FCC PART 90 TYPE APPROVAL

EMI MEASUREMENT AND TEST REPORT

ABOUT USER MANUL FOR

COMMUNICATION NETWORK INTERFACE, INC.

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FCC ID: N79CNI-800D

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This Report Concerns: ☒ Original Report	**Equipment Type:** Radio Packet Modem

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Appendix A – USER MANUAL

User Guide to

CNI-800D

(Radio Packet Modem)

CNI Inc.

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1. Overview

CNI-800D, RPM(Radio Packet Modem), 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 870Mhz for reception.

This modem 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 'Interface Connector' you can apply this modem to many kinds of machines to use 'Native Control Language(NCL)' protocol for communication. And it enables you to monitor the operation during communication.

- ● Basic specification
  - Dimension   : 68.5 × 46.6 × 10.4mm
  - Weight   : 45g
  - Supply voltage   : 4.2V
  - 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

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- Image frequency rejection : > 50dB
- Hum & noise   : < 30dB

3. Circuit guide

A. RF circuit
CNI-800D 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.

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.

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

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, Decoder part, modem part, RF/DTE Interface 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

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-   Checking and processing of RSSI Level come from R/F part
-   Perform Data transaction with DTE through DTE interface part

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.

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