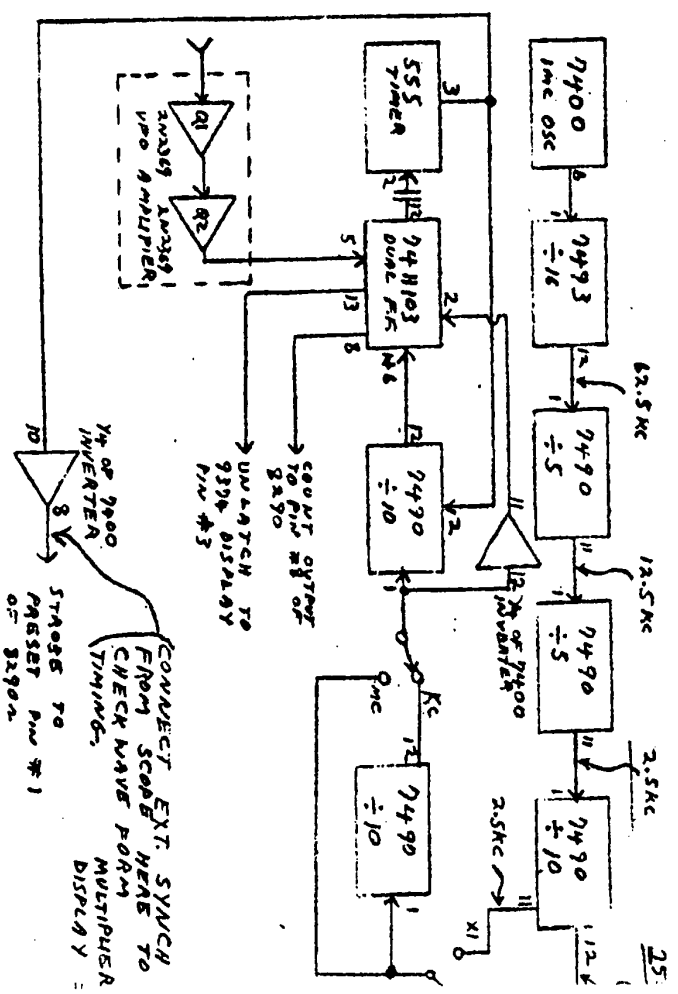


OPERATION: CLOCK PULSES LEAVING 7490 PIN #2 CLEAR COUNT PIN #10 OF 74H103 FOR A PERIOD OF 2MS ALLOWING IT TO SETTLE AT THE FREQ. ARRIVING AT PIN #5 + DIVIDING IT IN HALF (x2). PIN #5 (74H103) HAS 2MS OF GATED INPUT FREQ. x2.

WHEN CLOCK PULSE ON PIN #6 (74H103) DROPS TO ZERO THE FIRST CLEAR PULSE AT PIN #2 CAUSES PIN #10 TO RESET GENERATING A PULSE AT PIN #12 (x1). THE PULSE AT PIN #13 UNMATCHES THE 9374 DISPLAY DECODER + DRIVER UNMATCHING THE NEW DISPLAY.

THE PULSE SIMULTANEOUSLY APPEARING AT PIN #11 TAGGERS THE TIMER ON WHICH RESETS THE 7490 AT PIN #10 BLOCKING ANY FURTHER CLOCK PULSES FROM IT AT THE END OF .45 SECONDS, THE TIMER RESETS + ALLOWS THE 7490 TO DELIVER A NEW CLOCK PULSE.

WHEN THE CYCLE REPEATS IT SELF,



FLOW DIAGRAM OF GATE LOGIC

CLEAN OCT 13, 1968

CONNECT EXT SYNCH FROM SCOPE HERE TO CHECK WAVEFORM MULTIPLEXER DISPLAY

74 OP 7400 INVERTER STROBE TO PIN #1 OF 8290.

COUNT QYTRG TO PIN #8 OF 8290

UNMATCH TO 9374 DISPLAY PIN #3

7490

7490

7490

7490

7490

7490

7490

7490

7490

7490

7490

7490

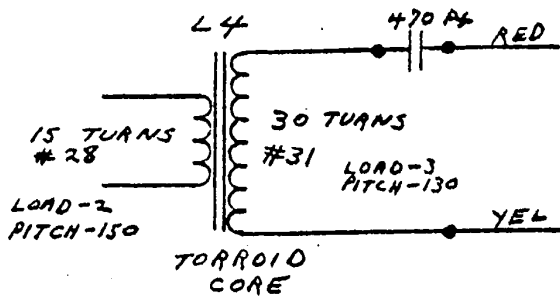
7490

7490

7490

7490

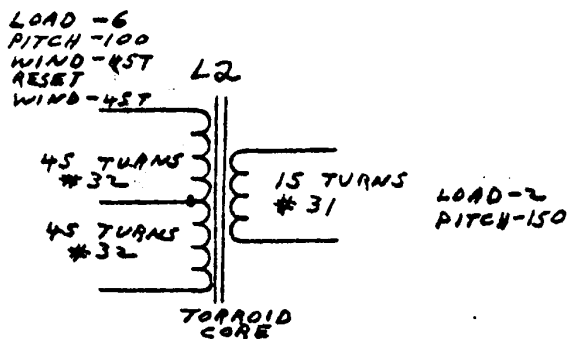
OPERATION FREQUENCY = 7-25 MHz



BALUN COIL - LEAD LENGTH 2 INCHES LONG.

CORE FREQUENCY 7-30 MHz
 CORE I.D. - .2 INCHES
 CORE O.D. - .4 INCHES
 CORE THICKNESS - .125 INCHES

FIG #109 326 G BALUN OUTPUT 2:1 STEP UP

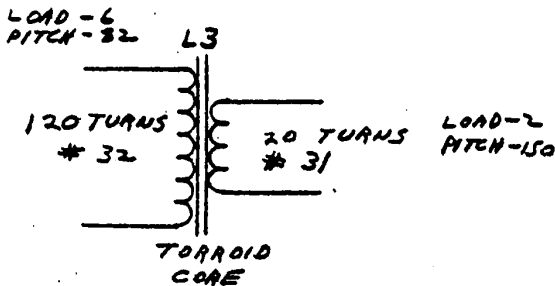


OPERATION FREQUENCY = 7-25 MHz

PUSH PULL VFO OUTPUT COIL
 LEAD LENGTH 1 INCH LONG

CORE FREQUENCY 7-30 MHz
 CORE I.D. - .2 INCHES
 CORE O.D. - .4 INCHES
 CORE THICKNESS - .125 INCHES

FIG #110 326 G VFO OUTPUT 3:1 STEP DOWN



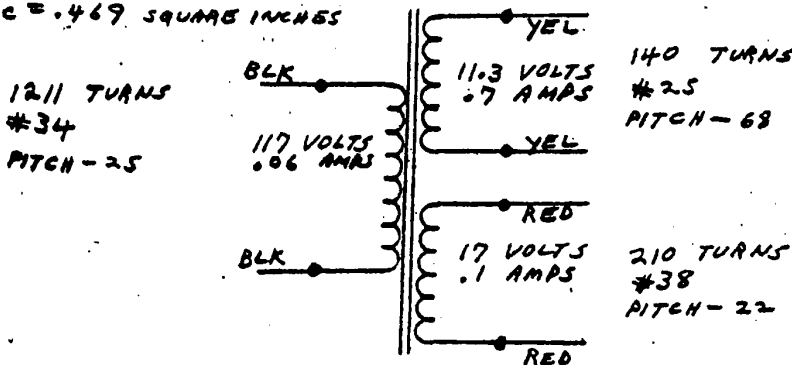
OPERATION FREQUENCY = 1.2 MHz

D.C. CONVERTER TORROID
 LEAD LENGTH 1 INCH LONG

CORE FREQUENCY 3 MHz
 CORE I.D. - .2 INCHES
 CORE O.D. - .4 INCHES
 CORE THICKNESS - .125 INCHES

FIG #111 326 G D.C. CONVERTER TORROID 6:1 STEP DOWN

$B_m = 12K$ GAUSS
 TURNS/VOLT = 10.4
 $A_c = .469$ SQUARE INCHES



FREQUENCY = 60-400 CPS
 GRADE M6 SILICON STEEL
 TYPE E1 625 @ M6-.014
 WIDTH - .625 INCHES
 STACKED - .750 INCHES HIG.
 BOBBIN WOUND
 .005 FISH INSULATION
 BETWEEN WINDINGS
 .01 FISH FINAL COVER
 BOBBIN FOR E1 625 (7/8)
 3/4" DEPTH

FIG #112 326 G POWER TRANSFORMER

SYMPTOM: Talking or listening to a station several hundred KC away from present frequency.

DIAGNOSIS: This is what is commonly referred to as an image and is primarily noticeable most on sets with an IF frequency of 265 and 455 KHZ.

EXPLANATION: When a signal is received, it is converted to a lower frequency by the "mixer" and then further amplified by the "I. F." (Intermediate Frequency Amplifier)

The mixer frequency is the difference between the received frequency and the "I. F." frequency. As an example:

Received Frequency = 27.255 MHZ
"I. F." Frequency = .455 MHZ
Mixer Frequency = 27.710 MHZ

The received image would then be $27.710 \text{ MHZ} + .455 \text{ MHZ}$, or 28.165 MHZ. This means that both 27.255 and 28.165 MHZ would be received simultaneously on a system with .455 MHZ "I.F.'s". Note that the mixer frequency could also be 26.800 MHZ, thus making an image of $(26.800 - .455)$ or 26.345 MHZ.

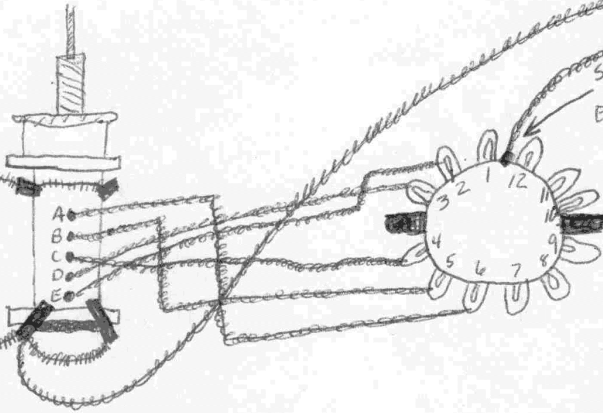
If the "I.F." frequency is 10 MHZ, this would place the image so far out of the band that it would probably not be noticeable.

Received frequency = 27.255 MHZ
"I.F." Frequency = 10.000 MHZ
Mixer Frequency = 37.255 MHZ, or 17.255 image =
47.255 MHZ or 7.255 MHZ

All of the newer radios use a higher "I.F." of 7 to 10 MHZ to eliminate this problem.

Edge Connector
PIN "U"

EC PIN "V"



3-95
GJ

A	GOES TO	6
B	" "	5
C	" "	4
D	" "	3
E	" "	2

FREQ SET
COIL

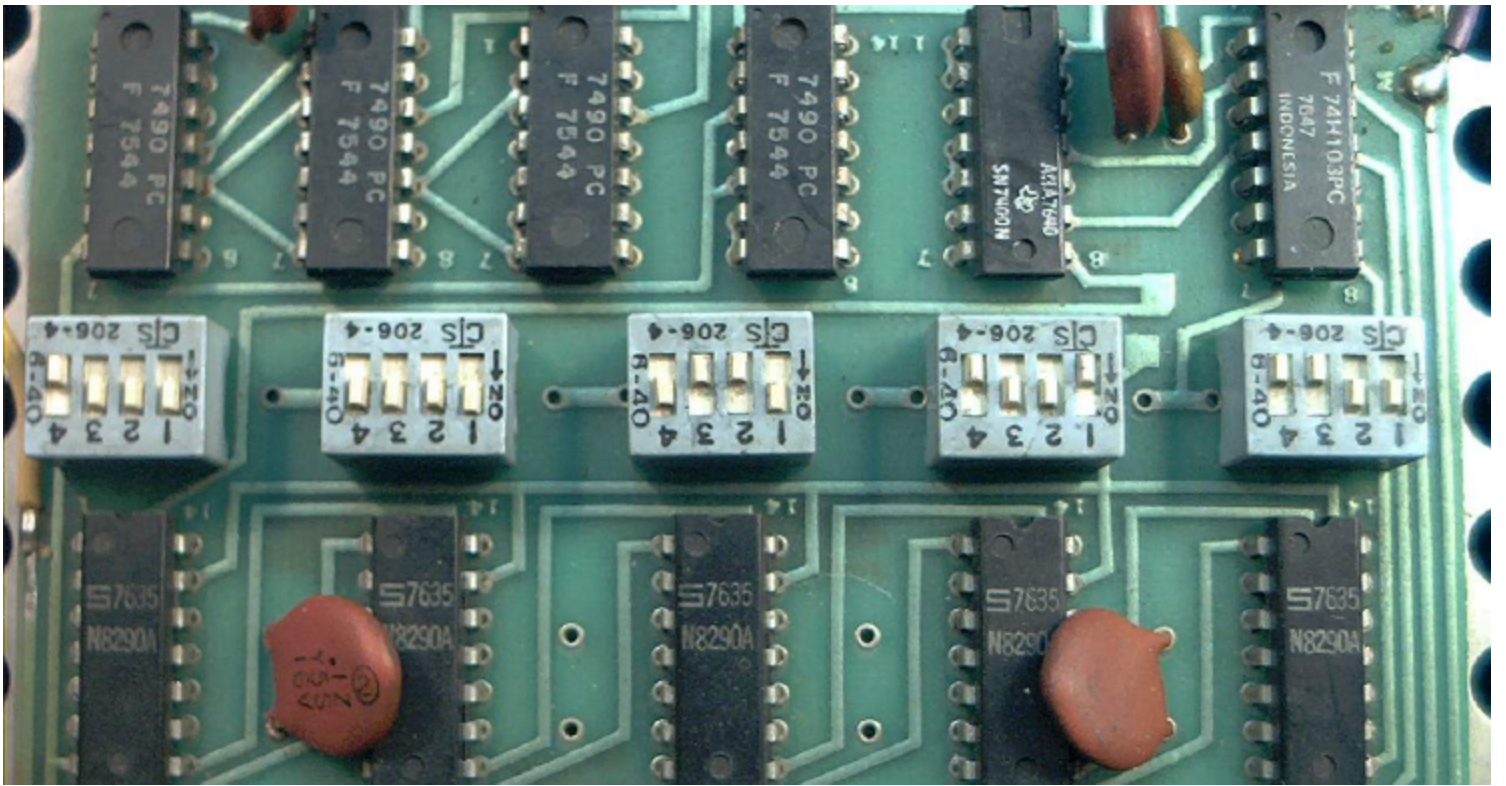
'SIDE VIEW'

BAND
SWITCH

END VIEW
OPPOSITE
KNOB END



Make 32ga.
WITH ~~32ga~~ wire - the total amount
of wire put on slug spool will look less ??
But operates like original that had more
wire.



Preset for Mark III