MODEL FM-110

COMMUNICATIONS SERVICE MONITOR

INSTRUCTION MANUAL

aie

Measurements Division

AUTOMATED INDUSTRIAL ELECTRONICS CORP.

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INSTRUCTION MANUAL

CONTENTS

Welcome to the Measurements Corporations Model FM-110 Communicaitons Service Monitor! With it one can evaluate the performance of all FM two-way radios in business bands from 30 to 512 MHz.

The following instructions are condensed to aid in initial set up. Complete information is on later pages.

GETTING STARTED

Before operating your FM-110, read the following directions carefully. Doing this will ensure maximum performance and enjoyment of your FM-110. We also recommend that you save all instructions for future reference.

1. Unpack the unit from the carton and check for damage. If the unit is damaged, contact the AIE Corporation immediately.
2. Check the contents of the box with the packing list. Report any shortages to the place of purchase.
3. Connect the FM-110 power cord to 115V AC receptacle.
4. Before turning on the unit, adjust the SQUELCH knob all the way CCW and throw generate/receive switch to receive position.
5. Now adjust the VOLUME knob approximately 1/3 of the way CW.
6. Throw power switch at lower right ON. Red lamp lights.
7. To obtain proper scanning action, SQUELCH must be set properly. Adjust the knob CW until the static just disappears. The Squelch knob past this point may result in poor reception of weaker channels. When scanning, however, the SQUELCH control may have to be adjusted slightly to eliminate false stopping.
8. Connect unit to be tested to its power source and its control panal.
9. Enter the frequency of unit to be tested on FM-110 as follows:
   9.1 Press MANUAL switch in FREQUENCY/FUNCTION section.
   9.2 Key in frequency digits, including decimal point.
   9.3 Press ENTER.

NOTE: Frequency setting while in SCAN or SEARCH modes is described in later pages.

TESTING TRANSMITTER PORTION

1. Set GENERATE/RECEIVE switch to RECEIVE.
2. Loosely couple (with antennas or RF load and attenuators) unit under test to RF IN jack of FM-110.
   CAUTION: DO NOT EXCEED 0.1 WATTS (0.2 Volts rms) TO RF IN JACK.*
3. Key transmitter.
4. Readjust VOLUME control for convenient sound.

5. Frequency error is shown on BAR GRAPH, in KHz (multiplied by lower switch position).
   NOTE: 30 to 50 MHz signals are shown in opposite polarity, i.e, if unit frequency is high BAR GRAPH reads low.
6. Modulation is displayed on scope. Full scale deviation in KHz is displayed by the setting of the DEVIATION (kHz) switch.
   NOTE: Deviation calibration procedure on next page is recommended for first time use or for precision deviation measurement.
7. CTCSS (Tone, PL) modulation is also displayed on the scope.
8. CTCSS frequency is measured by:
   8.1 Set SWEEP RANGE (ms) switch to F2.
   8.2 Set DEVIATION (kHz) switch to 1.5.
   8.3 Press MODULATION Key F2.
   8.4 Set F2 LEVEL Control to partly fill scope screen.
   8.5 Adjust F2 MODULATION frequency thumbwheel switch(including multiplier toggle) to form Lissajous oval on scope. F2 MODULATION thumbwheel switch (including multiplier) now indicates CTCSS frequency.

TESTING RECEIVER PORTION

1. Connect RF OUT jack to input of receiver under test.
   CAUTION: DO NOT KEY TRANSMITTER OF UNIT UNDER TEST WHILE IN THIS MODE.
2. Set GENERATE/RECEIVE switch to GENERATE.
3. Reset frequency (as above) is necessary.
4. Preset OUTPUT LEVEL X10 switches off (down) and uV dial control fully counter-clockwise (zero RF putput).
5. Connect receiver under test audio output to SINAD INPUT jack of FM-110. Adjust receiver under test volume until SINAD bargraph reads 0 db.
6. Set DEVIATION (kHz) switch to 5.
7. Press F1 switch of MODULATION section.
8. Adjust F1 MODULATION control to produce ±3.3 kHz deviation on scope.
   NOTE: If receiver under test is CTCSS equipped, it will be necessary to DISABLE CTCSS (monitor the channel OR proceed to step 10.
9. Rotate OUTPUT LEVEL control clockwise unitl SINAD bargraph indicates -12 db. If necessary, turn on (up) one or more of the X10 switches. SINAD sensitivity is the product of the OUTPUT LEVEL dial reading times the number of X10 switches in UP position.
10. For CTCSS equipped receivers:
    10.1 Press MODULATION key F2.

10.2 Adjust F2 MODULATION frequency thumbwheel switch(including multiplier toggle) to CTCSS frequency.
10.3 Set DEVIATION (kHz) switch to 1.5.
10.4 Adjust F2 LEVEL switch to ±0.7 kHz on scope.
10.5 Press MODULATION switch F1 + F2.
10.6 Measure SINAD sensitivity as in Step 9 above.

DEVIATION CALIBRATION

Calibration Frequency Deviation.

1. Set DEVIATION (kHz) to CAL, set F2 for 1000 Hz.
2. Adjust DEV CAL for full scale display.

USING THE SCOPE AS A SEPARATE DEVICE

1. Turn REAR PANEL switch to EXTERNAL.
2. Place a probe on REAR PANEL BNC jack.
3. Adjust SWEEP RANGE and SWEEP VARI controls for horizontal sweep speed.
4. Adjust DEVIATION (kHz) and DEV CAL controls for vertical gain.
5. Adjust POSITION controls as desired.

SETTING FREQUENCY/FUNCTION FOR SCAN AND SEARCH MODES

1. SCAN
   Press this button to start scanning action. All channels which are not locked out will be scanned.
2. MANUAL
   Press this button to advance channels from 1 to 10. Programming frequencies into channels is done in the MANUAL mode. (SEE PROGRAMMING)
3. LOCK
   Press this button to lock (omit) a channel. (Unit must be stopped on that channel to lock or unlock.) The locked channel will have an LCK in the display. The locked channel will be skipped during scanning. To unlock a channel, press LOCK.
4. SEARCH
   Use this button to set lower and upper search frequencies and for searching unknown frequencies within the set limits. (See PROGRAMMING SEARCH LIMITS and USING THE SEARCH FEATURE.) The display will show SRH during search.

PROGRAMMING

1. TEST
   Press to check processor operation. The display will show rolling 8's (signaled by two beeps) and then the ten programmed frequencies one-by-one. Unit will always return to channel 1 in the MANUAL mode.
2. DIM
   Press to change display brilliance from bright to dim or dim to bright.
3. DISPLAY
   Press to display frequency (in MHz) of a given channel in SCAN or MANUAL mode. Press again to display channel number.
4. DELAY-HOLD
   Dual function key. DELAY effective in SCAN and SEARCH modes. Press to delay resumption of scan or search when stopped on a given channel. DLY will appear on display next to channel number. Press key again to remove delay.
   Use HOLD position of the key to remain on an active frequency in SEARCH mode. HLD will appear on display.
5. CLEAR
   Dual function key. Use to erase an incorrect frequency (ex., outside permitted range) prior to pressing enter. The decimal (.) on the key is for entering a decimal point.
6. 1-9
   Numerical keys for entering frequencies or selecting channel numbers.
7. 0/10
   Dual function key. 0 is used for entering frequencies; 10 is for channel 10.
8. ENTER
   Use this key to enter a frequency during programming.

PROMPTING MESSAGES

The following is an explanation of the prompts/indications that appear on the display during the course of operation.

SRH	Unit is searching.
LCK	Locked channel. Appears in Manual only.
DLY	Delay effective in SCAN and SEARCH.
HLD	Hold. Effective in SEARCH only.
Fr Err	Frequency is outside permitted range.
no ch	All channels are locked. Appears in SCAN only.
Pr Off	Indicates that the microprocessor has been reset or that power has been lost for more than 24 hours.

PROGRAMMING SEARCH FREQUENCY LIMITS

In the SCAN mode, the unit can be programmed to search for frequencies between a lower (LO) and an upper (UP) limit. To set the LO and UP frequency limits, proceed as follows:

1. Press MANUAL and then SEARCH. The display will alternately flash LO and the current lower frequency limit.
   NOTE: SRH will appear on display in the SEARCH mode.
2. Press numeral keys corresponding to the desired lower frequency limit (Use CLEAR for decimal). Press ENTER.
3. Press ENTER again. The display will alternately flash UP and the current upper frequency limit.
4. Press numeral keys corresponding to the desired upper frequency limit (Use CLEAR/. for decimal). Press ENTER.

   NOTE: The new frequency limits may be reviewed (verified) by pressing ENTER.

USING THE SEARCH FEATURE

After the search limits have been programmed, press SCAN and then SEARCH. The unit will start to search and stop on an active frequency. This frequency can be assigned to any of the 10 channels by pressing ENTER and the channel number (EX.: to assign frequency to channel 5, press ENTER and then 5). The unit will resume search on the same channel frequency. To stop the search, press MANUAL. To resume the search after stopping, press SCAN and then SEARCH.
NOTE: Activate the hold feature if you wish to stay on the first active channel.

ACCESSING CHANNELS DIRECTLY

Manual Mode: Press the numeral keys for the desired channel number, and then MANUAL again.

SCAN Mode: Press the numeral Keys for the desired channel number. The unit will now be in MANUAL for the desired channel.

SCANNING CHANNELS

Press SCAN. The unit will go through all unlocked channels and stop on an active channel. It will stay there until transmission ceases, and thereafter goes to the next active channel.
NOTE: All locked channels will be skipped.

RESETTING MICROPROCESSOR

A momentary power line failure or a voltage drop may cause erratic display and/or keyboard operation. If this occurs, simply push SEARCH and SCAN buttons at the same time while the unit is turned on. The display will read "PR Off".
NOTE: You must then reprogram the unit with all of your frequencies.

MEMORY

Your FM-110 is equipped with a permanent backup system, requiring no batteries. A memory capacitor retains stored frequencies for approximately 24 hours during a power outage.

NATIONAL WEATHER SERVICE

The National Oceanic and Atmospheric Administration(NOAA) broadcasts continous (24 Hours) weather infromation throughout the US on the following frequencies (MHz):

162.400	162.500
162.425	162.525
162.450	162.550
162.475	

(Canadian weather can be monitored on 161.650 MHz.)

If you are located within 25 to 30 miles of one of these cities, reception can usually be obtained with the telescopic antenna.

IMPORTANT: When set to automatic scan, the FM-110 will stop and remain on the weather channel because it broadcasts continously. Thus, this channel should only be activated when you desire to hear the current weather report.

*We recommend the use of an RF Fuse (one is supplied with the FM-110 unit. Others may be purchased from AIE Corporation.

OPTION 8 -- Digital Squelch

1. To enable Digital Squelch, set the first digit of the F2 switch bank to 0.

2. Digital Squelch is now enabled and the next 3 digits of the F2 switch bank will be your digit code. For example: For a digital code of 123, your switches will read 0123.

3. In the event that inversion of the code is required, you may do this by switching the F2 range switch to X.1.

4. To set Deviation Squelch levels, adjust the F2 level control for the desired deviation level.

OPTION 9 -- 12V DC OPERATION

General Information

When it is desired to operate the FM-110 from a 12volt external source, replace the normal 110/220V power cord with the two conductor cable supplied with your unit.

It is necessary now only to connect the black wire to (-) ground and the white wire to (+) voltage. The unit will operate over a 12V DC to 16V DC range. It is essential that a source capable of supplying at least two (2) ampere is provided.

In the 12 volt mode of operation, the oscillascope is inoperative. Deviation can be measured or set by viewing the bar graph and switching the Normal/Deviation switch to Deviation. Calibration for the bar graph is internal. Error and SINAD measurements can be made by switching bands to NORMAL.

An internal fuse is installed for protection of the 12 volt circuits. In the event that the unit will operate from an AC source, but will not operate from a 12 volt DC source, it is probable that this fuse is blown. To replace, remove the top cover and you will observe the fuse on the upright panel.

FM 110 ADDENDUM 1

After following the GETTING STARTED procedure, if the scope trace appears skewed, proceed as follows:

1. Set function switch to GENERATE.
2. Set MODULATION switch to EXT with no input to EXT jack.
3. Observe unmodulated scope trace.

NOTE: Make sure to observe the trace from directly in front of the center of the scope, otherwise parallax error may cause apparent skew.

4. If skew needs readjustment (from shipping jolts) continue below:
5. Remove from rear panel 6 black Phillips screws, all within 3/4" of edge. Do not remove 4 screws around speaker opening.
6. Gently lay back rear panel. Speaker wires are still connected.
7. Locate 1/16" x 3/8" slot in plate behind scope tube. Loosen slightly, but do not remove, 2 screws near arrows 1 1/4" from each end of slot.
8. Insert large, flat blade screwdriver into slot and turn carefully until trace is horizontal as viewed from directly in front of scope.
9. Retighten screws at ends of slot.
10. Replace rear panel and its 6 screws.

CAUTION: During panel replacement, make certain that speaker wires are not pinched between panel and case.

FM 110 ADDENDUM 2
Applies to serial numbers 0124 and higher

NOTE: If serial number is 0123 or lower, see ADDENDUM 1

A. SCOPE TRACE ALIGNMENT

After following the GETTING STARTED procedure, if the scope trace appears skewed, proceed as follows:

1. Set function switch to GENERATE.
2. Set MODULATION switch to EXT with no input to EXT jack.
3. Observe unmodulated scope trace.

NOTE: Make sure to observe the trace from directly in front of the center of the scope, otherwise parallax error may cause apparent skew.

4. If skew needs readjustment (from shipping jolts) continue below:
5. Locate 3 holes in rear panel behind scope tube socket. Center hole is larger than 2 outer holes.
6. Using Phillips screwdriver, loosen slightly, but do not remove, both outer screws.
7. Using a large flat-blade screwdriver in larger center hole, rotate axis of scope until trace is horizontal as observed from directly in front of unit.
8. Retighten both adjacent Phillips screws loosened above.

B. R-F INPUT FUSE

1. If in RECEIVE mode, unit seems insensitive to incoming signals, check r-f input fuse as follows:
2. At lower left corner of front panel, unscrew BNC connector labelled RF IN.
3. Check fuse. If open, replace with 1/8 Amp Picofuse. Cut axial leads to 3/16" on both ends. Reinstall BNC connector.
4. Probable cause of fuse failure was excessive r-f power input.

FM-110 Addendum 3
Rev B 040490

SIMPLEX-DUPLEX OPERATION

1. Simplex Operation. **Generating OR receiving** on the same frequency, according to the GEN/REC switch:
1.1 Place switch in **GEN OR REC** position.
1.2 Key in frequency (See manual). Press ENTER.
1.3 Unit now **generates OR receives** according to GEN/REC switch.

2. Duplex Operation. Simultaneously **generating AND) receiving** on different frequencies.
2.1 Place switch in **GEN OR REC** position.
2.2 Press MANUAL, then key in **generate** frequency.
2.3 Press ENTER. Make a note of **generate** frequency because **generate** frequency will no longer be displayed.
2.4 Place switch in **GEN + REC** position.
2.5 Press MANUAL, then key in **receive** frequency.
2.6 Press ENTER. Display now reads **receive** frequency only. **Generate** frequency cannot be displayed.
2.7 Unit now **generates** previously entered **generate** frequency (undisplayed) and also **receives** displayed frequency.
2.8 Use the GEN/REC switch as follows:
2.8.1 GEN position: Scope displays **generated** waveform and SINAD bargraph operates. Speaker is muted.
2.8.2 REC position: Scope displays **received** waveform and bargraph indicates **received** frequency error.

3. Once in Duplex mode, then what?
3.1 To revert from Duplex to Simplex: Place switch in **GEN OR REC** position, press ENTER. Unit now **generates OR receives** on displayed frequency, depending upon position of GEN/REC switch. Change frequency if desired. (Press MANUAL, key in frequency, then press ENTER).
3.2 To reenter Duplex operation again, go back to Step 2.
NOTE: If input power to the FM-110 is lost by ON/OFF or any reason, it is necessary to reset Duplex mode by step 2.

EXAMPLE

To analyze a repeater station whose **receive** input frequency is 452.1 MHz and **transmit** output frequency is 457.1 MHz:
1. Connect cable from FM-110 RF-OUT to repeater receiver input.
2. Connect (not directly, but via attenuators or loosely coupled antennas) from repeater transmit output to to FM-110 RF-IN. Maximum input to FM-110 is 3.5 V rms (.25 Watts).
3. Place FM-110 in **GEN OR REC** and GEN positions.
4 Key in: MANUAL-4-5-2-.-1-ENTER. Display shows 452.100.
5. Place switch in **GEN + REC** position.
6. Key in: MANUAL-4-5-7-.-1-ENTER. Display shows 457.100.
7. In GEN position, adjust f1 and/or f2 modulation using scope. Connect repeater audio output to FM-110 SINAD INPUT to measure SINAD sensitivity on bargraph.
8. Place switch in REC position. Scope now displays the modulation from the repeater's transmitter. Bargraph shows its frequency error.

ADDENDUM 4
Rev. A

Level Control of External Modulation

When applying external modulation to EXT input jack, press Modulation Function switch to EXT. External modulation level is now adjustable by F1 control as observed on scope. Internal F1 1000Hz is disabled.

NOTE: EXT switch is push ON-push OFF type, not returned to OFF when F1, F2 or F1+F2 is pressed.

Combining Internal and External Modulation

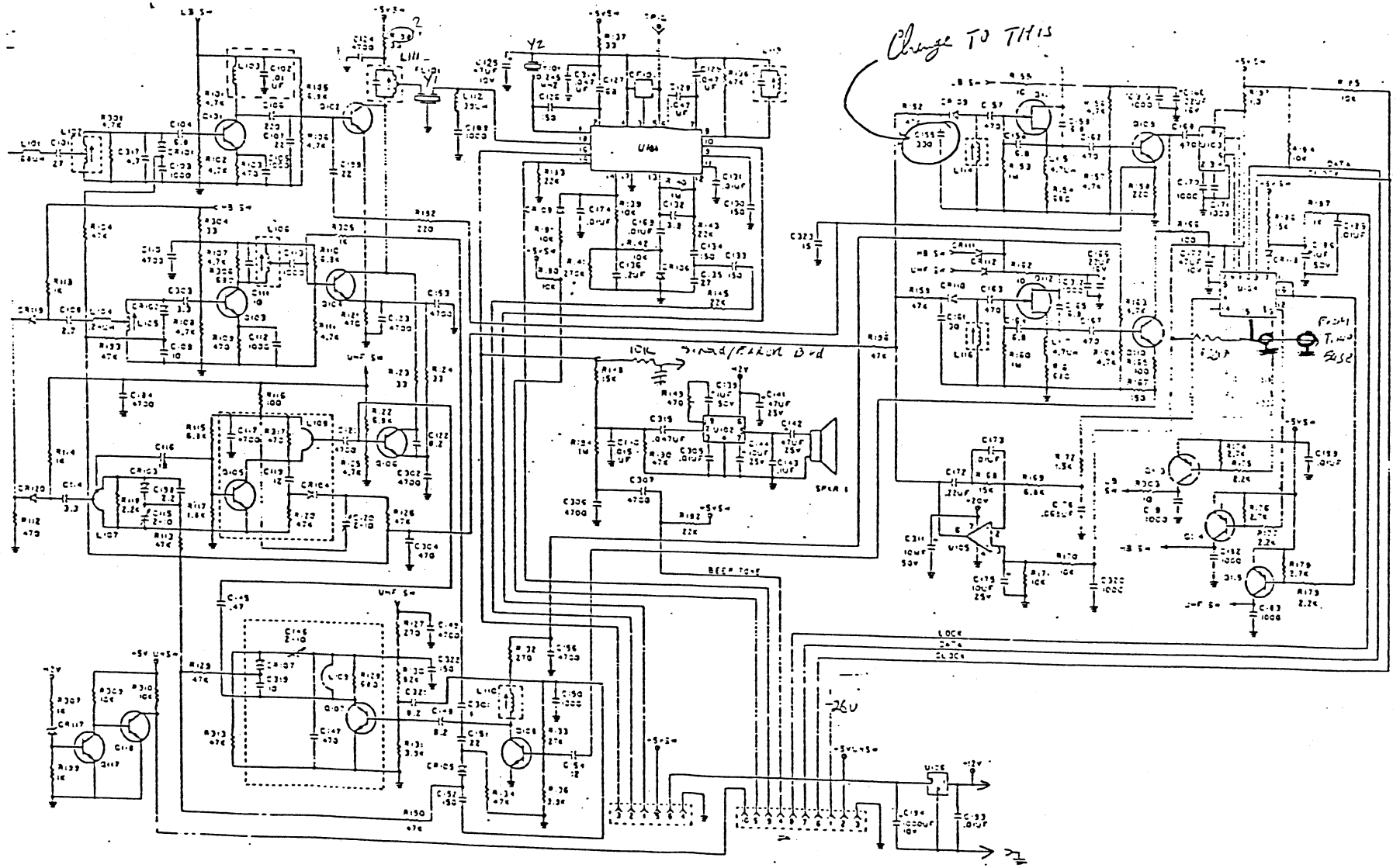
1. Place unit in GEN position.
2. Apply external modulation to EXT jack.
3. Press Function Switch EXT (in=ON).
4. Release Function Switches F1, F2 and F1+F2 to OFF (out).
5. Use F1 control to set external modulation as observed on scope.
6. Press Function Switch EXT to release (out=OFF).
7. Press Function Switch F2 to ON.
8. Adjust internal modulation frequency with F2 Frequency Switch.
9. Adjust F2 level with F2 control as observed on scope.
10. Combine EXT with F2 by pressing F1+F2 switch and EXT switch to ON.

Addendum 5

A 1/8 amp Fuse has been added in the RF Out Line. This fuse is necessary to protect the output attenuator from accidental reverse power. DO NOT OPERATE the equipment without the proper rated fuse.

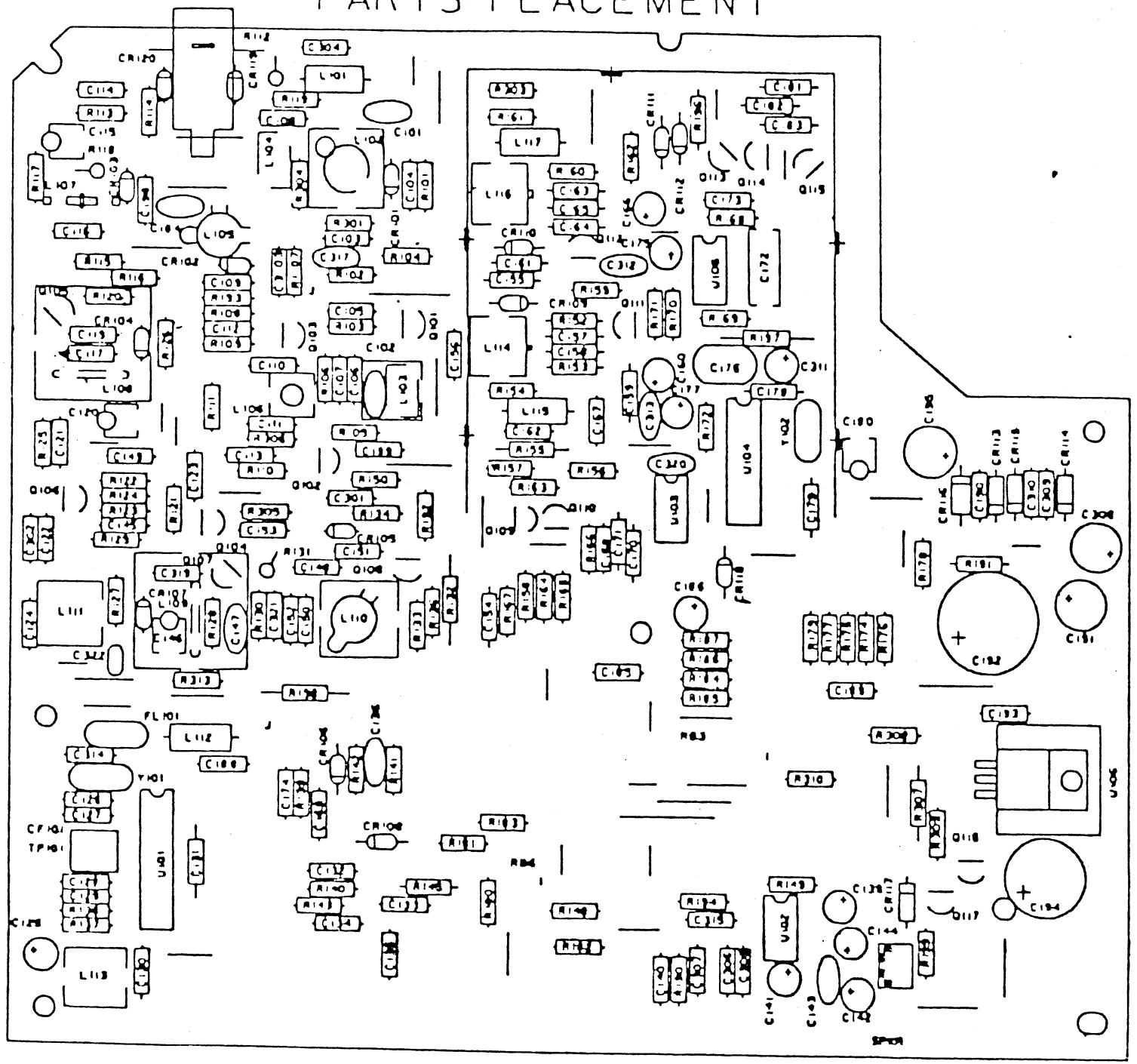
To replace this fuse, remove the (3) three #6 screws along the bottom of the front panel. Turn the unit upside down and remove the front part of the bottom. To do this it is necessary to remove the (5) #6 screws and the (11) #4 screws.

You will note the RF fuse is soldered directly to the connector. Replace with an identical rated part in the same manner.

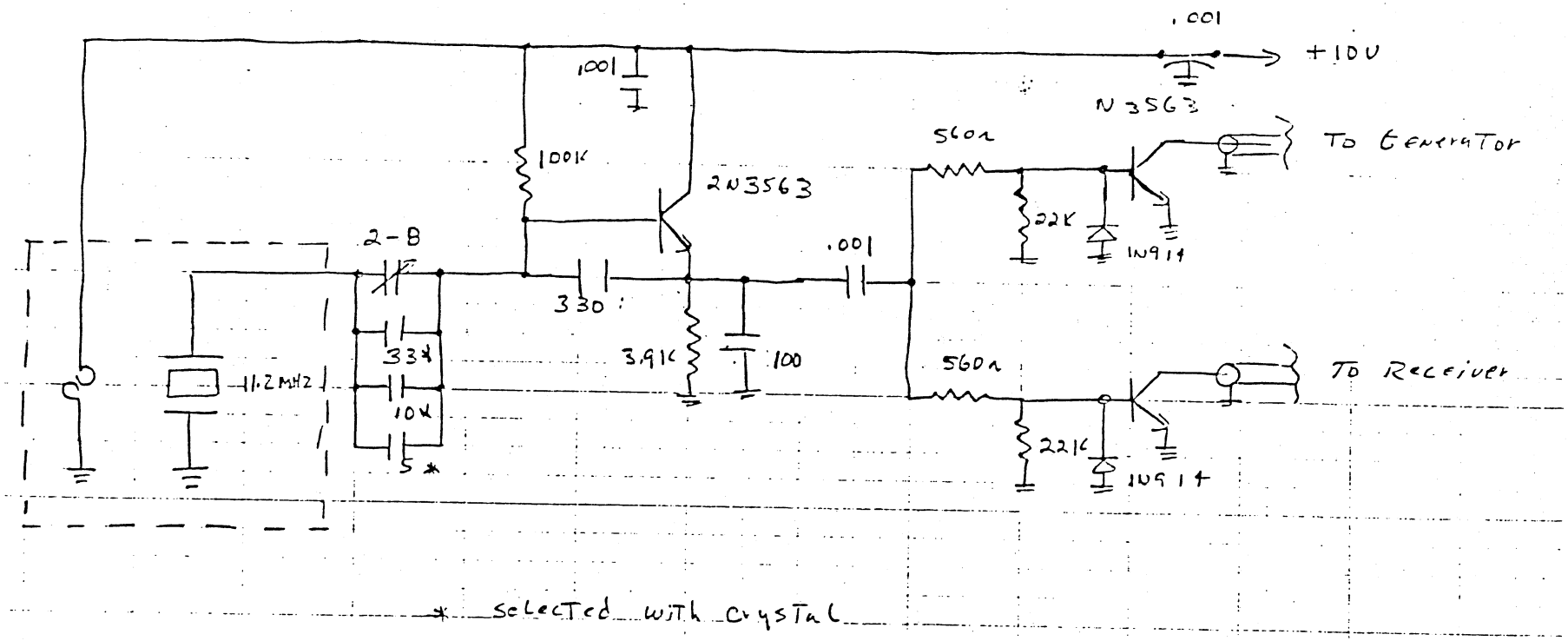


RECEIVER BOARD

PARTS PLACEMENT

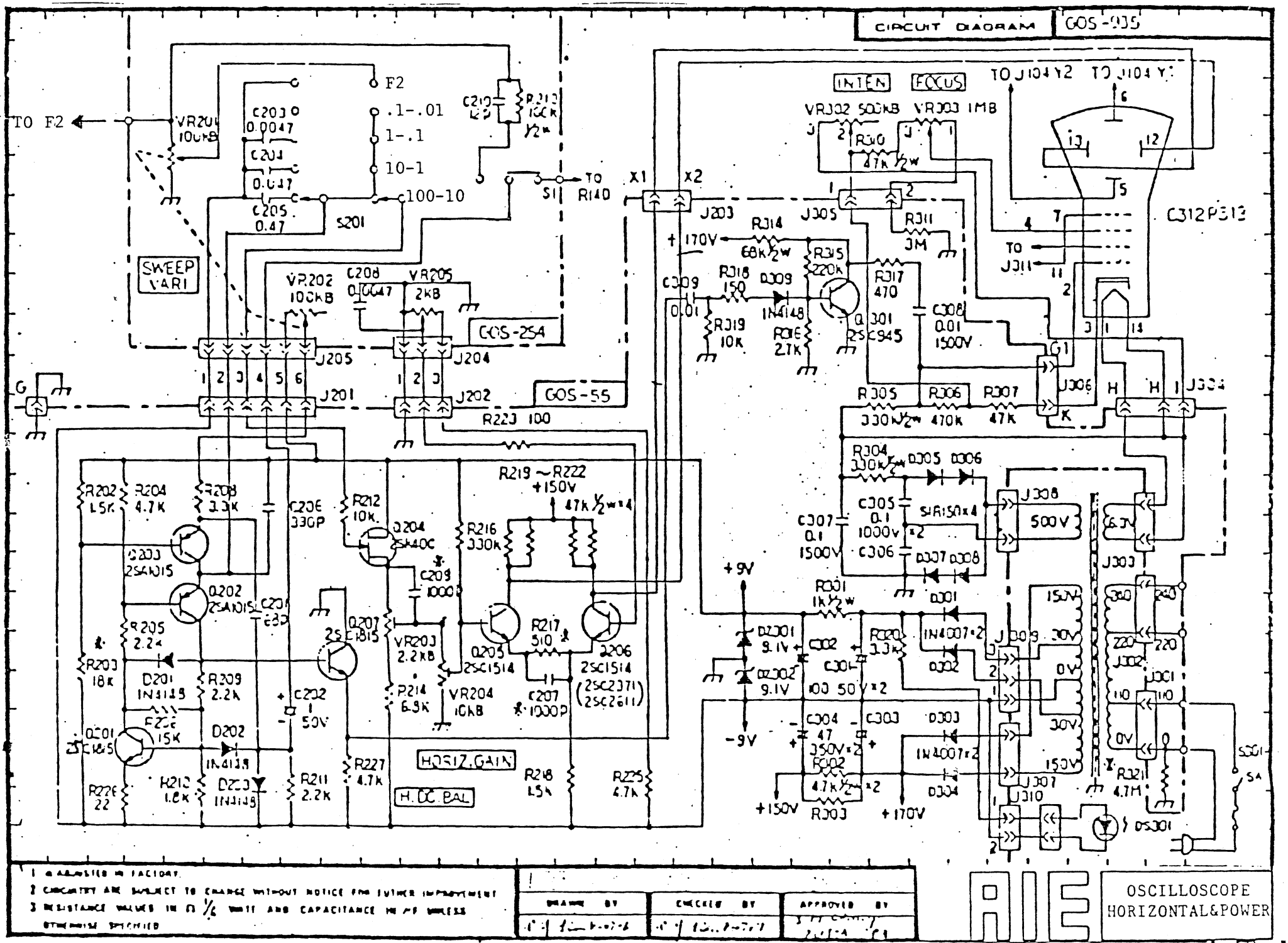


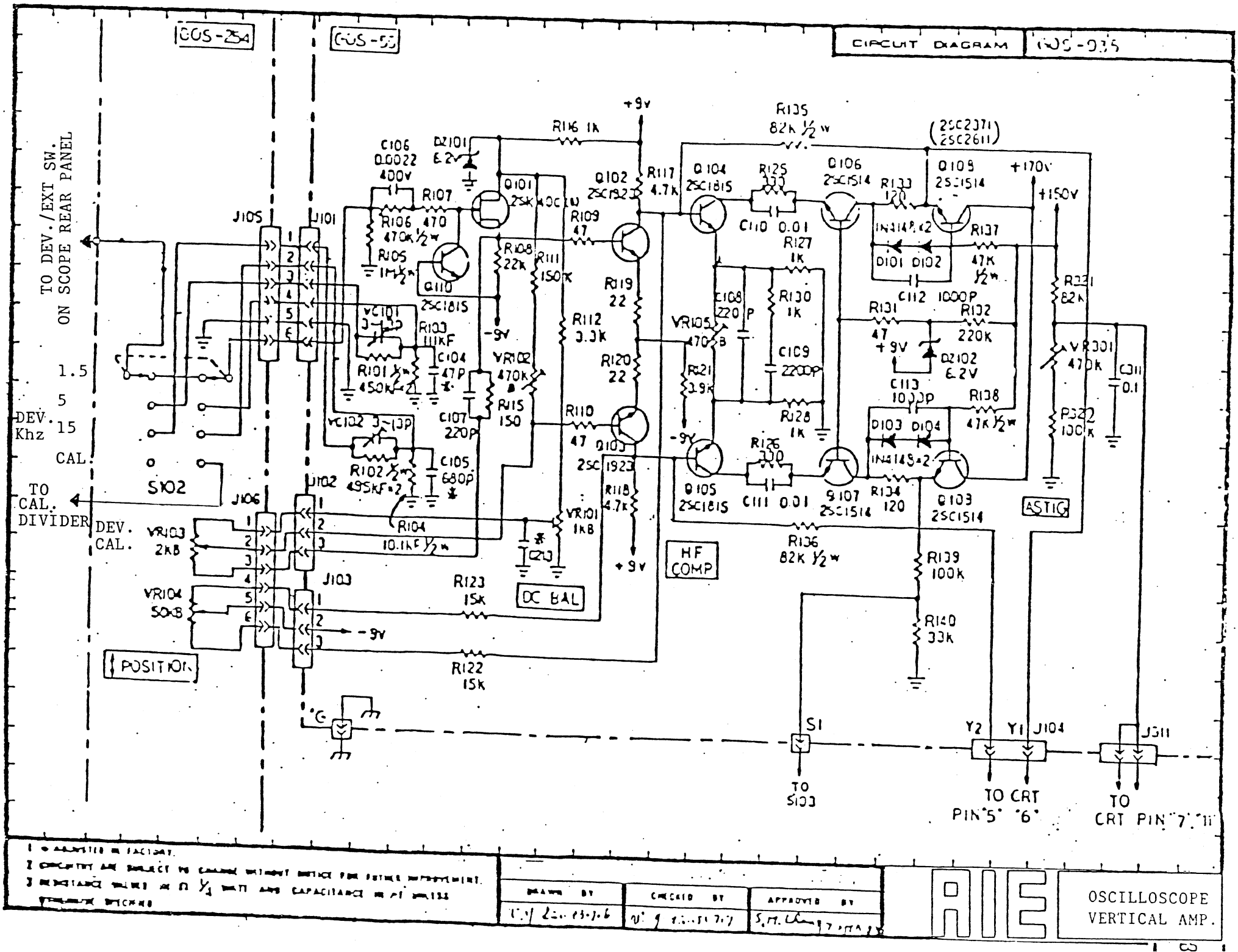
RECEIVER BOARD

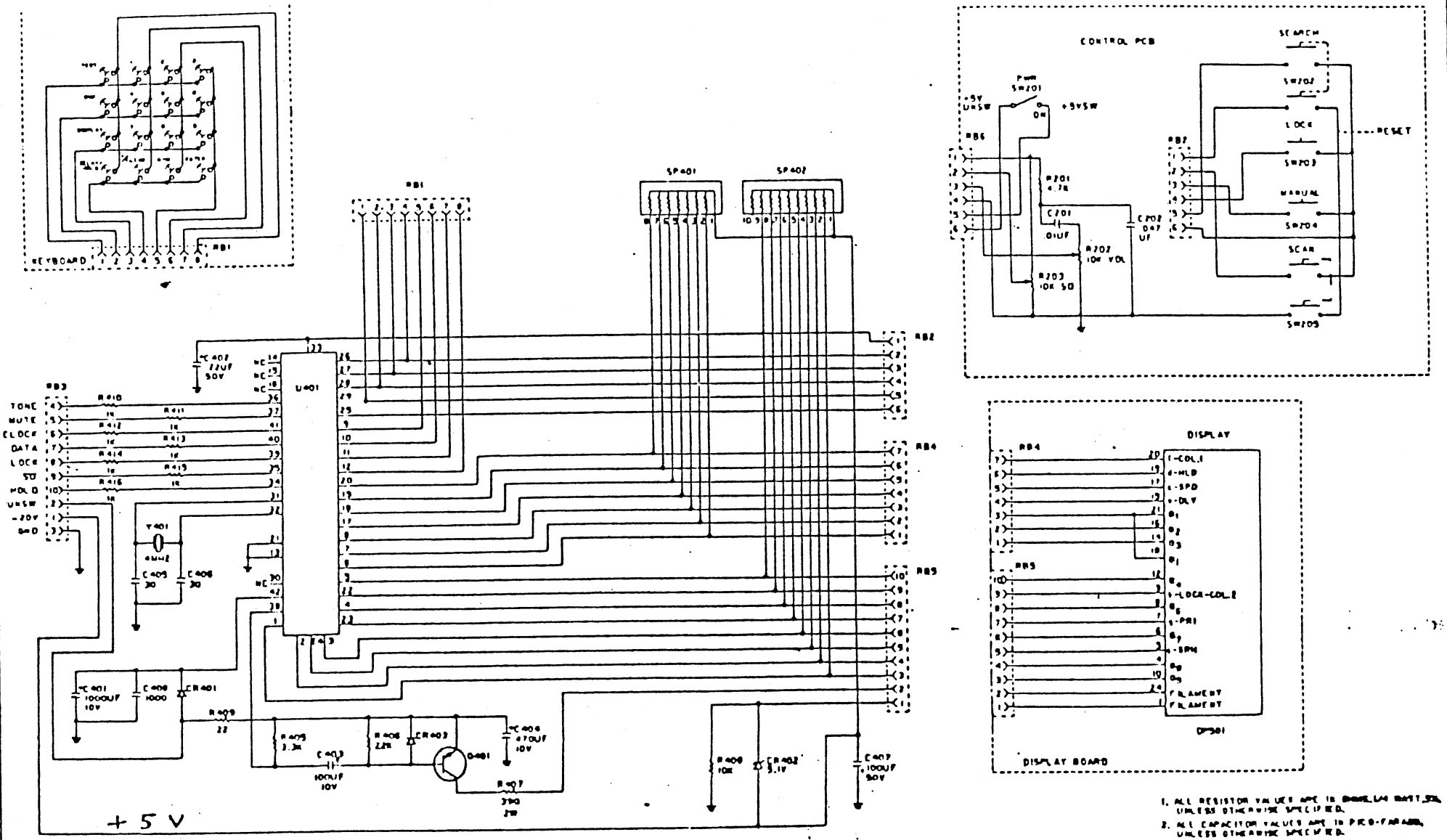


AIE

TIME BASE OSC.


CIRCUIT DIAGRAM
GOS-935
TO F2
F2
.1-.01
1-.1
10-1
100-10
SWEEP VARI
GOS-254
GOS-55
HORIZ.GAIN
H.DC BAL
INTEN
FOCUS
OSCILLOSCOPE
HORIZONTAL&POWER


GOS-254
GOS-53
CIRCUIT DIAGRAM
GOS-035
TO DEV./EXT SW. ON SCOPE REAR PANEL
1.5
5
DEV. Khz
15
CAL
S102
TO CAL. DIVIDER
DEV. CAL.
VR103 2kB
VR104 50kB
POSITION
J105
J101
J102
J106
J103
C106 0.0022 400V
DZ101 6.2V
R107
R106 470 470k ½w
R105 1M ½w
Q101 2SK40(L)
Q110 2SC1815
R108 22k
R111 150k
VC101
R103 111kF
R101 ½w 450kF
C104 47P
VC102
R102 ½w 495kF
C105 680P
C107 220P
VR102 470k B
R115 150
R104 10.1kF ½w
VR101 1kB
C103
R123 15k
DC BAL
-9V
R122 15k
R116 1k
+9V
R117 4.7k
Q102 2SC1923
R109 47
R119 22
R112 3.3k
R120 22
R110 47
Q103 2SC1923
R118 4.7k
HF COMP
R135 82k ½ w
(2SC2371) (2SC2611)
Q104 2SC1815
R125 330
C110 0.01
Q106 2SC1514
R133 120
Q109 2SC1514
+170V
+150V
IN4148×2
D101 D102
R137 47k ½w
C112 1000P
R127 1k
R130 1k
C108 220P
VR105 470 B
R121 3.9k
C109 2200P
R128 1k
R131 47
+9V
DZ102 6.2V
R132 220k
C113 1000P
R138 47k ½w
D103 D104
IN4148×2
R126 330
C111 0.01
Q105 2SC1815
Q107 2SC1514
R134 120
Q103 2SC1514
R136 82k ½w
R139 100k
R140 33k
ASTIG
R331 82k
VR301 470k
C311 0.1
R322 100k
S1
TO S103
Y2
Y1
J104
J311
TO CRT PIN 5 6
TO CRT PIN 7 11
1 = ADJUSTED IN FACTORY.
2 = COMPONENTS ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT.
3 = RESISTANCE VALUES ARE Ω ¼ WATT AND CAPACITANCE VALUES ARE pF UNLESS OTHERWISE NOTICED
DRAWN BY
CHECKED BY
APPROVED BY
AIE
OSCILLOSCOPE VERTICAL AMP.



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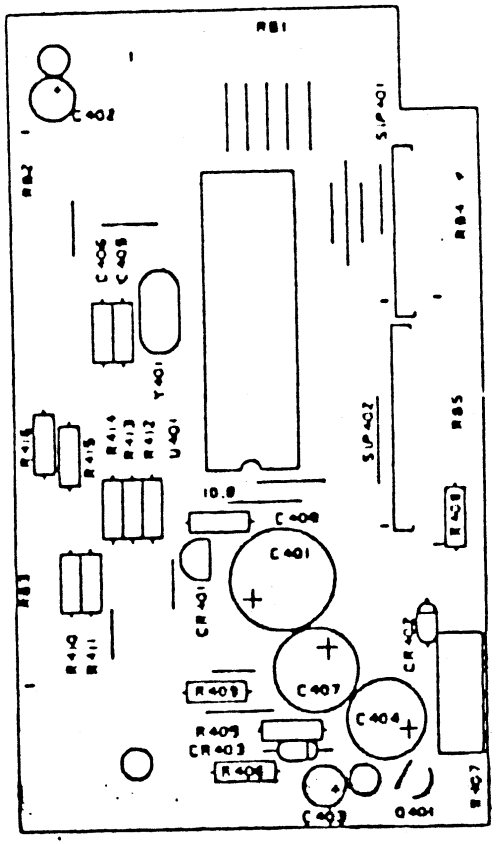
PROCESSOR
FRONT PANEL

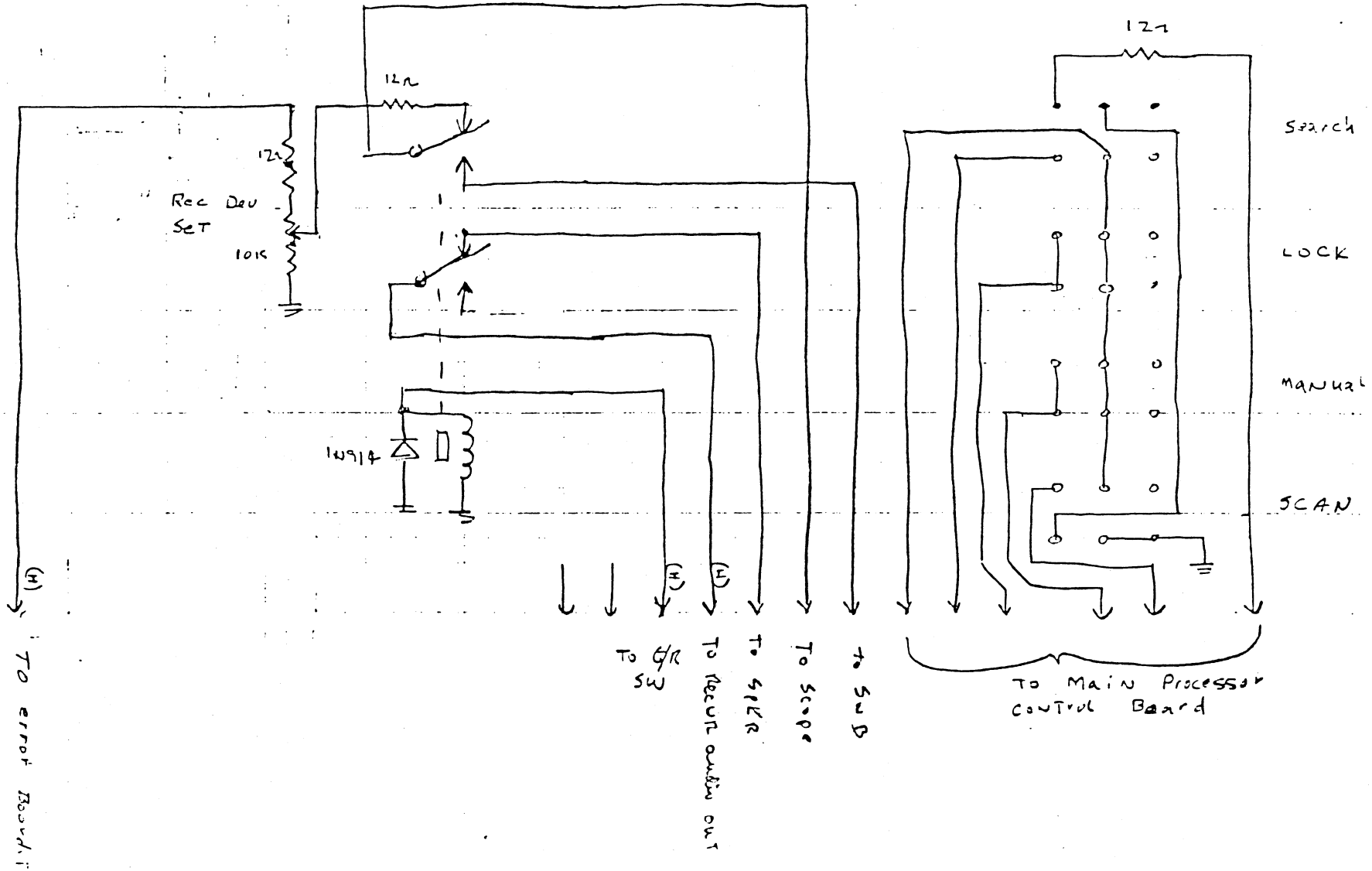
PARTS PLACEMENT



PROCESSOR BOARD

AIE

PROCESSOR
FRONT PANEL



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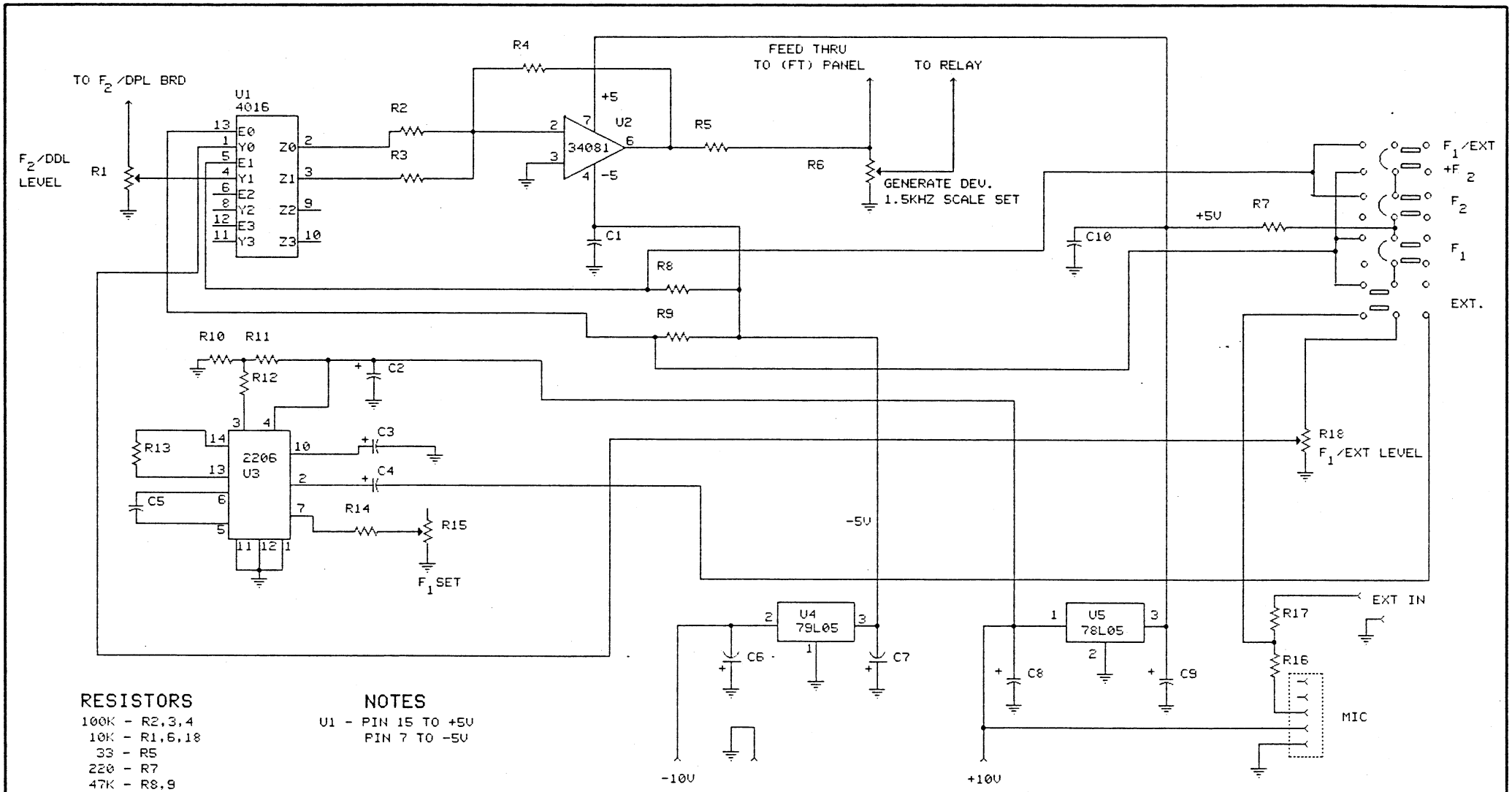
FUNCTION SW.
BOARD (F PANEL)



RESISTORS

100K - R2,3,4
10K - R1,6,18
33 - R5
220 - R7
47K - R8,9
4.7K - R10,11
8.2K - R12
200 - R13
27K - R14
5K - R15
680 - R16,17

CAPACITORS

0.1u - C1,10
10u - C2,3,4
0.033 - C5
1u - C6,7,8,9

IC'S

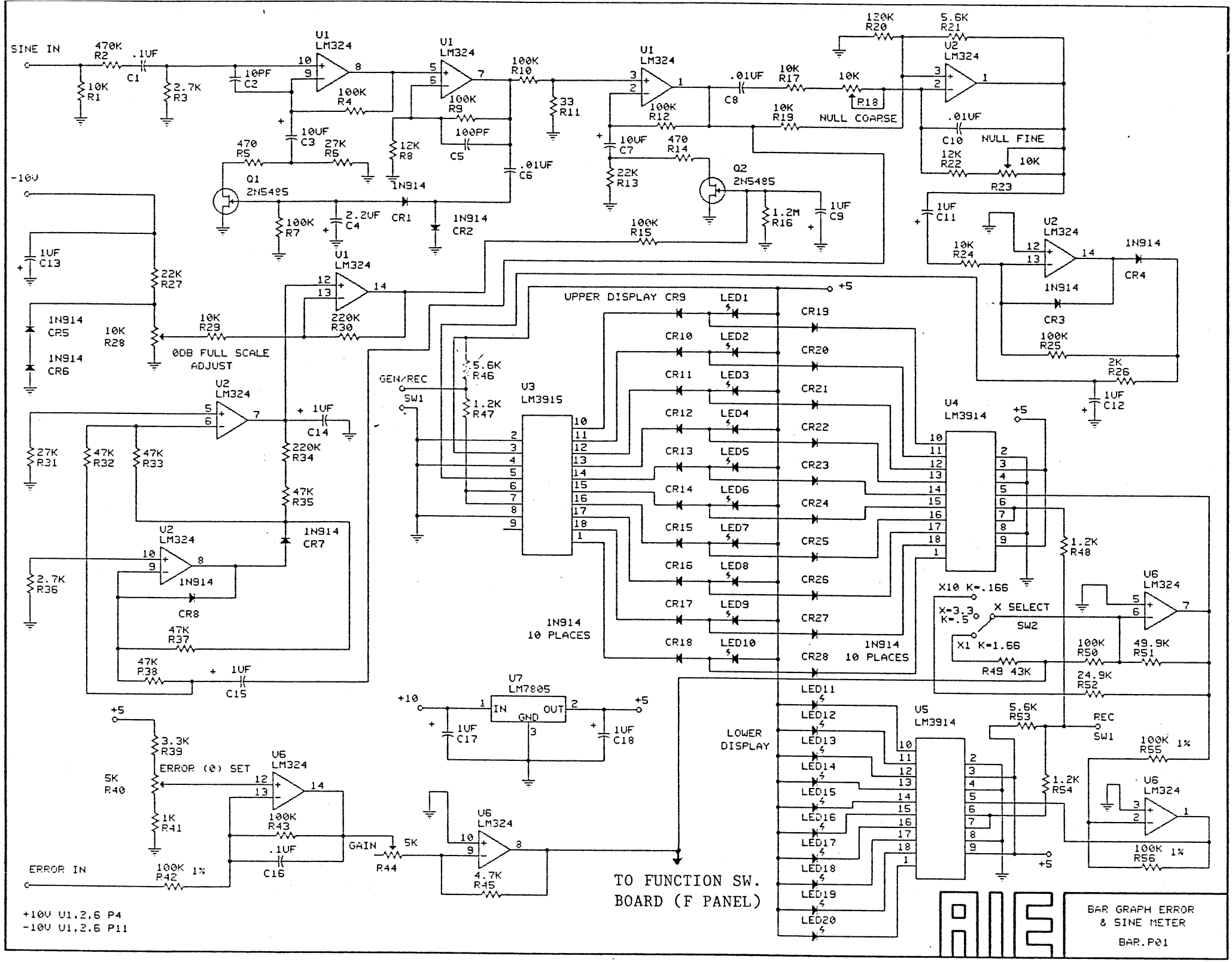
4016 - U1
34081 - U2
2206 - U3
79L05 - U4
78L05 - U5

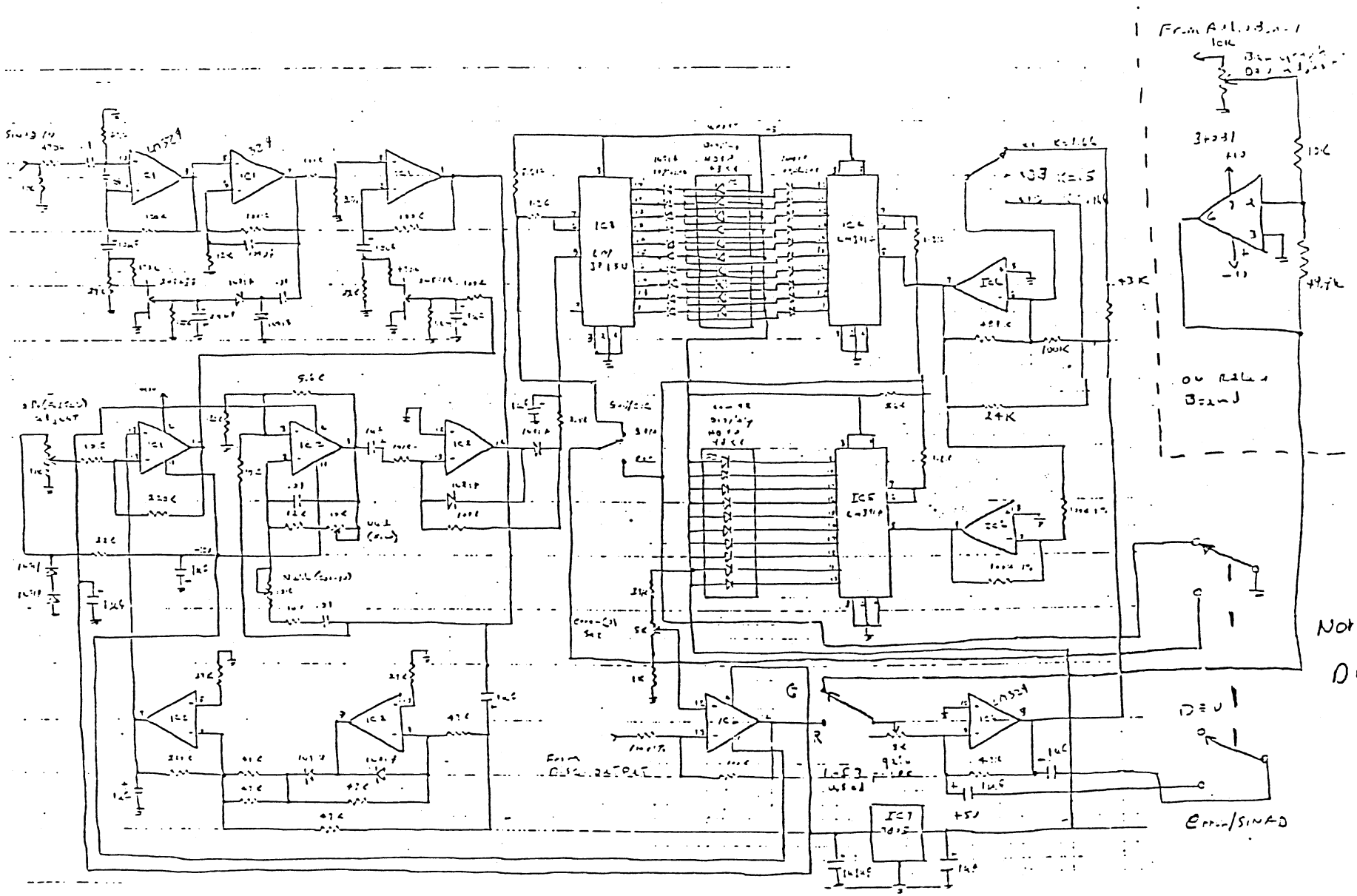
NOTES

U1 - PIN 15 TO +5V
PIN 7 TO -5V

AIE

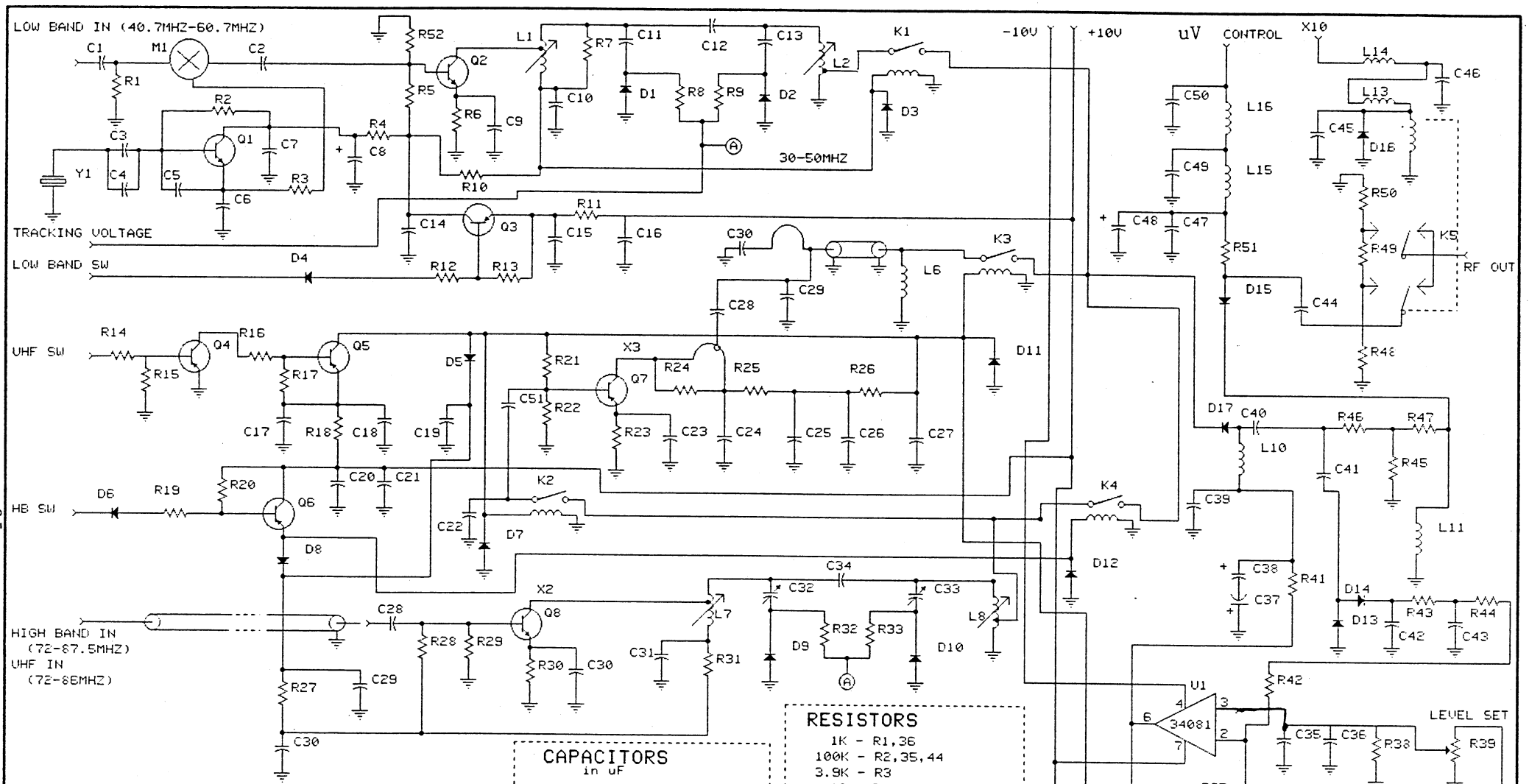
F1 GENERATOR AND SWITCH BRD.


SINE IN
470K R2
.1UF C1
10K R1
2.7K R3
10PF C2
U1 LM324
100K R4
100K R10
33 R11
100K R9
100PF C5
12K R8
10UF C3
27K R6
470 R5
.01UF C6
1N914 CR1
1N914 CR2
Q1 2N5485
100K R7
2.2UF C4
-10V
1UF C13
22K R27
1N914 CR5
1N914 CR6
10K R28
10K R29
0DB FULL SCALE ADJUST
220K R30
U1 LM324
U2 LM324
1UF C14
27K R31
47K R32
47K R33
220K R34
47K R35
1N914 CR7
2.7K R36
CR8
47K R37
47K P38
1UF C15
U1 LM324
100K R12
.01UF C8
10K R17
10K R19
10K R18 NULL COARSE
120K R20
5.6K R21
U2 LM324
.01UF C10
NULL FINE
12K R22
10K R23
10UF C7
470 R14
22K R13
Q2 2N5485
1.2M R16
1UF C9
100K R15
1UF C11
U2 LM324
10K R24
1N914 CR4
1N914 CR3
100K R25
2K R26
1UF C12
+5
UPPER DISPLAY CR9
CR19 CR10 CR20 CR11 CR21 CR12 CR22 CR13 CR23 CR14 CR24 CR15 CR25 CR16 CR26 CR17 CR27 CR18 CR28
LED1 LED2 LED3 LED4 LED5 LED6 LED7 LED8 LED9 LED10
1N914 10 PLACES
GEN/REC SW1
5.6K R46
1.2K R47
U3 LM3915
U4 LM3914
1.2K R48
X10 K=.166
X=3.3 K=.5
X SELECT SW2
X1 K=1.66
R49 43K
U6 LM324
100K R50
49.9K R51
24.9K R52
U7 LM7805
IN GND OUT
+10
1UF C17
1UF C18
LOWER DISPLAY
LED11 LED12 LED13 LED14 LED15 LED16 LED17 LED18 LED19 LED20
U5 LM3914
5.6K R53
REC SW1
1.2K R54
100K 1% R55
100K 1% R56
3.3K R39
ERROR (0) SET
5K R40
1K R41
100K R43
.1UF C16
GAIN
5K R44
4.7K R45
ERROR IN
100K 1% R42
TO FUNCTION SW. BOARD (F PANEL)
+10V U1,2,6 P4
-10V U1,2,6 P11
BAR GRAPH ERROR & SINE METER
BAR.P01



AIE

BAR GRAPH USED WITH DC OPTION



TRANSISTORS

MPS3563 - Q1,2,8
MPS6562 - Q3,5,6
MPS6560 - Q4,9
MRF901 - Q7

RELAYS

K1-5

IC'S

U1 - 34081

MISCELLANEOUS

MIXER - M1

DIODES

1N914 - D1,2,3,4,5 6,7,8,9,10, 11,12,15,16, 17
1N82 - D13,14

INDUCTORS

15u - L6,10,11,13,14, 15,16
VARIABLE - L1,2,7,8

CRYSTAL

Y1 - 10.7MHZ

CAPACITORS

in uF

15p - C1
270p - C2,43
39 - C4,23,28,41
68 - C6,24,25
0.01 - C7,14
1 - C8,48
0.001 - C9,10,15,16,17,18, 19,20,21,26,27,29, 31,35,39,40,46,47 49,50
10p - C22
68p - C51
150p - C30
1p - C12,34
100 - C36
330 - C5,37
350 - C38
39p - C42
- C44
3-20 - C3,32,33
270 - 11,13,45

RESISTORS

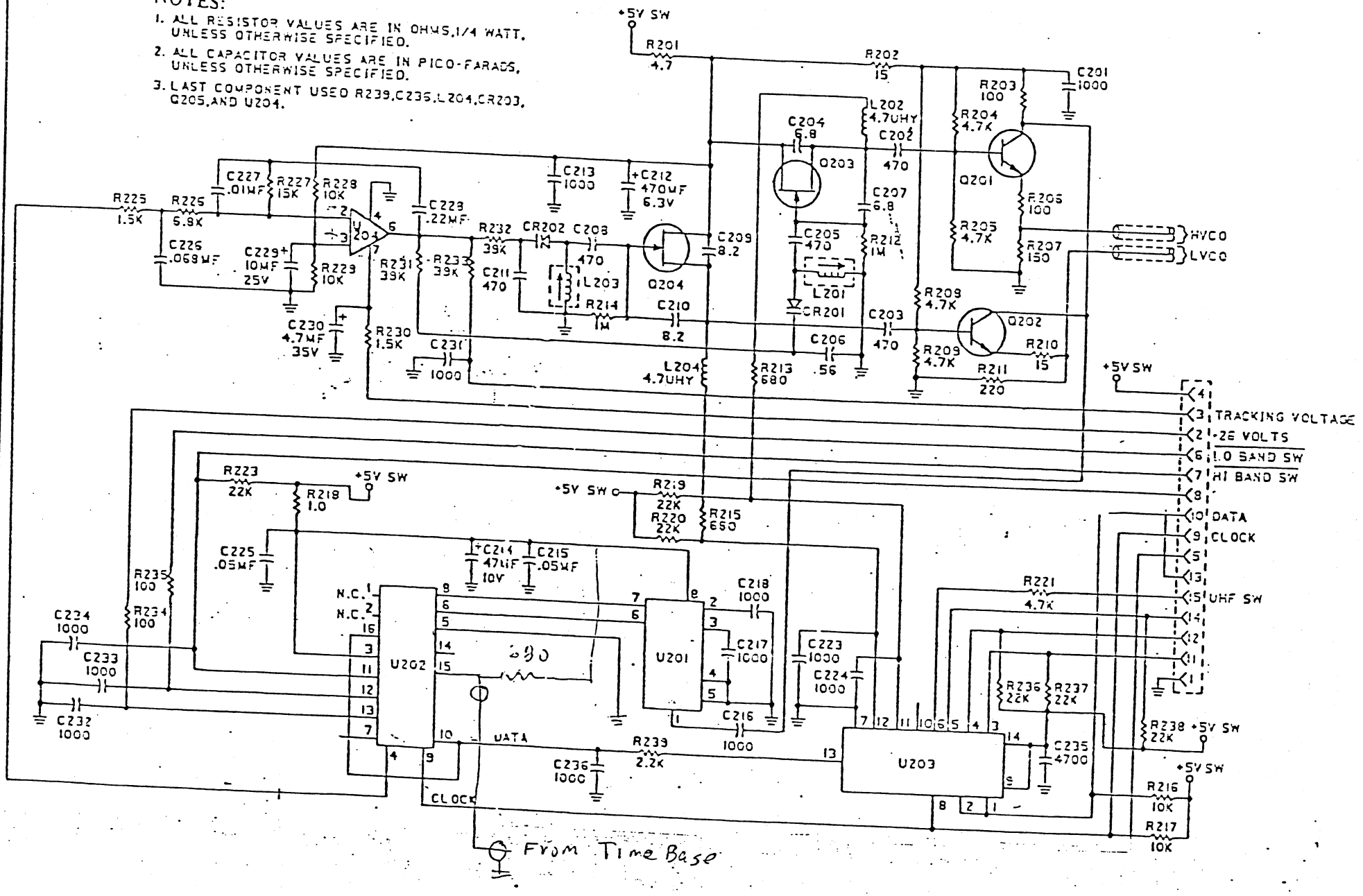
1K - R1,36
100K - R2,35,44
3.9K - R3
10 - R4,11,18,26,27
8.2K - R5
220 - R6,31
10K - R14,15,52
3.3K - R7,43
39K - R8,9,21,28,32,33
2.2K - R12,19
15K - R13,16,17,20,34
12K - R22,29
150 - R23,30
51 - R24
82 - R25,41
6.8M - R37
5.1K - R38
100 - R10,39
4.7K - R40
1.62K - R42
68 - R45
16 - R46,47
62 - R48,50
249 - R49
680 - R51

AIE

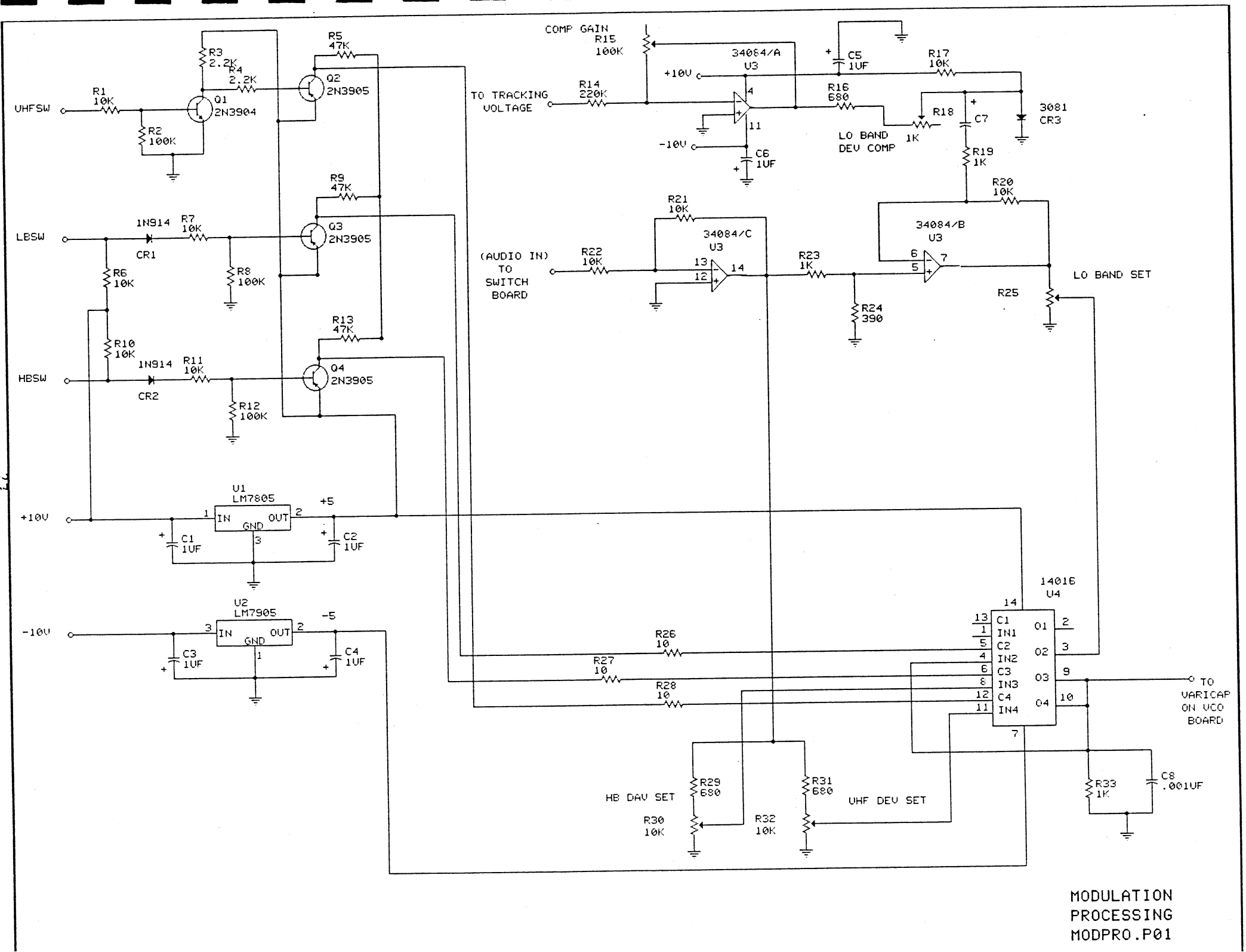
RF DECK(4X8).P01

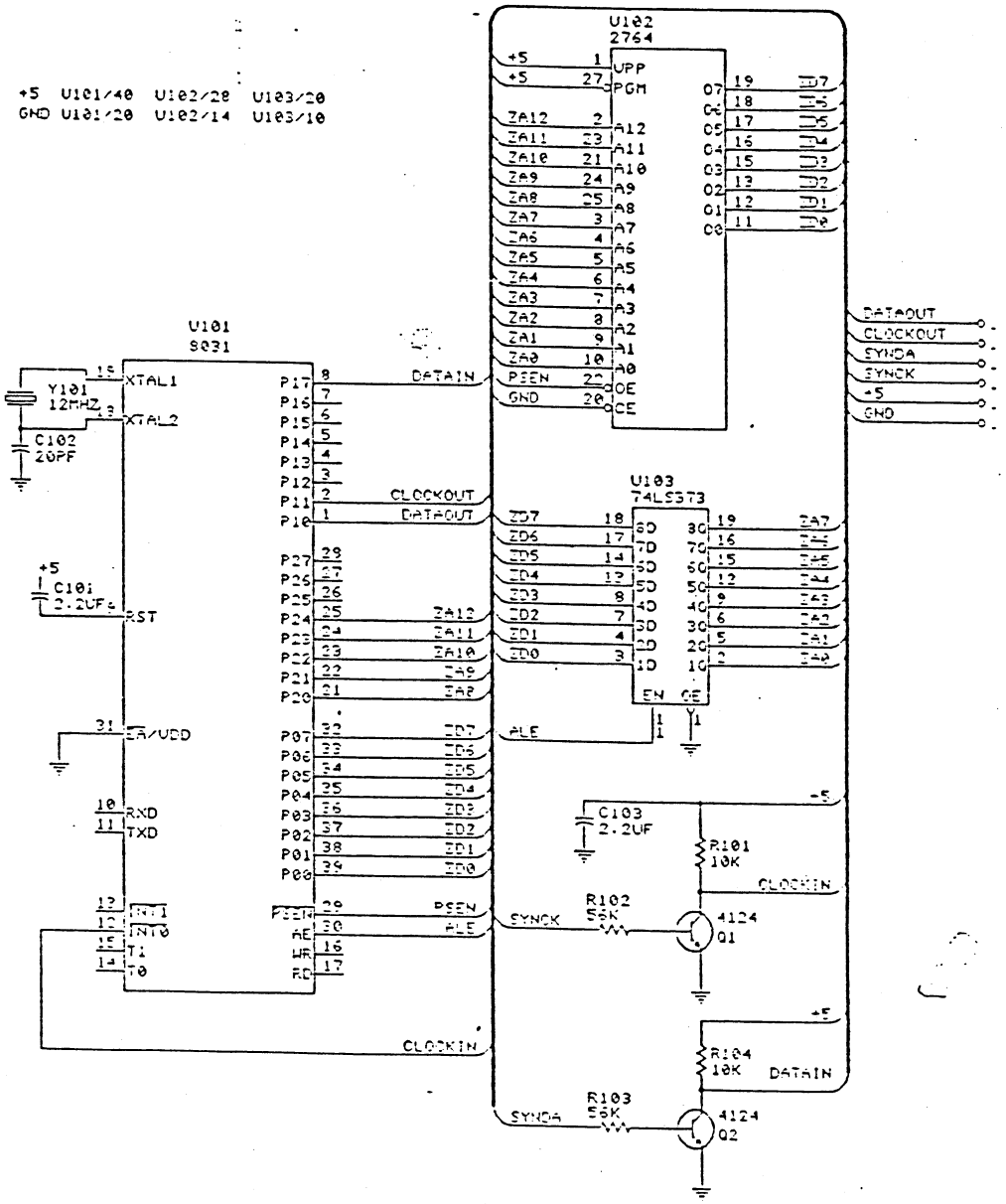
NOTES:

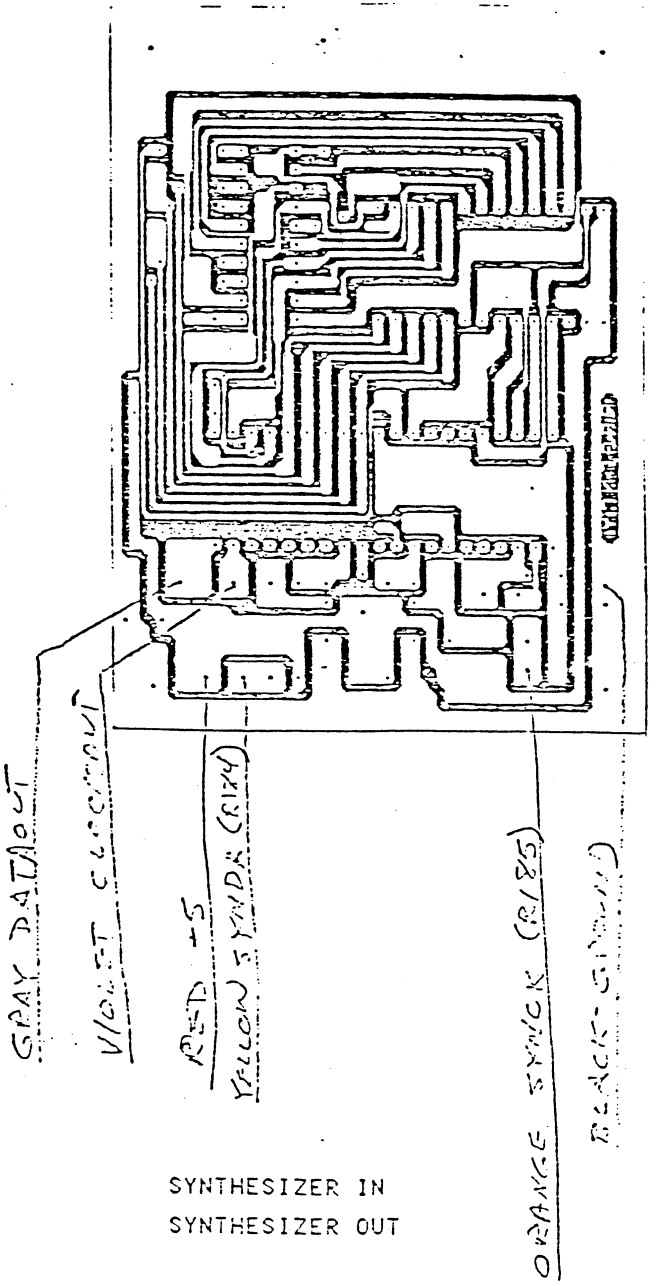
1. ALL RESISTOR VALUES ARE IN OHMS, 1/4 WATT, UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES ARE IN PICO-FARADS, UNLESS OTHERWISE SPECIFIED.
3. LAST COMPONENT USED R239, C236, L204, CR203, Q205, AND U204.



GENERATOR
VCO BOARD

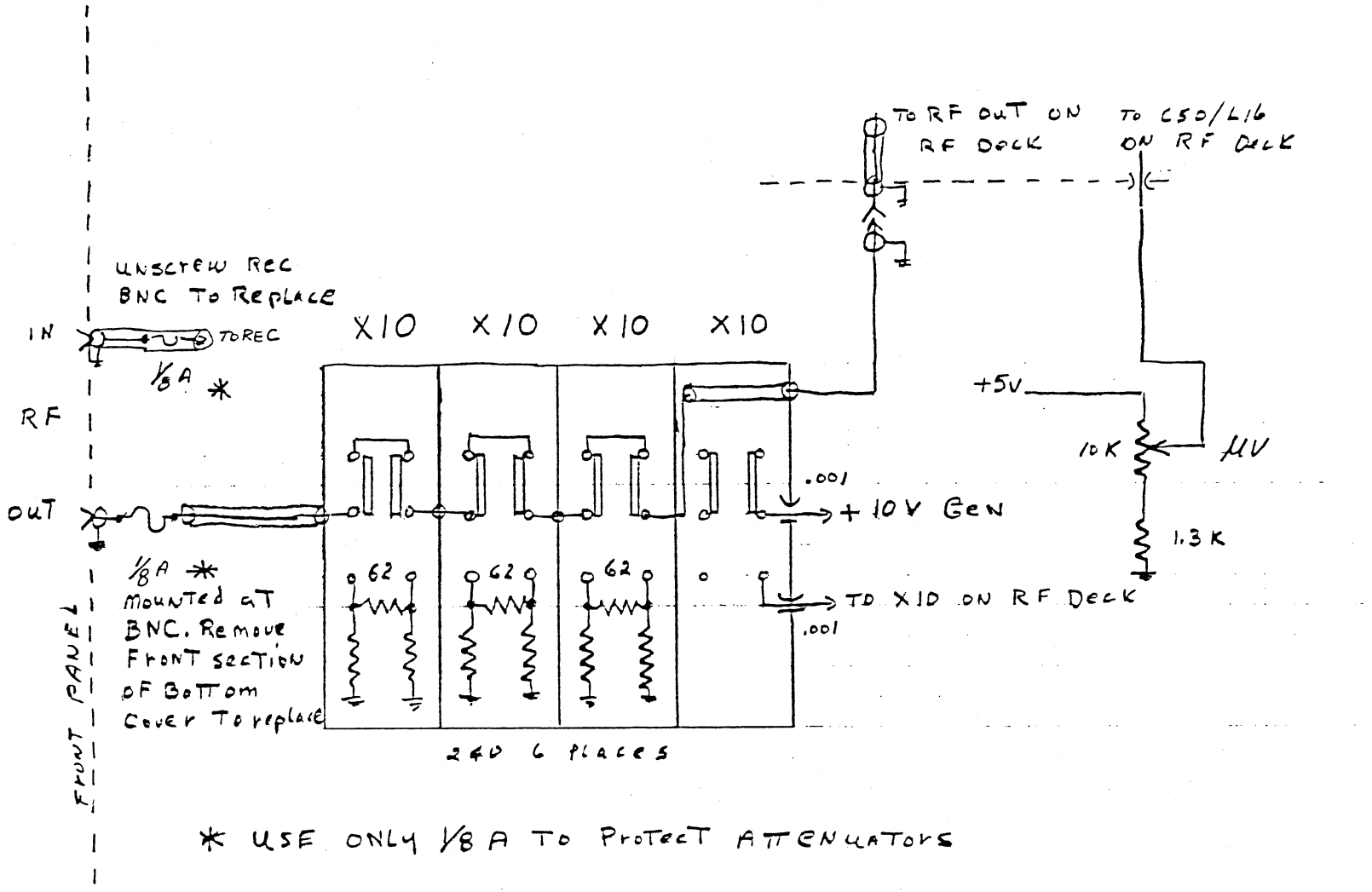

UHFSW
R1 10K
R2 100K
R3 2.2K
R4 2.2K
Q1 2N3904
R5 47K
Q2 2N3905
LBSW
1N914
CR1
R6 10K
R7 10K
R8 100K
R9 47K
Q3 2N3905
HBSW
1N914
CR2
R10 10K
R11 10K
R12 100K
R13 47K
Q4 2N3905
+10V
-10V
U1 LM7805
IN
GND
OUT
+5
C1 1UF
C2 1UF
U2 LM7905
-5
C3 1UF
C4 1UF
COMP GAIN
R15 100K
TO TRACKING VOLTAGE
R14 220K
34084/A U3
+10V
-10V
C5 1UF
C6 1UF
R16 680
R17 10K
R18 1K
LO BAND DEV COMP
C7
3081 CR3
R19 1K
R20 10K
(AUDIO IN) TO SWITCH BOARD
R21 10K
R22 10K
34084/C U3
R23 1K
34084/B U3
R24 390
R25
LO BAND SET
14016 U4
R26 10
R27 10
R28 10
TO VARICAP ON VCO BOARD
HB DAU SET
R29 680
R30 10K
UHF DEU SET
R31 680
R32 10K
R33 1K
C8 .001UF
MODULATION PROCESSING
MODPRO.P01



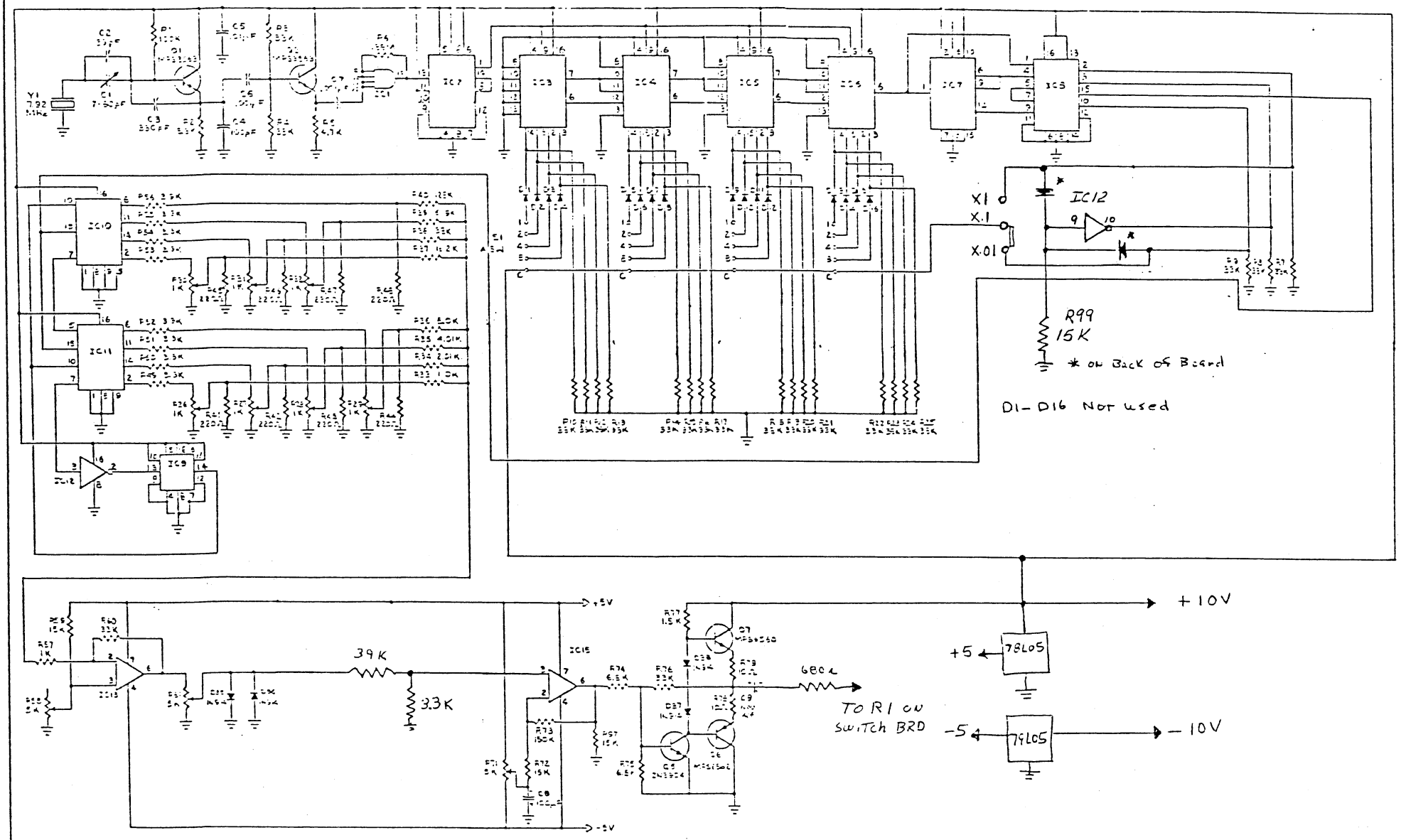


SYNTHESIZER IN
SYNTHESIZER OUT

GENERATOR

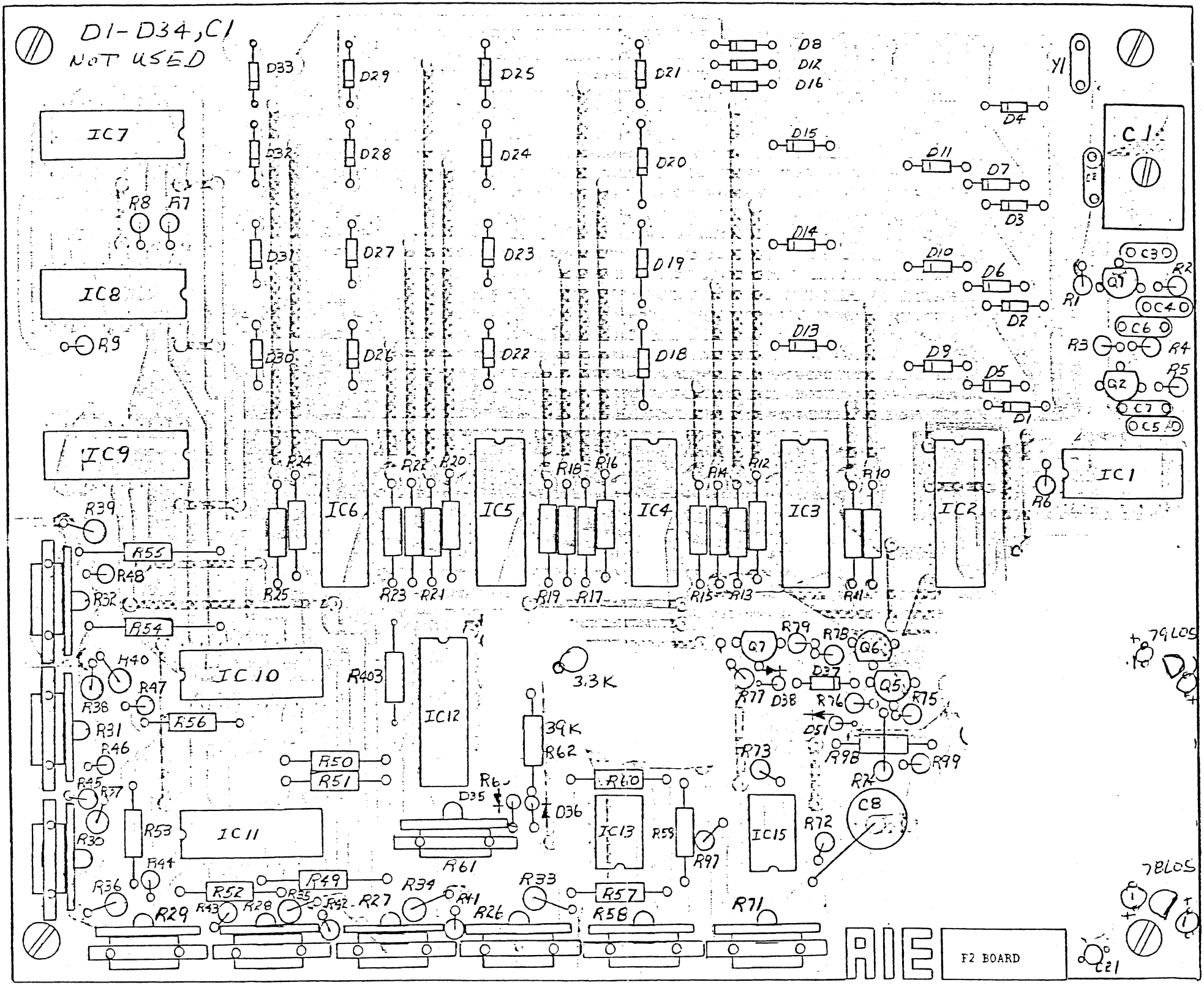


ATTENUATOR
PART OF FRONT


X1
X.1
X.01
IC12
R99
15K
* on Back of Board
D1-D16 Not used
39K
3.3K
+5V
-5V
+10V
-10V
78L05
79L05
TO R1 on
switch BRD

AIE

F2 BOARD


D1-D34, C1 NOT USED
IC7
IC8
IC9
IC10
IC11
IC12
IC13
IC15
IC6
IC5
IC4
IC3
IC2
IC1
C1
C8
F2 BOARD
AIE
Y1
3.3K
39K
79LOS
78LOS