DMR Data/Voice MODEM module User's Manual

CM405(UHF)

Version 1.4

Revision History

Revision	Date	Author	Status/Comments
1.0	Feb.10.2016	HI Lee	Initial Release
1.2	Oct.07.2016	HI Lee	Pin function, Flash memory
1.3	Mar.10.2017	HI Lee	Pin map
1.4	Oct.13.2017	HI Lee	Update contents

Important

This user manual contains important information for operating instructions.

Please read this manual carefully and completely before using CM405 Radio modem.

For additional information on 2-way radio, visit the following websites :

http://www.sytcl.co.kr

http://www.celetra.co.kr

Copyright Information

The AMBE+2™ voice coding Technology embodied in this product is protected by intellectual property rights including patent rights, copyrights and trade secrets of Digital Voice Systems, Inc. This voice coding Technology is licensed solely for use within this Communications Equipment. The user of this Technology is explicitly prohibited from attempting to extract, remove, decompile, reverse engineer, or disassemble the object code, or in any other way convert the Object Code into a human-readable form. US Patent Nos. #8,595,002 B2, #8,359,197, #8,200,497, #6,912,495 B2, #6,199,037 B1, #5,826,222, #5,754,974, #5,701,390, and #5,715,365.

Declaration of Conformity

EU Regulatory Conformance

This product is compliant with the essential requirements and other relevant provisions of the Directive 2014/53/EU.

This product has been constructed so that it can operate in at least one member state i.e. United kingdom, Italy.   There are no restriction of use.

This product is also compliant with directive 2011/65/EU having been designed and manufactured to the ROHS requirements.

Federal Communication Commission (FCC) Regulations

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

The OEM/integrator must test final product to comply with unintentional before declaring compliance of their final product to Part 15 of the FCC Rules.

The CM405 has been certified for mobile and base radio applications. If the CM405 will be used for portable applications, the device must undergo SAR testing.

A separate approval is required for all other operating configurations, including portable configuration with respect to FCC 47 CFR 2.1093 and different antenna configurations. It is the responsibility of the OEM to gain type approval for the host product.

The CM405 does not require any further shielding and therefore can be fitted into any host product. The end-users of the product must be provided with transmitter/antenna installation requirements and operating conditions to satisfy RF exposure compliance by the integrator. The RF output is via a 50Ω SMA(RP-SMA female) connector.

The final end product must be labeled in a visible area with the following " Contains FCC ID: 2AJRJ-CM405 ".

This transceiver works on frequencies which are not generally permitted. For frequency allocation, apply for a license at your local spectrum management authority. For actual usage contact your dealer or sales shop in order to get your transceiver adjusted to the al-located frequency range.

Important Notice for North American Users Regarding 406 MHz Guard Band

Frequency band 406 - 406.1 MHz is reserved for use ONLY as a distress beacon by the US Coast Guard and NOAA.

Under no circumstance should this frequency band be part of the preprogrammed operating frequencies of this radio.

FCC RF Exposure Requirements

The external ¼ wave dipole antenna used with this module must be installed to provide a separation distance of at least 49 cm from all persons, and must not transmit simultaneously with any other antenna or transmitter, except in accordance with FCC multi transmitter product procedures.

Contents

1. Introduction

1.1   Overview

The CM405 MODEM is designed for DMR Data/Voice communication purpose. It supports DMR Tier I, II protocol of ETSI Standard (ETSI TS 102 361). The CM405 MODEM is composed of aluminum die-cast housing with LED for status indicator, SMA RF connector and a main connector for Data communication service.
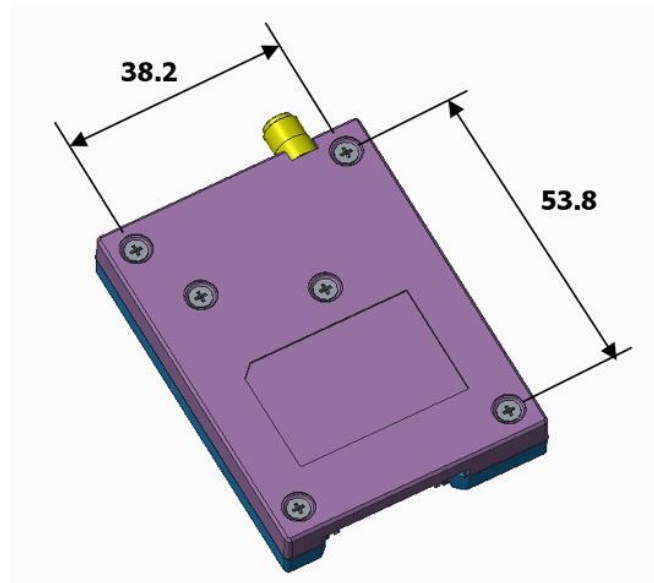
1.2   Features

- Serial Communication interface **(UART 3.3V Logic Level)**

- Operation status LED indicator (Power/CD/TX/RX)

- 5 Watts Output Power.

Parameter	Value
Length (mm)	64
Width (mm)	48
Thickness (mm)	10.4
Weight (g)	50

Table1. Mechanical Dimensions (Unit: mm)
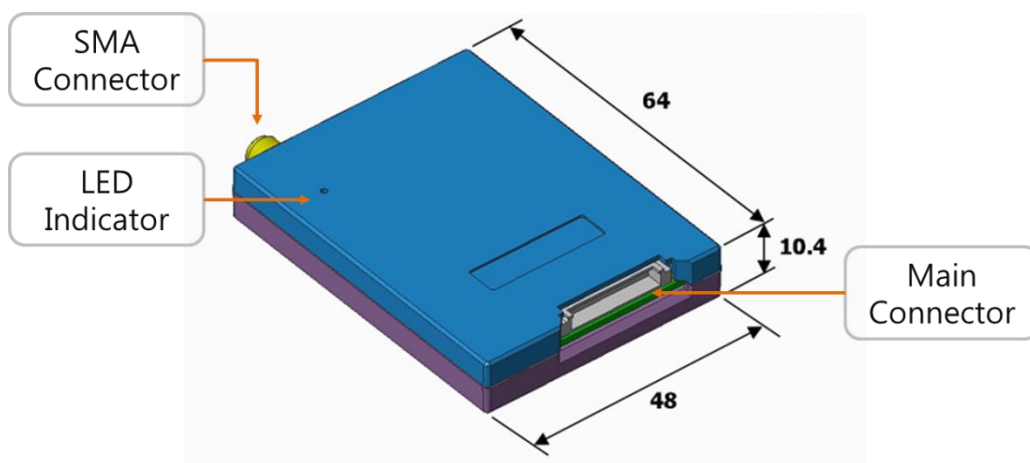
Fig 1. CM405, Top

Fig 2. CM405, Bottom

1.3   Interface Description

- Power In (7.4V, 2000mA)

- Indication LED

  Red, Green LED

- UART, 3wire (Tx, Rx, Gnd) interface

  Signal Level: 3.3V

Parameter	Value
Speed (Baud rate)	38400 [bps]
Data bits	8
Parity bit	None
Stop bit	1

Table 2. UART interface parameter

- RF Interface

  UHF:400 ~ 470 MHz, 5W RF Output power
  Compliant ETSI TS 102-361 / ETSI TS 102-490 / ETSI TS 102-658
  RF Connector type : RP-SMA female Connector (FCC)
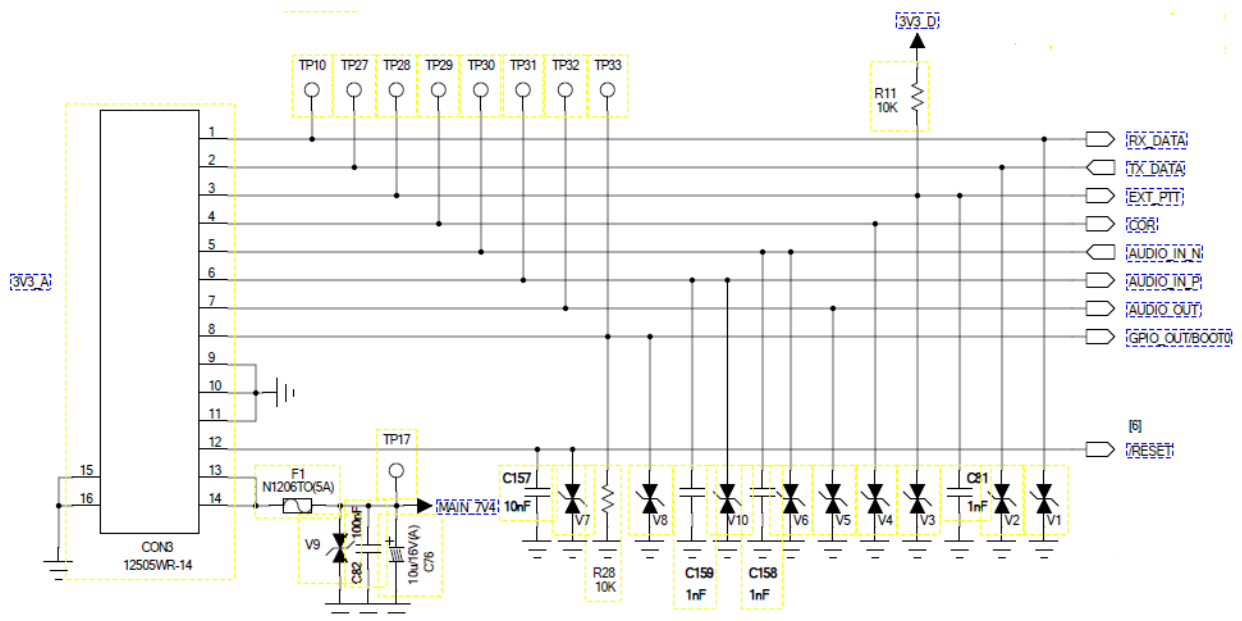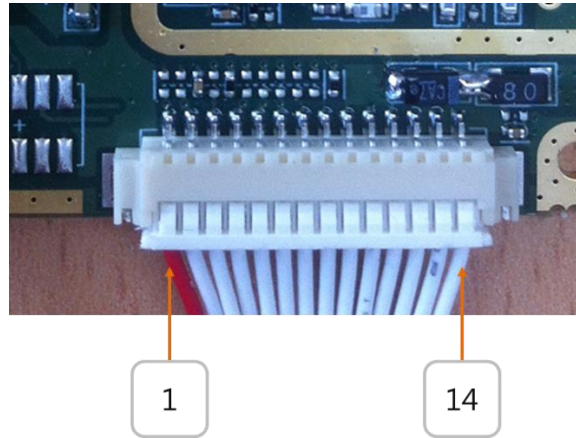
1.4   Pin Description

Fig 3. Pin Descriptions

Pin Number	Name	Signal Level	Note
1	Rx_Data	3.3V	UART (Signal Level: 3.3V)
2	Tx_Data	3.3V	UART (Signal Level: 3.3V)
3	Ext_PTT	3.3V	Digital Input (Low Active)
4	COR	3.3V	Digital Out (High Active)
5	Audio_In_N	10mV (nominal)	Analog In (Mic_N)
6	Audio_In_P	10mV (nominal)	Analog In (Mic_P)
7	Audio_Out	1V (peak)	Analog Out
8	Boot 0		GPIO_In (for upgrade F/W)
9	GND		
10	GND		
11	GND		
12	/Reset		Digital Input (Low Active)
13	Vcc (7.4V)		7.4V±5%
14	Vcc (7.4V)		7.4V±5%

Table 3. Pin Description

1.5   Antenna Connector

RF Connector type: RP-SMA Connector (female) or SMA Connector (female)

Fig 5. SMA Connector

2. Specifications

2.1 General Specifications

General	Description	Remark
Frequency Range	UHF: 400~470 MHz	CM405
Channel Capacity	512	
Channel Spacing	12.5 kHz	
Operating Voltage	DC 7.4V±5%, 2000mA	
Frequency Stability	1.5 ppm	
Antenna Impedance	50 Ω	
Digital VOCODER	AMBE+2	
Receiver		
Analog Sensitivity	-121 dBm	
Digital Sensitivity	-117 dBm (1% BER)	
Intermodulation	> 65 dB	
Adjacent Channel Selectivity	> 60 dB	
Spurious Rejection	> 70 dB	
Blocking	> 84 dB	
Hum and Noise	- 40 dB	
Audio Impedance	16 ohm	
Audio output	Typ. 7mW	
Audio Response	+1/-3 dB	
Conducted Spurious Emission	< -57dBm	
Transmitter		
RF Output Power	5W/1W (± 1.5 dB)	High/Low Power
Modulation Limiting	± 2.5 kHz	
FM Hum and Noise	- 40 dB	
Conducted/Radiated Emission	< -36 dBm	
Adjacent Channel Power	< -60 dBc	
Frequency Error	± 1.5 ppm	
Audio Distortion	3%	
Reliability		
Operating Temperature	-30°C ~ 60°C	
Storage Temperature	-40°C ~ 85°C	
ESD	IEC61000-4-2 Level 3	

Table 4. General Specifications

2.2 LED Indication

Item	Description	Remark
POWER	Lit up at Power ON (Red and Green)	
CD	Indicate carrier detection (Green)	
Tx	Indicate transmit status (Red)	
Rx	Indicate receive status (Green)	

Table 5. LED Indication

2.3 Internal Flash Memory (Option)

CM405 MODEM includes an internal flash memory for voice recording. Capacity of the flash memory is 64Mbit(Optional). Maximum recording time is about 4.5hours. User can control the voice recording and play via AT commands. For more detailed information on AT command list document.

3. AT Commands

CM405 MODEM is controlled by Celetra's AT command, refer to AT command list in AT_Command_List_DMR_Vxx_xxxxxxxx.pdf document.

4. MODEM Test Tool

Celetra provides simple MODEM test tool "CeletraRadioTester.exe" for evaluate and guide the AT command usage. It is not necessity to install but just execute it. User can use normal UART hyper terminal also (Ex: Tera term, Putty ...).
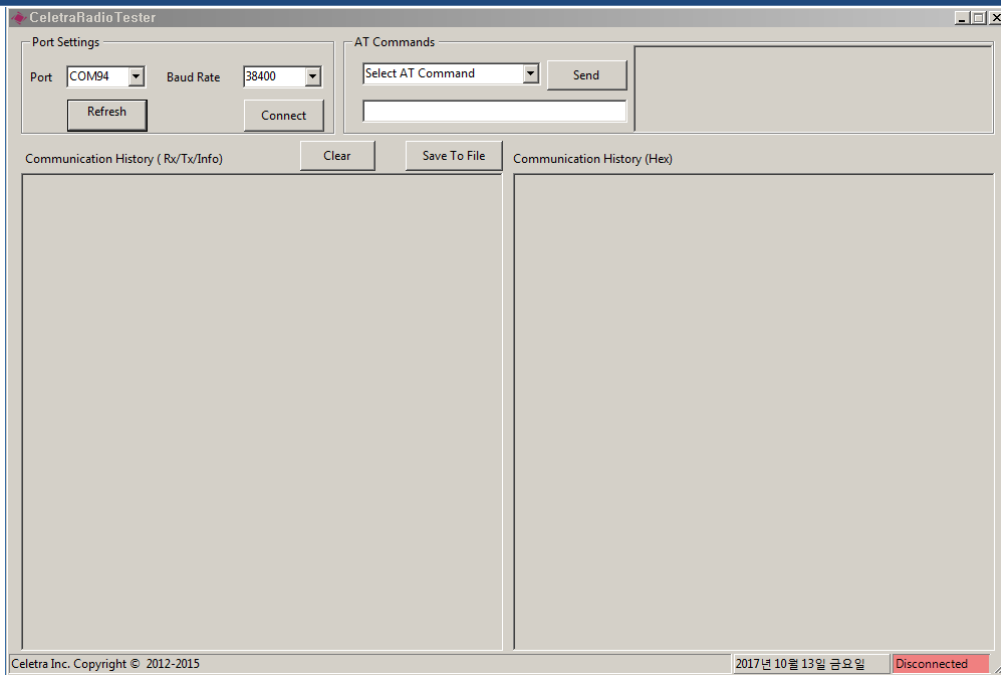
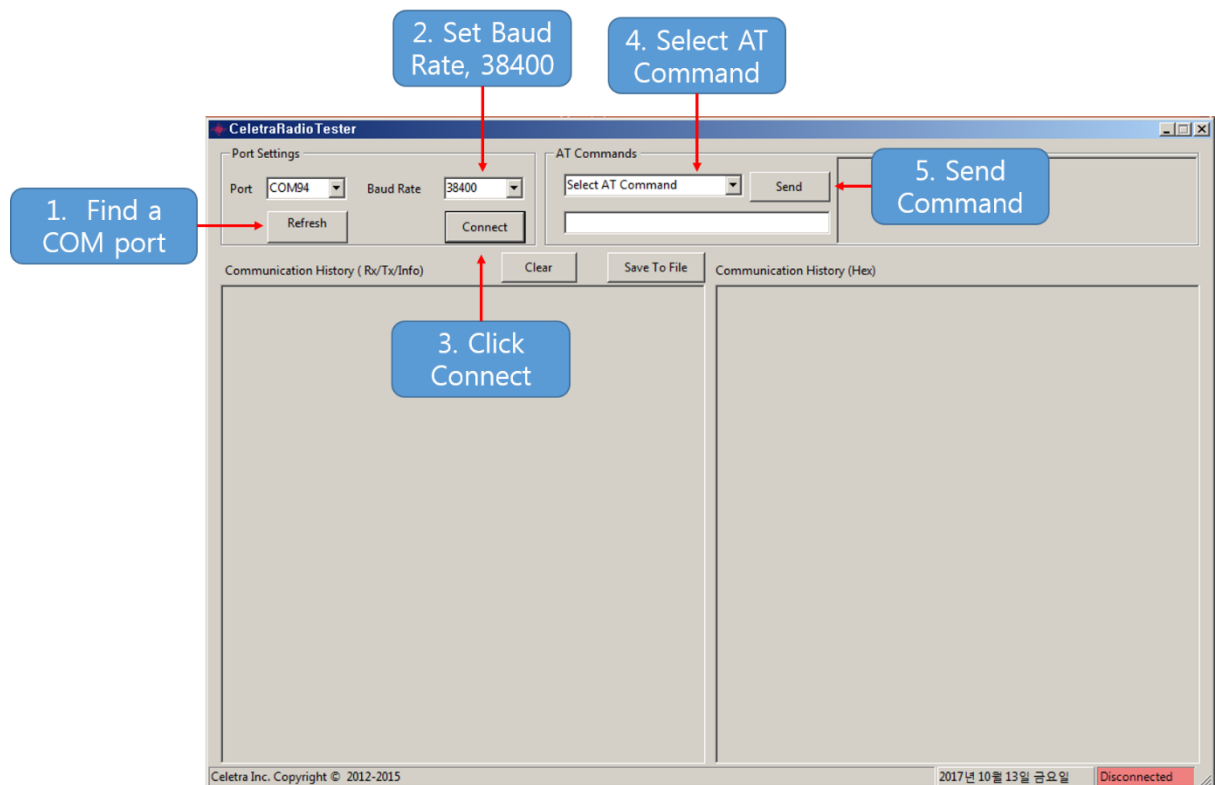**Fig 6. Celetra Radio Tester**

4.1   Set Connection

Fig 7. Connection Procedure

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Successfully connect to the MODEM, Status indication changed to "Connected". User can select the AT Command and send it to the MODEM. Right side of window display the related command explain and usage.
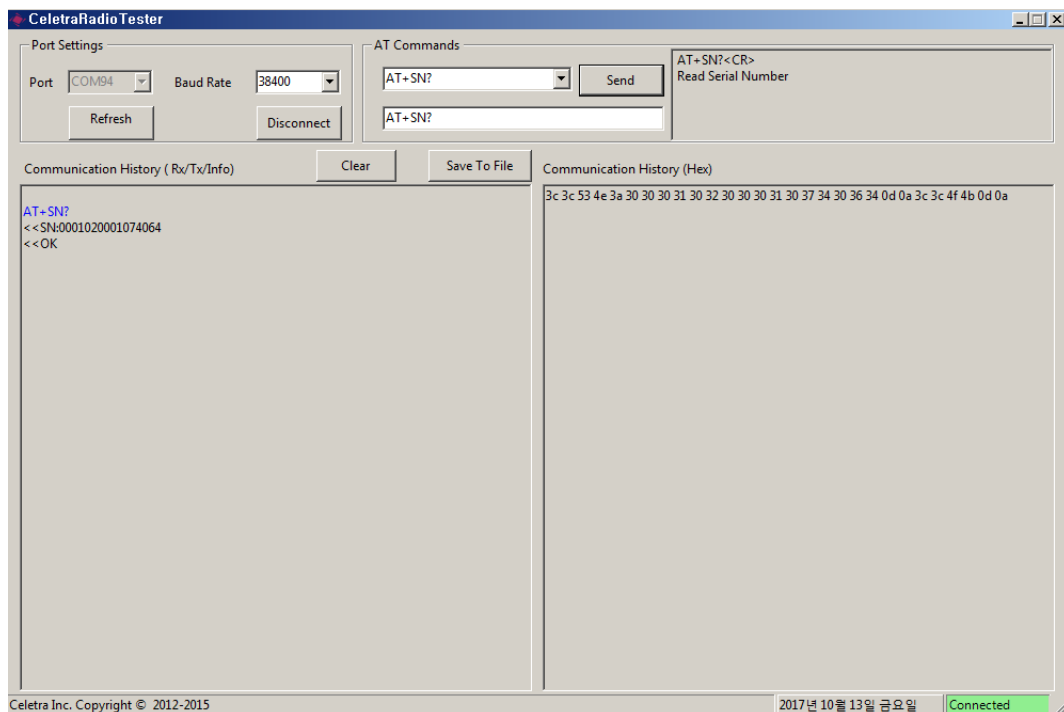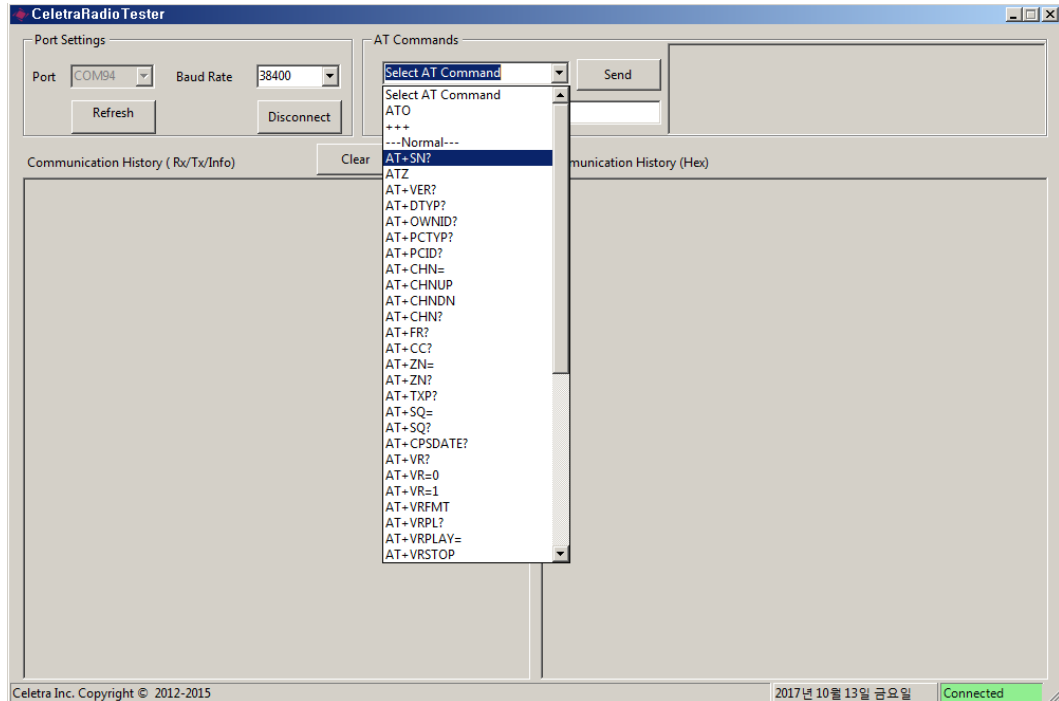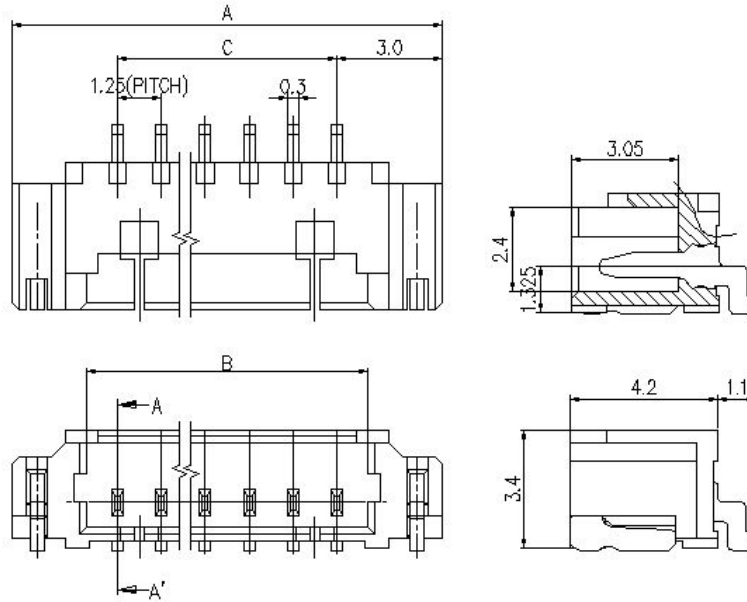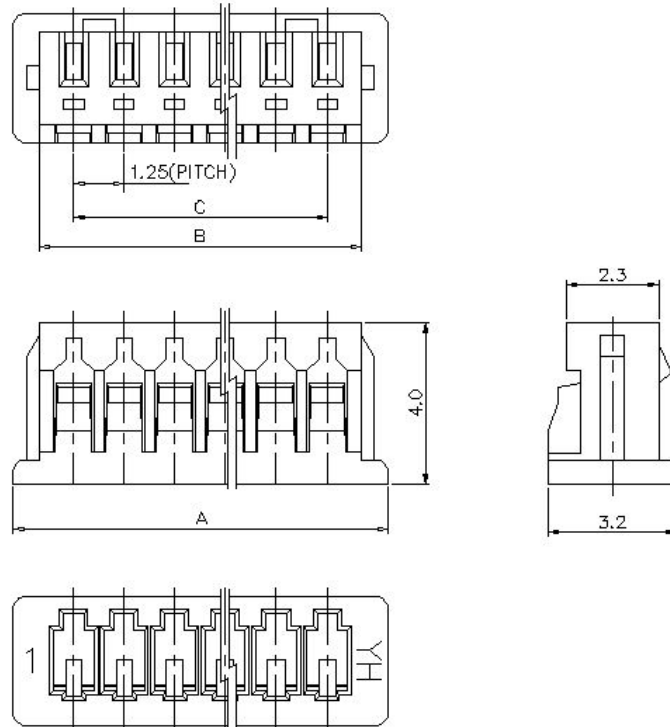

Fig 8. Example Command

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5. Connector (14 Pin Main Connector)

Connector: 12505WR-14, Yeonho Electronics

Housing: 12505HS-14, Terminal: 12505TS, Yeonho Electronics

6. Mechanic Dimension

Unit: mm