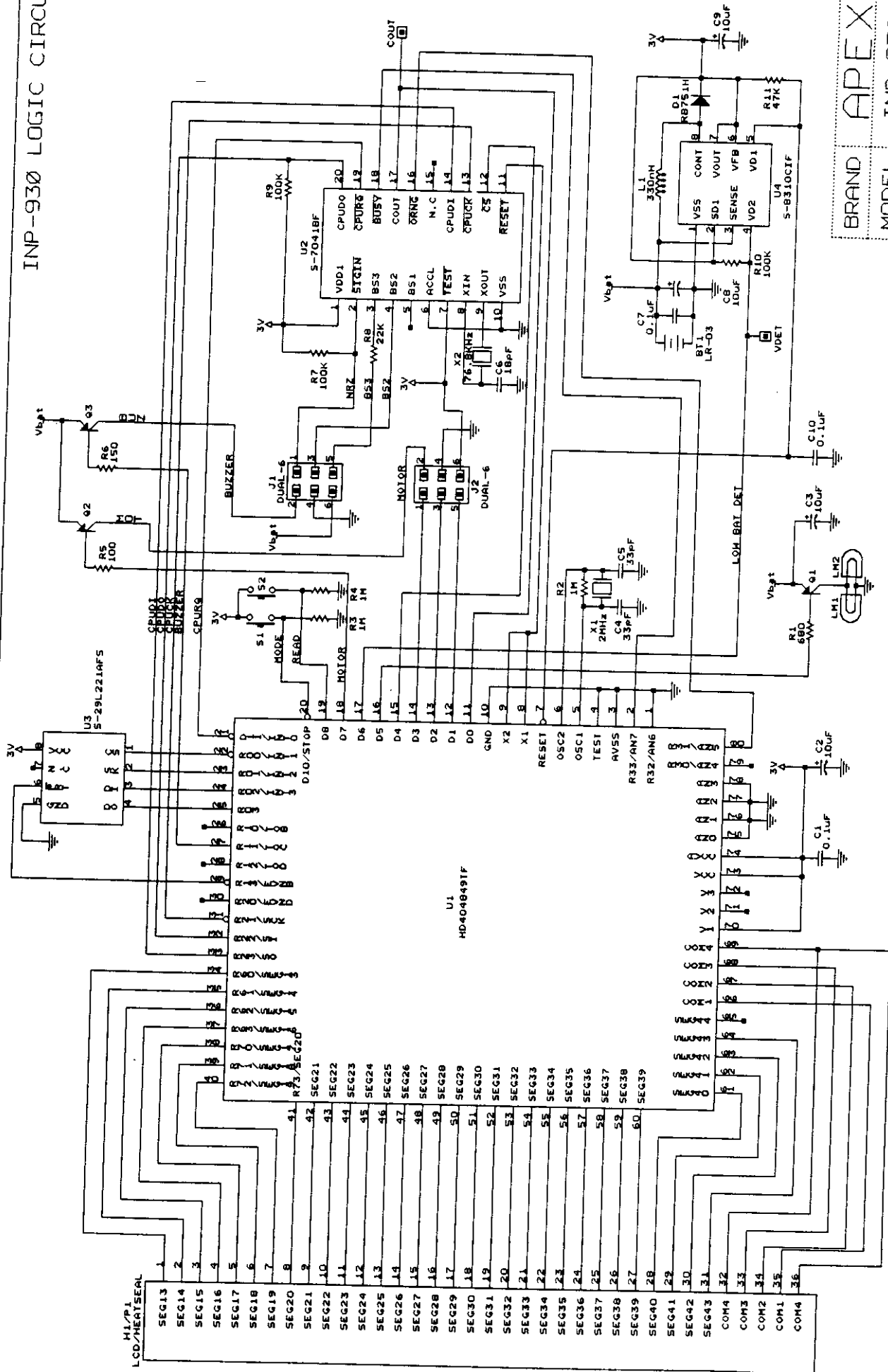


[illegible]

1200bps	C55	C56
2400bps	3300pF	560pF
	1800pF	270pF

BRAND	APEX
MODEL	INP-930
DATE	98.8.10.
REV	0
MAKER	INTRON

# INP-930 LOGIC CIRCUIT



BRAND	APEX
MODEL	INP-930
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REV	0
MAKER	INTRON

## Circuit Description

### 1. RF Circuit description

INP-930 is operated in the frequency band of 929.0375~931.9375 MHz 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 A20, A21. 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 12nd harmonic frequency of the crystal's 3rd over tone signal by Q25, L29 and C46. And also spurious signal is rejected by L30, C47, C62.

#### 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( $IF = RF \pm LO$ ). 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  $\pm 7.5\text{KHz}$  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, oscillation circuit of FM1F I.C(U20) inside as well as the 1st IF signal filtered by F21, generates the 2nd IF signal (455KHz) mixed by the 2nd mixer of I.C inside.

RF is eliminated by the 2nd IF Filter(F22) and 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 inserting loss of the 2nd IF Filter is maximum 4KHz and the passband is  $\pm 7.5\text{KHz}$ . The 2nd IF signal which is amplified by the Amplifier of IC inside, generates the demodulated data to Audio output terminal through demodulation circuit of IC inside. The generated data is filtered by the Audio Filter and it is provided to comparator of IC inside, then it is shaped to square waver. The quick charge & discharge circuit prevents date from damage by charge& discharge of Capacitor connected with comparator

The Voltage Regulator which is built in FM IF IC helps to provide the voltage to IV from Battery in regular. And FM IF IC controls power On/Off to save the power consumption by battery save signal from decoder.

## 2. Logic Circuit description

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

### ①. DC/DC convertor & Voltage Detector

S-8310C(DC/DC convertor IC which supplies raised 3V battery voltage to each Logic board) adopts pulse width modulation(PWM) method and it keeps up the out-put voltage against load changing. Oscillator frequency is approx. 30KHz and voltage converting effect is approx. 65%. Two voltage detector are built in S-8310 inside. VD-1 generates "High" and sends it to CPU when the battery's voltage is  $1.1 \text{ volt} \pm 0.05 \text{ volt}$ . VD-2 generates "Low" when the out-put voltage of DC/DC convertor is approx. 2.2 to decrease the power on/off discharging time and it helps CPU and Decoder to make the stable reset signal during power on/off.

### ②. Decoder

U2(Decoder I.C) which decodes POCSAG code format is composed of data filter, oscillation circuit, clock extracting circuit, serial data processor and various control circuit. The data which was modulated at receiver part is decoded after being 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. If the data error is came from noise during data is at weak area decoder corrects error of random 2 bit. Also, the decoder can correspond to 512/1200 bps speed automatically 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 functional select it of every kind especially the information of each local frequency and Dummy code. Also, it keeps locked message as well as set time and various value without battery(Back-up).

#### 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 and 2 seconds of beep alert & 1 second of vibration to be activated when the battery is inserted to do self-test. After the self-test, Micro Controller controls to scan the service area automatically and set channel the area frequency according to POCSAG signal's existence.

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 constantly working at Sub-clock 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 are originated by Micro Controller. The originated buzzer is driven by Q3 and the originated vibration is driven by Q2.

#### ⑥. Ramp Driver

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