ATTACHMENTS 1

STATEMENT FOR SECTION 15.37 OF THE RULES

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Date : January 20, 1999

Statement for Section 15.37 of the Rules

Equipment : Pager Receiver

FCC ID. : ODGBFX7ECL1

Concerning the FCC Part 15, section 15.37 transition provision, we, Hantel Co., Ltd., hereby confirm above referenced device as follows.

This device(Pager Receiver) subject to the regulations in FCC Part 15 that are manufactured on or after June 23, 1999 complies with new rules adopted under Docket 87-389.

This Device is not associated with a transmitter that could not have been authorized under regulations in effect prior to June 23, 1989. e.q., a transmitter operating under the provisions of section 15.209 or section 15.249 (below 960MHz).

This device is not scanning receivers or frequency converters designed or marketed for use with scanning receivers.

Best Regards

Hoe-Bum Kim, General Manager
Hantel Co., Ltd.

ATTACHMENTS 2

PROPOSED FCC ID. LABEL AND MARKING

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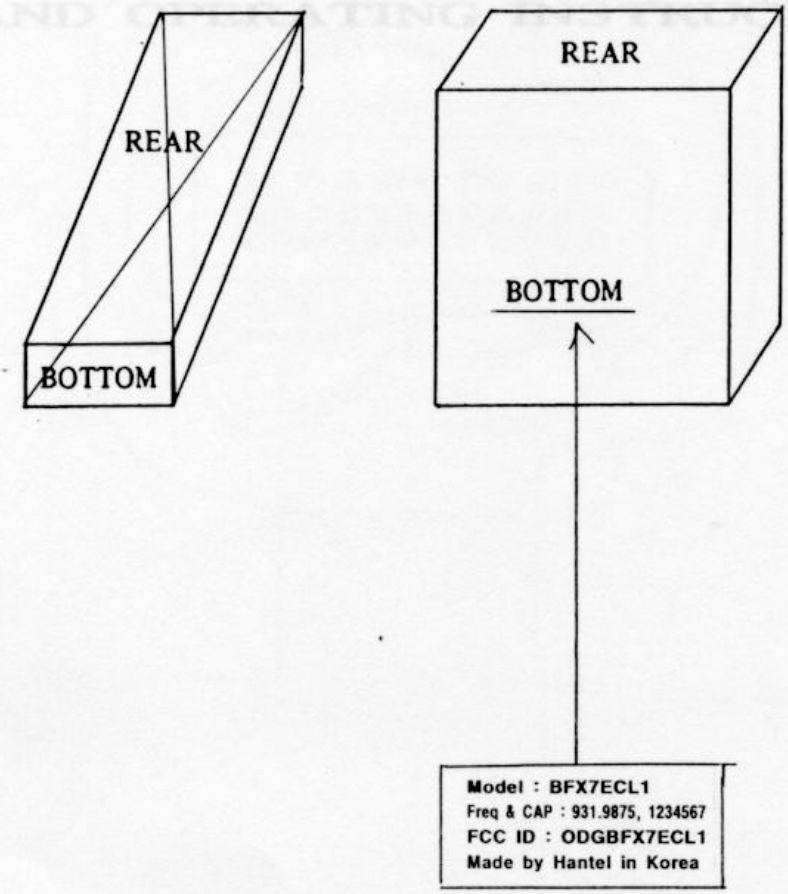
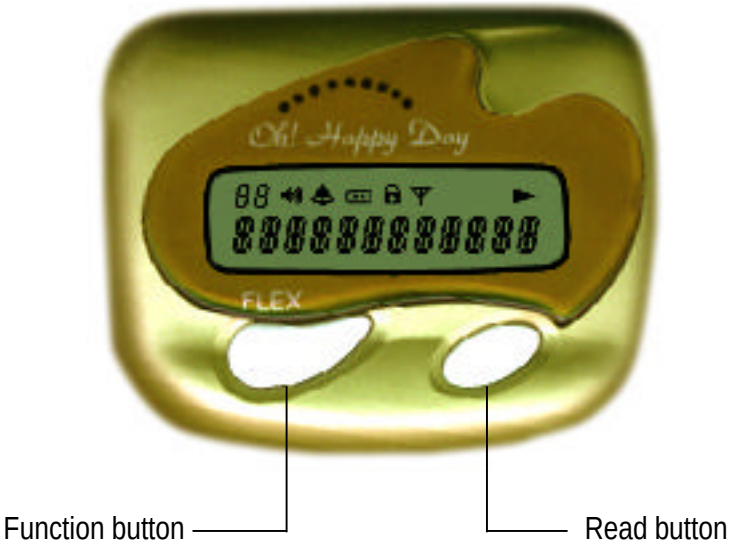


ATTACHMENTS 3

MANUAL FOR INSTALLATION AND OPERATING INSTRUCTION

HANTEL FLEX PAGER



Caution : Any changes or modifications in construction of this device which are not expressly approved by responsible for compliance could void the user 's authority to operate the equipment.

This device complies with part 15 of the FCC Rules.
Operation is subject to the condition that device does not harmful interference.

USER MANUAL

1.Controls

The. PERCOMM has 2 push buttons (Read and Function buttons) for the pager controls and operations.

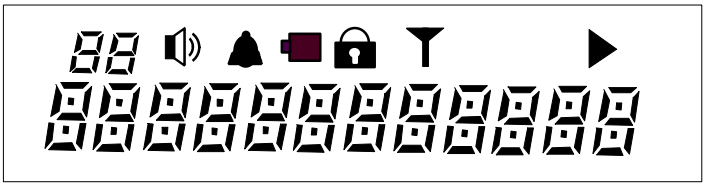
A. Read button

. Used to read the received messages
. Used to exit to current function mode
. Used to select functions
. Used to delete a message

B. Function button

. Used to select functions
. Used to set the lock and unlock the message

2. LCD & Icons



Audio alert mode enabled icon

Alarm activated icon

Low battery icon

Message locked icon

In service area icon

Message continuation icon

3. Message display and read message

When a message is received, the pager alerts with either audio or vibration (depending on alert mode set). The word "1 NEW" is displayed. If there are 2 unread messages, the word "2 NEW"

❶ While the standby screen is displayed, press the read button to display the first received message.

❷ Pager automatically stores incoming messages, along with the time each message is received.
Press the read button to display next message.

❸ In case of no message, "NO PAGE" is displayed.

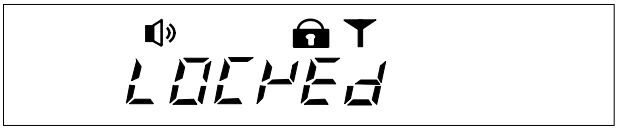
4. Lock/Unlock message

Up to 5 messages can be selectively locked in the memory so that they cannot be overwritten by incoming messages or erased if CLEAR function is selected.

❶ Select the message you want to lock.

❷ Press the function button to display "LOCK"

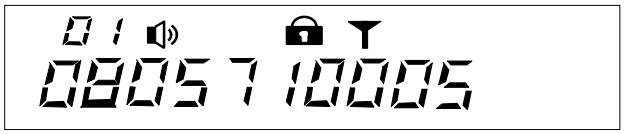
❸ Press the read button to lock the message,. "LOCKED" is displayed.



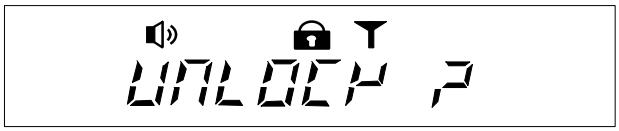
When you read a message and try to lock it, if the number of the locked message received is more than 5, "LOCK FULL" is displayed on the LCD.

A locked message can be unlocked in the same way. when the locked message is confirmed, "Lock icon" is displayed in the upper part of screen.

❶ Select the locked message to want to unlock.



❷ Press the function Button : "UNLOCK?" is displayed.



❸ Press the read button : "Lock icon" is disappeared.

5. Clear individual message

Press the function button while the message desired to be deleted is on screen. Then "CLEAR ?" will be displayed.

❶ Select the message to erase through Read button

❷ Press twice the function button . "CLEAR ?" will be displayed.

❸ Press the read button. "CLEARED" will be displayed. After that the message will be deleted.

6. Power on

Insert battery into the battery compartment and close the battery door. The pager alerts with full display lit. and it will go into standby mode which is a state of capable of receiving a message.

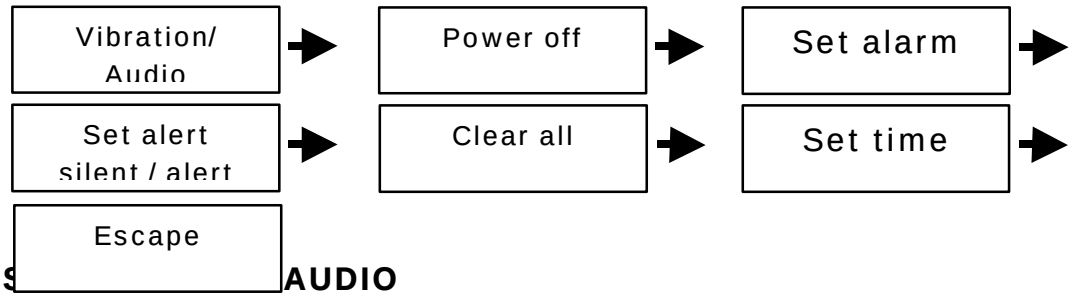
7. Select function menu.

To enter Function menu ;

❶ At standby screen , press the function button for over 2 seconds to scroll through the function menu, which enables the user to access various features of the pager through a series of icons and prompts.

❷ Every time press the function button, pager enter next mode. Then press the read button, you can select the wanted function

❸ Pager is at standby, if you don't press any button for 8 seconds.



8. S AUDIO

There are two alert modes ; vibration/audio

❶ While in standby mode, press Function button for more than 2 seconds.
Screen shows "AUDIO ?" or "VIBRATION ?" This screen shows unselected mode.

< State of audio mode >

< State of vibration mode >

❷ Press the read button to enter the displayed mode

< State of vibration mode >

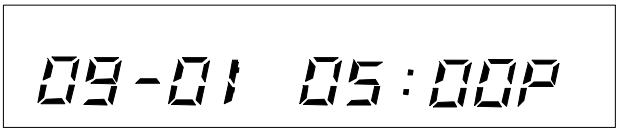
< State of audio mode >

9. PAGER OFF

While in pager off, pager shows only date and time. It can't receive message at this mode. But alarm feature is operating normally.

❶ While in pager standby, press the function button for 2 seconds. After that select function mode until pager shows "POWER OFF?" .

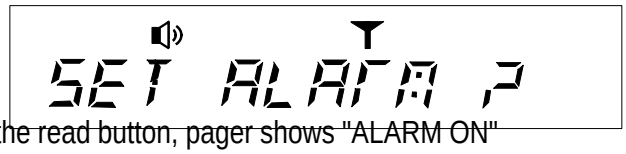
❷ Press the read button. Pager is in Power Off.



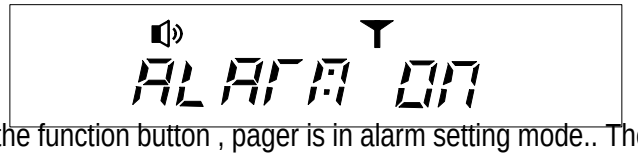
10. ALARM on/off

Select alarm on

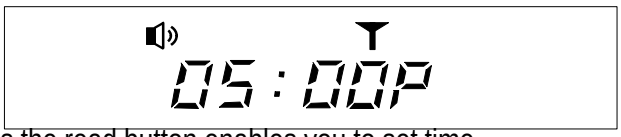
❶While in standby mode , press the function button for more than 2 seconds. and choose "SET ALARM ?"



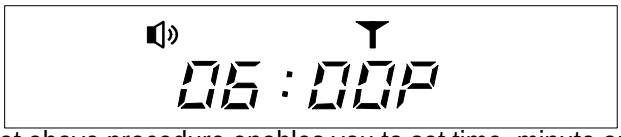
❷ Press the read button, pager shows "ALARM ON"



❸ Press the function button , pager is in alarm setting mode.. The hour digits blink.



❹ To press the read button enables you to set time.



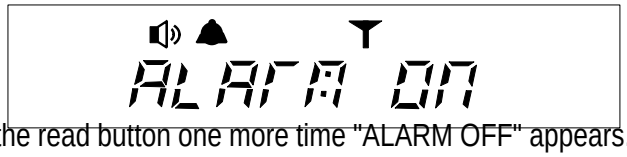
❺ To repeat above procedure enables you to set time, minute and AM/PM

❻ After setting your desired time, pager is in standby.

Select alarm off

❶ While in standby mode press the function button for more than 2 seconds then pager enters in function mode. Press button until "SET ALARM?" appears

❷ Press the read button "ALARM ON" appears.



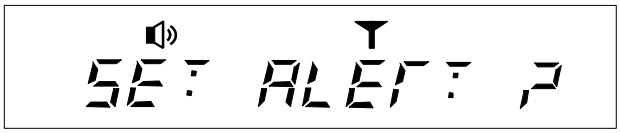
❸ Press the read button one more time "ALARM OFF" appears.

❹ Press the function button pager is in standby as well as select alarm off mode.

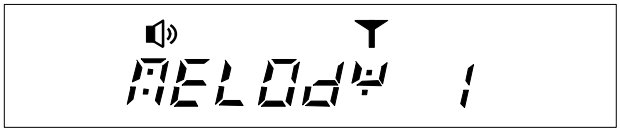
11. SELECT SILENT/AUDIO/MELODY

You can choose the alert mode, audio or melody, according to your preference . Silent mode is useful in sleeping or meeting.

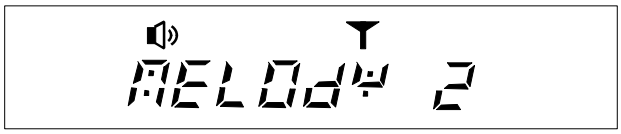
❶ While in standby mode, press the function button for more than 2 seconds choose the wanted function mode. Press until pager shows " SET ALERT ?"

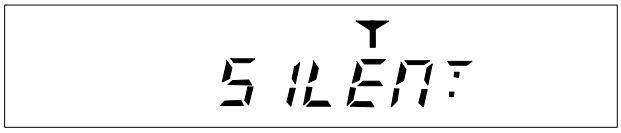


❷ Press the read button pager shows present chosen mode.

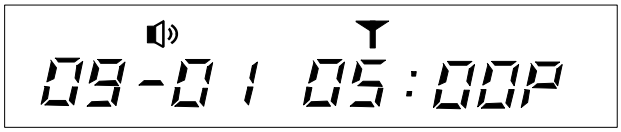


❸ Press the read button until pager shows melody/ audio mode you want.





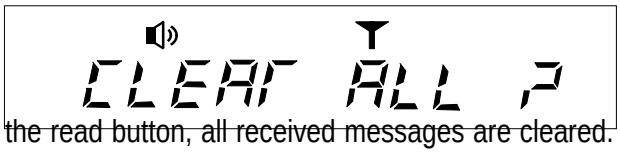
❹ Press any button then stop melody/audio . After that press Function button, chosen melody is decided.



12. CLEAR ALL

This function mode is capable if only all received messages are more than 2 ones.

❶ While in standby mode, press the function button for more than 2 seconds choose the wanted Function mode. Press until pager shows " CLEAR ALL ?"



❷ Press the read button, all received messages are cleared. But unread or locked ones are not cleared.

13. Set Time manually

You can set up present time, date, and year

❶ While in standby mode, press the function button for more than 2 seconds choose the wanted function mode. Press until pager shows " SET TIME ?"

❷ Press Read button, the year digit blinks. Press the read button continually to increment. year's digit.

❸ Press the function button, the date digit blinks.

09-01 05:00P

❹ Set up the date you desired

10-02 05:00P

❺ Repeat the procedure for minute , hour and AM/PM field.

10-02 12:30P

❻ Press Read button, "GPS ON" appears.

GPS ON

❼ Press Read button, select "GPS ON/OFF "

❽ Press Function button, setting is over. Pager is in standby mode.

10-02 12:30P

14. ADDITIONAL FUNCTION

Display of low battery

10-02 12:30P

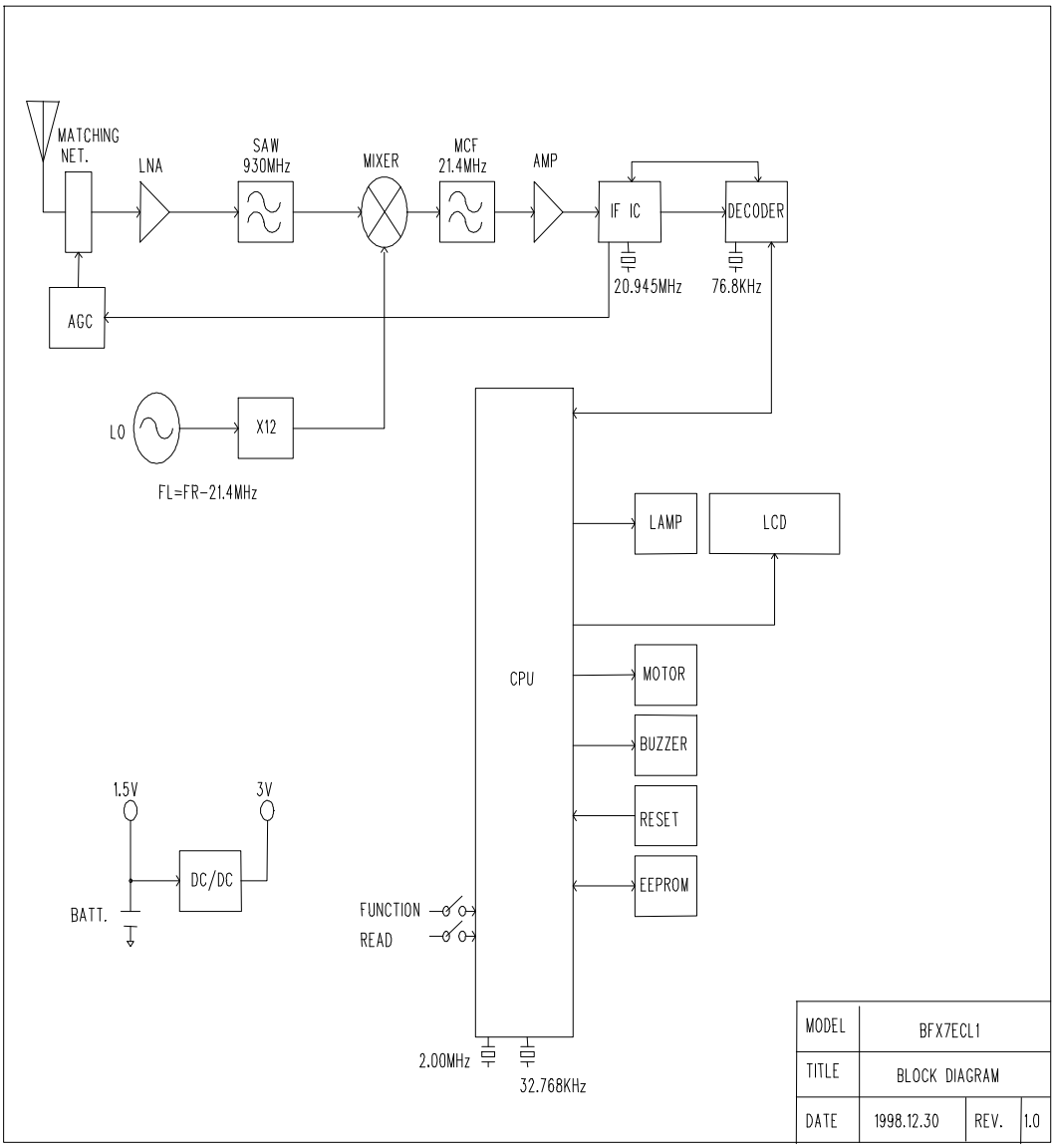
Display of full message

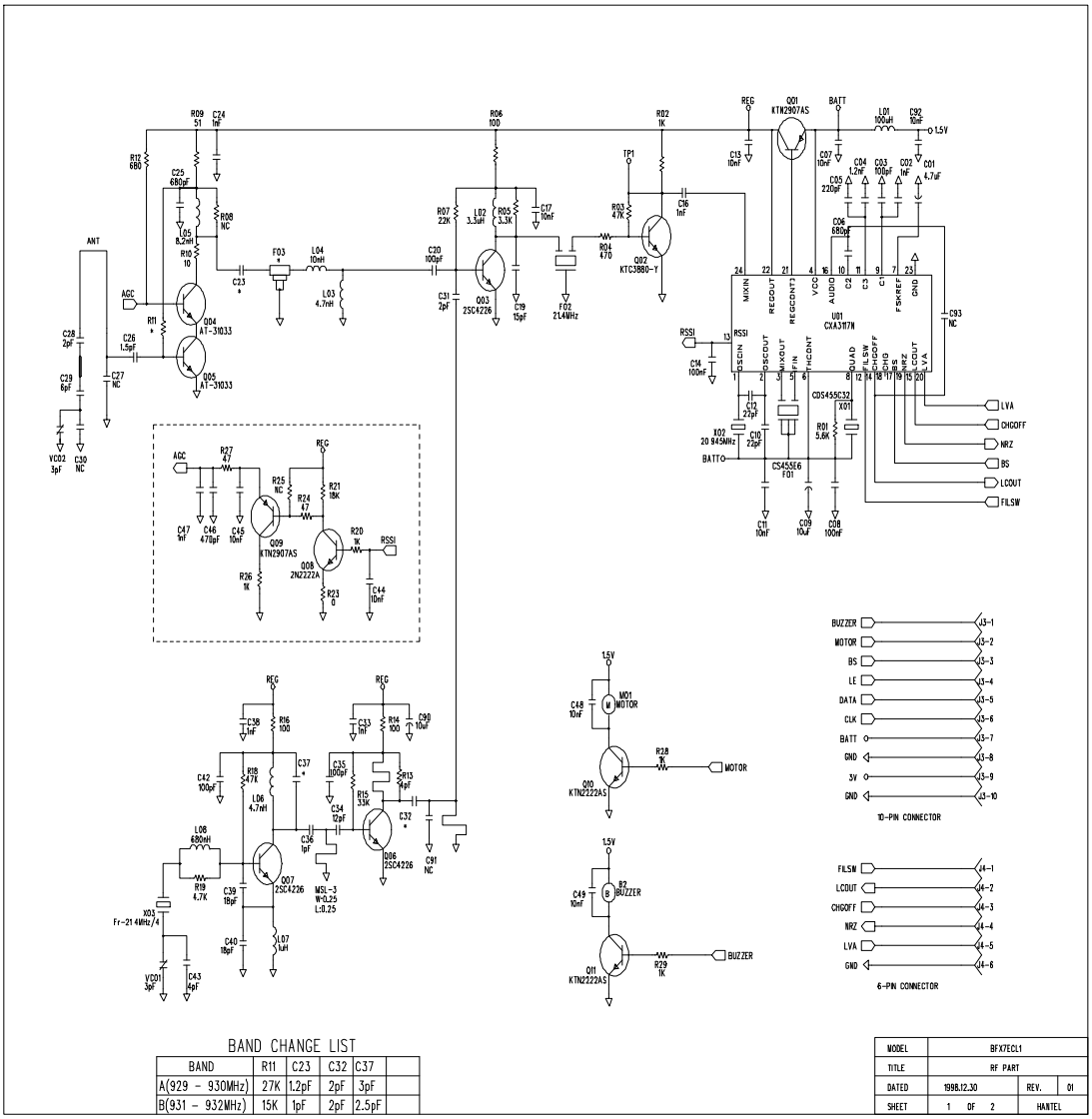
AEA FULL

ATTACHMENTS 4

BLOCK DIAGRAM & SCHEMATIC DIAGRAM

BLOCK DIAGRAM & SCHEMATIC DIAGRAM

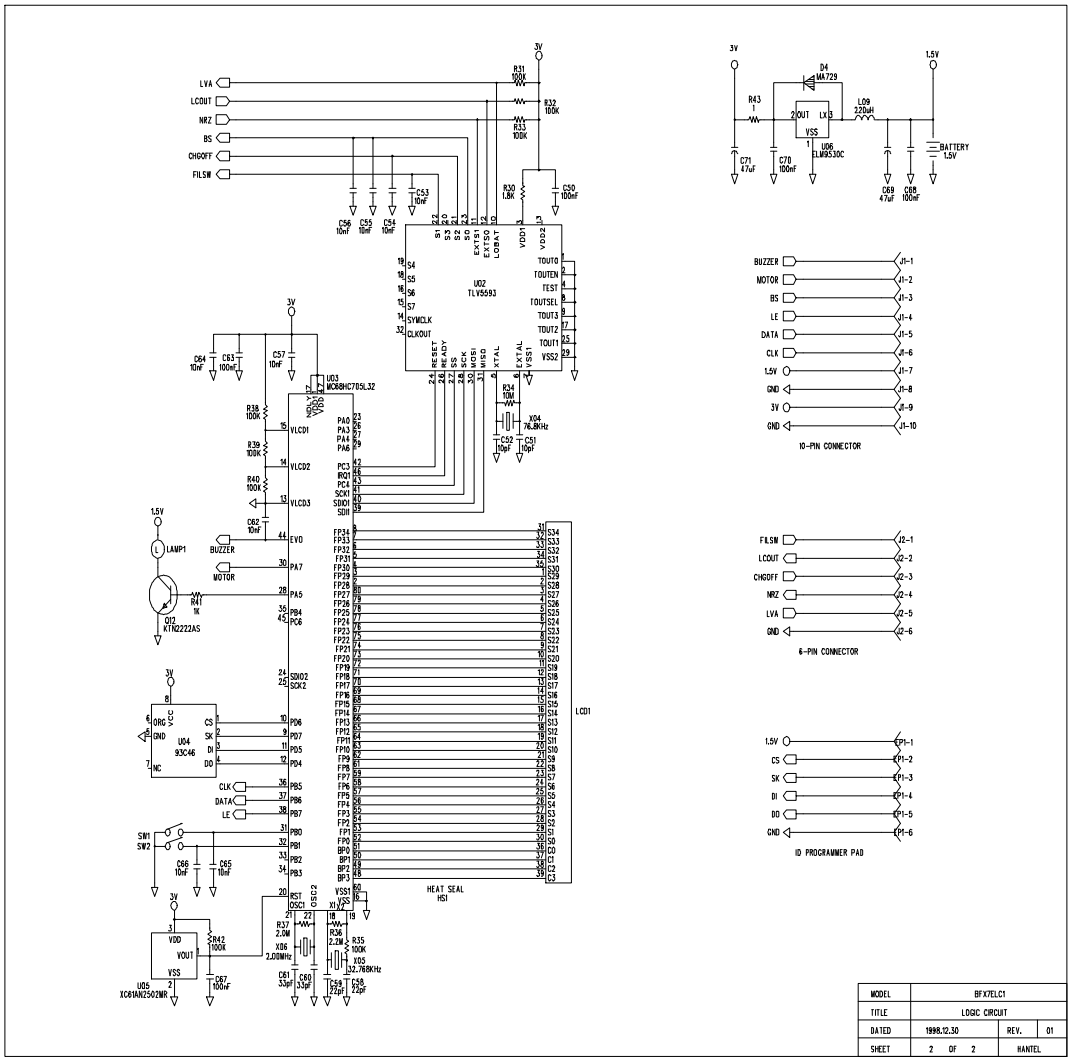




BAND CHANGE LIST

BAND	R11	C23	C32	C37	
A(929 - 930MHz)	27K	1.2pF	2pF	3pF	
B(931 - 932MHz)	15K	1pF	2pF	2.5pF	

MODEL	BFX7ECL1		
TITLE	RF PART		
DATED	1998.12.30	REV.	01
SHEET	1 OF 2	HANTEL	



LVA
LCOUT
NRZ
BS
CHGOFF
FILSW
U02
TLV5593
U03
MC68HC705L32
U04
93C46
U05
XC61AN2502MR
U06
ELM9530C
D4
MA729
LCD1
HEAT SEAL
HS1
BATTERY
1.5V
10-PIN CONNECTOR
6-PIN CONNECTOR
ID PROGRAMMER PAD
MODEL
BFX7ELC1
TITLE
LOGIC CIRCUIT
DATED
1998.12.30
REV.
01
SHEET
2 OF 2
HANTEL

ATTACHMENTS 5

DESCRIPTION OF CIRCUIT FUNCTION

DESCRIPTOIN OF CIRCUIT FUNCTION

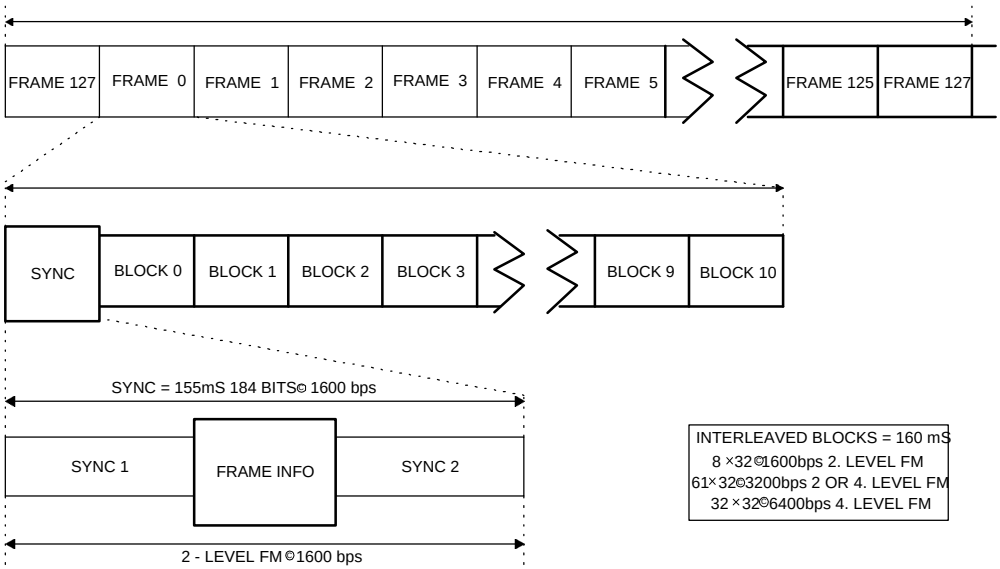
1. INTRODUCTION

The HANTEL FLEX numeric display pager uses a microcomputer to control radio frequency(RF) circuits and other customized decoding hardware to receive, decode, store, and display FLEX numeric pages. A page is received via the main RF carrier modulated with the proper base band sequence defined by the FLEX paging protocol. As FLEX is a multi-speed code, the base band signal is at a symbol rate of either 1600 or 3200 symbols per second (bps) with either 2 level or 4 level modulation. Note that 3200 symbols per second with 4 level modulation results in a maximum FLEX baud rate of 6400 bits per second (bps).

The circuitry in the receiver performs the RF to intermediate frequency (IF) conversion. The receiver then passes the frequency demodulated audio signal to the decoder, which contains the customized analog and digital circuitry necessary to decode the page information. Additionally, the decoder contains other support circuitry to capture switch closures to provide audio and visual alerts, and to display page and other user information on the LCD screen.

2. FLEX PAGING FORMAT, CODE, AND CODE CAPACITY

A FLEX cycle is defined as 128 frames (4minutes) with each frame numbered from 0 to 127. An hour is divided into 15 FLEX cycles numbered 0 through 14. The structure of a FLEX frame is shown the below. FLEX frames are transmitted at 32 frames per minute (1.875 seconds per frame). The Sync 1 portion of each frame is transmitted at 1600 bps providing means for obtaining frame timing, 1600 bps symbol timing, and an indication of the speed of the remainder of the frame. The frame information word carries the cycle number indications by time multiplex phase of low traffic (address field does not extend past Block 0), and a 4-bit check character to ensure quality of the received information.



The Sync 2 portion of the frame is designed to provide synchronization at the frame's block speed allowing proper demultiplexing and decoding of the message blocks.
When the pager is turned on, it does a continuous search for a FLEX frame for a minute. The pager is programmed to search for up to 4 minutes.

Upon reception of a valid frame, the pager decodes the frame number to determine where it is in the FLEX cycle. The pager decodes future frames based on two parameters, Home frame and Collapse, which are programmed with its address. The pager always decodes its programmed frame, the Home Frame.

For example, if the pager is programmed for frame 10, and collapse 2, the decode frequency is equal to 22 frames or every four frames. Therefore, the pager decodes frames 10, 14, 18, 22, 16 and so on.

A system collapse is also transmitted as part of the FLEX frame. the pager uses the smaller of the two collapse values. Either the system collapse or the programmed collapse value determines the frequency of frame decoding.
If the initial search time end without the pager finding a FLEX frame, the pager changes to a baud search mode where it "wakes up" every 1.6 seconds and looks for a signal on the channel for approximately 80 milliseconds. If the baud search detects a signal, the pager then begins another continuous search for a FLEX frame.

3. GENERAL CIRCUIT DESCRIPTION

a. Power

Operating power for both the receiver and decoder boards is obtained from the battery. On the receiver board, a 1-volt regulator supplies the rf circuitry with power. The regulator is turned on and off from the decoder via the battery-saver strobe. The decoder board receives its power from the battery and generates 3 volts, which is supplied to the microcomputer/LCD driver and the code plug.

b. Standard receiver basic circuit description

The basic pager circuits consist of the following receiver board stages : antenna and amplifier/preselector to receive, amplify, and filter the RF paging signal. The mixer converts the RF signal to an intermediate frequency(IF). The crystal filter attenuates the signal above and below the RF carrier. The oscillator/multiplier supplies the appropriate injection signal to convert the RF paging signal to the correct IF. The IF demodulator amplifies, filters, and mixes with the first IF to produce a 455KHz second IF and demodulates the signal to recover the audio data.

The receiver board receives power from the main system battery. A 1 Volt regulator contained in the IF demodulator supplies the receiver circuits with power. Control lines turn this regulator on and off as well as to select the IF demodulator model of operation.

c. Decoder basic circuit description.

The basic decoder consists of the following functional module : Microcomputer module with LCD driver, LCD display module, user interface buttons, FLEX decoder. The FLEX decoder is a signal processing module which communicates with the host microcomputer, which contains

FLEXstack software driver used to fully reconstruct a FLEX page. Two switches provide user interface for the pager.
The DC-DC converter contains the voltage management circuits that provide the main system voltage from the primary battery. The microcomputer controls the major functions involving data decoding and control of the alert circuitry and the LCD.

4. OPERTING MODES

There are two modes of operation for the decoder : power-up and page search.

a. Power-up

The power-up condition starts when the primary battery is inserted into the pager. the voltage management circuits in the DC/DC converter activate and begin to regulate the system voltage(nominal 3.0V).

b. Page search

When the pager powers up, the receiver is turned on and the decoder begins to search for a valid FLEX frame. When a valid FLEX frame is detected, the pager synchronizes to the channel and begins to operate at the desired collapse value continuously. If no frame is detected within 1 minutes, the pager enters a baud detect mode. While in this mode, the pager searches every 1.84 seconds to determine if there is any FLEX information on the channel. Once FLEX data rates are detected, the pager then searches for a valid frame as noted before.

The microcomputer searches for the pager's FLEX address once it synchronizes to the channel. If no address is present, the pager shuts off the receiver and data decoding circuits and enters a lower current consumption mode. While in this mode the pager waits until the next frame is due on the channel. If a matching address is detected, the microcomputer extracts the message data from the signal and stores it in the internal RAM.

The pager notifies the user by enabling the appropriate alert circuits dependent upon the user and code plug information. if the audio alert options is selected, the tranducer activates with the appropriate alert waveform. If the vibration mode is selected, the vibrator motor is enabled. The alerts are stopped by pressing any of the two buttons. The message is then read by pressing the READ button.

5. DETAILED CIRCUIT DESCRIPTION

a. Battery voltage, voltage multiplier, voltage regulator and battery-saver strobe circuits.

The negative side of the battery is connected to circuit common. The positive voltage from the battery is distributed throughout the decoder and receiver section. A voltage regulator on board the IF demodulator supplies 1.0 volt to sections of the receiver at discrete times, reducing current drain.

The battery voltage is applied to the decoder DC-DC converter IC(U06), where it is converted to 3.0V operating voltage. This higher voltage is applied to the microcomputer(U03), and FLEXchip.

b. FLEX receiver circuit descriptions.

(1) Battery voltage and DC-DC converter.

The negative side of the battery is connected to circuit common. Positive voltage from the battery, B+, is distributed throughout the decoder and receiver sections.

BATT is applied to the dc to dc converter(U06) where it is boosted to 3.0 volts. This higher voltage is applied to Microcomputer(U03), Reset IC(U05) and EEPROM(U04)

(2) Antenna and RF amplifier

The antenna system for the pager is the metal-looped type which resonates with the capacitors C26, C28 and VC2 trimming capacitor. Matching the antenna impedance to the input of RF amplifier(Q4, Q5) is performed by the fixed capacitor C26. By tuning the VC2 capacitor, the antenna can be turned to the pager's operating frequency.

The RF signal is coupled by C26 to the input of the RF amplifier, cascoded pair Q4 and Q5. Resistors R11, R12 and R9 provide DC bias stability. DC supply decoupling were performed by C25. The output of the RF amplifier is coupled to the mixer Q3 via a SAW filter. The antenna circuitry, together with the SAW filter, provide image and spurious response protection.

(3) Two-pole crystal filter.

The two pole crystal filter is a very high Q bandpass filter, resonant at the IF frequency. The low-conversion output contained frequencies other than desire 21.4MHz. The very narrow bandpass filter out the signal above and below 21.4MHz.

(4) Low-conversion/Demodulation module.

The first IF signal from filter F2 couples to the second mixer at pin 24 of low conversion module U01. It mixes with the second oscillator frequency for an output of 455KHz.

The second oscillator is a crystal controlled unit X2. There are no peaking or tuning adjustments. Output of the second oscillator must be 455KHz below the first IF. Output of the second mixer(second IF) is routed through ceramic filter F1 and the two internal IF amplifier stages. This further reduces the unwanted signals and provide better adjacent channel selectivity. After the second IF amplifier, the signal is applied to the audio demodulator.

c. FLEX decoder circuit description

(1) Microprocessor module

The microcomputer(U03) module controls the overall operation of the decoder section. Each time the pager is turned on, the U03 reads the code-plug information and performs the necessary operations to produce a power-up alert(audio beeps). Basically, the U03 consists of a microprocessor and a read-only memory(ROM).

A program in the ROM instructs the U03 to decode the recovered data, store the data message, power the RF/IF circuits on and off, process display data, and interact with the user controls and switches.

The MC68HC05L32 is an 80 pin MCU with highly sophisticated on-chip peripheral functions. The memory map includes 24K bytes of user ROM and 768 bytes of RAM. The MCU has eight

parallel ports A, B, C, D, E, F, G, and J. ports A, B, C, and E have 8 I/O pins, port D has 7 I/O pins, port J has 2 I/O pins, port F has 8 input-only pins, and port G has 8 output-only pins. The MC68HC05L32 includes 16-bit and 8-bit timers, a COP Watch dog timer, LCD drivers, an 8 channel ADC, and two channel serial peripheral interface. The details features are as below.

. Low cost, HC05 core, 80 pin QFP package
. 24592 bytes of MASK ROM including 16 bytes of user vectors
. 768 bytes of on-chip RAM
. 41 bidirectional I/O lines, 8 input-only lines, 8 output-only lines
. 16 bit timer with 2 input capture and 2 output compare
. 8 bit event counter / Modulus clock divider (8 bit timer)
. COP Watch dog timer
. 2 channel serial perpheral interface (SPI)
. 8 bit 8 channel analog to digital converter
. LCD drivers (4 back plane drivers) X (39 front plane drivers)
. On chip time base circuits
. Dual oscillators and selectable system clock frequency
. Power saving STOP mode / wait mode
. Two IRQ inputs
. Key wake up interrupt with 8 bit input.

(2) Code plug module

The code plug module includes an electrically erasable programmable read only memory(EEPROM) integrated circuit. It is programmed with pager address codes, functions to which the pager will respond, and pager options.

(3) FLEX Decoder

It simplifies implementation of a FLEX paging device by interfacing with any of several off-the-shelf paging receiver IC's and any of several off-the-shelf host microcontroller/microprocessors. Its primary function is to process information received and demodulated from a FLEX radio paging channel, select messages addressed to the paging device and communicate the message information to the host. The host's function is the interpret the message information in an appropriate manner. The FLEXchip IC also operates the paging receiver in an efficient power consumption mode and enables the host to operate in a low power mode when monitoring a single channel for message information.

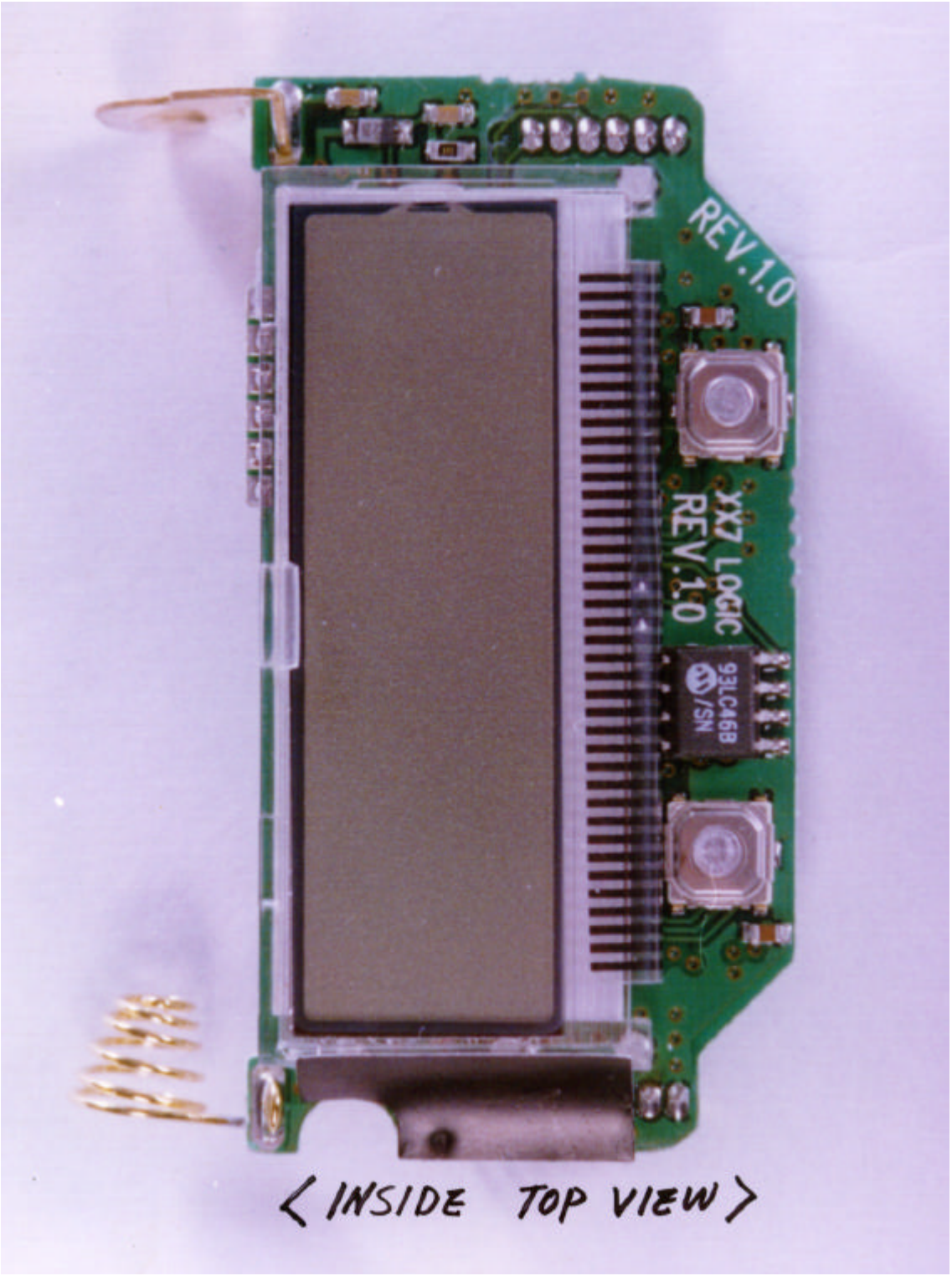
ATTACHMENTS 6

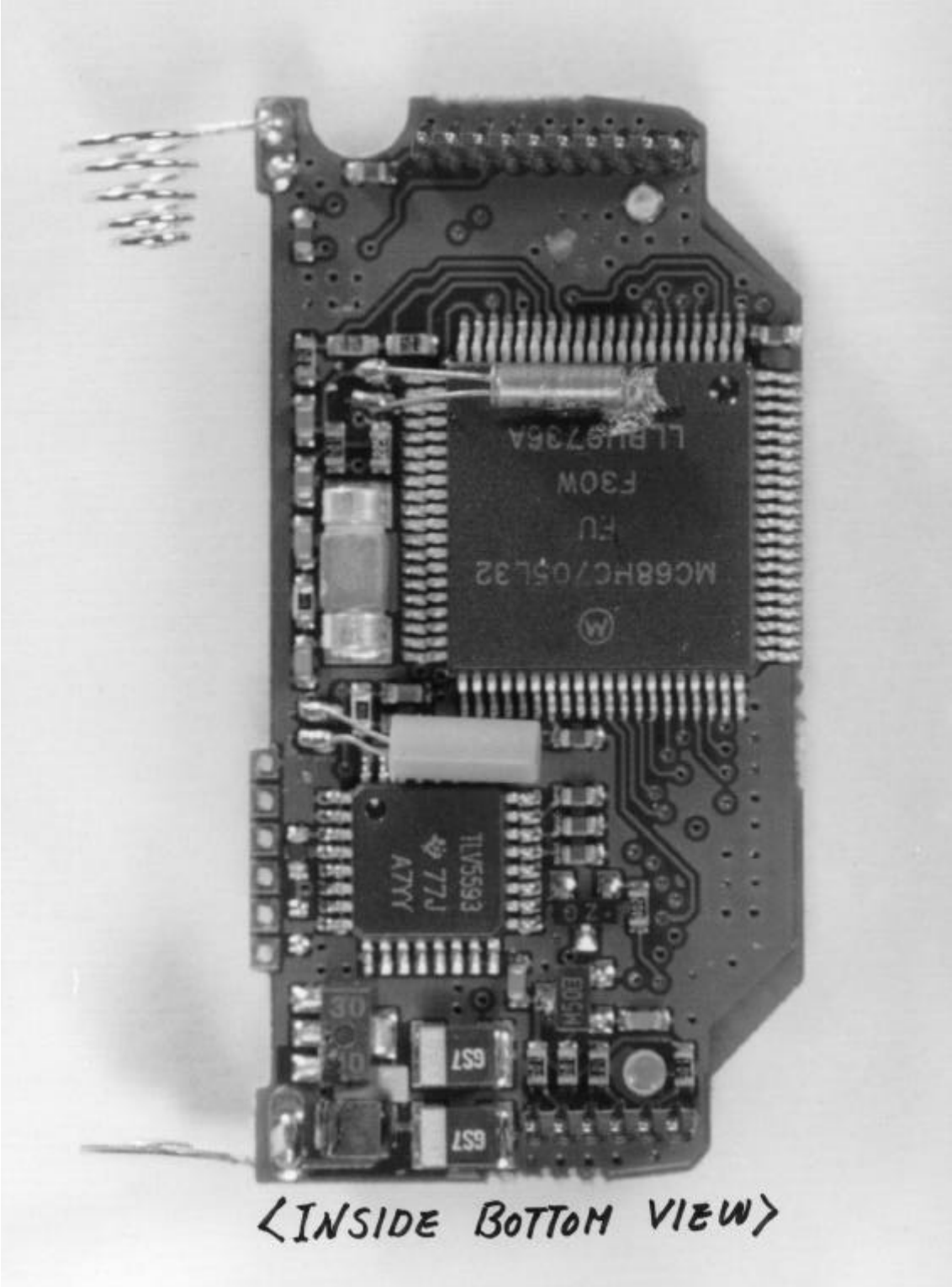
PHOTOGRAPHS

<TOP VIEW>

Model : BFX7ECL1
Freq. & CAP. : 900.500, 12345567
FCC ID : ODGBFX7ECL1
Made by Hantel in Korea

<BOTTOM VIEW>


REV.1.0
XX7 LOGIC
REV.1.0
93LC46B
/SN
< INSIDE TOP VIEW >



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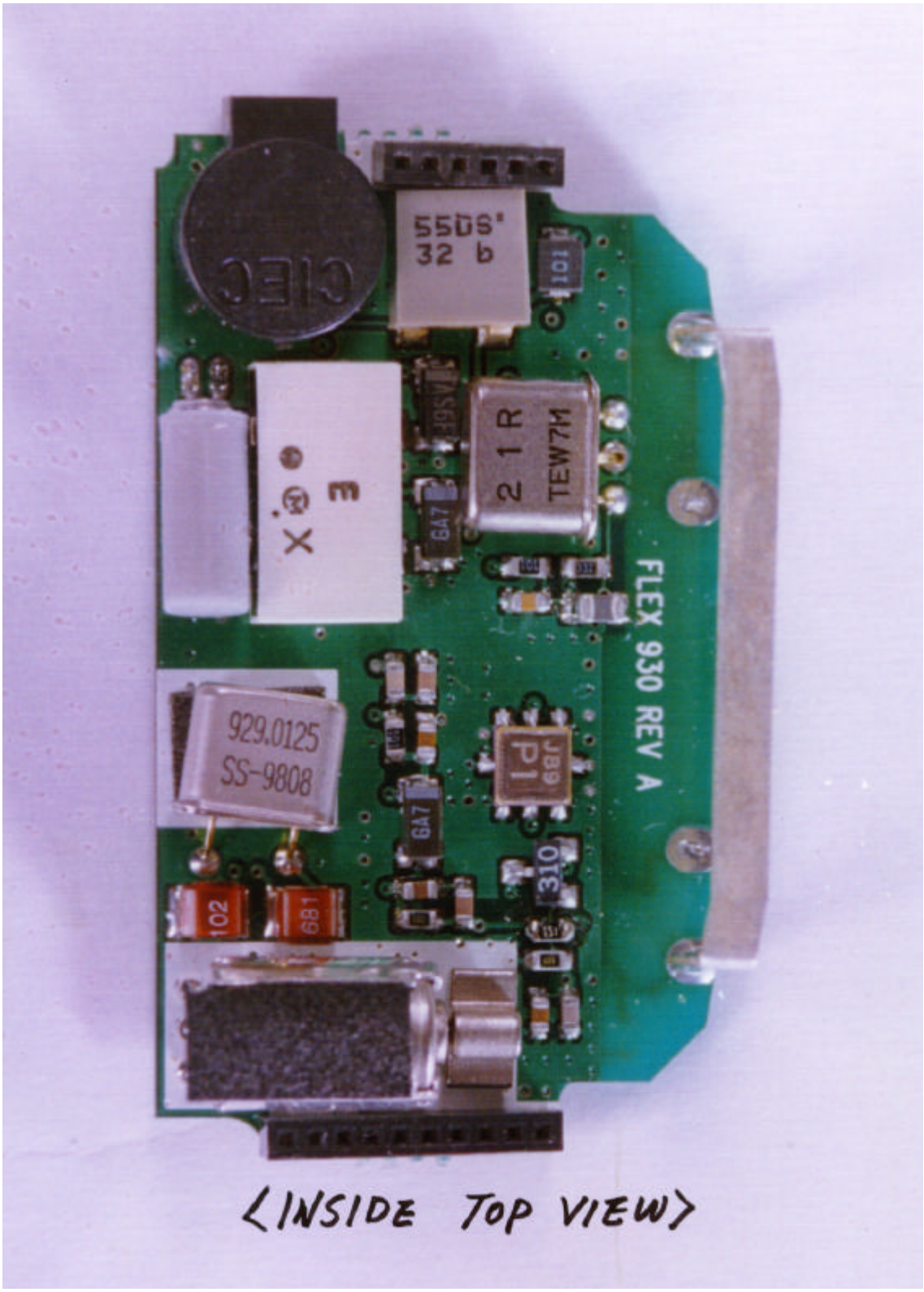

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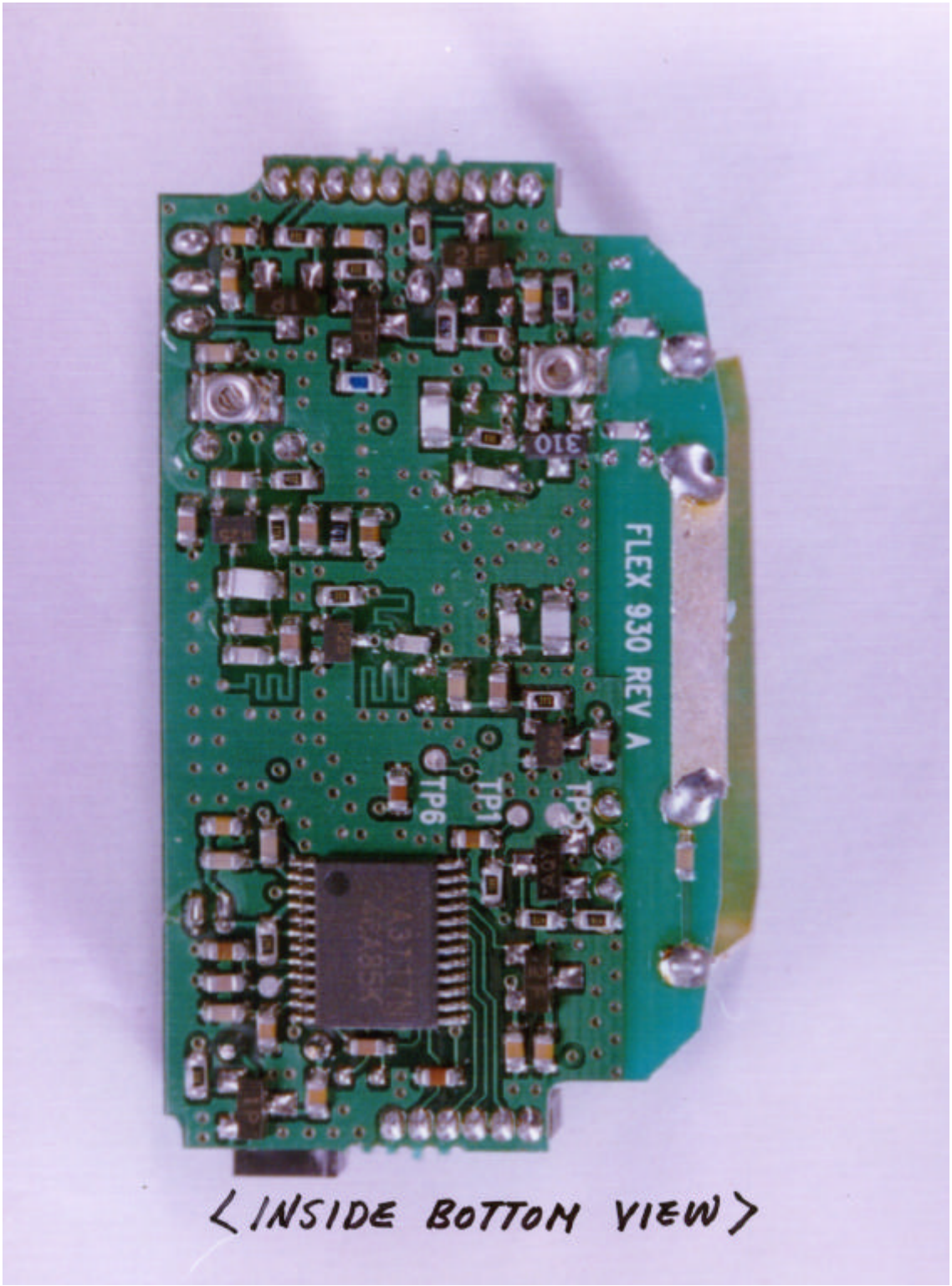

<INSIDE BOTTOM VIEW>