7-2-83

MODEM
Feasibility Study

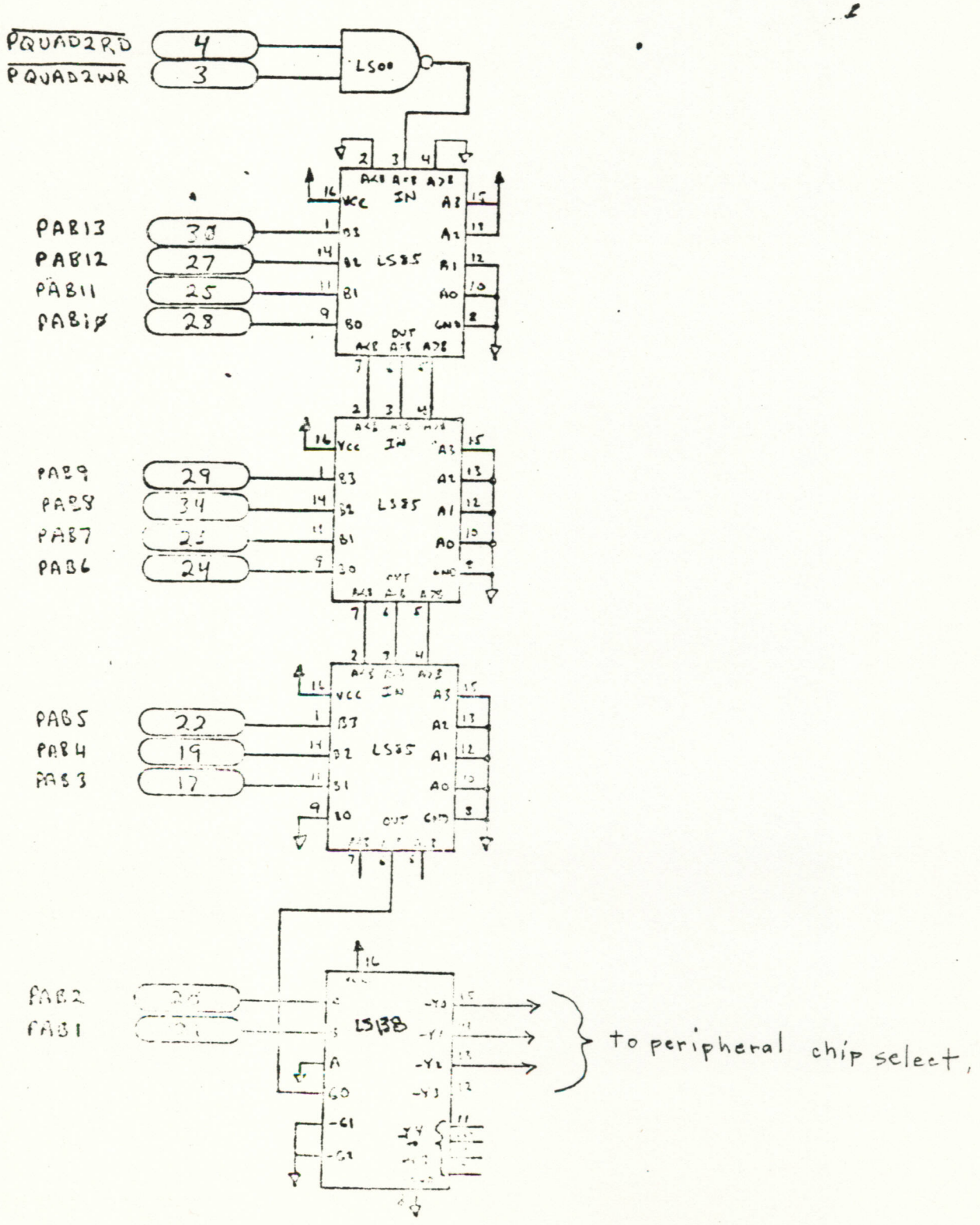
Modem Parts List

Quant.	Description	Price each 100-999	Unit Price 1CK QUANT.
	Modem Interface:		
1	MC6850P (ACIA)	$3.95	$2.00
1	CD4059A (Programmable ÷N)	$5.01	
2	.1μF, 25V, 25U, Ceramic (Decoupling)		.06
1	100μF, 25V, Electrolytic "		.12
1	100μF, 6V, " "		.12
1	Connector, Edge. (for ROM PORT) (44 pin)		.86
	Address Decoder:		
1	74LS00	$.64	.19
3	74LS95	$1.34 ea	
1	74LS138	$1.16	
	Modem Section (+ misc.):		
1	XR2206CP (Tone Generator)	$2.64	2.25
1	XR2211CP (Demodulator)	$3.23	2.60
1	MC4741CP (QUAD OP AMP)	.13	.50
30	Resistors, 1/4W, ±5%		.24
15	" " ±1%		
6	Capacitor, .01μF, 25V, ±5%		
10	" , .1μF, 25V, Ceramic Disk		.30
5	" , 10μF, 25V, Electrolytic		.25
5	Trim Pots, 5K, Linear, ±20%		1.75
	Telephone Dialing Circuit:		
1	MC6821CP, (PIA)	$7.50	$2.00
1	MC14410PD, (Tone Encoder)	$8.15	
1	MC1741CP (OP AMP)	$.36	.15
1	Crystal, 1MHz ±.1%		$1.50
1	DAA Circuit (estimated cost)	—	$4.00
1	P.C. Board 19¢/sq. inch		$2.50

Note: *DAA [illegible] not [illegible] included *

7-2-80
-K.

Address Decoder



(from APH prototype schematic)

Modem Interface

7-1-20
EK

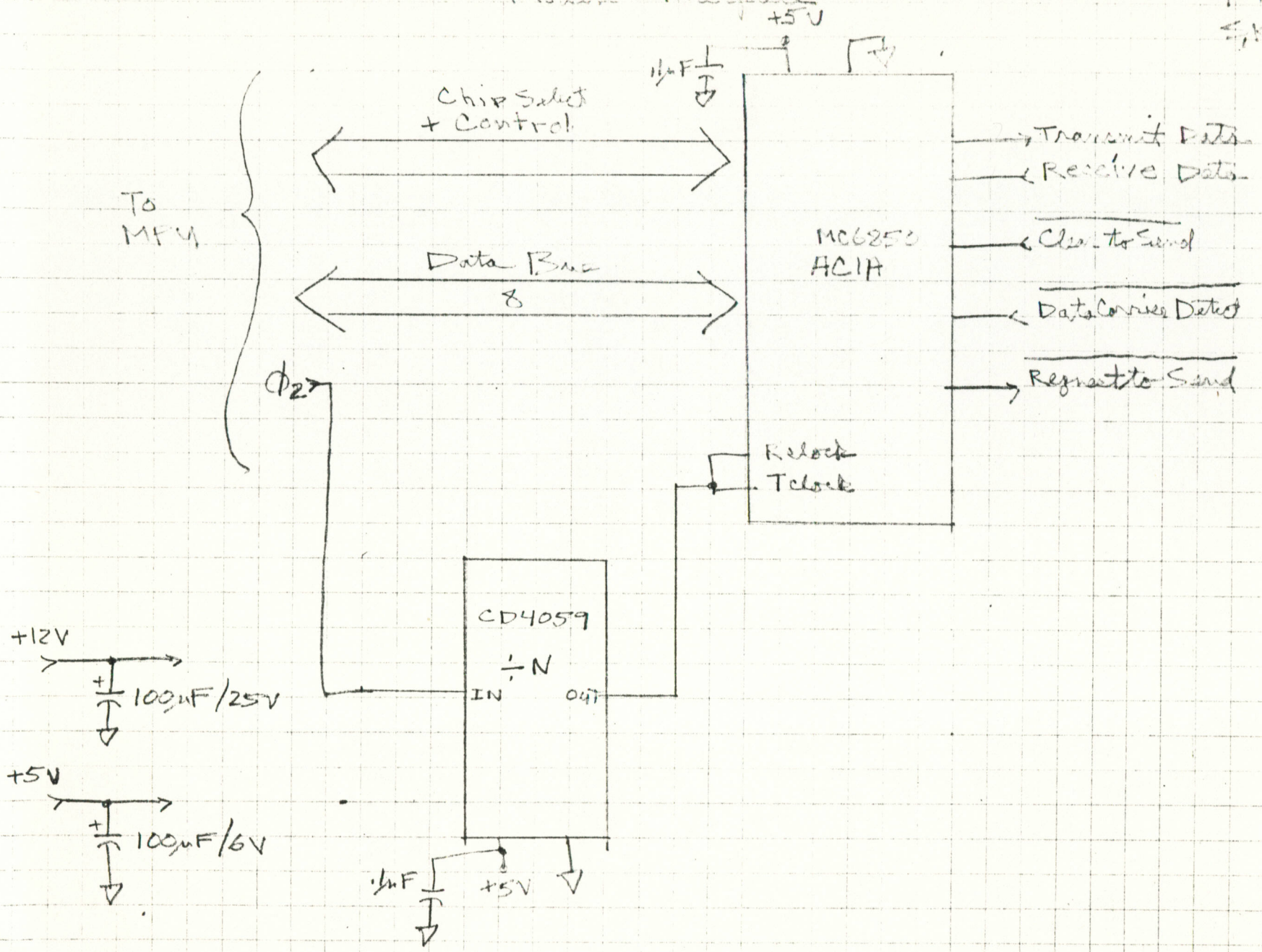


Figure 9 shows a circuit schematic for a complete "Originate or Answer" modem. The values for the XR-2206 are given in Table 6. For an originate modem the transmitting frequencies are 1070 Hz and 1270 Hz, the receiving frequencies are 2025 Hz and 2225 Hz, for a space and mark respectively.

The first op amp in Figure 9 is connected as an active hybrid which should supply a minimum of 10 dB isolation from transmit to receive, while adding 3 dB gain from the line to the receiver.

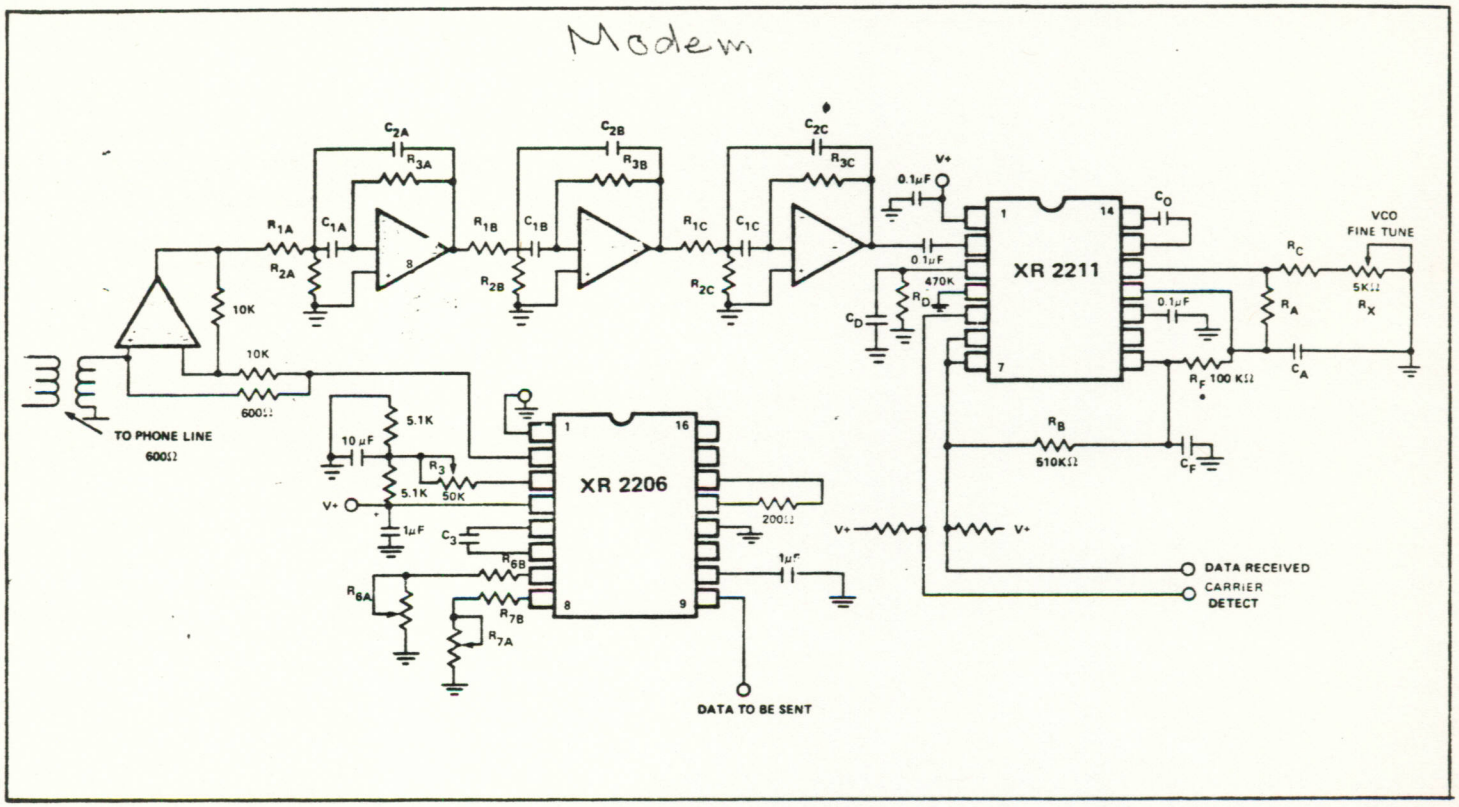


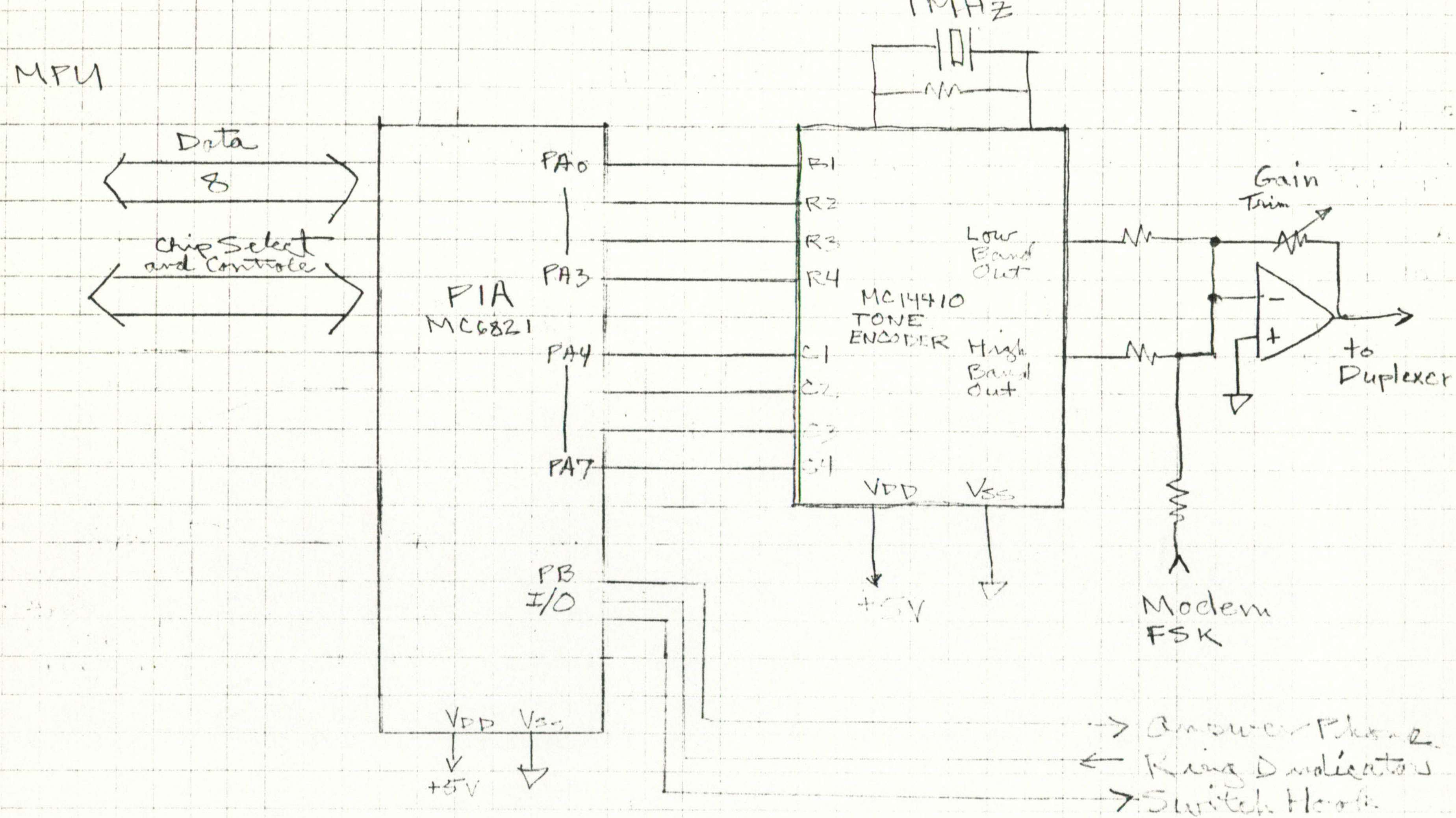
FIGURE 9

TABLE 6
Recommended Component Values for Typical FSK Bands
Units: Frequency – Hz; Resistors – kΩ; Capacitors – μF.

FSK Band			Component Values											
			XR-2206					XR-2211						
Baud Rate	f_L	f_H	R_{6A}	R_{6B}	R_{7A}	R_{7B}	C_3	R_X	R_C	R_A	C_O	C_A	C_F	C_D
Originate	1070	1270	10	18	10	20	.039	10	18	100	.039	.01	.005	.05
Answer	2025	2225	10	16	10	18	.022	10	18	200	.022	.0047	.005	.05

7-1-80
S.K

Telephone Dialing Circuit
(two tones)



As of 6-2-80
Price (100 lots)
MC14508CP $3.92
MC14410PD $8.15

September 27, 1981

To: Dave Chandler
Chuck Rudd

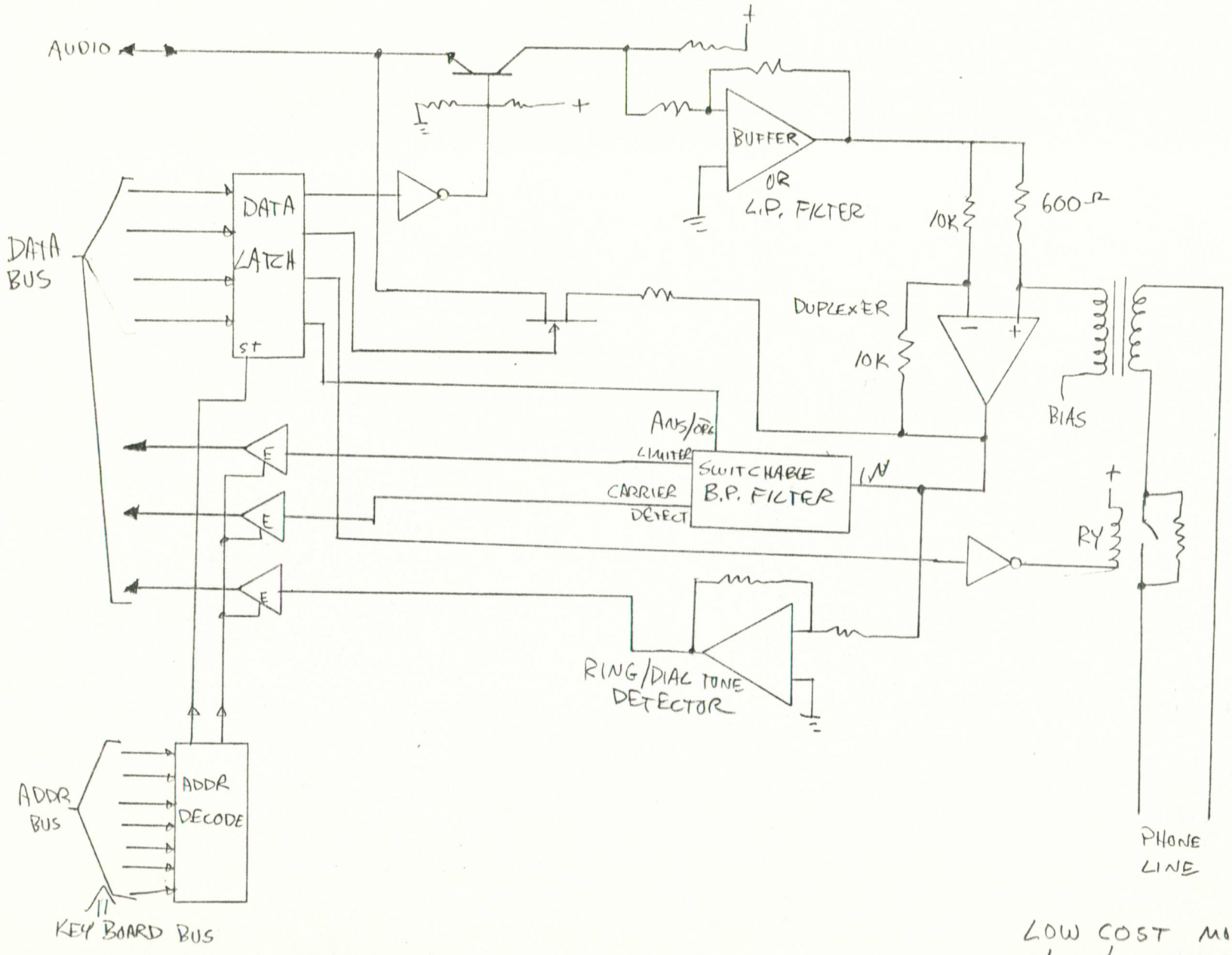
From: Dave Hostetler

Subj: IN SEARCH OF...A $25 MODEM

In keeping with my obsession that every ounce of hardware be flogged to its limits, the following proposal is presented. In a conventional modem we might have a device that interfaces to the present Keyboard Component bus, taking in and returning parallel data to the bus. It would handle the parallel-serial conversion, modulation, demodulation, hybrid, line coupling, ring detection and dialing. In a simple terminal application, the 1610 would put up a colored background and doze-off; the 6502 would have a slightly heavier load, having to occasionally deliver a character from the keyboard to the modem or from the modem to the screen. Tough work, really keeps them sweating!

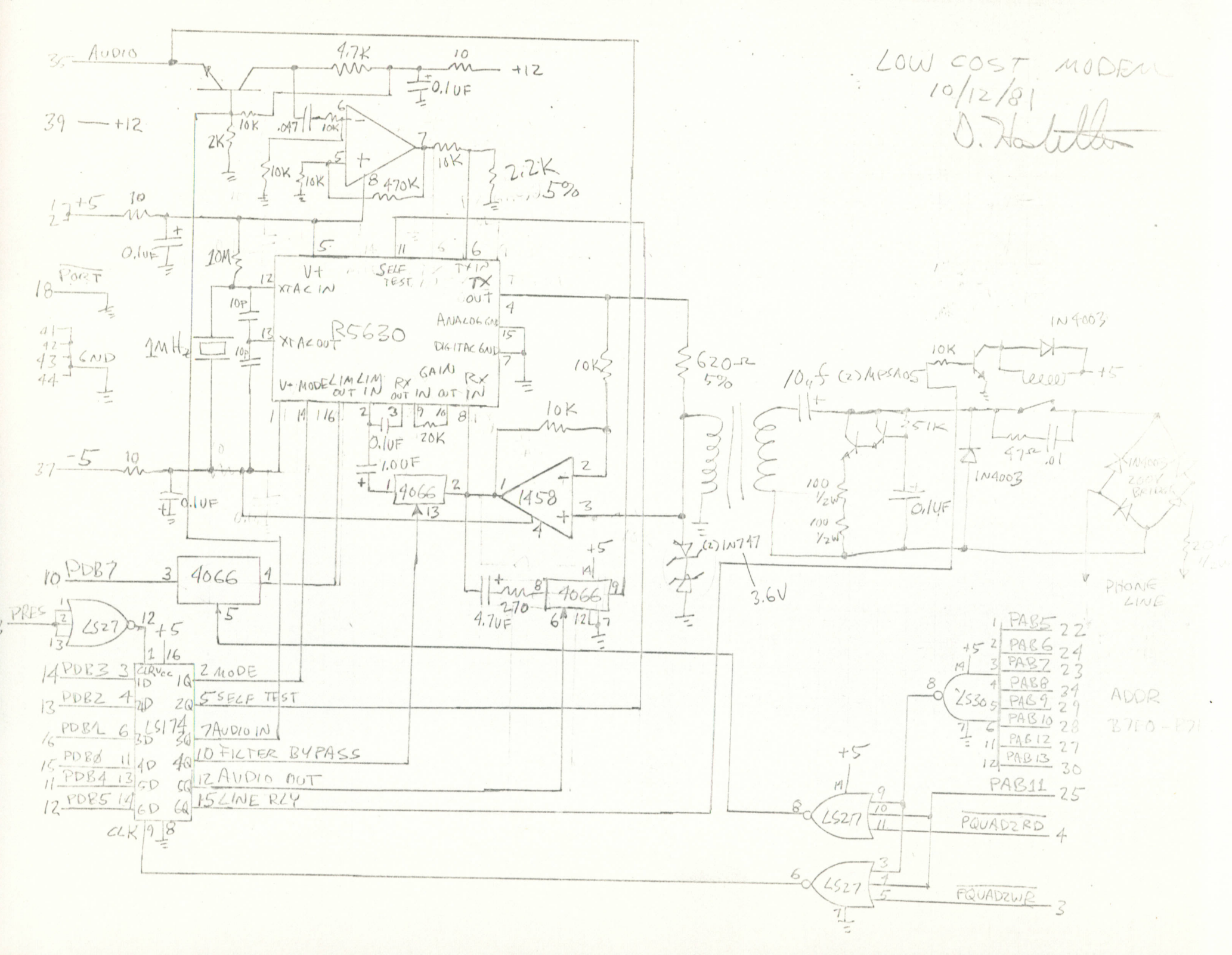
Having decided that the processors are not very busy, what can they do to reduce the modem hardware? Taking the serial/parallel conversation is obvious. Not so obvious is using the sound generator in the Master Component to generate the transmit tones (and Touch-Tone when applicable) and using the 6502 to decide if the mark or space frequency is currently being received. On the transmit side the output level must be regulated to keep the phone company and FCC happy; a little feedback to the amplitude control section of the sound chip handles this nicely. Ring detect and dial tone detect may well be combined to the same hardware with a little software help.

The accompanying diagram is a very rough outline of a circuit that should accomplish the above. With the exception of the switchable bandpass filter(which is needed in any case), is very much simpler than anything previously proposed. Maybe not $25, but close.



LOW COST MODEM

9/28/81 D. HOSTETLER


LOW COST MODEM
10/12/81
D. Hamilton
AUDIO
4.7K
10
+12
0.1UF
39
+12
2K
10K
.047
10K
10K
10K
10K
470K
2.2K
5%
+5
0.1UF
10M
PORT
18
R5630
XTAL IN
XTAL OUT
V+
SELF TEST
TX IP
TX OUT
ANALOG GND
DIGITAL GND
V+ MODE LIM OUT
LIM IN
RX OUT
GAIN IN
GAIN OUT
RX IN
GND
41
42
43
44
1MHz
10P
10P
10K
620Ω
5%
10K
0.1UF
20K
1.0UF
4066
13
1458
-5
37
0.1UF
10μF (2) MPSA05
51K
IN4003
100
1/2W
100
1/2W
0.1UF
47Ω
.01
IN4003
IN4003
200V BRIDGE
(2) IN747
3.6V
PHONE LINE
+5
4.7UF
270
4066
10
PDB7
4066
PRES
LS27
+5
LS174
PDB3
PDB2
PDB1
PDB0
PDB4
PDB5
CLR Vcc
1D
2D
3D
4D
5D
6D
1Q
2Q
3Q
4Q
CQ
6Q
2 MODE
5 SELF TEST
7 AUDIO IN
10 FILTER BYPASS
12 AUDIO OUT
15 LINE RLY
CLK
LS30
PAB5
PAB6
PAB7
PAB8
PAB9
PAB10
PAB12
PAB13
PAB11
ADDR BYTE-PDP
LS27
PQUAD2RD
LS27
PQUAD2WR

LOW COST MODEM

ITEM	QTY	COST	EXTEN
1/4 W RESISTOR 5%	21	.007	0.15
1/2 W RESISTOR 5%	3	0.01	0.03
10 PF DISC	2	0.03	0.06
0.1 UF ELEC 25 WV	5	0.06	0.30
.047 UF FILM 100 V	1	0.04	0.04
1.0 UF ELEC 25 WV	1	0.06	0.06
4.7 UF ELEC 25 WV	1	0.06	0.06
10 UF ELEC 25 WV	1	0.06	0.06
0.01 UF DISC 400 V	1	0.04	0.04
1N747 ZENER 3.6V	2	0.06	0.12
1N4003 DIODE 400 V	6	0.01	0.06
MPS A05 TRANSISTOR(NPN)	4	0.06	0.24
RETICON R5630 MODEM FILTER	1	8.00	8.00
1458 DUAL OP AMP	1	0.30	0.30
4066 QUAD BILAT SW (CMOS)	1	0.30	0.30
74LS174 HEX LATCH	1	0.40	0.40
74LS27 TRIPLE 3IN NOR GATE	1	0.25	0.25
74LS30 8 INPUT NAND GATE	1	0.25	0.25
1.0 MHZ XTAL OR CER RESONAT	1	0.30	0.30
600-600 OHM TRANSFORMER	1	0.30	0.30
REED RELAY	1	1.00	1.00
PCB EDGE CONECTOR	1	0.70	0.70
MODULAR PHONE CONECTOR	1	0.20	0.20
MODULAR PHONE CABLE 6 FT	1	0.80	0.80
PC BOARD APROX 9 SQ IN	1	0.72	0.72
PLASTIC HOUSING	1	0.50	0.50
		TOTAL	15.24