The MT3647 provides an intelligent interface between a Host and the vehicle's Electronic control units. The MT3647 is designed to act as a bridge between Heavy Duty vehicle protocol and UART interface.

Features

- Power voltage monitoring.
- Support： J1939 and J1708 protocols.
- Configurable via AT command. Automatically searches for protocols.
- Provide ASCII and HEX CODE format output.
- Provides several formats output will be available to the integration with different applications.
- Baud Rate: 9600,19200,38400,57600,115200 are available.
- J1939 Auto Baud 500K and 250K.

(1) J1939 :

CANBUS SAE-J1939 truck brands,VOLVO trucks ,MACK,John Deere,Caterpillar ,Detroit Diesel,Nissan Diesel,Kubota, Freightliner,DongFeng Motor, SinoTruck, Daimler Trucks, Navistar,Chery Auto,SAIC MOTOR, SINO Truck (CNHTC),Shannxi AutoMobile, HINO

(2) According to Bus FMS-Standard Interface description Vers. 00.02 ,10.11.2010

Daimler AG ,Scania AB,Iveco SpA, MAN Nutzfahrzeuge AG , Volvo Truck Corporation, DAF Trucks N.V.,Renault Trucks

(3) J1708:

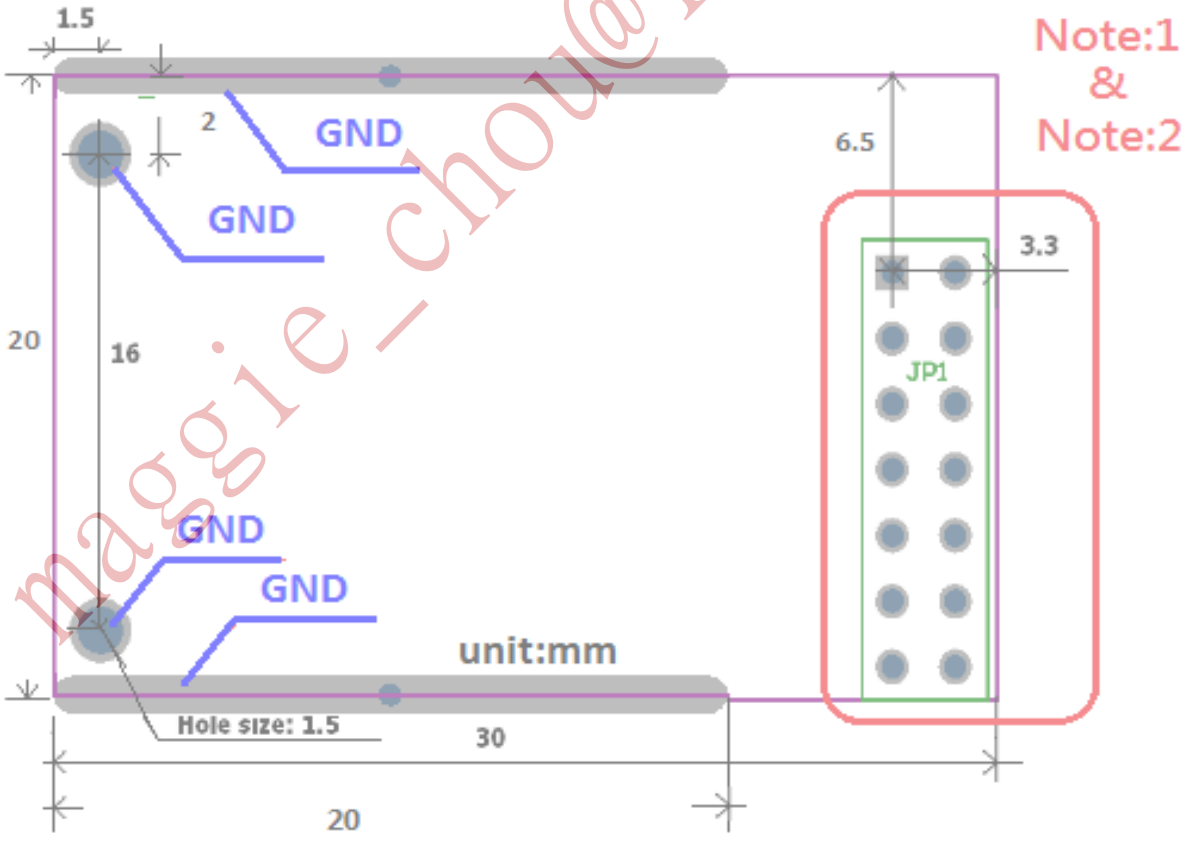
Caterpillar: CAT C-15,VOLVO: VOLVO Engine, (6 pins connector),CUMMINS ISX 475 2000, CUMMINS ISX 450 ST2 2000,Freightliner: DETROIT12.(PREMIUM SERIES), CUMMINS ISM 370, CUMMINS N14-370 ESP+ ,Caterpillar ,Detroit Diesel,Freightliner, Renault (OBD2 connector)

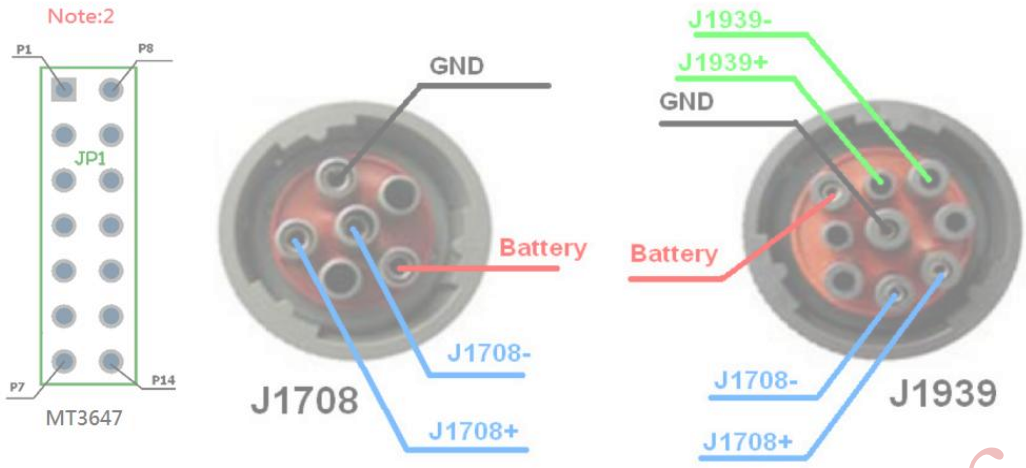
1. Electrical Characteristics

Part Name	**M T 3 6 4 7**
Part No	**8 7 P 0 U 0 5 7 9**
Operating Voltage/ Current	**5V/ 0.05A**
Operating Temperature	**-40~+85 ℃**
Dimensions	**PCBA: L:30mm x W:20mm x H:5.24 mm (with Components)**
Output	**UART 3.3 or 5.0 V,** **Baud Rate : 9600 , 8 ,N, 1(Default)**

2. PCB Dimensions

There are 2 fixture holes, one interface I/O.





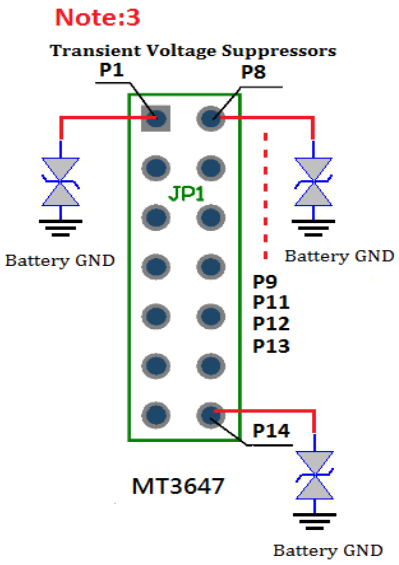
3. Descriptions:

M T 3 6 4 7	Definition
Pin2	Indicate communication status. DO(Digital Output)： Protocol Connected : High (3.3 or 5V) Protocol disconnected: Low (0.0V)
Pin3	GND
Pin4	Wake up MT3647： Rising Edge(0 ➔3.3 or 5V)
Pin5	UART TX (0 ~3.3 or5 V), to your device RX
Pin6	UART RX (0~3.3 or 5V), to your device TX
Pin7	Power input: DC 5.0V, Max current 50mA.

M T 3 6 4 7	Definition
Pin1	Battery 24Vin
Pin8	N/A
Pin9	N/A
Pin10	Battery GND
Pin11	J1708+
Pin12	J1708-
Pin13	J1939+

Pin14	J1939-

4. Application Note:



GPIO added transient voltage suppressors for surge protection. (MT3647 Pin1、11、12、13、14)

5.Communicating with the MT3647

The MT3647 communicate with a PC through a UART connection or virtual serial port. No matter how you physically connect to the MT3647, you need use one COM port monitor program to send and receive data. To use a terminal program , you will need to make several settings.

1.) Setting proper "COM' port, data rate is default **9600**.
2.) Setting your connection for 8 data bits, no parity bits, and 1 stop bit.
3.) Setting 'LINE END' mode.

Properly connected and powered, the MT3647 will print interpreter information.

The '>' character that is shown on the second line is the MT3647's prompt character. It indicates that the device is in the idle state, ready to receive characters on the UART . If you did not see the identification string, you might try resetting the Interpreter again with the ATR(reset) command. Simply type the letters A T and R (spaces are optional), then press the return key:>ATR

If you type HEX code, it will be “41”,”54”,”5A”,”0D”, as ASCII code “A” ,its HEX code is “41”.The commands ‘ATR’,‘AtR’ is all exactly the same to the MT3647.

If you see strange looking characters, then check your baud rate, you have likely set it incorrectly. If you send a incorrect command the MT3647 will print a single question mark (‘?’) to show that the input was not understood, in case it failed to communicate to BUS, MT3647 will print

P L E A S E R E B O O T
>

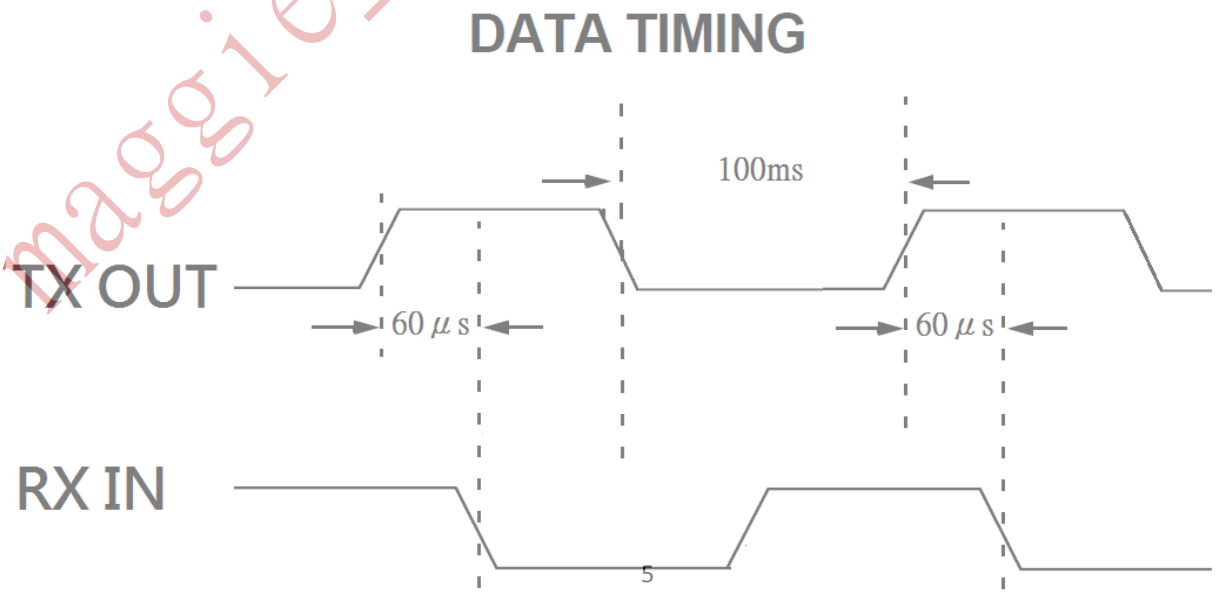
Once MT3647 connect to BUS, the power LED lit and it starts to try J1939 or J1708 protocol. Next time MT3647 only try the successful protocol unless use ATR to reset it.
In case MT3647 has not connected to BUS, or wrong command AT3647 will print a

E R R O R
>

After trying 180 seconds, in case the AT3647 can not find correct protocol, it will enter sleeping mode for power saving. You can restart engine to wake MT3647 up.
The MT3647 provides several formats output will be available to the integration with different applications.

1.) Simple Data by ASCII code.
2.) Raw data.
3.) Packaged Messages by ASCII or HEX code.

Its default format is Simple Data format, MT3647 will send messages out once it communicates with vehicle successfully.



6.AT Command Summary

@1	AT@1: Display version information ATBS MT3647S VXX.X.XXXXXX>
BRxy	Setting RS232 baud rate. xy is baud rate parameter. ATBR09: 9600 ATBR19: 19200 ATBR38: 38400 ATBR57: 57600 ATBR99: 115200
Eh	ATE0: echo off(Default) ATE1; echo on
T	ATT: Terminate sending. To use ATS will continue it.
I	ATI : Request vehicle ID, the length is variable. 1.) J1708: Output format: ASCII code Byte 0:0x2A Byte 1: Vehicle ID byte 1 Byte 2: Vehicle ID byte 2 Byte N:Vehicle ID byte N Byte N+1: Check Sum=Byte 1+Byte2+…….+Byte N Byte N+2:0x0D Byte N+3:0x0A N: Max 20 2.)J1939 Byte 0:0x2A Byte 1: Vehicle ID byte 1 Byte 2: Vehicle ID byte 2 Byte N:Vehicle ID byte N Byte N+1: Check Sun= Byte1+Byte2 +…..ByteN Byte N+2:0x0D Byte N+3:0x0A N: Max 35
PA	ATPA: Print data by ASCII CODE format
PH	ATPH: Print data by HEX CODE format
R	ATR: Clear protocol and distance (D1 ,D2)memory, the ATR command clear current protocol then continue learning next new protocol.
RJ	ATRJ: Request J1939 FMS High Resolution Total Vehicle Distance #33~#36

RH	ATRH: Request Hino Truck Total vehicle distance (#33~#36)
S	ATS: Continue auto-send data every 100~200ms. To use ATT will terminal it.
SS	ATSS: Auto- send Simple Data every 100~200 ms. Refer to Simple Data format Protocol
SP	ATSP: Auto-send Packaging Messages every 100~200 ms. Refer to Packaging Messages protocol.
SR	ATSR: Auto-send J1939/J1708 Raw Data, Refer to Raw Data Protocol.
X	ATX: Request to send data of alternate, data format as ATS/ATSP command. ● For J1939 protocol: Packing1 Packing2 Packing 3 Packing4 Packing5 Packing6 Packing1 ● For J1708 protocol: Packing1➔Packing2 ➔Packing 3➔ Packing4➔Packing5 ➔Packing1
#xy	AT#xy: The command will print designated data by ASCII code. “xy” is data address, it is decimal. J1708: 00~53 J1939: 00~99. EX: AT#01 , to get speed high byte.

- **Simple Data Protocol: (ASCII CODE)**

Data	Description
HEAD	@
Byte 0	,
Byte 1	Speed , (0~255) KM/HR
Byte 2	,
Byte 3	RPM High Byte (RPMHB)
Byte 4	,
Byte 5	RPM Low Byte(RPMLB) , RPM=RPMHB*256+RPMLB
Byte 6	,
Byte 7	Engine Loading, (0~100%)
Byte 8	,
Byte 9	Battery Voltage (BV), = (BV+100)/10 (v)
Byte 10	,
Byte 11	Engine Temperature(ET), =ET-40 ℃
Byte 12	,
Byte 13	Throttle position 0~100 %
Byte 14	,
Byte 15	Status , Note 2
Byte 16	,
Byte 17	MAF (0~255), MAF RATE= MAF * 3;
Byte 18	,
Byte 19	Distance : D1
Byte 20	,
Byte 21	Distance: D2
Byte 22	,
Byte 23	FU, Average Fuel Economy (km/L) =Fu /10
Byte 24	,
Byte 25	Check sum (odd numbers)= Byte1+ Byte3+Byte5+ Byte7+ Byte9+Byte11+ Byte13+ Byte15+Byte17+ Byte19+ Byte21+Byte23
Byte 26	Carry return (0x0D)
Byte 27	Line feed (0x0A)

- **Simple Data Protocol: (HEX CODE)**

Data	Description
HEAD	@ (=0x40)
Byte 1	Speed , (0~255) KM/HR
Byte 2	RPM High Byte (RPMHB)
Byte 3	RPM Low Byte(RPMLB) , RPM=RPMHB*256+RPMLB
Byte 4	Engine Loading, (0~100%)
Byte 5	Battery Voltage (BV), = (BV+100)/10 (v)
Byte 6	Engine Temperature(ET), =ET-40 ℃
Byte 7	Throttle position 0~100 %
Byte 8	Status , Note 2
Byte 9	MAF (0~255), MAF RATE= MAF * 3;
Byte 10	Distance: D1
Byte 11	Distance: D2
Byte 12	FU, Average Fuel Economy (km/L) =Fu /10
Byte 13	Check sum (odd numbers)= Byte1+ Byte2+Byte3+ Byte4+ Byte5+Byte6+ Byte7+ Byte8+Byte9+ Byte10+ Byte11+Byte12
Byte 14	Carry return (0x0D)
Byte 15	Line feed (0x0A)

NOTE:

1.) Data format : ASCII CODE

@ , 7 8 , 0 E , 7 0 , 0 0 ,0 3 , 9 8 , 2 8 , Status ,MAF,D1,D2,Fu,CS

speed=78 km/hr

rpm=0x0E70= 3696

2.) status:

Bit 7:

0: Normal

1: Emergency Braking (Acceleration < - 6 m/s2)

Bit 6:

0: Brake OFF

1: Brake ON

Bit 5:

0: Clutch OFF

1: clutch ON

Bit 4:

0: Cruise Control OFF

1: Cruise Control ON

Bit 3:

0: Brake (ON/OFF) unavailable

1: Brake(ON/OFF) available

Bit 2:

0:Clutch (ON/OFF) unavailable

1: Clutch (ON/OFF) available

Bit 1:

0: Cruise Control (ON/OFF) unavailable

1: Cruise Control (ON/OFF) available

Bit 0:

0: NORMAL

1: DTC ON

2.) Distance = D1*256+D2

3.) Average Fuel Economy =Fu /10

- **J1939 Raw Data Protocol (HEX CODE)**

Support for J1939 PGN / SPN access as defined in the J1939 standards. This function will report all PGNs and their source node on the J1939 network. Each SPN under this function should be set to a size of 32 bits.

J1939	Format	
Byte 0	@ (=0x40)	
Byte 1	Bit4,3,2: Priority Bit0: Data Page Bit1,5,6,7:Reversed	
Byte 2	PDU Format (PF)	PGN
Byte 3	PDU Specific (PS)	
Byte 4	Source Address	
Byte 5	Data1	
Byte 6	Data2	
Byte 7	Data3	
Byte 8	Data4	
Byte 9	Data5	
Byte 10	Data6	
Byte 11	Data7	
Byte 12	Data8	
Byte 13	Check Sum	
Byte 14	0x0D	
Byte 15	0x0A	

J1708 Raw Data Protocol (HEX CODE)

This function will report all MID and PID that broadcasting on the J1708 network. Its data length is not fixed, please refer to SAEJ1708.

Format	PIDs 192-253	PIDs 128-191	**PIDs 0-127**
Byte 0	@ (= 0x40)	@ (= 0x40)	@ (= 0x40)
Byte 1	**Message identification (MID)**	**MID**	**MID**
Byte 2	**Parameter identification (PID)**	**PID**	**PID**
Byte 3	Number of data bytes	Data1	Data1
Byte 4	Data 1	Data2	Check Sum
Byte 5	Data 2	Check Sum	0x0D
Byte 6	……..	0x0D	0x0A
Byte 7	Data N	0x0A	
Byte 8	Check Sum		
Byte 9	0x0D		
Byte 10	0x0A		

PIDs 0-127 describe data parameters that are one byte long.
PIDs 128-191 describe data parameters that consist of two bytes.
PIDs 192-253 The first byte following these PIDs will contain the number of data parameter bytes.

EX:

0x40	0x80	0x15	0x01	0x32	0xC8	0x0D	0x0A
64	128	21	1	50	200	13	10

MID=128

PID=21 (Engine ECU temperature)
Data=50

- **1939 Packaged Messages Protocol**

S

ATS: send packaged messages by turns.

Response HEX CODE (default) after ATPH command		
Packing 1 (#00~#17) Byte 0:“ @” ,(0x40) Byte 1: “1”, (0x31) Byte 2: #00 Byte 3: #01 ..... Byte 19:#17 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0X0D Byte 22: 0X0A	Packing 2 (#18~35) Byte 0: “ @” ,(0x40) Byte 1: “2”,(0x32) Byte 2: #18 Byte 3: #19 ..... Byte 19:#35 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0X0D Byte 22: 0X0A	Packing 3 (#36~53) Byte 0: “ @” ,(0x40) Byte 1: “3”,(0x33) Byte 2: #36 Byte 3: #37 ..... Byte 19:#53 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0X0D Byte 22: 0X0A
Packing 4 (#54~#71) Byte 0:“ @” ,(0x40) Byte 1: “a”,(0x61) Byte 2: #54 Byte 3: #55 ..... Byte 19:#71 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0X0D Byte 22: 0X0A	Packing 5 (#72~#89) Byte 0: “ @” ,(0x40) Byte 1: “b”,(0x62) Byte 2: #72 Byte 3: #73 ..... Byte 19:#89 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0X0D Byte 22: 0X0A	Packing 6 (#90~105) Byte 0: “ @” ,(0x40) Byte 1: “c”,(0x63) Byte 2: #90 Byte 3: #91 ..... Byte 17:#105 Byte 19:0 Byte 20:0 Check sum = Byte2 + ..+Byte 19 Byte 21: 0X0D Byte 22: 0X0A

NOTE :

1.) AT#00 ~ AT#102 respond ASCII CODE format data.

2.) Packing 6, Byte15~Byte19 not defined (set to ”0”)

3.) After ATPA command, byte 21& 22 were ignored.

4.) This is the common J1939 measurement overview showing which measurements are available. Note that not all measurements are supported by the individual engines.

<table>
<tr><td>#00</td><td>Speed Low Byte (SLB)</td></tr>
<tr><td>#01</td><td>Speed High Byte (SHB)
speed=(SHB*256+SLB)/256</td></tr>
<tr><td>#02</td><td>
<table>
<tr><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td></tr>
<tr><td colspan="2">Clutch switch</td><td colspan="2">Brake switch</td><td colspan="2">NOT USED</td><td colspan="2">Cruise control active</td></tr>
<tr><td colspan="2">00 = pedal released
01 = pedal depressed</td><td colspan="2">00 = pedal released
01 = pedal depressed</td><td colspan="2"></td><td colspan="2">00 = switched off
01 = switched on</td></tr>
</table>
</td></tr>
<tr><td>#03</td><td>
<table>
<tr><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td></tr>
<tr><td colspan="3">B7: Emergency brake(-6m/s2)B6: speed up (6m/s2)
B5: Double Emergency brake (over -12m/s2)
1: Enable, 0:Disable</td><td colspan="5">PTO state
00000 = off/disabled
00101 = Set
11111 = not available</td></tr>
</table>
</td></tr>
<tr><td>#04</td><td>0.4 % / Bit gain, Accelerator Pedal Position(APP) , 0 to 100 %
APP= Data* 0.4</td></tr>
<tr><td>#05</td><td>Engine Total Fuel used 0,5 L / Bit gain , ETF1</td></tr>
<tr><td>#06</td><td>Engine Total Fuel used 0,5 L / Bit gain , ETF2</td></tr>
<tr><td>#07</td><td>Engine Total Fuel used 0,5 L / Bit gain , ETF3</td></tr>
<tr><td>#08</td><td>Engine Total Fuel used 0,5 L / Bit gain , ETF4
Engine Total Fuel used
=((ETF4*256*256*256)+(ETF3*256*256)+(ETF2*256)+ETF1)*0.5</td></tr>
<tr><td>#09</td><td>Fuel Level (FL) , 0 to 100 %, 0.4 %/bit
Fuel Level=FL*0.4</td></tr>
<tr><td>#10</td><td>RPM Low byte, RL</td></tr>
<tr><td>#11</td><td>RPM High byte, RH
RPM= (RH*256+ RL)* 0.125</td></tr>
</table>

<table>
<tr><td>#12</td><td>
<table>
<tr><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td></tr>
<tr><td></td><td colspan="3">NOT USED</td><td colspan="4">Engine Starter Mode</td></tr>
</table>
B7: 1, Total Vehicle Distance is provided by vehicle ECU
0, Total Vehicle Distance is calculation value
B3~B0:
0000 start not requested
0001 starter active, gear not engaged
0010 starter active, gear engaged
0011 start finished; starter not active after having been actively engaged ?
(after 50ms mode goes to 0000)?
0100 starter inhibited due to engine already running
0101 starter inhibited due to engine not ready for start (preheating)
0110 starter inhibited due to driveline engaged
0111 starter inhibited due to active immobilizer
1000 starter inhibited due to starter over-temp
1001-1011 Reserved
1100 starter inhibited - reason unknown
1101 error
1111 not available</td></tr>
<tr><td>#13</td><td>Axle location The value 0xFF indicates not available.
<table>
<tr><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td></tr>
<tr><td colspan="4">Axle location Bit-mapped position number counting front to back facing forward
F = not available
position number, counting front to back on the vehicle. B7,B6,B5,B4
Axle location Bit-mapped position number counting front to back facing forward.</td><td colspan="4">Tire location Bit-mapped counting left to right facing forward
F = not available
The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel</td></tr>
</table></td></tr>
<tr><td>#14</td><td>Axle weight 0.5 kg / Bit gain (Low Byte),AWL</td></tr>
<tr><td>#15</td><td>Axle weight 0.5 kg / Bit gain (High Byte), AWH
Weight=(AWH*256+AWL)*0.5</td></tr>
<tr><td>#16</td><td>Engine total hours of Operation, EH1</td></tr>
<tr><td>#17</td><td>Engine total hours of Operation, EH2</td></tr>
</table>

#18	Engine total hours of Operation, EH3
#19	Engine total hours of Operation, EH4 Accumulated time=((EH4*256*256*256)+(EH3*256*256)+(EH2*256)+EH1)*0.05
#20~ #27	Vehicle identification number, aabbccddeeffgghh (If the Vehicle ID contains more than 8 Bytes then #20~#27 are “00”, please use ATI command to request.
#20	aa
#21	bb
#22	cc
#23	dd
#24	ee
#25	ff
#26	gg
#27	hh
#28	Engine Percent Load At Current Speed (0~125 %)
#29~ #32	SW-version supported for trucks, Version number in the format ab.cd where this byte represents ASCII code #29 : “a” , #30: ‘b’, #31:’c’ , #32:’d’
#33~ #36	High Resolution Total Vehicle Distance, 5 m/bit, 0 to 21,055,406 km =((D4*256*256*256)+(D3*256*256)+(D2*256)+D1)*0.005 (KM)
#33	D1
#34	D2
#35	D3
#36	D4
#37~ #38	The distance which can be traveled by the vehicle before the next service inspection is required SERV=(V2*256+V1)*5-160635 (KM)
#37	V1
#38	V2

#39

B7	B6	B5	B4	B3	B2	B1	B0
Vehicle motion(B7,B6): 00 = Vehicle motion not detected 01 = vehicle motion detected		Driv. 2 working stat state (B5,B4,B3)。G 000 = Rest 001 = Driver available 010 = Work 011 = Drive 110 = Error 111 = not available			Driv. 1 working state (B2,B1,B0): 000 = Rest 001 = Driver available 010 = Work 011 = Drive 110 = Error 111 = not avaiable		

#40

B7	B6	B5	B4	B3	B2	B1	B0
Vehicle Overspeed		Driver 1 card		Driver 1 time related state			

Vehicle Over speed (B7,B6)。GIndicates whether the vehicle is exceeding the legal speed limit set in the tachograph.

00 = No over speed

01 = Over speed

Driver 1 card (B5,B4)

00 = Card not present

01= Card present

Driver 1 time related state (B3,B2,B1,B0)。GIndicates if the driver approaches or exceeds working time limits (or other limits).

0000 = normal

0001 = 15 min bef. 4.5 h

0010 = 4.5 h reached

0011 = 15 min bef. 9 h

0100 = 9 h reached

0101 = 15 min bef. 16 h

0110 = 16h reached

1110 = Error

1111 = not available

#41

B7	B6	B5	B4	B3	B2	B1	B0
NOT USED		Driver 2 card (B5,B4) 00 = Card not present 01= Card present		Driver 2 time related state (B3,B2,B1,B0)。 GIndicates if the driver approaches or exceeds working time limits (or other limits). 0000 = normal 0001 = 15 min bef. 4.5 h 0010 = 4.5 h reached 0011 = 15 min bef. 9 h 0100 = 9 h reached 0101 = 15 min bef. 16 h 0110 = 16h reached 1110 = Error 1111 = not available			

#42

B7	B6	B5	B4	B3	B2	B1	B0
Direction indicator		Tachgraph performance		Handling information		System event	

Direction indicator (B7,B6)。G
00 = Forward
01 = Reverse
Tachgraph performance (B5,B4)
00 = Normal performance
01 = Performance analysis
Handling information (B3,B2)
00 = no handling information
01 = handling information
System event (B1,B0)
00 = no tachogr. Event
01 = tachogr. Event

#43~ #44	Tachogr. vehicle speed 1/256 km/h Bit gain Speed= ((VS2*256)+VS1)/256
#43	VS1
#44	VS2

#45	Engine Coolant Temperature(ECT) , -40 to 210 deg C ECT=data-40 ℃
#46	Engine Turbocharger Boost Pressure(ETBP), 2 kPa/bit , 0~500 KPA ETPB=data *2 (KPA)
#47	Engine Intake Manifold 1 Temperature(EIMT) , -40 to 210 deg C EIMT=data-40 ℃
#48	Bit7,6 Anti-Lock Braking (ABS) Active。G 00 - ABS passive but installed 01 - ABS active 10 – Reserved 11 - Not available Bit5~Bit0: Resvered.
#49	Brake Pedal Position (BPP), 0.4 %/bit, 0~100% BPP=data*0.4 (%)
#50	Parking and/or Trailer Air Pressure(PTAP), 8 kPa/bit PTAP=data *8 (KPA)
#51	Service Brake Air Pressure Circuit #1 (SBAPC1), 8 kPa/bit SBAPC1=data*8 (KPA)
#52	Service Brake Air Pressure Circuit #2 (SBAPC2), 8 kPa/bit SBAPC2=data*8 (KPA)
#53	Parking Brake Switch 00 = Parking brake not set 01 = Parking brake set
#54	Bit 1 ,Bit 0: Diagnostics supported 00 = diagnostics is not supported 01 = diagnostics is supported 10 = reserved 11 = don´t care Bit 3 ,Bit 2: Requests supported 00 = request is not supported 01= request is supported 10 = reserved 11 = don´t care Bit4~Bit7:Resvered

#55~ #56	Ambient Air Temperature: Temperature of air surrounding vehicle. AAT=(AATH* 256+AATL)*0.03125 -273 deg C #55: AATL #56: AATH
#57	Door Control 1: Bit 7,Bit6: Status 2 of doors 00 = all bus doors disabled 01 = at least 1 bus door enabled 10 = error 11 = not available Bit 5, Bit4: Ramp/Wheel chairlift 00 = inside bus 01 = outside bus 10 = Error 11 = not available Bit 3,2,1,0 : Position of doors 0000 = at least 1 door is open 0001 = closing last door 0010 = all doors closed 1110 = Error 1111 = not available
#58~ #65	Door Control 2, #58~#65 Lock Status: locked ➔ doors cannot be operated by the driver or a passenger unlocked ➔ door may be operated by the driver or a passenger Open Status: closed ➔door is completely closed open ➔door is not completely closed Enable Status: disabled ➔ door cannot be opened by a passenger enabled ➔➔ door can be opened by a passenger

#58

B7	B6	B5	B4	B3	B2	B1	B0
Bit 7, Bit 6: Lock Status Door 2 00 = Unlocked 01 = Locked 10 = Error 11 = Not available		Bit 5,Bit 4: Enable Status Door 1 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit 3,Bit 2: Open Status Door 1 00 = Closed 01 = Open 10 = Error 11 = Not available		Bit 1,Bit 0: Lock Status Door 1 00 = Unlocked 01 = Locked 10 = Error 11 = Not available	

#59

B7	B6	B5	B4	B3	B2	B1	B0
Bit 7, Bit 6: Open Status Door 3 00 = Closed 01 = Open 10 = Error 11 = Not available		Bit 5, Bit 4: Lock Status Door 3 00 = Unlocked 01 = Locked 10 = Error 11 = Not available		Bit 3, Bit 2: Enable Status Door 2 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit 1, Bit 0: Open Status Door 2 00 = Closed 01 = Open 10 = Error 11 = Not available	

#60

B7	B6	B5	B4	B3	B2	B1	B0
Bit 7, Bit 6: Enable Status Door 4 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit 5, Bit 4: Open Status Door 4 00 = Closed 01 = Open 10 = Error 11 = Not available		Bit 3, Bit 2: Lock Status Door 4 00 = Unlocked 01 = Locked 10 = Error 11 = Not available		Bit 1, Bit 0: Enable Status Door 3 00 = Disabled 01 = Enabled 10 = Error 11 = Not available	

#61

B7	B6	B5	B4	B3	B2	B1	B0
Bit 7, Bit 6: Lock Status Door 6 00 = Unlocked 01 = Locked 10 = Error 11 = Not available		Bit 5, Bit 4: Enable Status Door 5 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit 3, Bit 2: Open Status Door 5 00 = Closed 01 = Open 10 = Error 11 = Not available		Bit 1, Bit 0: Lock Status Door 5 00 = Unlocked 01 = Locked 10 = Error 11 = Not available	

#62

B7	B6	B5	B4	B3	B2	B1	B0
Bit 7, Bit 6: Open Status Door 7 00 = Closed 01 = Open 10 = Error 11 = Not available		Bit 5, Bit 4: Lock Status Door 7 00 = Unlocked 01 = Locked 10 = Error 11 = Not available		Bit 3, Bit 2: Enable Status Door 6 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit1, Bit 0: Open Status Door 6 00 = Closed 01 = Open 10 = Error 11 = Not available	

#63

B7	B6	B5	B4	B3	B2	B1	B0
Bit 7, Bit 6: Enable Status Door 8 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit 5, Bit 4: Open Status Door 8 00 = Closed 01 = Open 10 = Error 11 = Not available		Bit 3, Bit 2: Lock Status Door 8 00 = Unlocked 01 = Locked 10 = Error 11 = Not available		Bit1, Bit 0: Enable Status Door 7 00 = Disabled 01 = Enabled 10 = Error 11 = Not available	

#64

B7	B6	B5	B4	B3	B2	B1	B0
Bit 7, Bit 6: Lock Status Door 10 00 = Unlocked 01 = Locked 10 = Error 11 = Not available		Bit 5, Bit 4: Enable Status Door 9 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit 3, Bit 2: Open Status Door 9 00 = Closed 01 = Open 10 = Error 11 = Not available		Bit1, Bit 0: Lock Status Door 9 00 = Unlocked 01 = Locked 10 = Error 11 = Not available	

#65

B7	B6	B5	B4	B3	B2	B1	B0
Bit 3, Bit 2: Enable Status Door 10 00 = Disabled 01 = Enabled 10 = Error 11 = Not available		Bit1, Bit 0: Open Status Door 10 00 = Closed 01 = Open 10 = Error 11 = Not available					

#66~#71

Time / Date:
#66 : Second=data * 0.25
#67 : Minutes=data
#68 : Hours=data
#69 : Month=data
#70 : Day=data * 0.25
#71 : Year=data-1985 (1985 to 2235 years)

<table>
<tr><td>#72</td><td>Alternator Status
<table>
<tr><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td></tr>
<tr><td colspan="2">Bit 7, Bit6:
Alternator Status 4
00 = not charging
01 = charging
10 = error
11 = not available</td><td colspan="2">Bit 5, Bit4:
Alternator Status 3
00 = not charging
01 = charging
10 = error
11 = not available</td><td colspan="2">Bit 3, Bit 2:
Alternator Status 2
00 = not charging
01 = charging
10 = error
11 = not available</td><td colspan="2">Bit 1, Bit 0:
Alternator Status 1
00 = not charging
01 = charging
10 = error
11 = not available</td></tr>
</table></td></tr>
<tr><td>#73</td><td>Selected Gear = data -125negative gear are reverse gears
00000000 = neutral
11111011 = park</td></tr>
<tr><td>#74</td><td>Current Gear=data-125
negative gear are reverse gears
00000000 = neutral
11111011 = park</td></tr>
<tr><td>#75~
#76</td><td>Bellow Pressure Front Axle Left
Information of the pressure of the air suspension bellow at the left side of the front axle
Pressure= ((BPFAL2*256)+BPFAL1)* 0.1 ,KPA</td></tr>
<tr><td>#75</td><td>BPFAL1</td></tr>
<tr><td>#76</td><td>BPFAL2</td></tr>
<tr><td>#77~
#78</td><td>Bellow Pressure Front Axle Right
Information of the pressure of the air suspension bellow at the left side of the front axle
Pressure= ((BPFAR2*256)+BPFAR1)* 0.1 ,KPA</td></tr>
<tr><td>#77</td><td>BPFAR1</td></tr>
<tr><td>#78</td><td>BPFAR2</td></tr>
<tr><td>#79~
#80</td><td>Bellow Pressure Rear Axle Left
Information of the pressure of the air suspension bellow at the left side of the front axle
Pressure= ((BPRAL2*256)+BPRAL1)* 0.1 ,KPA</td></tr>
</table>

#79	BPRAL1
#80	BPRAL2
#81~ #82	Bellow Pressure Rear Axle Right Information of the pressure of the air suspension bellow at the left side of the front axle Pressure= ((BPRAR2*256)+BPRAR1)* 0.1 ,KPA
#81	BPRAR1
#82	BPRAR2
#83~ #90	Driver's Identification (Driver 1 & Driver 2 identification) #83 | #84 | #85 | #86 | #87 | #88 | #89 | #90 The driver ID is only available if a digital tachograph is present
#91~ #92	Engine Fuel Rate (EFR). Amount of fuel consumed by engine per liter of hour. EFR=(EFR2*256+EFR1)* 0.05 , L/h Data Range: 0 to 3,212.75 L/h
#91	EFR1
#92	EFR2
#93~ #94	Engine Instantaneous Fuel Economy(EIFE). Current fuel economy at current vehicle velocity. EIFE=(EIFE2*256+EIFE1) / 512 , km/L Data Range: 0 to 125.5 km/L
#93	EIFE1
#94	EIFE2
#95~ #102	FMS Tell Tale Status #95 | #96 | #97 | #98 | #99 | #100 | #101 | #102 The Tell Tale Status information is derived from information displayed to the driver's dashboard.
#95	Bit 3,2,1,0: Telltale Block ID Bit 7,6,5,4: Telltale Status 1 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available

#96	Bit 3,2,1,0: Telltale Status 2 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 3 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available
#97	Bit 3,2,1,0: Telltale Status 4 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 5 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available

#98	Bit 3,2,1,0: Telltale Status 6 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 7 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available
#99	Bit 3,2,1,0: Telltale Status 8 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 9 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available

#100	Bit 3,2,1,0: Telltale Status 10 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 11 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available
#101	Bit 3,2,1,0: Telltale Status 12 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 13 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available

#102	Bit 3,2,1,0: Telltale Status 14 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 15 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available
#103	Battery Voltage (BV), = (data+100)/10 (v)
#104	Engine Oil Filter Differential Pressure EODP= data*0.5 (kPa)
#105	YUTONG Bus, speed: 0~255 km/h

- **J1708 Packaged Messages Protocol**

<table>
<tr><td>S</td><td>Once AT1708 SLEEP, it can wake it up.
Start to send data by 3 packing, response HEX CODE
<table>
<tr><td>Packing 1:
Byte 0: “ @” , 0x40;
Byte 1: 4
Byte 2: #00
Byte 3: #01
Byte 4: #02
Byte 5: #03
Byte 6: #04
Byte 7: #05
Byte 8: #06
Byte 9: #07
Byte 10: #08
Byte 11: #09
Byte 12: #10
Byte 13: #11
Byte 14: #12
Byte 15: #13
Byte 16: #14
Byte 17: #15
Byte 18: #16
Byte 19: #17
Byte 20: Check sum
= Byte2 + ..+Byte 19
Byte 21: 0X0D
Byte 22: 0X0A</td><td>Packing 2:
Byte 0: “ @” , 0x40;
Byte 1: 5
Byte 2: #18
Byte 3: #19
Byte 4: #20
Byte 5: #21
Byte 6: #22
Byte 7: #23
Byte 8: #24
Byte 9: #25
Byte 10: #26
Byte 11: #27
Byte 12: #28
Byte 13: #29
Byte 14: #30
Byte 15: #31
Byte 16: #32
Byte 17: #33
Byte 18: #34
Byte 19: #35
Byte 20: Check sum
= Byte2 + ..+Byte 19
Byte 21: 0X0D
Byte 22: 0X0A</td><td>Packing 3:
Byte 0: “ @” , 0x40;
Byte 1: 6
Byte 2: #36
Byte 3: #37
Byte 4: #38
Byte 5: #39
Byte 6: #40
Byte 7: #41
Byte 8: #42
Byte 9: #43
Byte 10: #44
Byte 11: #45
Byte 12: #46
Byte 13: #47
Byte 14: #48
Byte 15: #49
Byte 16: #50
Byte 17: #51
Byte 18: #52
Byte 19: #53
Byte 20:Check sum
= Byte2 + ..+Byte 19
Byte 21: 0X0D
Byte 22: 0X0A</td></tr>
</table></td></tr>
</table>

Packing 4 & 5 will display only there is trouble code occurrence.

Packing 4:	Packing 5:	
Byte 0: “ @”	Byte 0: “ @”	
Byte 1: **7**	Byte 1: **8**	
Byte 2:a	Byte 2:a	
Byte 3:b	Byte 3:b	
Byte 4:c	Byte 4:c	
Byte 5:a	Byte 5:a	
Byte 6:b	Byte 6:b	
Byte 7:c	Byte 7:c	
Byte 8:a	Byte 8:a	
Byte 9:b	Byte 9:b	
Byte 10:c	Byte 10:c	
Byte 11:a	Byte 11:a	
Byte 12:b	Byte 12:b	
Byte 13:c	Byte 13:c	
Byte 14:a	Byte 14:a	
Byte 15:b	Byte 15:b	
Byte 16:c	Byte 16:c	
Byte 17: Check sum = Byte2 + ..+Byte 21	Byte 17: Check sum = Byte2 + ..+Byte 21	
Byte 18: 0X0D	Byte 18: 0X0D	
Byte 19: 0X0A	Byte 19: 0X0A	

a — MID
b — SID or PID of a standard diagnostic code.
C — Diagnostic code character.
Bits 4-1: Failure mode identifier (FMI)

	NOTE : The #00~#52 command respond that data are ASCII code.
#00~ #01	***Road Speed—***Indicated vehicle velocity Maximum Range: 0.0 to 205.2 km/h (0.0 to 127.5 mph) speed=(SHB*256+SLB)/256
#00	Speed Low Byte (SLB)
#01	Speed High Byte (SHB)

#02	***Cruise Control Status—***State of the vehicle velocity control system (active, not active), and system switch (on, off), for various system operating modes. Bit 8: cruise mode 1=active/0=not active Bit 7: clutch switch 1=on/0=off Bit 6: brake switch 1=on/0=off Bit 5: accel switch 1=on/0=off Bit 4: resume switch 1=on/0=off Bit 3: coast switch 1=on/0=off Bit 2: set switch 1=on/0=off Bit 1: cruise control switch 1=on/0=off
#03	***Brake Stroke Status—***Identifies the current state of the vehicle foundation brakes. Bit 8-5: Axle number 1 to 16 (represented as 0 to 15) Bit 4-2: Brake status/Stroke adjustment 000 = OK 001 = Out of adjustment 010 = Delay brake return 011 = Brake pads worn 100 = Delayed brake application 101 = Reserved 110 = Error 111 = Not available Bit 1: 1 = Left wheel, 0 = Right wheel
#04	***Percent Accelerator Pedal Position(PAPP)—***Ratio of actual accelerator pedal position to maximum pedal position. Maximum Range: 0.0 to 102.0% PAPP= Data* 0.4
#5~ #8	***Total Fuel Used (Natural Gas)—***Accumulated amount of fuel used during vehicle operation. Maximum Range: 0.0 to 2 147 483 648 kg (0.0 to 4 724 464 025 lb) TFU=((ETF4*256*256*256)+(ETF3*256*256)+(ETF2*256)+ETF1)*0.473
#05	Engine Total Fuel used 0473 L / Bit gain , ETF1
#06	Engine Total Fuel used 0,473 L / Bit gain , ETF2
#07	Engine Total Fuel used 0,473 L / Bit gain , ETF3
#08	Engine Total Fuel used 0,473 L / Bit gain , ETF4

#09	***Fuel Level—***Ratio of volume of fuel to the total volume of the primary fuel storage container. Maximum Range: 0.0 to 127.5% Fuel Level=FL * 0.5 %
#10~ #11	***Engine Speed (RPM)—***Rotational velocity of crankshaft. Maximum Range: 0.0 to 16383.75 rpm RPM= (RH*256+ RL)* 0.25
#10	RPM Low byte, RL
#11	RPM High byte, RH
#12	***Engine Oil Pressure(EOP)—***Gage pressure of oil in engine lubrication system as provided by oil pump. Maximum Range: 0.0 to 879.0 kPa (0.0 to 127.5 lbf/in2) EOP=data * 3.45 KPA
#13	***Throttle Position(TP)—***The position of the valve used to regulate the supply of a fluid, usually air or fuel/air mixture, to an engine. 0% represents no supply and 100% is full supply. Maximum Range: 0.0 to 102.0% TP= data * 0.4%
#14	***Cargo Weight—***The force of gravity of freight carried. Maximum Range: 0.0 to 1 166 056.9 N (0.0 to 262 140.0 lbf) (Low Byte),AWL
#15	(High Byte), AWH Weight=(AWH*256+AWL)* 17.792 N
#16	***Total Engine Hours(TEH)—***Accumulated time of operation of engine. Maximum Range: 0.0 to 214 748 364.8 h TEH=((EH4*256*256*256)+(EH3*256*256)+(EH2*256)+EH1)*0.05
#16	Engine total hours of Operation, EH1
#17	Engine total hours of Operation, EH2
#18	Engine total hours of Operation, EH3
#19	Engine total hours of Operation, EH4
#20~ #27 #85~ #96	***Vehicle Identification Number—***Vehicle Identification Number (VIN) as assigned by the vehicle manufacturer. Vehicle identification number, aabbccddeeffgghh “ATI” command can show max 20 character VIN
#20	aa
#21	bb

#22	cc
#23	dd
#24	ee
#25	ff
#26	gg
#27	hh
#28	***PTO Engagement Control Status*** PTO output status: Bits 8-5: Reserved—all bits set to 1 Bits 4-3: PTO #2 engagement actuator status Bits 2-1: PTO #1 engagement actuator status NOTE—Each status will be described using the following nomenclature: 00 Off/Not active 01 On/Active 10 Error condition 11 Not available
#29~ #30	***Average Fuel Economy*** AFE=((AFE2*256)+AFE1) *1.660 72 x 10-3 km/L
#29	AFE1
#30	AFE2
#31~ #32	***Mass Air Flow—***Mass air flow measured at the fresh air intake MAF=((MAF2*256)+MF1)* 0.125 kg/min
#31	MAF 1
#32	MAF2
#33~ #36	***Total Vehicle Distance(TVD)—***Accumulated distance travelled by vehicle during its operation. Maximum Range: 0.0 to 691489743 km (0.0 to 429 496 729.5 mi) Bit Resolution: 0.161 km (0.1 mi) TVD=((D4*256*256*256)+(D3*256*256)+(D2*256)+D1)*0.161 (KM) If vehicle dose not provide TVD, AT1708 replace the information with the calculated distance, deviation is 0.5%, The first time connection AT1708 please command ATR to clear distance memory.
#33	D1
#34	D2
#35	D3

#36	D4
#37~ #38	***Fuel Rate (Instantaneous)—***Amount of fuel consumed by engine per unit of time. Maximum Range: 0.0 to 1.076 65 L/s FR=(V2*256+V1) * 16.428 x 10 6 L/s
#37	V1
#38	V2
#39~ #40	***Total Vehicle Hours(TVH)—***Accumulated time of operation of vehicle. Maximum Range: 0.0 to 214 748 364.8 h TVH=((H4*256*256*256)+(H3*256*256)+(H2*256)+H1)*0.05 (H)
#39	H1
#40	H2
#41	H3
#42	H4
#43	Reserved
#44	***Percent Engine Load(PEL)—***Ratio of current output torque to maximum torque available at the current engine speed. Maximum Range: 0.0 to 127.5% PEL=data * 0.5%
#45	***Engine Coolant Temperature(ECT)*** , Maximum Range: 0.0 to 255.0 F ECT= data ℉
#46	***Boost Pressure (BP)—***Gage pressure of air measured downstream on the compressor discharge side of the turbocharger. Maximum Range: 0.0 to 219.8 kPa (0.0 to 31.875 lbf/in2) PB=data * 0.862 (KPA)
#47	***Intake Manifold Temperature (IMT)—***Temperature of precombustion air found in intake manifold of engine air supply system. Maximum Range: 0.0 to 255.0 F IMT=data℉
#48	***ABS Control Status*** Bits 8-7: ABS off-road function switch Bits 6-5: ABS retarder control Bits 4-3: ABS brake control Bits 2-1: ABS warning lamp

	00 Off/Not active 01 On/Active 10 Error condition 11 Not available
#49	***Parking Brake Switch Status—***Identifies the state (active/inactive) of the parking brake switch. Bit 8: 1=active/0=inactive Bits 7-1: Undefined
#50	***Brake Application Pressure (BAP)*** Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in2) BAP=data *4.14 kPa
#51	***Brake Primary Pressure (BPP)—***Gage pressure of air in the primary, or supply side, of the air brake system. Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in2) BPP=data* 4.14 (KPA)
#52	***Brake Secondary Pressure—***Gage pressure of air in the secondary, or service side, of the air brake system. Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in2) BPP=data* 4.14 (KPA)
#53	***Road Speed Limit Status*** :State (active or not active) of the system used to limit maximum vehicle velocity. Bit 8: 1=active/0=not active Bits 7-1: Undefined

- **J1708 Command Example:**

1.) >AT#h,

Response: “Data1” “Data2” “H0D” “H3E” by ASCII CODE.

EX1:

AT#1, to get vehicle speed, if speed is 255,

Display,

FF

>

(H46,H46, H0D,H3E).

2.) Trouble code :

40 37 **80 8 CA** 80 A AA 80 B AA 80 C AA 80 1 AA FC D A

Trouble code :

MID 128(H80)

PID 8(H8)

Diagnostic code character (CA), FMI= A , bit4~bit1

2A	31	47	31	4A	46	32	37	57	38	47	4A	31	37	38	32	32	37	0	0	0	27	0D	0A
	1	G	1	J	F	2	7	W	8	G	J	1	7	8	2	2	7				CS		

Country Manufactured	1	U.S.A.(1 or 4), Canada (2), Mexico (3), Japan (J), Korea (K), England (S), Germany (W), Italy (Z)
Manufacturer	G	
Vehicle Type	1	
Vehicle Features	JF27W	
Accuracy Check Digit	8	
Model Year	G	1988 (J), 1989 (K), 1990 (L), 1991 (M), 1992 (N), 1993 (P), 1994 (R), 1995 (S), 1996 (T), 199 7(V), 1998 (W), 1999 (X), 2000 (Y),2001(1), 2002 (2), 2003 (3)…..
Production Plant	J	
Sequential Number	178227	The sequence of the vehicle for production as it rolled of the manufacturers assembly line.