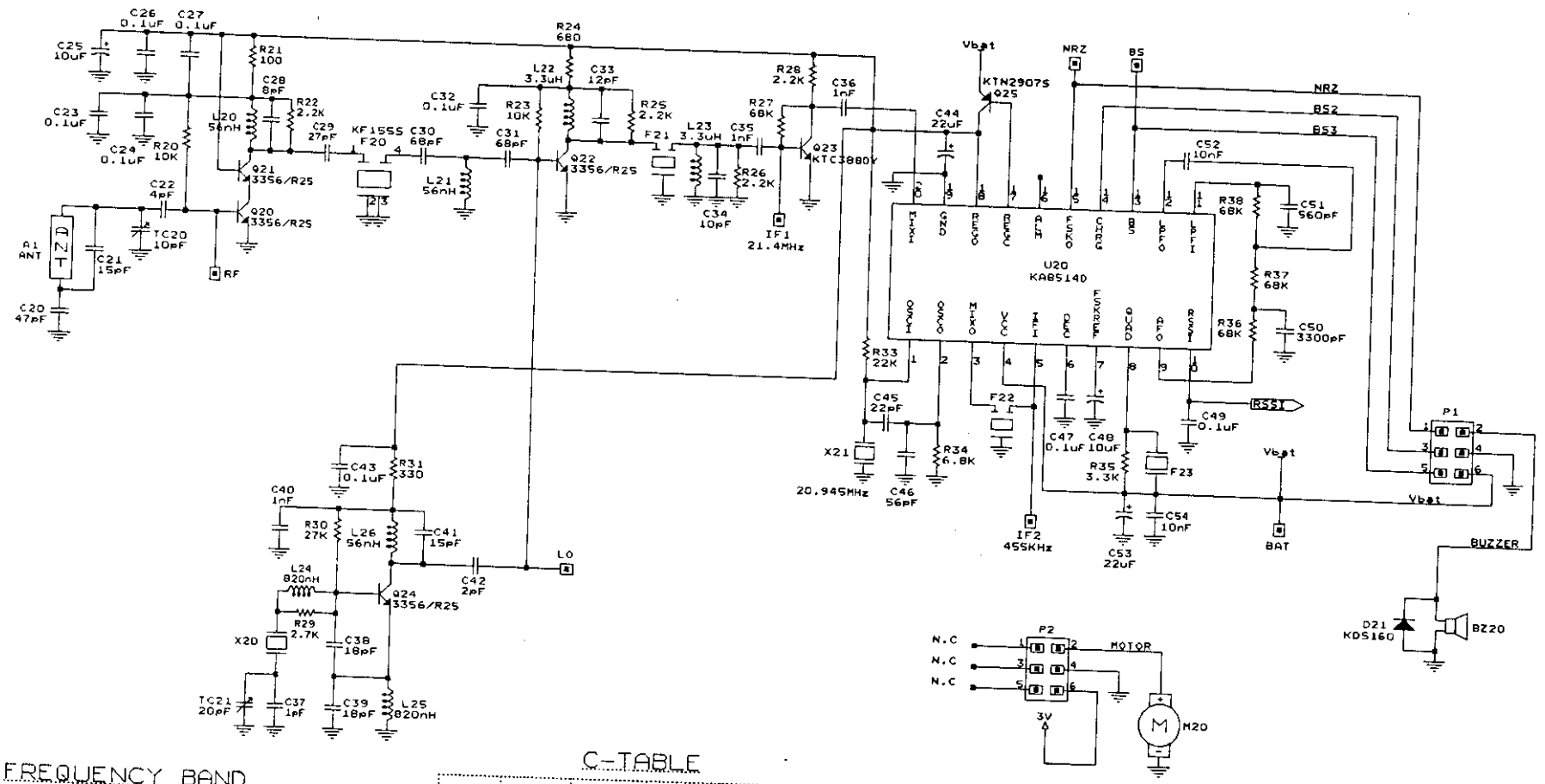
INP-150 RF CIRCUIT



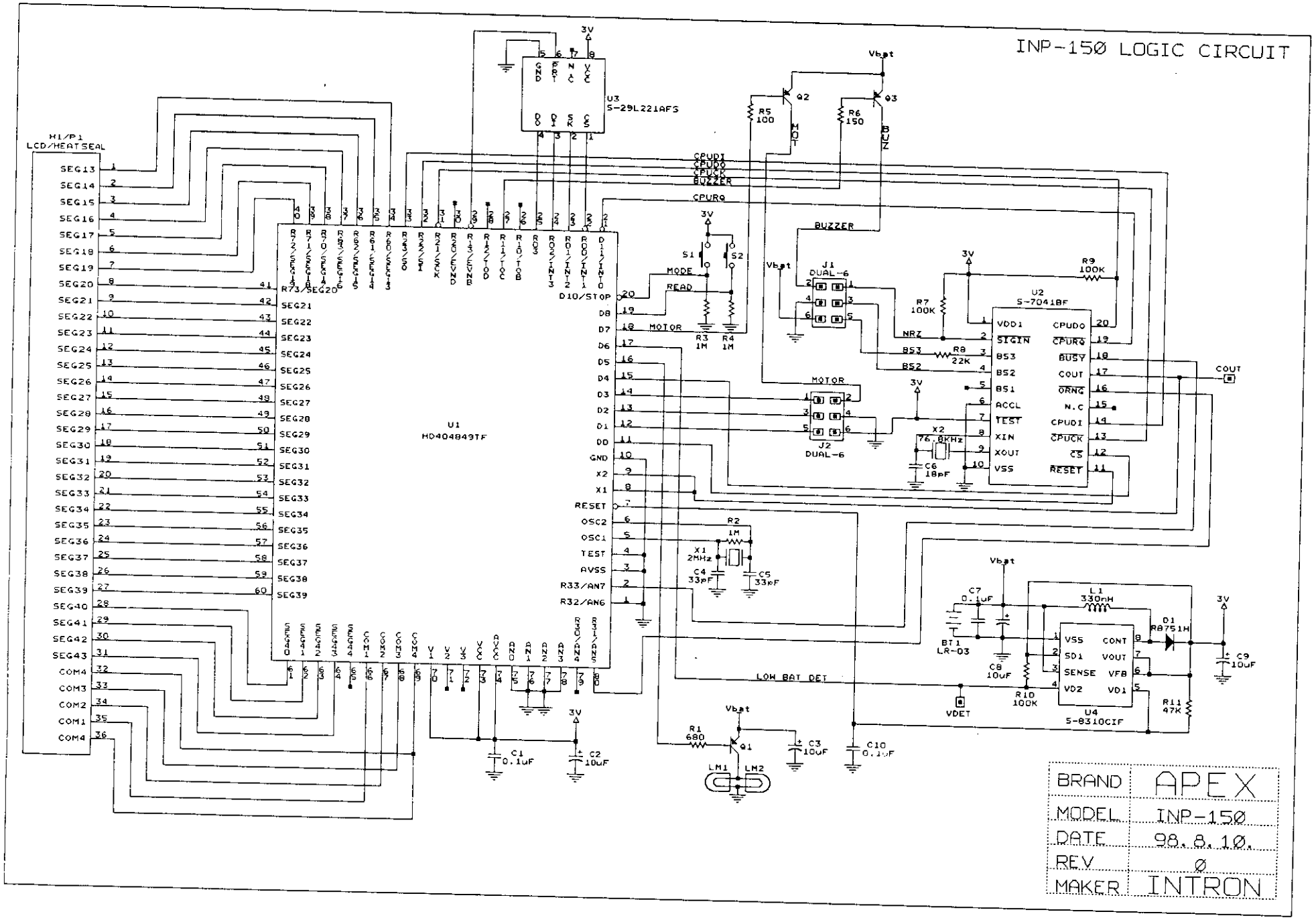
FREQUENCY BAND

A	KF139S	135-143MHz
B	KF147S	143-151MHz
C	KF155S	151-159MHz
D	KF163S	159-167MHz
E	KF171S	167-175MHz

C-TABLE

	139	147	155	163	171
C21		18pF	15pF	15pF	
C28		9pF	8pF	5pF	
C30		1nF	68pF	68pF	
C39		22pF	18pF	15pF	
C41		15pF	15pF	15pF	

BRAND	APEX
MODEL	INP-150
DATE	98.5.10.
REV	0
MAKER	INTRON



BRAND	APEX
MODEL	INP-150
DATE	98.8.10.
REV	0
MAKER	INTRON

Circuit Description

1. RF Circuit description

INP-150 is operated in the frequency band of 144~174MHz with 25 channel spacing and crystal method like following.

①. LNA(Low Noise Amplifier)

RF signal which is caught by loop antenna inside is amplified to approx. 12dB by RF transistor Q20, Q21. And the amplified signal is rejected the spurious by passing through F20(RF Bandpass Filter) which occurs approx. 4dB of inserting loss.

②. The 1st Local Oscillator

The 1st local oscillator is crystal oscillation circuit and it is oscillated by RF Transistor Q24 and crystal X20(the 3rd over tone type). The oscillator frequency is controlled by TC21(Trimmer capacitor) and it is multiplied to the 2nd harmonic frequency of the crystal's 3rd over tone signal by Q24, L26 and C41.

③. The 1st Mixer and the 1st IF filter

Channel Signal which passes through the RF signal bandpass filter and the signal which is multiplied at the 1st Local Oscillator are mixed by Q22(RF Transistor) where the difference and sum of these two signal are generated(IF=RF±LO). At this time, only the signal which is generated by the difference pass and the signal which is generated by the sum as well as the spurious signal are eliminated by F21(The 1st IF Filter).

The signal(21.4MHz) which is generated by the difference is the 1st IF and the 16dB conversion gain is happened when it is generated. The passband of F21(IF filter) is ±7.5KHz and the insertion loss is a approx. within 2dB. The 1st IF signal is amplified again by Q23 and injected by the Mixer which is built in U20(FM IF I.C)

④. FM IF IC

KA8514D(FM IF I.C) is monolithic linear IC which is composed of the 2nd Mixer, the 2nd local oscillator, the 2nd IF amplifier, quadrature detector, audio filter & wave shaper, quick charge & discharge circuit, low battery detection circuit, battery saving circuit, voltage regulator and RSSI. The 2nd local oscillator signal which is generated by crystal X21 and the oscillation circuit of FM1F I.C(U20) inside. Two signal is mixed by the internaal mixer of FM IF I.C and the 2nd IF signal is generated by the difference between the 1st IF signal and the 2nd local.

At this time the spurious signal is rejected by the 2nd IF Filter(F22) and so, only the 2nd IF signal which is generated from the difference is passed through. The conversion gain by the Mixer is approx. 12dB and the insertion loss of the 2nd IF Filter is maximum 4dB and the passband is ±7.5KHz. The 2nd IF signal which is amplified by the the internal amplifier output the demodulated data to Audio output terminal through the internal demodulation circuit of IC. The output data is filtered by the audio filter and it is provided to comparator of IC inside, then it is shaped to square the wave. The quick charge & discharge circuit prevents date from damage of the charge & discharge of capacitor connected to comparator.

The Voltage Regulator which is built in FM IF IC provides the constand 1V voltage output from variable battery voltage. And FM IF IC controls the receiving circuit power to save the power consumption by the battery save signal from decoder.

2. Logic Circuit description

Logic board is composed of DC/DC convertor, decoder, micro controller, code memory and LCD.

①. DC/DC convertor & Voltage Detector

S-8310C which up-converts to the constant 3V from variable battery by pulse width modulaton(PWN) method. The oscillator frequency is approx. 30KHz and voltage converting effective ratio is approx. 65%. Two voltage detector are built in S-8310 inside. VD-1 output is normally "Low" and goes to "High" when the battery voltage is below 1.1Volt. This output is sent to CPU and "Low batt" will be display on the LCD screen by CPU. VD-2 output is used to the reset signal of CPU and also prevent from the capacitor charging and the multifunction discharging when the initial power input.

②. Decoder

U2(Decoder I.C) which decodes POCSAG code format is composed of date filter, oscillation circuit, clock extracting circuit, serial date processor and several control circuit. The data which was demodulated the receiving is decoded after bing filtered by switched capacitor filter of decoder inside. The decoded address is compared with the address which is saved in EEPROM to identify it. At this time, the decoder sends a message to Micro controller after correcting the error of received message. Decoder corrects 2 bit random error. Also, the decoder can correspond to 512/1200/2400 bps selectively and it has 6 different address(Cap-Code) of which each has same frame

③. EEPROM

S-29L221AFX(EEPROM) is ID ROM which has 6 address and save the locked message, date, time and each status by "Bac-up" function. And so above things are kept even though battery is changed.

④. Micro-Controller

Micro Controller(U1) is CPU which is composed of RAM, ROM, LCD Driver, Serial Data port, In/Out port. Micro controller enables all the segment to be displayed on the LCD during 2 seconds of beep alert & 1 second of vibration to be activated when the battery is inserted to do self-test.

Micro Controller saves serial data which is provided from decoder and displays it on the LCD. Micro Controller checks 2 buttons and it keeps up the stand-by mode to save the battery life by being provided Sub-Clock from Decoder. So, main Oscillator oscillates shortly(Oscillator frequency is 2MHz) after receiving the data from decoder.

⑤. Buzzer & Motor Driver

The buzzer(beep & melody) and vibration output are generted by micro controller. The buzzer output is drived by Q3 and the vibration output is drived by Q2.

⑥. Ramp Driver

In case any button is pressed more than 2 seconds, Micro Controller output the lamp port to "High" by recognizing it, and then, the lamp is turned on. The turned lamp is maintained for 8 seconds and it returns to idle mode.