FCC PART 90 TYPE APPROVAL

EMI MEASUREMENT AND TEST REPORT
ABOUT EUT USER MANUAL FOR

COMMUNICATION NETWORK INTERFACE, INC.

51-2, SungSan 1-dong, Mapo-gu

SEOUL 121-251, KOREA

FCC ID: N79CNI-810D

May 2, 1999

This Report Concerns: ☒ Original Report	**Equipment Type:** Two Way Messenger

Test Engineer:	John Chan
Test Date:	May 2, 1999
Certified By:	
	John Y. Chan - Director, Compliance Engineering
Prepared By:	Bay Area Compliance Laboratory Corporation 230 Commercial Street, Suite 2 Sunnyvale, CA 94086 (408) 732-9162

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Communication Network Interface, Inc.,* FCC ID *N79CNI-810D (TWO WAY MESSENGER)* or the "EUT" as referred to in this report is a digital data communication equipment in accordance with Motorola DataTac 5000 RD-LAP 19.2 specification. The frequency it uses ranges from 806 MHz to 821 MHz for transmission and from 851 MHz to 866 MHz for reception. The EUT measures 105.7mm L x 70.5 mm W x 17.6mm H.

Basic Specification include:

- Weight: 163g

- Power: 4.2 V Ni-MH

- RF protocol: RD-LAP 19.2 on DataTAC 5000

- Host protocol: DataTAC NCL 1.2

- Etc.

Appendix A –EUT USER MANUL

Technical Guide to

CNI-810D

(Two Way Messenger)

CNI Inc.

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1. Overview

CNI-810D, TWM(Two Way Messenger), is a digital data communication equipment in accordance with Motorola DataTAC 5000 RD-LAP 3.2 specification. The frequency it uses ranges from 806Mhz to 821Mhz for transmission and from 851Mhz to 866Mhz for receiving.

This terminal enables you to make data communication in two-way, and it also helps you to enjoy various types of data services with full mobility due to support for roaming.

With high-resolution graphic LCD display, you can manipulate various types of information to communicate with others in many ways.

- ● Basic specification
  - - Dimension   : 105.7 × 70.5 × 17.6mm
  - - Weight   : 163g
  - - Supply voltage   : 4.2V Ni-MH
  - - RF protocol   : RD-LAP 19.2 on DataTAC 5000
  - - Host protocol   : DataTAC NCL 1.2

2. Specification and features

A. Environment
- - Operation temperature : -30 ～+50
- - Storage temperature   : -35 ～+80
- - Humidity   : normal operation after 8 hours storage in 95% non-condensed

B. General RF specifications
- - Modulation   : 4-level FSK
- - Mode   : half-duflex
- - Bit rate   : 19,200bps

C. Radio interface
- - Frequency   : Tx 806 ~ 821 Mhz / Rx 851 ~ 866Mhz
- - Channel spacing   : 25Khz
- - Bandwidth   : 20Khz

D. Transmitter
- - Transmit power   : 1W
- - Frequency stability   : ±2.5ppm
- - Modulation stability   : ±5%(-30 ～+50 , 806~821Mhz)
- - FM deviation   : 5.6Khz
- - Spurious rejection level : <-60dB
- - Adjacent channel power : <-60dBc

E. Receiver
- - Sensitivity   : -113 ± 3dBm (1% BER, all types of data)
- - Channel selectivity   : > 55dB
- - Inter-modulation   : > 50dB
- - Spurious rejection   : > 60dB
- - Image frequency rejection : > 50dB
- - Hum & noise   : < 30dB

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3. Circuit guide

A. RF circuit
CNI-810D circuit consists of five parts, each of which is power supply, antenna, synthesis/modulation of frequency, transmission and reception.

1   power supply

Power supply is composed of voltage regulation and switch part. Voltage regulator U2 generates 3V of power supplied from VBB on the control of PWR ON/OFF switch.

U2 is changed to RX VCC through Q1 only when RX is on, and is authorized to LNA, MIXER, and IF AMP to be supplied to IF IC, frequency synthesizer, PLL IC(U5), TX DRIVE AMP(Q8) and switching part(Q9, 10) each.

The switch between Tx and Rx can be achieved by control of RX_EN(Q1 & Q2) and TX_EN(Q9 & Q10).

2   Antenna
Antenna part is composed of antenna matching circuit, BPF, and Rx/Tx signal isolation circuit.

CNI-800D adapts /4 WHIP antenna to match to mid range frequency of communication, and CNI-810D contains the antenna internally and attachs FPC near the flip area to implement the function of re-radiation with space coupling switch.

TX/RX signal isolation circuit isolates signals of communication and is composed with switching diode and inductor.

The signals received from antenna meet the send/receive path and then D1 is turned on and the signals proceed only to receiving path.

In receiving mode, signals from Tx Power Amp can not go through Rx path because D1 is off.

3   frequency synthesizer and modulator

Frequency synthesizer consists of PLL part and pre-modulation filter. The PLL part is composed of phase detector, loop filter, VCO and 12.8Mhz X-TAL.

VCO generates 806~821Mhz frequencies in accordance with the voltage which is from charge pump of PLL to loop filter. Programmable Divider in PLL makes the VCO output frequency to any channel value according to the frequency data from Logic CPU. Phase detector gets low and high frequencies from comparison of phase. Loop filter filters the frequencies to get a value of voltage. The voltage is input to VCO to achieve phase lock process.

Modulation is completed when modem IC signal of Logic part is input to VCO and authorized.

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4   Receiver

Receiver filters and amplifies RF signal through SAW filter and LNA

Rx part is super heterodyne type, and consists of LNA, LPF, 1st Mixer, SAW and IF IC part. There happens RF signal from antenna and the signal is low-noise-amplified through SAW filter and LNA, and it comes to 2nd IF 455Khz via 1st IF 45Mhz.

SAW filter(FL4) rejects Image frequency(RF ±2*IF) generated from 1st Mixer while receiving. For example, if the input channel is 860Mhz, the output frequency would be 45Mhz from mixer while LO frequency is 815Mhz. But if SAW filter will not filter the image frequency of 860-2*IF, S/N would be worse with 45Mhz(815-770=45) of noise. And SAW filter should filter to prevent LO frequency becoming spurious through LNA and reverse path.
LNA(Q5) amplifies and sends the faint signal from antenna to mixer, and mixer(Q4) mixes and generates 1st IF with frequency from antenna.

IF comes from mixer. And IF contains inter-modulation product component. MCF removes that product component. So clean IF can be inserted to IF IC. 2nd LO entered IF IC is mixed with the IF signal to be 2nd IF of 455Khz simultaneously.

2nd IF signal of 455Khz is modulated with discriminator method, and the signal passes LPF(FL3) to removed without band noise. Here detected RF signal entered into receiver and RSSI signal which indicates the strength, and they are passed to micro processor in analogue value.

5   Transmitter

Transmitter consists of driver amp and power amplifier. It generates carrier frequency while share Rx with frequency synthesizer.

LO frequency is used to direct transmission frequency because there is difference between transmission and reception. So it only amplifies and propagates through PA(U6) which can get high level of gain easily with low power.

B. LOGIC Circuit
1   Summary
        This unit consists of CPU part, memory part, Decoder part, modem part, RF/DTE Interface part, screen display part, and power supply part.

2   CPU part(U3)
        The CPU adopted by this unit has 32bit RISC architecture and works on 4.9152MHz. The main functions are as follows;

-    Execute RD-LAP protocol
-    Execute NCL protocol
-    Control PLL circuit of R/F board and perform Power Saving function
-    Perform Data transaction function(receiving and transmitting) through Data Pump(Modem)part
-    Checking and processing of RSSI Level come from R/F part
-    Perform Data transaction with DTE through DTE interface part

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3   Memory part(U2, U6)
    Memory part consists of FLASH Memory(8Mb, U2) and SRAM(4Mb, U6).
    Flash Memory stores LLI information and program. And SRAM supplies
    memory stacks for program.

4   Decoder Part(U7)
    Decoder decodes control signal of CPU and generates FLASH memory choosing
    signal.

5   Modem Data Pump(U1)
    Modem part is in charge of MAC protocol while executing RD-LAP protocol,
    and transmits two way Data between CPU and RF part. The main function is as
    followed.
    -   Packet Data Framing
    -   4-Level FSK Data Modulation
    -   FEC Encoding/Decoding
    -   Interleaving/De-interleaving

6   R/F Interface part(JP1)
    R/F Interface part is physical connector joining CPU part, Modem part, and all
    the signals of R/F part such as PLL control signal, R/F part On/Off signal, and 4-
    Level FSK signal.

7   Screen Display part
    With 164 x 56 pixel, legible high resolution display screen, all kinds of
    information composed of characters and graphics can be caught by simple
    glance of look. And adopted touch panel enables user's graphic data input.

8   Power Supply part
    Power Supply part converts external power source, VBB to 3V which is needed
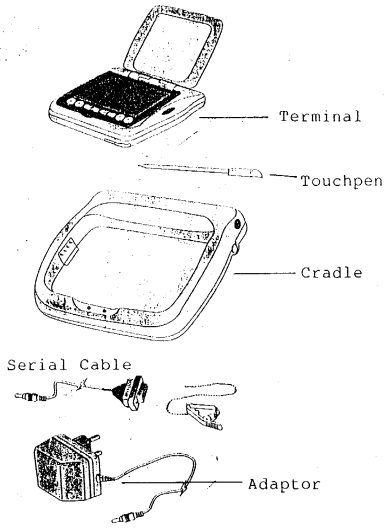   for internal operation.

4. Charger Circuit
The Charger of this unit supply VBB 300mA power to unit and by using
RS232C integrated in this Charger, serial communication is possible.
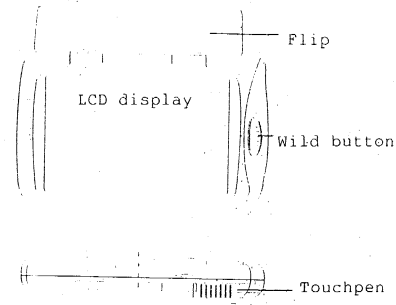
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User Guide to

CNI-810D

CNI Inc.

What's in a package

— Terminal

— Touchpen

— Cradle

Serial Cable

— Adaptor

Components

— Flip

LCD display

— Wild button

— Touchpen

- LCD display : displays information and contents
- Wild Button :
  1. stop button : stops the beep sound or vibration with a one push
  2. open list box : leads you to the message list box whatever menu you are in.
  3. show contents : shows contents of a message while it is highlighted.
  4. Power on/off : you can turn on/off the machine with pushing 3~10 seconds.
  5. Discharge : you can discharge the machine while on cradle.
- Touchpen : is used when you input a graphic or characters.

Icons on LCD display   Cradle

Status Line

(display)
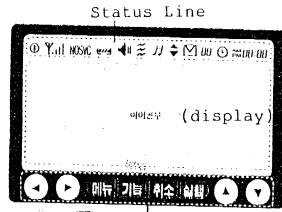
keypads

- 메뉴 : moves you to top menu
- 기능 : configures each functions, checks the transmission, and inputs formal sentenses.
- 취소 : escapes to previous menu.
- 실행 : executes the selected operation.

① : power-on status	♫ : beep melody selected
Y₁ıl : wave sensitivity	↕ : scrolls up and down
NOSVC : service is not available	☑ : unread messages exist
▱ : battery state	₿₿ : no. of unread message
◀‖ : beep alarm selected	⊙ : on-time alarm is set
≋ : vibration selected	ᴬᴹₚₘ ₿₿:₿₿ : present time

(battery pocket)
(terminal)
(adaptor)
(serial connect (cradle)
(discharge LED) (charge LED)
(touchpens)

(battery power on/o switch)
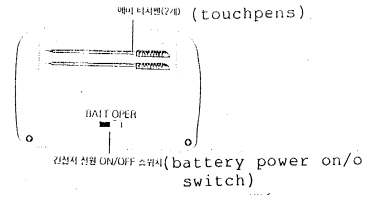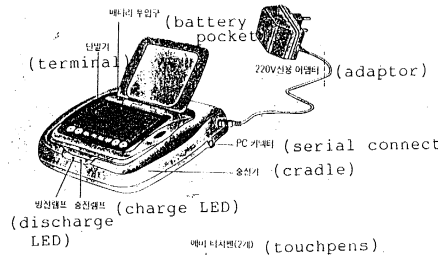
Initial Screens

There are three kinds of services in this product.

A. Data Communication Service

B. Information Service

C. PIM Service
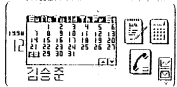
Data Communication Service

A. "Receive" icon   (receive)   (send)

When you click the 'receive' icon, you can move to message list box where you can see the contents of each message.

B. "Send" icon

When you select the 'send' icon, you can get some menus for sending a message such as e-mail, SMS, paging, TWM, and fax.

Information Provide Service

PIM service

calendar

memo pad
calculator
address book

⠏ : News and Weather information

⠏ : theater, convention, movie, and cultural event information

⠏ : stock market information
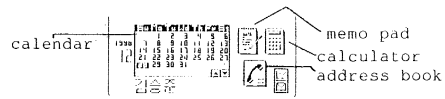
⠏ : position research service

⠏ : sports information

⠏ : entertainment, TV, music information

NEW : newly supplied information

⠏ : notices from the carrier

● calendar
● memo pad
● calulator
● address book

FCC Warning

Class B Computing Device

Information to User

This equipment has been tested and found to comply with the limits for a class B digital device pursuant to part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by tuning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1)   Reorient or relocate the receiving antenna.
2)   Increase the separation between the equipment and receiver.
3)   Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4)   Consult the dealer or an experienced radio/TV technician for help and for additional suggestions.

The user may find the following booklet prepared by the Federal Communications Commission helpful: "how to Identify and Resolve Radio-TV interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

FCC Warning

The user is cautioned that changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

NOTE: In order for an installation of the product to maintain compliance with the limits for a Class B device, shielded cables must be used.