DYNAMIC SPECIALTIES
PO BOX 20903
SAN JOSE, CA 95160
FEB. 18, 1983

Dear Sir:

Here is your RTTY-CW 800A PC board. I hope you are pleased with the quality. The PC shop does nice work.

Since the original layout was done, CT1 and CT2 were added as well as R129 and C45. Also a jumper option has been added to the board in the area of the relay. This is covered in the instructions. I have tried to provide you with the most accurate documentation possible. The schematics have been updated several times since the original boards have gone out, so some questions that others have had in the past should now be cleared up.

If you have any suggestions or improvements let me know. I will pass them on to all customers. The unit works well at 600 baud, but it doesn't quite work at 1200 baud. If anyone comes up with a 1200 baud modification please pass it on. Also, if you can find a reliable source for a 50 or 100 uA small meter at a reasonable price let me know. One user suggests that a diode be connected between the 5 volt and 10 volt power supplies as a protection in case one supply fails. This is a worthwhile idea, so use an extra 1N4001 with the anode to 5 volts. This will protect some of the op-amps if the 10 volt supply fails. You can add it on the bottom of the board in the power supply area. Also, at the bottom of this page is a suggested way to use a 170 volt loop supply with a model 15, 28 or other mechanical machine if you should have a need to.

I haven't any information yet on prices or availability for punched and silkscreened panels. If you use the cabinet from Jameco, a new panel can be added later on quite easily. There hasn't been much demand for panels so far.

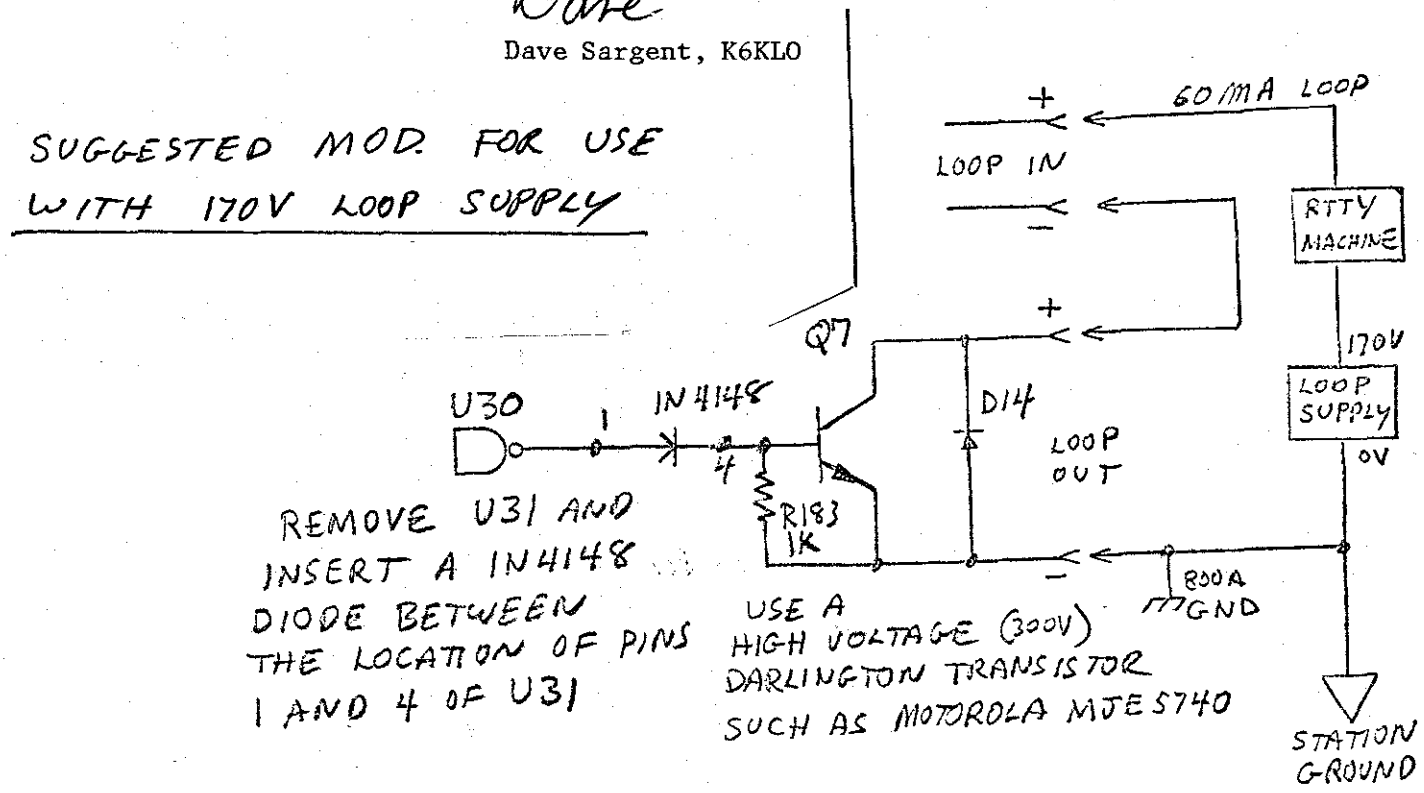
If you write for any information or about any problems, please include a SASE. it really helps.

Thank you for your business.

Dave

Dave Sargent, K6KLO

SUGGESTED MOD FOR USE WITH 170V LOOP SUPPLY



AFSK-CW 800A
INSTRUCTIONS

IMPORTANT: EXAMINE THE ENCLOSED MATERIAL CLOSELY. IF YOU DECIDE THAT THIS CONSTRUCTION PROJECT IS BEYOND YOUR CAPABILITIES, RETURN ALL THE MATERIALS POST-PAID AND YOUR FUNDS WILL BE REFUNDED. THIS MUST BE DONE BEFORE ANY SOLDERING IS DONE. BOARDS WHICH HAVE STARTED TO BE ASSEMBLED OR HAVE BEEN SOLDERED IN ANY WAY WILL NOT BE ACCEPTED FOR REFUND. THIS REFUND POLICY WILL BE IN EFFECT FOR 30 DAYS FROM THE SHIP DATE OF THE BOARD. AFTER THAT TIME NO REFUNDS CAN BE MADE.

THE CIRCUITS IN THIS SYSTEM ARE DESIGNED USING GOOD ENGINEERING PRACTICE WITH MODERN COST EFFECTIVE CIRCUITS USING TIME TESTED RTTY TECHNIQUE. DYNAMIC SPECIALTIES FEELS THAT THESE CIRCUITS WILL PROVIDE THE USER, WHO ASSEMBLES THE BOARD CORRECTLY AND PROPERLY SETS THE ADJUSTMENTS FOR ACCURATE OPERATION, WITH AN EXCELLENT RTTY AND CW TUNING UNIT AND MODULATOR/KEYER. WE CANNOT BE RESPONSIBLE FOR ERRORS IN ASSEMBLY OR IMPROPER ALIGNMENT. YOUR BOARDS HAVE BEEN INSPECTED, AND A SAMPLE FROM THE PRODUCTION RUN HAS BEEN ASSEMBLED AND TESTED. HOWEVER, BEFORE YOU START ASSEMBLY INSPECT THE BOARD ON BOTH SIDES CAREFULLY FOR ANY SOLDER BRIDGES. AFTER ASSEMBLY CHECK FOR SOLDER SPLASHES, OR ANY OTHER CONSTRUCTION ERROR BEFORE APPLYING POWER.

These instructions are intended to assist the builder of this system with some helpful hints, and are by no means intended to be complete step by step instructions. The builder should be capable of assembeling the boards and aligning the circuits with the information on the schematic diagrams alone. However, the following paragraphs should help answer most questions which may pop up, and the photographs of the assembled prototype should help the builder visualize the suggested packaging technique.

READ ALL OF THESE INSTRUCTIONS BEFORE STARTING ASSEMBLY.

Assembly of the board should not present any problems since the location of all IC's, and components are carefully labeled. There are two sets of holes for the trimpots to accommodate trimmers from either Jameco or Digi-Key. Install resistors and diodes first. Follow orientation markings for the diodes. Leave the programming diodes go until all other assembly is done. Next, install the IC's or sockets. Use only the 74LS family of TTL chips in the modulator. Other families will draw too much current, or be marginal in speed. This is important. CMOS would have been used if it would work in the modulator circuits. Note that all IC's are orientated the same EXCEPT U31. U31 was reversed for easier layout so, DON'T SOLDER U31 IN BACKWARDS. Next install the capacitors, and finally the trimpots. A wire jumper may be used for L1 unless the switching of the 555 chip causes noise in your receiver. Install the parts a few at a time, and cutoff the leads. Don't use excessive amounts of solder. Use a small tipped pencil iron with a hot tip. The PC pad should get hot enough to allow the solder to wick up into the plated through hole. A large lump of solder on the pad is not necessary. Plated through holes are quite durable compared to single sided pc boards, so a little more heat is allowable. Once the solder wicks into the hole, the joint should be good. Too much solder can cause shorts to adjacent pads. Some pads are very close, and a solder bridge would be easy to create. Check very closely for this. If the board is assembled properly it will work instantly when powered up.

The Jameco order form included lists most of the components need for

assembly. The remainder can be obtained from Radio Shack. Cross out parts you don't need, and increase the quantity of items you may wish to have spares of. Make the desired changes, add up the total cost, and send the order forms to Jameco. They are very prompt in delivery, and usually accurate in filling the order. The use of this filled out order form should greatly ease your parts ordering task. Parts on the Jameco form are less expensive than Radio Shack's. Some items not on the Jameco form are less expensive purchased from Radio Shack. The relay originally was a Radio Shack 275-228. It was made by CP CLare part no. 925A052A. This relay has been discontinued by Radio Shack and Clare. Too bad. It was good at a low price. Dynamic Specialties is providing a single pole 12 volt relay for $6.50 which includes postage and handeling. It is a CP Clare MRB1A12 which is in a metal case. Most parts houses that carry this and other similar relays have a $25 minimum order, so to solve the problem Dynamic Specialties will stock them.

R186 is 1/2 watt and may be purchased from Radio Shack. A 33 ohm unit may be used. U33 was not heat sinked in the prototype units, but it gets quite hot. No failure of U33 was experienced because of the heat. An Aluminum plate may be used for a heat sink. If it is L shaped it can be fastened to the back panel for better heat transfer. Be sure to insulate it from the tab on U33 with a mica washer and some heat sink grease. Some heat sink manufactures make a heat sink that will slip on to U33. Jameco has one that looks like it will fit. Order THM6047 for 35 cents.

It is advisable that sockets be used for all IC's, however, with the exception of the MF-10's and the 2211, all IC's are cheap enough to solder in directly if you have confidence that you can remove one without frying the PC board. Plated through holes are usually durable enough to withstand this operation once. If an IC is desoldered, it is recommended that a socket be used when it is replaced. IC's can be removed by using a vaccum solder sucker, or the leads can be clipped, and removed one at a time. This of course ruins the IC. Sockets are not included on the order form. To order low profile sockets from Jameco, add to the order form:

8 pin LP	socket	.16
14 pin LP	socket	.17
16 pin LP	socket	.19
20 pin LP	socket	.30

The XR2211 is 14 pin and the MF10's are 20 pin chips.

Rear panel connectors are not listed on the parts list. The microphone input needs to match the connector on your microphone. The photographs of the prototype show a connector for the TONE-MIC-PTT. You can use a plastic strain relief and wire a piece of microphone cable directly to the board. A connector isn't really necessary. The same goes for the RS232 connector, but you might want to use a 4 pin DIN connector like on the TRS80C RS232 cable. Radio Shack doesn't carry the 4-pin panel mount DIN connector, but lots of CB stores do. The keying relay connector on the prototype is a Radio Shack 274-1212 speaker connector. The 4 RCA type connectors are 274-346, and the current loop pushbutton connectors are 274-622. (The loop connector block needs a large rectangular hole in the panel.) The key jack in the front panel needs to be an ungrounded type. Radio Shack 274-249. It mates with 3 conductor plug 274-284.

Use the terminals that don't go to the panel ground. More on this later.

The meter on the prototype is a Radio Shack 270-1751. It is a nice meter for the price, but is too big. If you use it you will have to trim the plastic on the cabinet at the top of the meter. This is because the meter cannot be mounted lower without interfering with the PC board. If you use a 100 uA meter change R148 and R149 to 15K. A 1mA meter really isn't satisfactory because it loads the circuit too much, but if you want to use one, change R148 and R149 to 1K, R175 to 10K and C84 to 1.0uF.

The prototype used a different crystal than the one listed. The Radio Shack crystal gave some trouble, but the addition of CT1 and CT2 clears that up. CT1 is located next to C1. CT2 is next to R42 and pin 14 of U5. CT1 and CT2 are not silkscreened on the board. The Radio Shack crystal is at a very good price. The color burst crystal from Jameco is too big (HC33).

If you use the suggested cabinet, the mounting holes in the board will line up with built-in plastic stand-offs in the cabinet. It is helpfull to run a 6-32 tap into the plastic before inserting a screw. Use round head 6-32 machine screws to mount the board; they have smaller heads than pan head screws. You may notice a few low level "birdies" in your receiver. These are very low and haven't caused any problems, but you might want to consider an all metal cabinet. Lining the plastic cabinet with foil might help, but that hasn't been tried. Even the signal at the crystal frequency (3.5795MHz) is at a very low level.

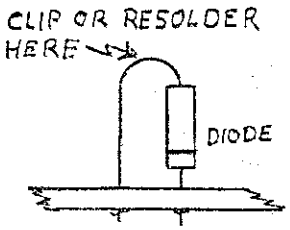
The biggest job you have is making nice looking panels. One nice thing about the Jameco cabinet is that if a panel is ruined, a replacement is just a flat sheet of aluminum. The next big job is wiring from the board to the panel components. The panel wiring drawing and the schematic should clearly show just how everything goes. Mount all the panel components and lay the panels alongside the board. Use fairly short wires to connect everything. A little excess length is desirable, and the excess can be tucked under and around the switches. The wires from the back to the front panel can be run under the board to keep things looking neat. Wires of various colors can help keep things straight. USE STRANDED WIRE. Wire stripped from ribbon cable is nice for this kind of wiring, and 24 gauge wire is large enough. You might find it helpful to use a large round file to file away a little of the back of the board near the center to allow a little more room for the wires from the power transformer. There is enough room, but it is tight. Don't leave any sharp burrs that might cut the cord. You might consider making some L shaped brackets out of a material that is solderable. One end should have a 1/4 inch hole to fit RCA jacks on the back, and a couple of switches in the front. The bent end of the bracket could be soldered to the ground plane along the board edge. This would support the panels to the board, and allow easier trouble shooting, programming, etc.

You will find two jumper locations on the bottom of the board near the relay. A jumper is part of the board to the 14V position. This is all OK for use with a 12 volt relay. If you use a 5 Volt relay

the jumper needs to be cut, and one put in to 5V. It is recommended however that a resistor to 14V be used rather than the 5V line because the relay current will be supplied by the 5V regulator. It depends on the relay. The Radio Shack relay (if you can find one) requires a 330 ohm, 1/2 watt resistor to 14V. Another 2 pole relay, CP Clare MRB2A05, has a 100 ohm coil and requires a 180 ohm, 1 watt resistor to 14V. These are 5 volt relays. Everything is set up for a 12 volt relay. Don't use C16 with 14 volts unless you are using a 5 volt relay. If you use C16 make sure it has a voltage rating above 14 volts. Your parts list may show it as a 12 volt unit. You can use any small relay that will fit in the area, or order the single pole unit from Dynamic Specialties. Keep in mind that the relay has to switch fast, and some relays are too slow. Dry reed relays like the ones mentioned above are more than fast enough. Also note that the relay will remain energized in the RTTY mode. If this is a problem, connect a small wire from the unused side (RTTY side) of S2a, page 1 to the base of Q1 (R29). This will release the relay in the RTTY mode.

Wiring of S1 can be done in several ways. Each position can be wired for totally different frequency pairs. The mark frequency is also the CW tone frequency. In some areas 1200/2200 is used as an AFSK pair for sending computer prograns on VHF. You could use the special position for this, or the CW position could be used. Some people use 2295 for space and 1295 for mark. The 1295 frequency would also be the CW tone frequency in the CW mode instead of 1000 Hz.

The programming diodes are installed standing up on end. This is a little hard to see in the pictures, but the drawing to the left should clearify the installation. The diodes should follow the diode symbol at the left of the matrix area on the board. Put the band on the diode against the board with the anode up. Once a diode is installed, it never needs to be removed. If you want to change frequency in a group, just add the diodes needed, and delete the unwanted diode by clipping the anode wire. If you want it back, just tack solder it back where you clipped it. The program provided will make locating the positions for the diodes easy. The program outputs the positions labeled on the board. The schematic shows were to place diodes for the most used frequencies. If you would like Dynamic Specialties to provide the location of diodes for a special frequency, send a SASE along with the frequency you want locations for.



ALIGNMENT

The first thing to do is to determine the polarity of your RS232 keying signal. If a positive level gives a mark, and negative gives a space, there is nothing to change. If the reverse is true, you will have to cut the board at J1 and solder in J2. If your CW keying and AFSK keying are not in agreement, (CW tone should be a mark) you may have to cut away U4 pin 2 from pin 9 and connect it to pin 8. This will reverse the AFSK keying. The previous discussion does not refer to the CW ID manual key jack. To reverse it, key pin 6 of U6 to ground instead of to R12. If you are confused, continue with the alignment and check it out later. There should be nothing to change

if you are using Clay Abrams software and a TRS80C.

There is really nothing to align in the modulator. C1 can be changed slightly to adjust the oscillator to exactly 3.579545 MHz, but with the values given, the output should be right on even if the oscillator is off slightly. In the variable space mode, U11 sets the space frequency with R44. The tuning range can be changed by selecting different values for R40, R43, and R44. You can check the output frequency on a counter, or send the tone on VHF FM, and have a friend with a counter measure it for you. Set R45 for an output level that is about the same as your microphone output. On CW, you can key a sideband rig with a tone in the microphone line or use a set of keying relay contacts. Actually, the relay isn't needed unless you want to key a keying line or an AM rig. The single tone into your sideband rig will appear as a CW carrier on the air which is shifted away from your actual carrier frequency by the amount of the audio tone.

On page 2 of the schematic, the OUT OF LOCK LED's will tell you if the modulator is at least in range. The LED's should not be on if everything is working properly. U14 and U16 multiply the modulator clock to provide the proper clock for the 8 pole mark and space filters. When you change modulator frequencies, the filters clock also changes, and the filter will be tuned to the modulator frequency. Switch S1 between different frequencies. The lock LED's should blink on for an instant. If not you have a problem. The LED may be reversed or bad, or you have a short etc. CT2 was added to the circuit to stretch the pulse at pin 14 of U16 slightly to make locking of U16 more reliable.If everything checks out you are ready to tune the filters. You can use a oscilloscope at the mark/space outputs or the panel meter. Jumper the modulator output to the audio input. Put out a mark tone, and adjust R61, 65, 71, and 74 for maximum on the meter or scope. Put out a space and do the same for R91, 95, 101, and 105. Do this with the input level set just at the point were the limit LED comes on. Thats all there is to tuning the filters. They now will track the modulator. If the mark and space frequencies do not provide the same meter deflection the value of R141 or R142 can be changed slightly. The prototype required a 4.7K resistor at R142 to even things up.

The Autostart trimpot is set with a mark tone at a level just below limiting. Adjust R163 at the point where pin 4 of U27 goes near zero volts. If the mark tone is removed, the level should go to 9 volts or more after a slight delay. The delay can be changed by adjusting the values of C56 and R164. You could of course bring R163 out as a front panel control, but S9 opens the output gates and seems to be enough control.

The power supplies are straight forward. U29 is used as an inverter power supply to provide the proper negative voltage for the RS232 output. It is unregulated and the voltage can range between -9 volts to -15 volts.

The CW detector, U24 and U25, is similar to the detector provided with Clay Abrams software. The mark filter is used to filter the input to it. The XR2211, U26 is the AFSK detector. It is in a circuit similar to one described in Dec. 1980 QST, except that an

active filter with some gain is used in the loop. This filter inverts the data, so the output at pin 7 is reversed. U28 corrects this, and allows selection of data in either direction.

U30 provides the various outputs. The output of this chip is current limited, so it can drive the diodes in the TTL output circuit directly as well as the diode in U31. Try to keep loop supply voltage across Q7 to less than 50 volts. Make sure your loop supply is current limited. Q7 should not need a heat sink. In the input current loop, R17 can be changed slightly for different current loops. Keep the diode current in the opto-isolator U6 to no more than 20 mA. The RS232 input will operate at RS232 levels or at TTL levels.

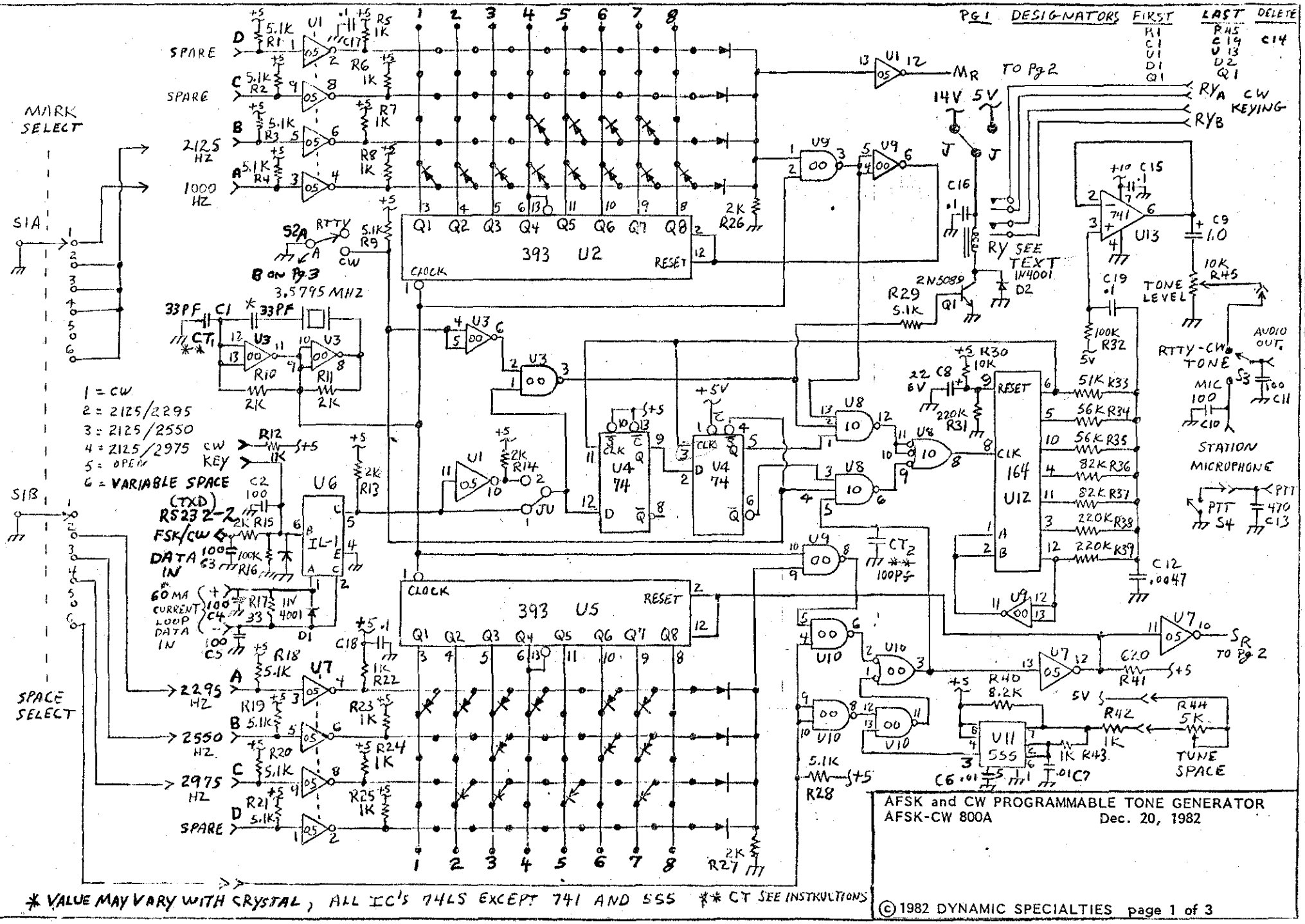
TUNING PROCEEDURE

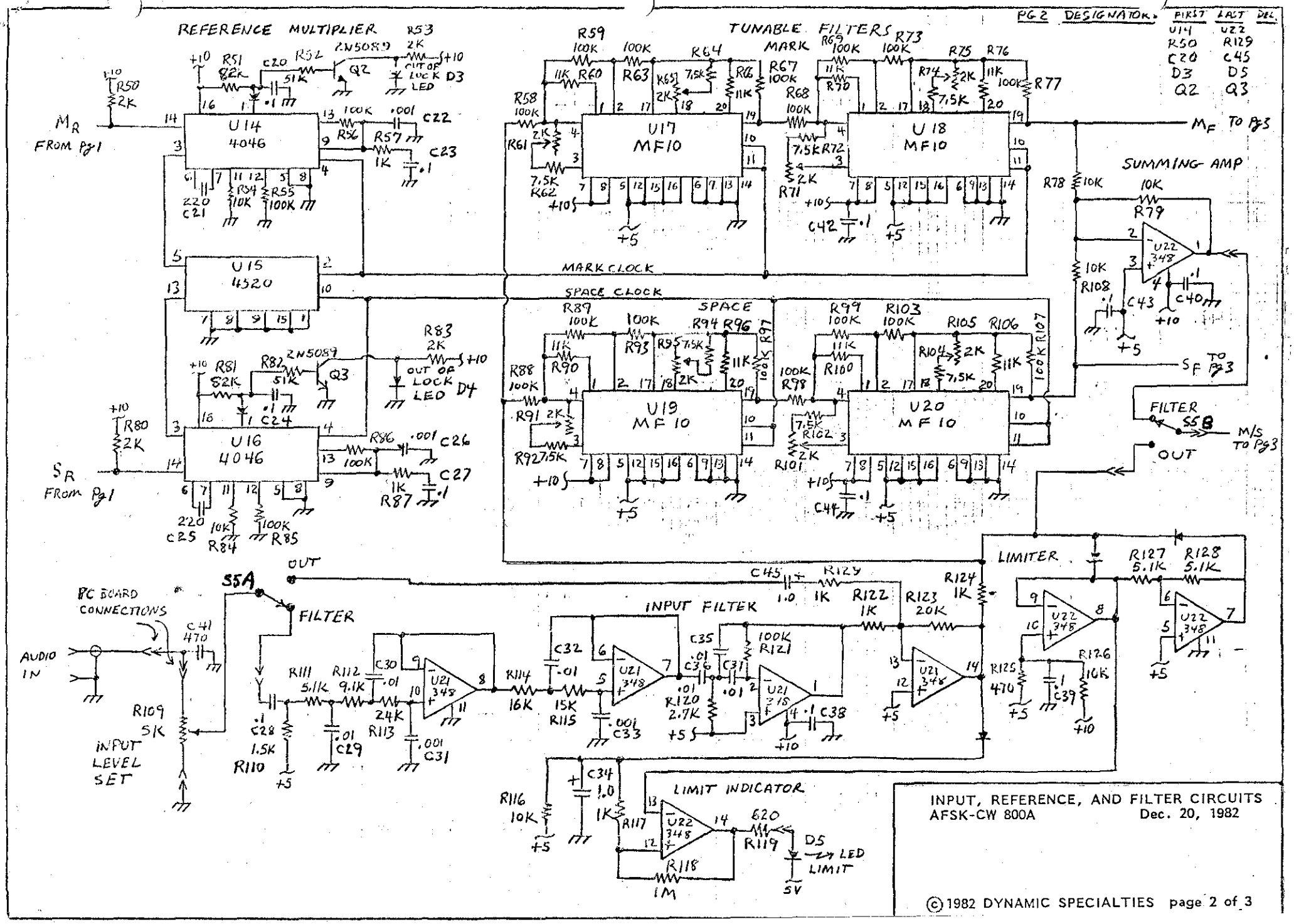
For 170 shift use the narrow, and slow switch positions. The meter will kick up about half scale on a mark tone and the mark LED will light. When a space tone comes in the space LED will light and the meter will kick up to almost full scale. (The meter indication is not as good if you use a 1 mA meter.) Now that the tones are properly tuned in switch the meter to the lock detect function, and adjust R170 for zero on the meter. You may have to adjust it one way or the other slightly for best copy. For 425 shift and more, select the wide switch position. For baud rates faster than 150 baud use the fast switch position. With VHF FM operation, tuning isn't a problem. Just select the proper shift and speed, and adjust the lock control for a null.

Variable shift will allow tuning of oddball shifts. Tune in the mark frequency with the meter and LED. Adjust R44 until the meter kicks up higher and the space LED lights. Make sure you haven't tuned the mark again. You not only have the shift tuned in, but your modulator will also be within a few Hz of shift of the signal you have tuned in.

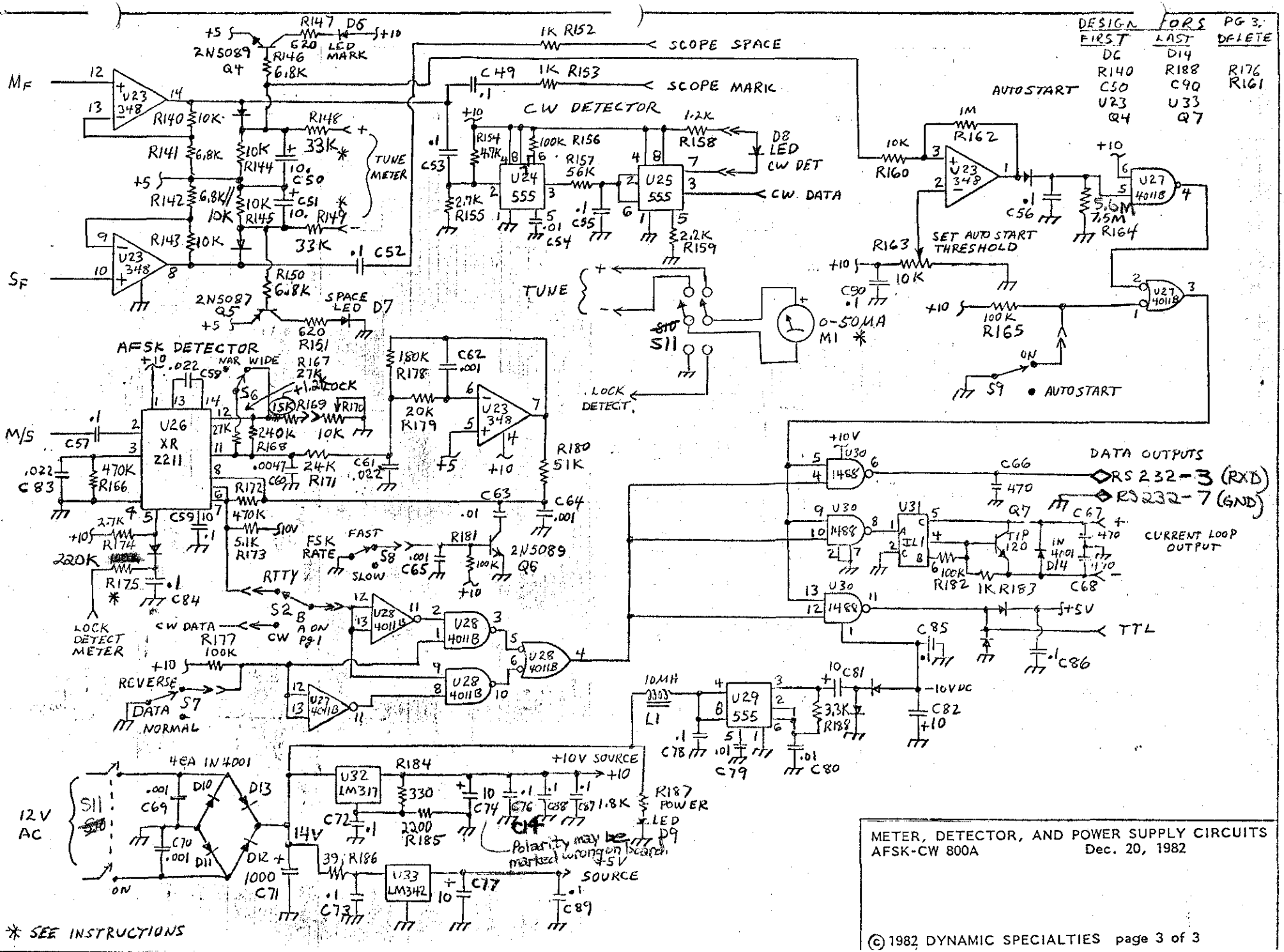
The CW LED will flash along with the mark LED. This is normal reguardless of the mode you are in.

These instructions should be enough to get you started. The answers to many questions you may have initally should be answered as you work with the unit. If you would like any specific questions answered by Dynamic Specialties, feel free to write. Please include a SASE.

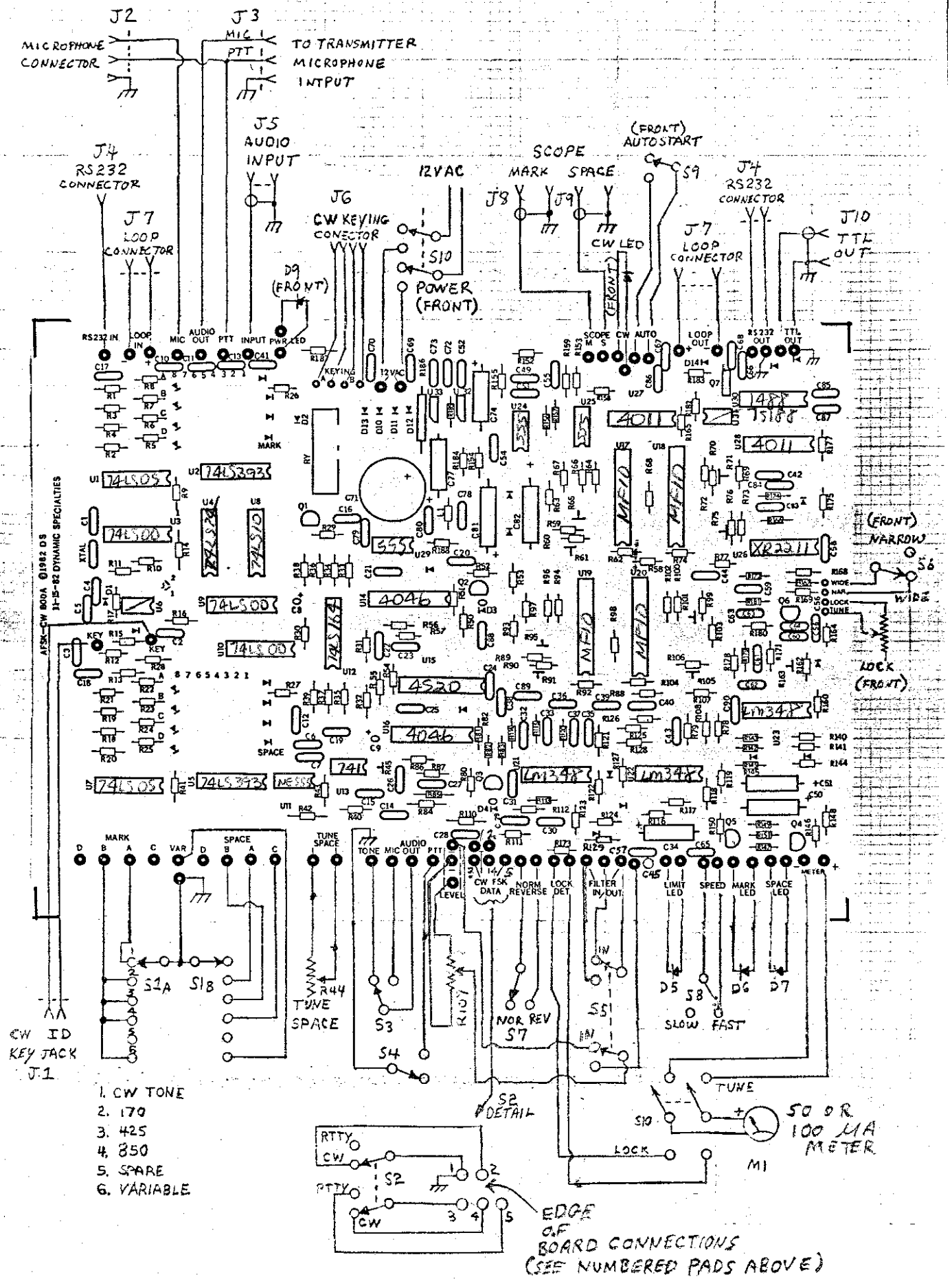

PG 1 DESIGNATORS FIRST LAST DELETE
R1 R45 C14
C1 C19
U1 U13
D1 U2
Q1 Q1
MARK SELECT
SPACE SELECT
SPARE
SPARE
2125 HZ
1000 HZ
2295 HZ
2550 HZ
2975 HZ
SPARE
S1A
S1B
1 = CW
2 = 2125/2295
3 = 2125/2550
4 = 2125/2975
5 = OPEN
6 = VARIABLE SPACE
CW KEY
RS232-2 (TXD)
FSK/CW & DATA IN
60 MA CURRENT LOOP DATA IN
393 U2
393 U5
CLOCK
RESET
3.5795 MHZ
B ON Pg 3
S2A RTTY CW
MR
TO Pg 2
14V 5V
RY SEE TEXT
1N4001 D2
2N5089 Q1
RYA CW KEYING
RYB
TONE LEVEL
RTTY-CW TONE
AUDIO OUT
MIC
STATION MICROPHONE
PTT
PTT S4
SR
TO Pg 2
TUNE SPACE
AFSK and CW PROGRAMMABLE TONE GENERATOR
AFSK-CW 800A Dec. 20, 1982
* VALUE MAY VARY WITH CRYSTAL, ALL IC's 74LS EXCEPT 741 AND 555 ** CT SEE INSTRUCTIONS
©1982 DYNAMIC SPECIALTIES page 1 of 3



INPUT, REFERENCE, AND FILTER CIRCUITS
AFSK-CW 800A Dec. 20, 1982



METER, DETECTOR, AND POWER SUPPLY CIRCUITS
AFSK-CW 800A Dec. 20, 1982



AFSK-CW 800A WIRING
PC BOARD TO FRONT + REAR PANELS
12-82 D.S.

```
10 REM: THIS PROGRAM LOCATES THE POSITION OF THE
20 REM: PROGRAMMING DIODES IN THE RTTY-CW 800A
30 REM: MODULATOR. IT WILL RUN UNDER TANDY COLOR
40 REM: BASIC, EXTENDED BASIC, TSC BASIC, AND
50 REM: OTHERS. IT MAY REQUIRE MODIFICATION FOR
60 REM: SOME BASICS HOWEVER, AND HAS ONLY BEEN
70 REM: RUN ON THOSE MENTIONED ABOVE.
80 REM: THE PROGRAM ASSUMES A COLOR BURST CRYSTAL FOR
90 REM: THE CLOCK. IF YOU WISH TO USE ANOTHER FREQUENCY
100 REM: CRYSTAL, CHANGE THE FREQUENCY IN LINE 160.
110 REM: WITH THIS CLOCK FREQUENCY, VALID OUTPUT
120 REM: FREQUENCIES ARE BETWEEN 1000 AND 3000 HERTZ.
130 REM:
140 PRINT "FREQUENCIES IN HERTZ"
150 PRINT
160 F=3.579545E6
170 INPUT "OUTPUT FREQUENCY";O
180 D=8
190 PRINT
200 N=F/(7*O)-1
210 R=INT(N)
220 R=N-R
230 IF R>.5 THEN N=N+1
240 PRINT "COUNT NEEDED=";INT(N)
250 PRINT "FOR AN OUTPUT OF";O
260 PRINT "DIODE LOCATIONS"
270 S=0
280 GOSUB 500
290 IF K>N THEN 330
300 IF (S+K)>N THEN 330
310 PRINT "USE Q";D
320 S=S+K
330 D=D-1
340 IF D=0 THEN 360
350 GOTO 280
360 PRINT
370 PRINT "ACTUAL COUNT=";S
380 X=F/(7*S)
390 PRINT "ACTUAL FREQUENCY=";X
400 P=((X-O)/O)*100
410 PRINT "PERCENT ERROR=";P
420 IF P>.5 THEN N=N+1 ELSE GOTO 480
430 PRINT "EXCESSIVE ERROR, INCREASE COUNT BY 1"
440 PRINT
450 S=0
460 D=8
470 GOTO 210
480 PRINT
490 END
500 K=1
510 FOR X=1 TO D
520 K=K*2
530 NEXT X
540 RETURN
```

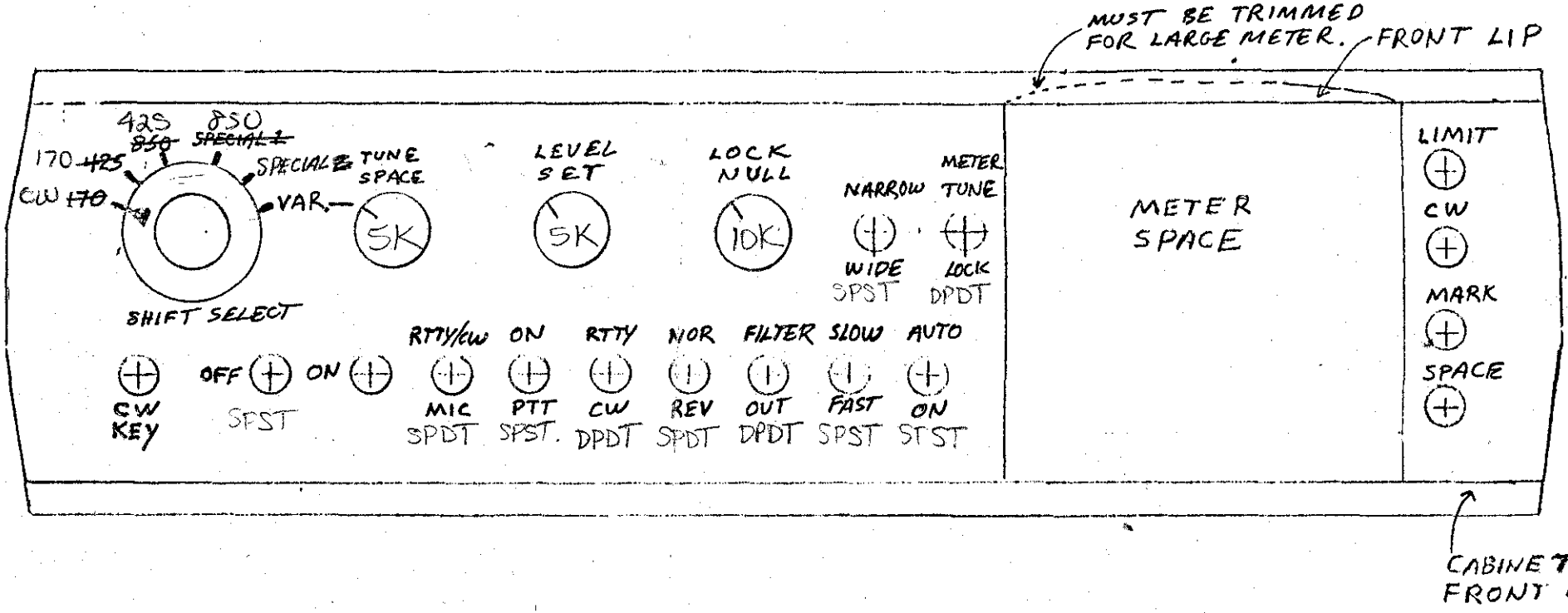
SAMPLE RUNS

```
FREQUENCIES IN HERTZ


COUNT NEEDED= 240
FOR AN OUTPUT OF 2125
DIODE LOCATIONS
USE Q 7
USE Q 6
USE Q 5
USE Q 4

ACTUAL COUNT= 240
ACTUAL FREQUENCY= 2130.68
PERCENT ERROR= .267371


FREQUENCIES IN HERTZ


COUNT NEEDED= 394
FOR AN OUTPUT OF 1295
DIODE LOCATIONS
USE Q 8
USE Q 7
USE Q 3
USE Q 1

ACTUAL COUNT= 394
ACTUAL FREQUENCY= 1297.88
PERCENT ERROR= .222168

FREQUENCIES IN HERTZ

COUNT NEEDED= 283
FOR AN OUTPUT OF 1800
DIODE LOCATIONS
USE Q 8
USE Q 4
USE Q 3
USE Q 1

ACTUAL COUNT= 282
ACTUAL FREQUENCY= 1813.35
PERCENT ERROR= .741442
EXCESSIVE ERROR, INCREASE COUNT BY 1

COUNT NEEDED= 284
FOR AN OUTPUT OF 1800
DIODE LOCATIONS
USE Q 8
USE Q 4
USE Q 3
USE Q 2

ACTUAL COUNT= 284
ACTUAL FREQUENCY= 1800.58
PERCENT ERROR= .031996
```

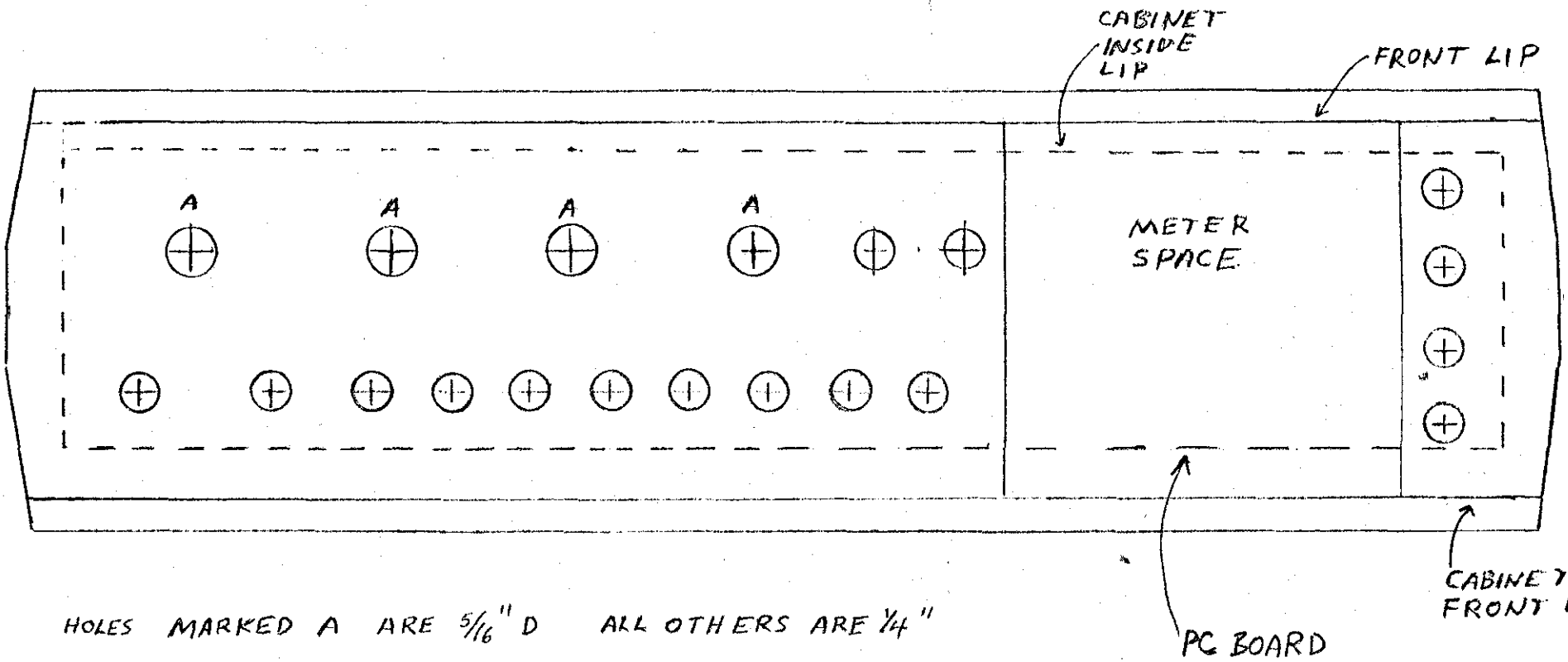
```
10 'THIS PROGRAM LOCATES THE POSITION OF THE
20 'PROGRAMMING DIODES IN THE RTTY-CW 800A
30 'MODULATOR.  IT WILL RUN UNDER COLOR EXTENDED
40 'BASIC.  THE PROGRAM ASSUMES A COLOR BURST
50 'CRYSTAL FOR THE CLOCK.  IF ANOTHER CRYSTAL IS
60 'USED. CHANGE THE FREQUENCY ON LINE 160.
70 'WITH THIS CLOCK, VALID OUTPUT FREQUENCIES
80 'ARE BETWEEN 1000 AND 3000 HZ.
90 '
100 PRINT "FREQUENCIES IN HERTZ"
110 PRINT
160 F=3.579545E6
170 INPUT"OUTPUT FREQUENCY";O
180 D=8.
190 PRINT#-2
200 N=F/(7.*O)-1.
210 R=INT(N)
220 R=N-R
230 IF R>.5 THEN N=N+1.
235 PRINT#-2, "FREQUENCY= ";O;" HZ"
240 PRINT#-2, "COUNT NEEDED=";INT(N)
250 PRINT#-2, "FOR AN OUTPUT OF";O
260 PRINT#-2, "DIODE LOCATIONS"
270 S=0
280 GOSUB 500
290 IF K>N THEN 330
300 IF(S+K)>N THEN 330
310 PRINT#-2,"USE Q";D
320 S=S+K
330 D=D-1
 40 IF D=0 THEN 370
350 GOTO 280
370 PRINT#-2,"ACTUAL COUNT=";S
380 X=F/(7.*S)
390 PRINT#-2,"ACTUAL FREQUENCY=";X
400 P=((X-O)/O)*100.
410 PRINT#-2,"PERCENT ERROR=";P
420 IF P>.5 THEN N=N+1 ELSE GOTO 480
430 PRINT#-2, "EXCESSIVE ERROR"
440 PRINT#-2," "
450 S=0
460 D=8.
470 GOTO 210
480 PRINT
485 GOTO 170
490 END
500 K=1.
510 FOR X=1 TO D
520 K=K*2.
530 NEXT X
540 RETURN
```

```
FREQUENCY=  2125  HZ
COUNT NEEDED= 240
FOR AN OUTPUT OF 2125
DIODE LOCATIONS
USE Q 7
 SE Q 6
USE Q 5
USE Q 4
ACTUAL COUNT= 240
ACTUAL FREQUENCY= 2130.68155
PERCENT ERROR= .267366926

FREQUENCY=  2295  HZ
COUNT NEEDED= 222
FOR AN OUTPUT OF 2295
DIODE LOCATIONS
USE Q 7
USE Q 6
USE Q 4
USE Q 3
USE Q 2
USE Q 1
ACTUAL COUNT= 222
ACTUAL FREQUENCY= 2303.43951
PERCENT ERROR= .367734697

FREQUENCY=  2550  HZ
COUNT NEEDED= 200
FOR AN OUTPUT OF 2550
DIODE LOCATIONS
USE Q 7
 3E Q 6
USE Q 3
ACTUAL COUNT= 200
ACTUAL FREQUENCY= 2556.81786
PERCENT ERROR= .267366933

FREQUENCY=  2975  HZ
COUNT NEEDED= 171
FOR AN OUTPUT OF 2975
DIODE LOCATIONS
USE Q 7
USE Q 5
USE Q 3
USE Q 1
ACTUAL COUNT= 170
ACTUAL FREQUENCY= 3008.02101
PERCENT ERROR= 1.10994987
EXCESSIVE ERROR

FREQUENCY=  2975  HZ
COUNT NEEDED= 173
FOR AN OUTPUT OF 2975
DIODE LOCATIONS
USE Q 7
USE Q 5
 3E Q 3
USE Q 2
ACTUAL COUNT= 172
ACTUAL FREQUENCY= 2973.04402
PERCENT ERROR=-.065747237

FREQUENCY=  1000  HZ
COUNT NEEDED= 510
FOR AN OUTPUT OF 1000
DIODE LOCATIONS
USE Q 8
```

FRONT PANEL DETAILS 1 & 2 CTB-1 CABINET

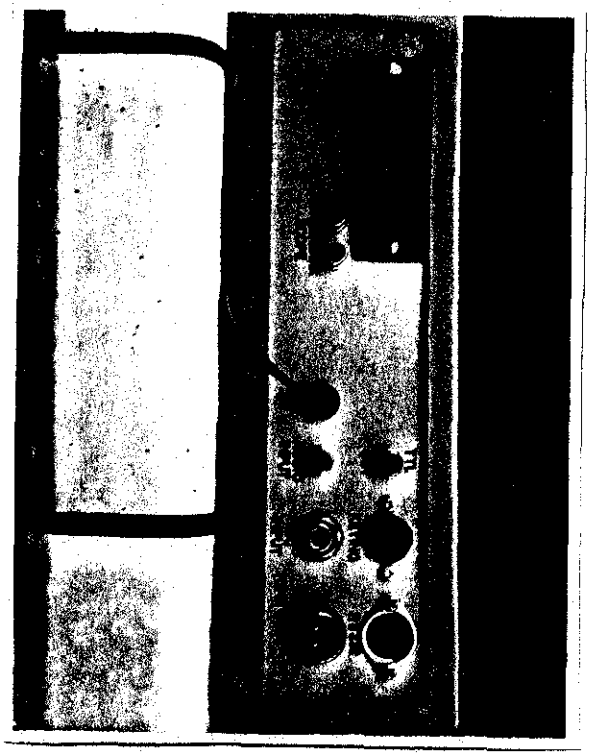


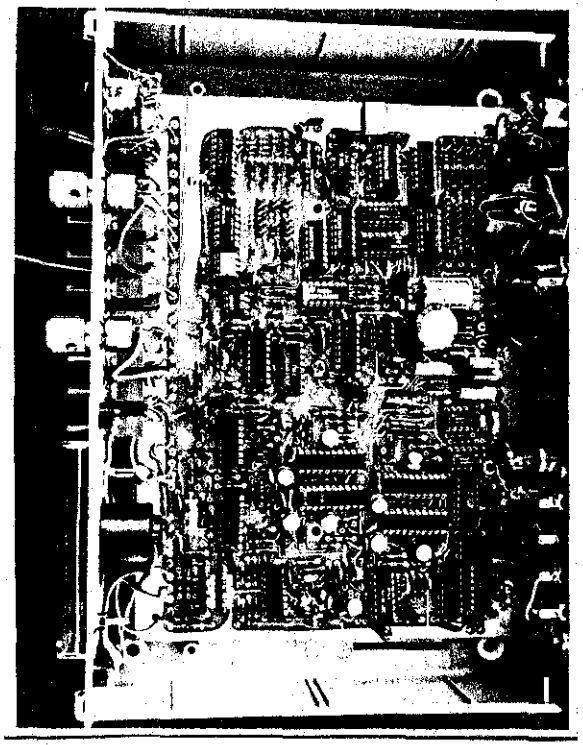
SUGGESTED FRONT PANEL LAYOUT. ENOUGH SPACE IS ALLOWED FOR THE RADIO SHACK METER. A NARROW EDGEWISE METER WOULD BE IDEAL AND ALLOW LESS CROWDING OF SWITCHES. SMALLER POTS AND FREQUENCY SELECT SWITCH WOULD ALSO ALLOW MORE SPACE.

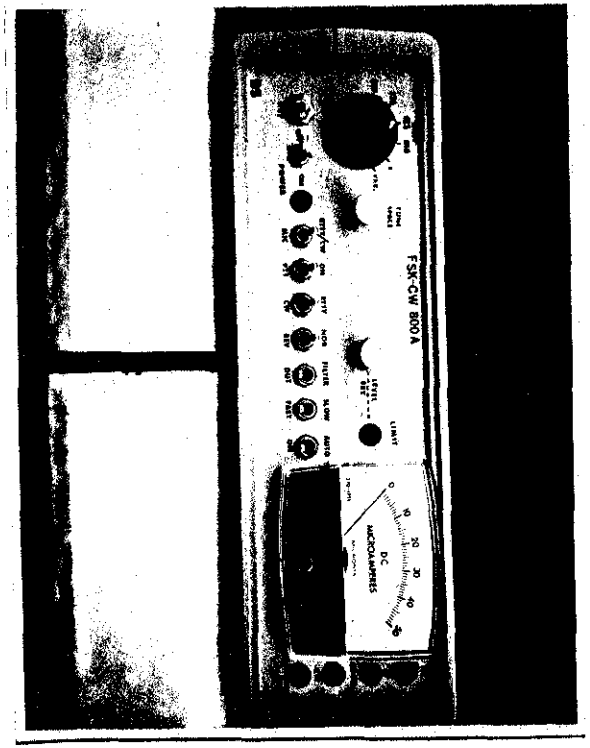


HOLES MARKED A ARE 5/16" D ALL OTHERS ARE 1/4"

NOTE: DUE TO A SLIGHT REDUCTION IN SIZE BY THE COPY MACHINE, THIS IS NOT AN ACCURATE TEMPLATE (CLOSE THOUGH). DOUBLE CHECK ALL CLEARANCES.







PHOTOGRAPHS OF THE PROTOTYPE

These three pictures will give you some ideas on panel layout. Not shown are the lock control, the wide/narrow switch, and the meter function switch. Note that the LED's at the right don't protrude very far into the cabinet; there is a post right behind them on the top cover of the box. There is also a LED for lock detect. It is no longer used. The meter lock null function is a much more sensitive indication. Note that the Radio Shack meter is used, and the top lip of the cabinet is trimmed to allow it to fit.

AFSK-CW 800A PARTS LIST

Capacitors

CT1	33 pf Mica
C2 3 4 5 10 11 CT2	100pf 50V ceramic
C6 54 63 79 80	.01uf 50V ceramic
C7 29 30 32 35 36 37	.01uf 100V mylar
C8	22uf 6V tantalum
C9 45	1.0uf 25V tantalum
C12 60	.0047uf 50V ceramic
C13 41 66 67 68	470pf 50V ceramic
C15 16 17 18 19 20 23 24 27 28 38 39 40 49	.1uf 12V ceramic
C42 43 44 52 53 55 56 57 59 72 73 76 78	.1uf 12V ceramic
C84 85 86 87 88 89 90 14	.1uf 12V ceramic
C21 25	220pf mica
C22 26 62 64 65 69 70	.001uf 50V ceramic
C31 33	.001uf 100v mylar
C34	1uf 16V electrolytic
C50 51 74 77 81 82	10uf 16V electrolytic
C58	.022uf 100V mylar
C61 83	.022uf 50V ceramic
C71 Radio Shack 272-1032	1000uf 25V electrolytic
C83	.022uf 50V ceramic

Transistors, Diodes, and IC's

Q1 Q2 Q3 Q4 Q6	NPN 2N5089 β_{min} = 400 @ 100μA
Q5	PNP 2N5087 β_{min} = 250 @ 100μA
Q7	TIP120 CURRENT LOOP
D1 2 10 11 12 13 14	1N4001
D3 4 Radio Shack 276-026	PC LED
D6 7 8 9 Radio Shack 276-068	Panel LED
Diodes without numbers are 1N4148, aprox. 75 needed	
U1 7	74LS05
U2 5	74LS393
U3 9 10	74LS00
U4	74LS74
U6 31	IL-1 (MCT-2)
U8	74LS10
U11 24 25 29	NE555
U12	74LS164
U13	LM741CN
U14,16	CD4046B (14046B)
U15	CD4520B (14520B)
U17 18 19 20	MF10CN
U21 22 23	LM348N
U26	XR2211
U27 28	CD4011B (14011B)
U30	DS75188N (1488)
U32	LM317MP
U33	LM342P-5

RY REED RELAY Radio Shack 275-228, CP Clare 925A052A or MRB2A05
The Radio Shack and 925A052A are discontinued,
You may order the single pole MRB1A12 relay from Dynamic Specialties for $6.50 shipping included. See the instructions for options and usage of the relay.

XAL 3.5795 MHz Radio Shack 272-1310

Wall Transformer 12V, 500mA Jameco AC500

AFSK-CW 800A PARTS LIST

Resistors, Trimpots, and Inductor

All resistors 1/4 watt unless noted, values in ohms

R1 2 3 4 9 15 18 19 20 21 28 29 111 127 128 173	5.1K
R5 6 7 8 12 22 23 24 25 42 43 57 87	1K
R117 122 124 129 152 153 183	1K
R10 11 13 14 26 27 50 53 80 83	2K
R16 32 55 56 58 59 63 67 68 69 73 77 85 86 88 89	100K
R93 97 98 99 103 107 121 156 165 175 177 181 182	100K
R17	33
R30 54 78 79 84 108 116 126 140 143 144 145 160	10K
R31 38 39	220K
R33 52 82 180	51K
R34 35 157	56K
R36 37 51 81	82K
R40	8.2K
R41 119 147 151	620
R60 66 70 76 90 96 100 106	11K
R62 64 72 74 92 94 102 104	7.5K
R110	1.5K
R112	9.1K
R113 171	24K
R114	16K
R115 169	15K
R118 162	1 MEG
R120 155 174	2.7K
R123 179	20K
R125	470
R141 142 146 150	6.8K
R148 149	33K
R154	4.7K
R158	1.2K
R159 185	2.2K
R164	7.5 MEG
R166 172	470K
R167	27K
R168	240K
R178	180K
R184	330
R186	39 1/2 WATT
R187	1.8K
R188	3.3K
R45 163	10K TRIMPOT
R61 65 71 75 91 95 101 105	2K TRIMPOT
R44 RADIO SHACK 271-1714	5K PANEL CONTROL
R109 RADIO SHACK 271-1720	5K PANEL CONTROL
R170 RADIO SHACK 271-1715	10K PANEL CONTROL
L1 (see instructions)	10 uH or bead

S1 2 POLE 6 POSITION Radio Shack 275-1386
S2 5 10 11 DPDT Radio Shack 275-614, Jameco FTN01/JMT123
S3 4 6 7 8 9 SPDT Radio Shack 275-613, Jameco FTD01/JMT223
M1 (see instructions) 50 or 100 uA meter
CABINET (from Jameco Electronics) CBT-1

suggested parts sources

Jameco Electronics (415) - 592-8097
Digi-Key Corp. 1-800-346-5144
Fuji-Seva Inc. 800-421-2841
Radio Shack