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M8128 User's Manual

This document is the User's Manual for M8128, the interface box for the force/torque sensor (loadcell) manufactured by SRI (Sunrise Instruments Co., Ltd). It's strongly recommended that anyone who uses M8128 should read this document before any operation. Please do not hesitate to contact SRI if there is any question.

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1. Introduction

The interface box M8128 provides bridge excitation, signal conditioning, data acquisition and digital communication to the user's controller or PC via RS232, CAN Bus or Ethernet. A 24 bit sigma-delta AD converter (16 bit effective) is used to provide high resolution (1/5000 to 1/10000 of full scale) analog to digital converting. The data rate is up to 2 kHz. A 6 axis loadcell is connected to the

interface box via a 19 pin LEMO connector.

Specifications:

- Analog
  - # of Channels: 6
  - Programmable gain
  - Automatically adjusting sensor's zero offset
  - Low noise instrumentation amplifiers

- Digital
  - RS232 , CAN Bus and Ethernet
  - 24 bit sigma-delta ADC (16 bit effective), Sampling rate: 10~2k Hz
  - Resolution: 1/5000 to 1/10000 of full scale
  - Programmable system parameters

- Frontal Panel
  - Loadcell connector: LEMO FGG.2B.319.CLAD52Z
  - Digital: Standard DB-9 connector(includes RS232 , CAN Bus and Ethernet communication)
  - Power supply: 12 to 36V, 200mA. Power cable - Diameter 3.5mm& Length 2m
  - Indicated lights: Power & Status

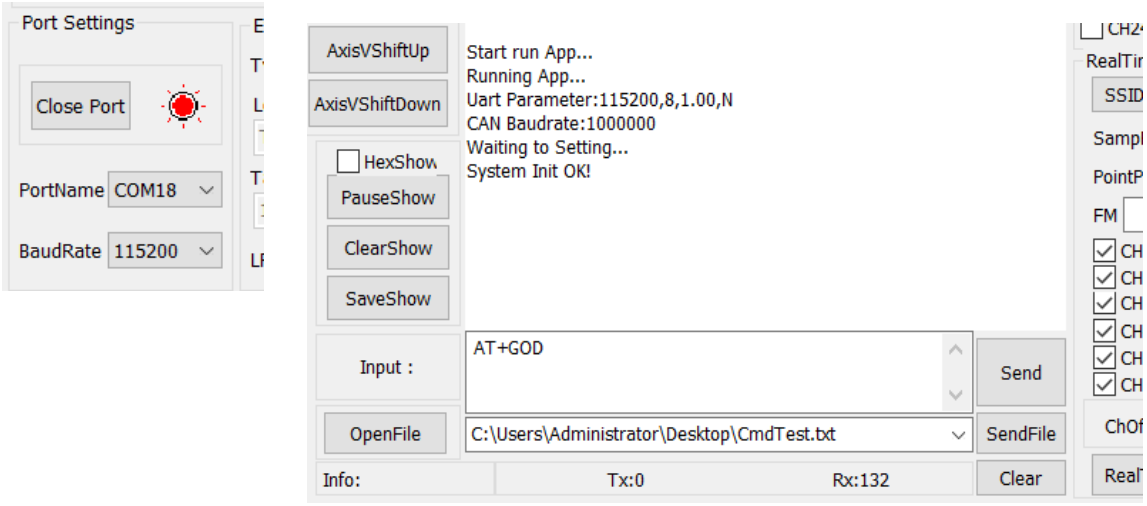
- Software
  - iDAS RD: Debugging software to display real-time sampling curve.
  - Open communication protocol
  - RS232 and Ethernet TCP sample code

2. Quick Start

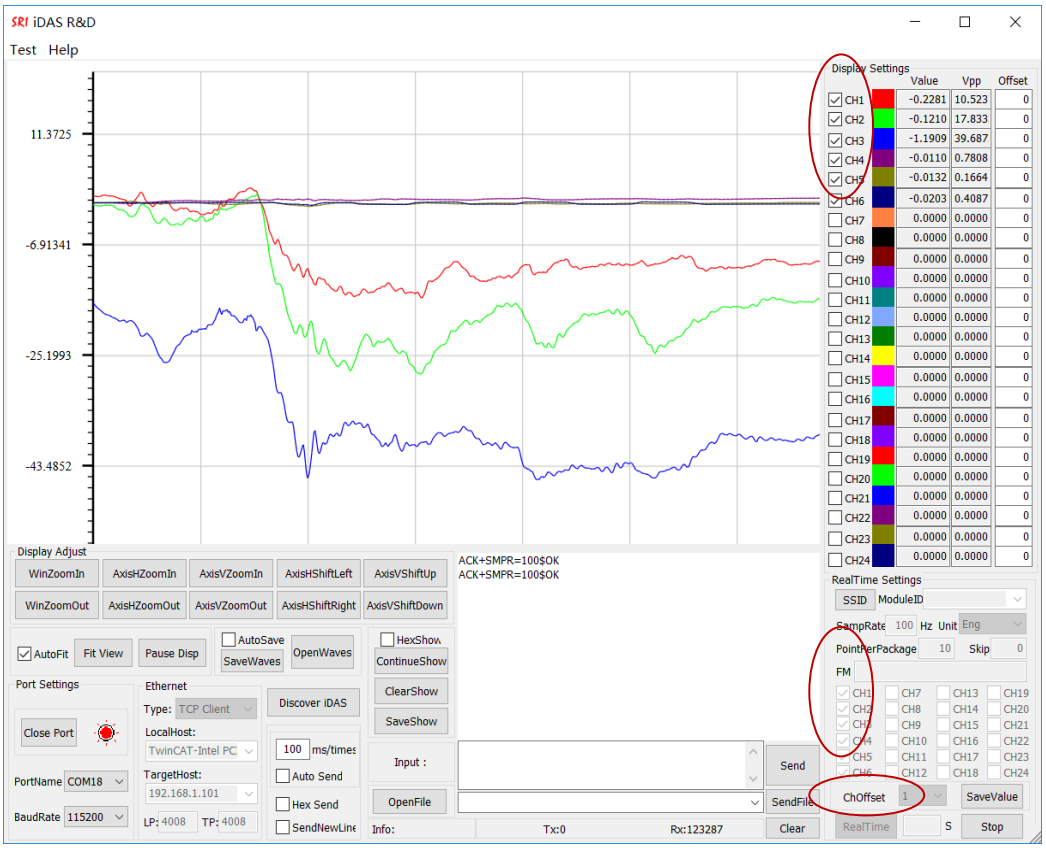
1). Connect the loadcell to M8128 via a LEMO connector.
2). Connect M8128 to PC via RS232/Ethernet/CAN.
3). Provide 24V DC power supply (not included) to the interface box M8128.

2.1 RS232 communication

Step1: Run iDAS R&D.exe. Then select PortName and BaudRate, and click Open Port. If the port is working, the indicated light will turn red.
Step2: Turn power on. Initialization information will appear in the information box.



Step 3：Select Eng in the “Unit” box, check CH1~CH6 boxes to represent FX, FY, FZ, MX, MY, MZ, then click “RealTime” button to start obtaining real-time force curves.

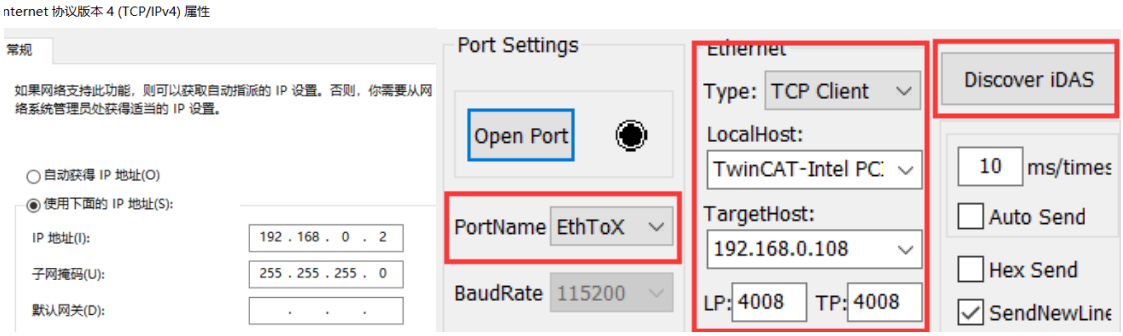


If the information box doesn’t show initialization information after 1 minute of power-on, please check if: 1) connection and PortName are correct；2) BaudRate is selected as 115200.
If the real time data of CH1~CH6 are incorrect, please check the decoupled matrix and the calculation unit, and refer to Chapters 4.0, 5.3, 5.4 and 7.0 of this Manual.

2.2 Ethernet communication

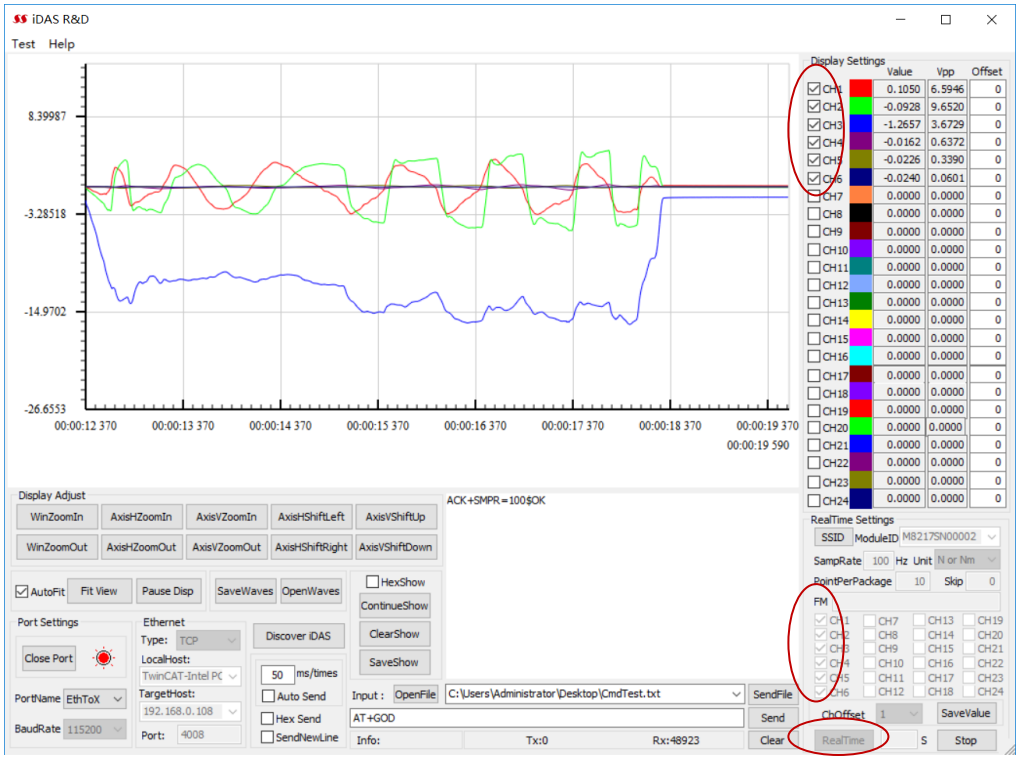
Step 1: Run iDAS R&D.exe. Then set PortName to EthToX; set Ethernet Type to TCP; select LocalHost (your PC's Ethernet card).

Click "Discover iDAS" button, software will search M8128. "1 iDAS found" will be shown on screen if M8128 is reached successfully.



Step 2: Click "Open Port", the indicated light will turn red.

Step 3: Select Eng in the output Unit box; check CH1~CH6 boxes to represent FX, FY, FZ, MX, MY, MZ; then click "RealTime" button to start obtaining real-time force/torque curves.



If the pop-up window shows "0 iDAS found", please try 1) click "Discover iDAS" button again; 2) click " LocalHost"; 3) change the network card and try again.
If the real time data of CH1~CH6 are incorrect, please check the decoupled matrix and the calculation unit, and refer to Chapters 4.0、5.3、5.4 and 7.0 of this Manual.

2.3 CAN Bus communication

Use RS232 communication to configure ID type, ID filter list, and baud rate for CAN BUS (refer to chapters 4, 5.1.6, 5.1.7, and 5.1.8.). Note that CAN BUS cable is not included, the cable can be made based on the pin definition for the DB9 connector in Section 3.2.2. The command should be converted into ASCII. When a command is longer than 8 bytes, the command should be divided into multiple frames.

Example:

RS232 communication

Sent: AT+CIDT=?\r\n

Reply: ACK+CIDT=STD$OK\r\n

Sent: AT+CFIDL=?\r\n

Reply: ACK+CFIDL=NULL$OK\r\n

Sent: AT+CRATE=?\r\n

Reply: ACK+CRATE=BR:1000000$OK\r\n

CAN communication

To convert AT+SMPF=?\r\n to ASCII: 41 54 2B 53 4D 50 46 3D 3F 0D 0A.

The first frame is: 41 54 2B 53 4D 50 46 3D, and the second frame is: 3F 0D 0A (or: 3F 0D 0A 00 00 00 00 00)

3. Power Cable, Connectors and LED Lights

3.1 Power cable

M8128 comes with a 2-meters power cable, allowing for DC input of 12～36V, with DC24V recommended. Note that DC power supply is not included. If connected with a SRI six axis loadcell, the consumed power is about 4.5W. The cable color codes are defined as follows:

Color	Definition	Note
Red, Blue, Orange	+24V	+Power, red clip
Black, Brown, Yellow, Green	GND	-Power, black clip
Shield	Shield	The power cable shield is connected to the external case of M8128. To reduce noise, it is recommended to connect the shield to both -Vin (black clip) and the true ground in your test lab.

3.2 Connector definition

3.2.1 19 pin LEMO connector

Pin #	Definition	Note
1	CH1+	Channel 1
2	CH1-	
3	CH2+	Channel 2
4	CH2-	
5	CH3+	Channel 3
6	CH3-	
7	CH4+	Channel 4
8	CH4-	
9	CH5+	Channel 5
10	CH5-	
11	CH6+	Channel 6
12	CH6-	
13~16	N/A	
17	-E	Negative excitation (if support)
18	+E	Positive excitation
19	GND	

3.2.2 Ethernet / RS232 / CAN Bus connector

Ethernet/RS232/CAN bus are included the same DB9 connector.
The pin assignments are as follows:

Pin #	Definition	Note
1	TDP	Ethernet
2	RX	RS232
3	TX	RS232
4	CANH	CAN BUS
5	GND	Ground
6	CANL	CAN BUS
7	TDN	Ethernet
8	RDP	Ethernet
9	RDN	Ethernet

3.3 Indicated lights

There are two indicated lights: PWR (Power) and STA (Status). The conditions of these lights are defined as follows:

PWR	STA	Definition	Instruction
ON		Power is on	
ON	Flickering	System is working properly	
ON	ON	Excitation is abnormal	Check the loadcell cable
OFF	Flickering	System works ok. PWR light may get damaged	Either ignore or repair PWR light
OFF	ON	Excitation is abnormal and PWR light may get damaged	Check the loadcell cable or contact us

4. iDAS R&D Debugging Software

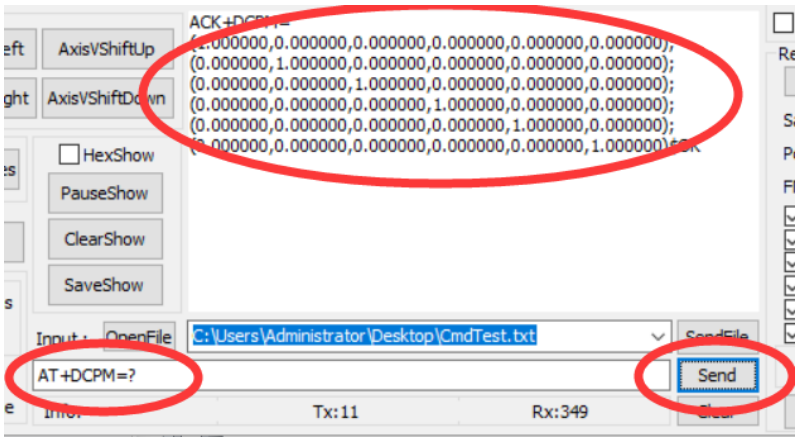
iDAS RD is a debugging software that supports the commands of M8128, which can be used to send a series of commands to M8128 to achieve a special application.

- PC Requirement：WIN 7 and above
- Installation Procedure：Uncompressed iDAS RD
- Support RS232 & Ethernet communication only

4.1 Software Interface

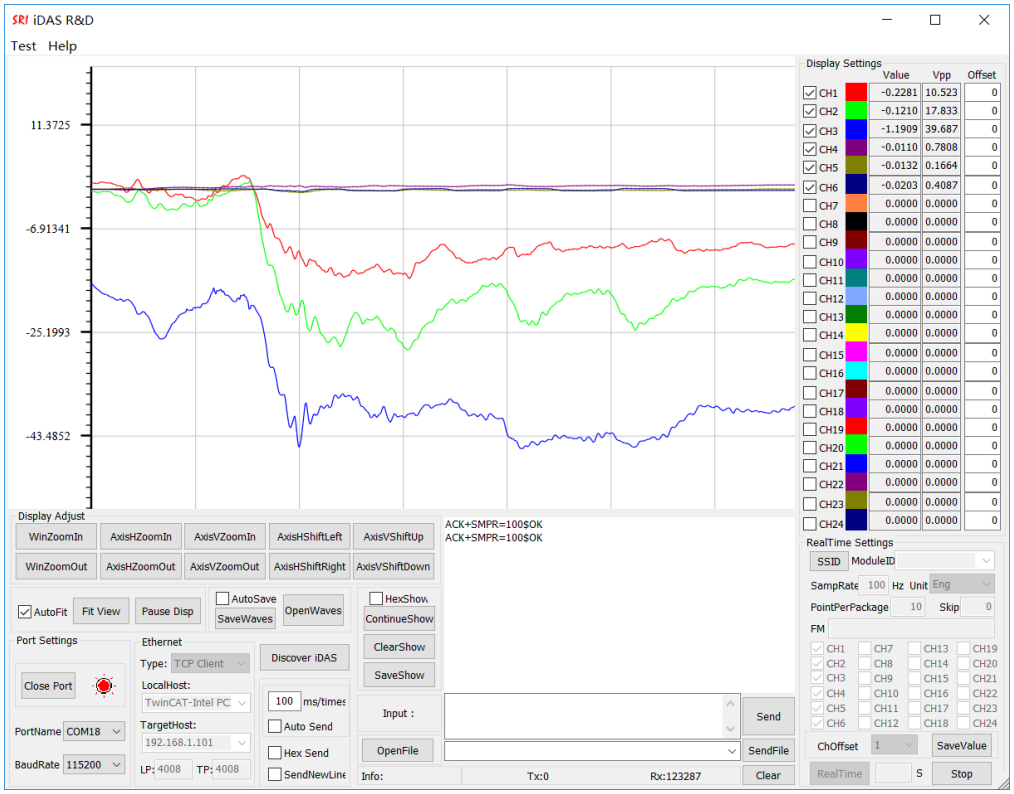
4.2 Send Commands

According to the command format in Section 5.0, type in a command to the Command Box, and click Send. The response information will be shown in the command response window. Error will be prompted or no response will be given if the input command is wrong or is not supported by M8128.



4.3 Realtime data curve

Step 1: Open Port correctly.
Step 2: Select CH1 through CH6 at the lower right corner on screen.
Step 3: Set SampRate to 100Hz, set Unit to N or Nm.
Set PointPerPackage to 10, and put in 0 at Skip.
Step 4: Select CH1 through CH6 at the top right corner on screen.
Step 5: Click "Realtime" to get data from M8128, the real time data will be shown in the window.



Note:
With RS232 communication, SampRate is up to 300 Hz for 6-channel data upload and 1 kHz for 1-channel data upload at BaudRate 115200bps.

With Ethernet communication, SampRate is up to 2K Hz for 6-channel data upload

.

If the real-time data shown by iDAS R&D is incorrect, please click Stop and send Commands DCPM and DCPCU to make sure that current matrix coefficients and calculation unit match the sensor calibration report. Refer to 5.3, 5.4 and 6.0 of this Manual.

5. Commands

Definition：

Master：The equipment that send commands to M8128, such as PC or the user's control system. M8128 is called as Slave Equipment.
ASCII Code：America Standard Code for Information Interchange，refer to ISO 646.
M8128 commands are comprised of ASCII codes.
Command structures are shown as follows：
Send to Slave Equipment：
AT+CMD=Parameter\r\n
Response from Slave Equipment：(Except for the command GOD and GSD)
ACK+CMD=Parameter$ResponseCode\r\n

All data that sent to slave equipment must be ASCII code.
All data that received from slave equipment are ASCII code.
Before sent or after received, the data must be converted to or from ASCII

Descriptions：
AT：Frame Header when sending data. All data that are sent to Slave Equipment must be started with AT.
ACK：Frame Header when receiving data. All data that are received from Slave Equipment are started with ACK.
CMD：Command，such as SMPF.
Parameter：Parameters follow a command.
\r\n：Return symbol (Enter), which denotes the end of a command.
ResponseCode：Response code，such as OK or ERROR.
$：Interval symbol.

Note：

- Parameter '?' denotes that Master is asking for a response from Slave Equipment.
- M8128 will not respond until the command sent by Master is executed.
- When debugging with iDAS R&D software, the software performs ASCII conversion and put \r\n at the end of the command automatically.

Example:

Send：AT+SMPF=?\r\n
ASCII: 41 54 2B 53 4D 50 52 3D 3F 0D 0A
Response：ACK+SMPF=100$OK\r\n
ASCII: 41 43 4B 2B 53 4D 50 46 3D 31 30 30 24 4F 4B 0D 0A
Send：AT+GOD\r\n
ASCII: 41 54 2B 47 4F 44 0D 0A
Response：AA 55 00 1B 04 BB A1 8C B8 41 E0 19 30 42 DD 82 B0 40 A2 62 B8 C0 DB 68 75 40 9B EB 16 40 30

Command	Function	Note
Configuration of RS232/CAN/Ethernet		
UARTCFG	Read or set parameters of RS232	Immediate effect
EIP	Read or set Ethernet IP address	Effect after restart
EMAC	Read or set Ethernet MAC address	Effect after restart
EGW	Read or set Ethernet gateway	Effect after restart
ENM	Read or set Ethernet netmask	Effect after restart
CRATE	Read or set CAN baud rate	Effect after restart
CIDT	Read or set ID type of CAN Bus	Effect after restart
CFIDL	Read or set ID of CAN Bus	Effect after restart
CFI	Read or set internal time between frames of CAN bus	Effect after restart
System parameters		
SMPF	Read or set sampling rate	
DCPM	Read or set decoupling matrix coefficient	
DCPCU	Read or set matrix calculation unit	(mV or mV/V)
SFWV	Read firmware version	
Get real-time data from M8128		
DCKMD	Read or set data validation method	
GSD	Get data from M8128 continuously	
GOD	Get one package data from M8128	

5.1 Commands to configure RS232/Ethernet/CAN

5.1.1 UARTCFG / Communication Parameters for RS232

Description: To read or set parameters for RS232
Command Syntax:AT+UARTCFG=Rate,DataBit,StopBit,ParityBit

Command	Possible Response(s)
AT+UARTCFG=? **\r\n**	Rate,DataBit,StopBit,ParityBit
AT+UARTCFG=Rate, DataBit, StopBit, ParityBit**\r\n**	OK/ERROR
Note: Immediate effect.	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Rate	Unsigned long int ($0 \sim 2^{32}-1$)	Baud Rate of RS232 in bps. Baud Rate of RS232 in M8128 can be 9600, 14400, 19200, 38400, 56000, 57600,115200, 230400, 256000, 460800, 921600bps. Default 115200
DataBit	Int	Number of data bits in RS232 communication. The choices are: 5,6,7 and 8. Default is 8
StopBit	float	Number of stop bits in RS232 communication. The choices are: 0.5,1.0.1.5 and 2.0. Default is 1.0
ParityBit	char	Parity in RS232 communication. Choices are N,O and E, which denote none, odd and even respectively. Default is N

Example:

Send: AT+UARTCFG=?\r\n

Response: ACK+UARTCFG=115200,8,1.00,N$OK\r\n

Send: AT+UARTCFG=19200,8,1.00,N\r\n

Response: Messy codes

The baud rate of the master equipment should be changed to the current set value of 19200 in order to communicate correctly.

5.1.2 EIP / Ethernet IP address

Description: To set Ethernet IP address
Command Syntax:AT+**EIP**=addr0.addr1.addr2.addr3

Command	Possible Response(s)
AT+**EIP**=?\r\n	addr0.addr1.addr2.addr3
AT+**EIP**= ddr0.addr1.addr2.addr3\r\n	OK/ERROR
Note: Effect after M8128 is restarted.	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
ddr0.addr1.addr2.addr3	String	Default：192.168.0.108

Example:

Send： AT+EIP=?\r\n

Response： ACK+EIP=192.168.0.108$OK\r\n

Send： AT+ EIP=192.168.0.108\r\n

Response： ACK+EIP=192.168.0.108$OK\r\n

5.1.3 EMAC / Ethernet MAC

Description: To set Ethernet MAC.
Command Syntax:AT+EMAC=addr0-addr1-addr2-addr3-addr4-addr5

Command	Possible Response(s)
AT+**EMAC**=?\r\n	addr0-addr1-addr2-addr3-addr4-addr5
AT+**EMAC**= addr0-addr1-addr2-addr3-addr4-addr5\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
addr0-addr1-addr2-addr3-addr4-addr5	String	12-13-14-15-16-17

Example:

Send： AT+EMAC=?\r\n

Response： ACK+EMAC=12-13-14-15-16-17$OK\r\n

Send： AT+EMAC=12-13-14-15-16-17\r\n

Response： ACK+EMAC=12-13-14-15-16-17$OK\r\n

5.1.4 EGW / Ethernet Gateway address

Description: To set Ethernet gateway address.
Command Syntax:AT+EGW= addr0.addr1.addr2.addr3

Command	Possible Response(s)
AT+**EGW**=?\r\n	addr0.addr1.addr2.addr3
AT+**EGW**=addr0.addr1.addr2.addr3\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
addr0.addr1.addr2.addr3	String	192.168.0.1

Example:

Send: AT+EGW=?\r\n

Response: ACK+EGW=192.168.0.1$OK\r\n

Send: AT+EGW=192.168.0.1\r\n

Response: ACK+EGW=192.168.0.1$OK\r\n

5.1.5 ENM / Ethernet netmask

Description: To set Ethernet netmask.
Command Syntax: AT+ENM= addr0.addr1.addr2.addr3

Command	Possible Response(s)
AT+**ENM**=?\r\n	addr0.addr1.addr2.addr3
AT+**ENM**= addr0.addr1.addr2.addr3\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
addr0.addr1.addr2.addr3	String	255.255.255.0

Example:

Send: AT+ENM=?\r\n

Response: ACK+ENM=255.255.255.0$OK\r\n

Send: AT+ENM=255.255.255.0\r\n

Response: ACK+ENM=255.255.255.0$OK\r\n

5.1.6 CIDT / ID type for BusCAN

Description: To read or set ID type for CAN Bus.
Command Syntax: AT+CIDT=Type

Command	Possible Response(s)
AT+CIDT=?\r\n	Type
AT+CIDT=Type\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Type	String	STD: Standard 11 bits ID EXT: Extended 29 bits ID

Example:

Send: AT+CIDT=?\r\n

Response: ACK+CIDT=STD$OK\r\n

Send: AT+CIDT=EXT\r\n

Response: ACK+CIDT=EXT$OK\r\n

5.1.7 CFIDL / ID of CAN Bus

Description: To read or set ID of CAN Bus.
Command Syntax:AT+CFIDL= id1,id2,id3,…,idn

Command	Possible Response(s)
AT+**CFIDL**=?\r\n	id1,id2,id3,…,idn
AT+**CFIDL**=id1,id2,id3,…,idn\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
idn	$0 \sim 2^{11}$ or $0 \sim 2^{29}$	NULL: no filter Up to 14 IDs: allow these IDs to be passed through

Example:

Send: AT+CFIDL=?\r\n

Response: ACK+CFIDL=NULL$OK\r\n

Send: AT+CFIDL=0,125,126,127,128\r\n

Response: ACK+CFIDL=0,125,126,127,128$OK\r\n

5.1.8 CRATE / Baud Rate of CAN Bus

Description: To read or set baud rate of CAN Bus.
Command Syntax: 1. AT+**CRATE**=BR:rate 2. AT+**CRATE**=RP:BS1,BS2,Prescaler

Command	Possible response(s)
AT+**CRATE**=?	1. BR:rate 2. RP:BS1,BS2,Prescaler
1. AT+**CRATE**=BR:rate 2. AT+**CRATE**=RP:BS1,BS2,Prescaler	OK/ERROR

Note:
1. The default Baud Rate of CAN Bus is 1Mb/s, and the baud rate can be changed by Command CRATE with two methods:
   1.1 Send "AT+CRATE=BR:rate" to set the Baud Rate, where the rate should be 1Mb/s, 0.8Mb/s, 0.75Mb/s, 0.6Mb/s, 0.5Mb/s, 0.45Mb/s, 0.25Mb/s or 0.125Mb/s.
   1.2 Send "AT+CRATE=RP:BS1,BS2,Prescaler" to set the Baud Rate. More Baud Rate can be achieved by this method. The Baud Rate is defined as following:
   Baud Rate = 36/((1+ BS1+ BS2)*(1+Prescaler))Mbps
2. Only one method can be used each time.
3. New Baud Rate will be effective after M8128 is restarted.

Parameters

Parameter	Variable Type (Valid Range)	Description
BR	String	Keyword
RP	String	Keyword
rate	Unsigned long int (0 ~ 2^{32}-1)	Baud Rate in bps. This parameter can be 1000000, 800000, 750000, 600000, 500000, 450000, 250000 or 125000.
BS1	Unsigned short int (0 ~ 65535)	1 ~ 16.
BS2	Unsigned short int (0 ~ 65535)	1 ~ 8.
Prescaler	Unsigned short int (0 ~ 65535)	1 ~ 1024.

Example:

Send: AT+CRATE=?\r\n

Response: ACK+CRATE=BR:1000000$OK\r\n

Send: AT+CRATE=?\r\n

Response: ACK+CRATE= RP:7,8,20$OK\r\n

Send: AT+CRATE=BR:125000\r\n

Response: ACK+CRATE=BR:125000$OK\r\n

5.1.9 CFI / Interval time between frames of CAN Bus

Description: To set Interval time between frames of CAN Bus
Command Syntax: AT+CFI=IntervalTime

Command	Possible response(s)
AT+**CFI**=?	IntervalTime
AT+**CFI**=IntervalTime	OK/ERROR
Note: New interval time will be effective after M8122C is restarted.	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
IntervalTime	0 ~ 10000	Interval time in µs. The default value in firmware is 0µs.

Example:

Send: AT+CFI=?\r\n

Response: ACK+CFI=10$OK \r\n

Send: AT+CFI=10\r\n

Response: ACK+CFI=10$OK \r\n

5.2 SFWV / Search Firmware version

Description: To search firmware version.
Command Syntax:AT+SFWV=?

Command	Possible Response(s)
AT+SFWV=?\r\n	version
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
version	String	Version #

Example:

Send: AT+SFWV=?\r\n

Response: ACK+SFWV=V11.00$OK\r\n

5.3 DCPM / Read or set decoupled matrix

Description: To read or set decoupled matrix
Command Syntax:AT+DCPM=Matrix

Command	Possible Response(s)
AT+**DCPM**=?\r\n	Matrix data
AT+**DCPM**=Matrix\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Matrix	String	The format is as follows.

Example:

Send: AT+DCPM=?\r\n

Response: ACK+DCPM=(0.000041,-0.020164,-0.000348,0.020287,-0.000145,-0.000047);(-0.000160,-0.011703,-0.000089,-0.011668,-0.000217,0.023526);(-0.031415,-0.000185,-0.032273,0.000010,-0.031708,-0.000481);(-0.000888,-0.000014,0.000951,-0.000006,0.000029,0.000009);(-0.000521,0.000011,-0.000531,-0.000009,0.001061,0.000015);(0.000002,0.000754,-0.000008,0.000753,-0.000007,0.000768)$OK\r\n
Refer to Section **7.0 Loadcell Decoupled Calculation** to obtain the decoupling matrix coefficients and calculation units of sensors

5.4 DCPCU / Calculation unit for decoupled data

Description: To set or read calculation unit.
Command Syntax:AT+DCPCU=Unit

Command	Possible Response(s)
AT+**DCPCU**=?\r\n	Uint
AT+**DCPCU**=Unit\r\n	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Unit	String	MV and MVPV(mV/V)

Example:

Send: AT+DCPCU=?\r\n

Response: ACK+DCPCU=MV$OK\r\n

Send: AT+DCPCU=MVPV\r\n

Response: ACK+DCPCU=MVPV$OK\r\n

5.5 SMPF / Read or set sampling rate

Description: To read or set sampling rate.
Command Syntax: AT+**SMPF**=SampleFreq

Command	Possible response(s)
AT+**SMPF**=?	SampleFreq
AT+**SMPF**=SampleFreq	OK/ERROR
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
SampleFreq	Unsigned short int (1 ~ 2000)	Sampling Freq in Hz. For example, 200.

Example:

Send: AT+SMPF=?\r\n

Response: ACK+SMPF=300$OK\r\n

Send: AT+SMPF=200\r\n

Response: ACK+SMPF=200$OK\r\n

5.6 DCKMD / Set data-check method

Description: To set data-check method.
Command Syntax: AT+**DCKMD**=Mod

Command	Possible response(s)
AT+**DCKMD**=Mod	OK/ERROR
Note: iDAS R&D debugging software only supports SUM check.	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
Mod	String	Data check methods include SUM and CRC32; The default method SUM is used for data accumulation and verification. See the C language source code of CRC32 in the attached CD.

Example:

Send: AT+DCKMD=?\r\n

Response: ACK+ DCKMD =SUM$OK\r\n

5.7 GOD / Get one package data from M8128

Description: To get one package data from M8128.
Command Syntax: AT+**GOD**

Command	Possible response(s)
AT+**GOD**	DataFormat
Note:	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
DataFormat		Data package, refer to the following for details.

5.8 GSD / Get data continuously

Description: To get data continuously.
Command Syntax: AT+**GSD**

Command	Possible response(s)
AT+**GSD**	DataFormat
Note: To stop receiving data, send "AT+GSD=STOP\r\n" to M8128.	

Parameters		
Parameter	**Variable Type (Valid Range)**	**Description**
DataFormat		Data package, refer to the following for details.

"DataFormat" is defined as follows:

Frame Header	PackageLength	PackageNo	Data	CRC32/SUM
0xAA ,0x55	HB,LB	2Byte	(ChNum*N*DNpCH) Byte	4Byte / 1Byte

Note:

- 0xAA ,0x55: Frame header of data package.
  PackageLength: Unsigned short int,16-bits, highest byte first, The length of data of each channel, which equals to 2+ChNum*N*DNpCH+1(SUM check) or 2+ ChNum*N*DNpCH+4(CRC32 check)
  Where
  ChNum: Total number of uploading channels, Defualt value 6
  N: the output unit, Defualt value 4
  DNpCH: Number of sampling points to upload in one package, Defualt value 1
- PackageNo: Every package is labeled, which increases in sequence from 0 to 65535.
- Data: Uploading data with the lowest byte first.
- CRC32/SUM: CRC32 or Checksum. The default data validation method is Checksum. Use Command DCKMD to select the data validation method (Checksum or CRC32).
  CRC32 function (MyCRC_GetCRC32 (uint8_t *pData, uint16_t Length)) in C program is included in the CD-ROM.

Example:

Send：AT+DCKMD=SUM\r\n

Response：ACK+DCKMD=SUM$OK\r\n

Send：AT+GOD\r\n

Response：AA 55 00 1B C4 C7 01 6A F4 C0 EF 7D 33 C0 49 62 C9 C0 A2 5C C6 BD A6 19 8F BD AF DA 69 3E 6E

Where

0xAA ,0x55：Frame header

00 1B：PackageLength 2+6*4*1+1=27 bytes；

C4 C7：Package No 50375；

Channel 1 Engineering Unit：01 6A F4 C0, single-precision float （C0F46A01）converted into -7.637940；

Channel 2 Engineering Unit：EF 7D 33 C0, single-precision float （C0337DEF）converted into -2.804561；

Channel 3 Engineering Unit：49 62 C9 C0, single-precision float （C0C96249）converted into -6.293248；

Channel 4 Engineering Unit：A2 5C C6 BD, single-precision float （BDC65CA2）converted into -0.096856；

Channel 5 Engineering Unit：A6 19 8F BD, single-precision float （BD8F19A6）converted into -0.069873；

Channel 6 Engineering Unit：AF DA 69 3E, single-precision float （3E69DAAF）converted into 0.228373

SUM Check: 6E

6. Get Realtime Data form M8128

Step 1: Use command SMPF to set sampling rate. If the sampling rate is 100Hz:

AT+SMPF=100\r\n

Step 2: Use command GOD to get one package data or command GSD to get data continuously from M8128. Refer to Sections 5.7 and 5.8

Note:

- The parameters set by Command SMPF are saved to M8128, and they are still available after power off.
- If iDAS R&D software is used, M8128 is required to restart (Power off and Power on) before debugging your own codes.
- If the real time data of CH1~CH6 is incorrect, please check the decoupled matrix and the calculation unit, and refer to Section 4.0, 5.3, 5.4 and 7.0 of this Manual

7. Decoupled Calculation

If the M8128 is purchased together with SRI sensor, the decoupled matrix and calculation unit of SRI sensor have been configured in the M8128. The decoupled matrix and calculation unit can be updated by Command DCPM and DCPCU when necessary.

Decoupled matrix and calculation unit can be found in the calibration report. Two different reports formats will be provided according to the sensor's structure.

7.1 Matrix decoupled loadcell

The decoupled matrix and calculation unit are provided in the calibration report, as shown below:

[DECOUPLED] =

-0.03220	0.49984	0.00136	-1.01398	-0.01208	0.50908
0.00046	0.84855	0.01531	0.02114	-0.03126	-0.86432
1.19167	0.00028	1.20748	0.00224	1.19808	0.00320
-0.06386	-0.00097	0.13028	-0.00009	-0.06523	0.00012
-0.11090	0.00016	-0.00049	0.00075	0.11138	-0.00019
-0.00046	0.08401	-0.00067	0.08304	-0.00089	0.08433

The six axis loads can be decoupled as follows:

Step 1: Obtain the raw data of Channels 1 through 6 into mV
[DAT] = {rawchn1, rawchn2, rawchn3, rawchn4, rawchn5, rawchn6}
where rawchn1, rawchn2, rawchn3, rawchn4, rawchn5 and raw chn6 are in mV

Step 2: To calculate decoupled loads
$[RESULT]^T = [DECOUPLED]*[DAT]^T$
where [RESULT] = {FX,FY,FZ,MX,MY,MZ}. Force Unit: N. Moment Unit: Nm
[DECOUPLED] is the above decoupled matrix

The Commands to input the matrix coefficients and to set the calculation unit are as follows:

AT+DCPM=(-0.03220,0.49984,0.00136,-1.01398,-0.01208,0.50908);(0.00046,0.84855,0.01531,0.02114,-0.03126,-0.86432);(1.19167,0.00028,1.20748,0.00224,1.198078,0.00320);(-0.06386,-0.00097,0.13028,-0.00009,-0.06523,0.00012);(-0.11090,0.00016,-0.00049,0.00075,0.11138,-0.00019);(-0.00046,0.08401,-0.00067,0.083040,-0.00089,0.08433)
AT+DCPCU=MV

7.2 Structurally decoupled loadcell

The sensitivity provided in the calibration report needs to be converted into a matrix as shown below:

Voltage Calibration

Bridge	Capacity	Zero Offset	Nonlinearity	Hysteresis	Output @ Capacity	Sensitivity	Change
	N/Nm	mV/V	%FS	%FS	mV/V	mV/V/EU	%
FX	-5400	0.0131	-0.08	-0.33	-3.0269	5.6054E-04	0.00
FY	5400	0.0007	0.08	0.27	3.0500	5.6481E-04	0.00
FZ	-10800	0.0001	-0.09	-0.18	-0.7369	6.8230E-05	0.00
MX	-540	-0.0027	-0.09	-0.10	-1.8703	3.4636E-03	0.00
MY	-540	-0.0090	-0.09	-0.09	-1.9014	3.5210E-03	0.00
MZ	432	-0.0099	0.05	0.08	1.9603	4.5378E-03	0.00

Sensitivity unit is mV/V/Eu,. The diagonal elements of the matrix are the inverse of the sensitivities (1/Sensitivity). The calculation unit is mV/V.

1783.9940	0	0	0	0	0
0	1770.5069	0	0	0	0
0	0	14656.3095	0	0	0
0	0	0	288.7169	0	0
0	0	0	0	284.0102	0
0	0	0	0	0	220.3711

The Commands to input the matrix coefficients and to set the calculation unit are as follows:
AT+DCPM=(1783.9940,0,0,0,0,0);(0,1770.5069,0,0,0,0);(0,0,14656.3095,0,0,0)
;(0,0,0,288.7169,0,0); (0,0,0,0,284.0102,0); (0,0,0,0,0,220.3711)
AT+DCPCU=MVPV

Four possible conversion formula:

1) Sensitivity unit is mV/V/Eu. The conversion formula is 1/Sensitivity.
Calculation unit is mv/V: AT+DCPCU=MVPV.
2) Sensitivity unit is mV/Eu. The conversion formula is 1/Sensitivity.
Calculation unit is mv: AT+DCPCU=MV.
3) Sensitivity unit is V/V/Eu. The conversion formula is 1/Sensitivity/1000.
Calculation unit mv/V: AT+DCPCU=MVPV.
4) Sensitivity unit is V/Eu. The conversion formula is 1/Sensitivity/1000.
Calculation unit is mv: AT+DCPCU=MV.

7.3 Other Loadcells

Except 6 axis loadcells, other sensors with voltage out put can also be connected to M8128.For calculation in M8128, a matrix is also needed.
Please follow the method described below to get the matrix.

3 Axis loadcell

Voltage Calibration

Bridge	Capacity	Zero Offset	Nonlinearity	Hysteresis	Output @ Capacity	Sensitivity	Change
	N/Nm	mV/V	%FS	%FS	mV/V	mV/V/EU	%
FX	-20000	0.0101	-0.13	-0.28	-2.8941	1.4471E-04	0.00
FY	20000	-0.0027	0.11	0.19	2.8894	1.4447E-04	0.00
FZ	-20000	0.0175	-0.07	-0.27	-0.5441	2.7207E-05	0.00

Sensitivity unit is mV/V/Eu. The diagonal elements of the matrix are the inverse of the sensitivities (1/Sensitivity).

6910.3725	0	0	0	0	0
0	6921.8523	0	0	0	0
0	0	36755.2468	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

The Commands to input the matrix coefficients and to set the calculation unit are as follows:
AT+DCPM=(6910.3725,0,0,0,0,0);(0,6921.8523,0,0,0,0);(0,0,36755.2468,0,0,0)
;(0,0,0,0,0,0);(0,0,0,0,0,0); (0,0,0,0,0,0)
AT+DCPCU=MVPV

Torque Sensor

Voltage Calibration

Bridge	Capacity	Zero Offset	Nonlinearity	Hysteresis	Output @ Capacity	Sensitivity	Change
	Nm	V	%FS	%FS	V	V/EU	%
MZ	100	-0.0049	0.04	0.27	2.0445	2.0445E-02	0.00

Sensitivity unit is V/Eu.
The first row and the first column equals to 1/sensitivity/1000.
Calculation unit is mV.

The Commands to input the matrix coefficients and to set the calculation unit are as follows:
AT+DCPM=(0.048913,0,0,0,0,0);(0,0,0,0,0,0);(0,0,0,0,0,0);(0,0,0,0,0,0);(0,0,0,0,0,0
);(0,0,0,0,0,0)
AT+DCPCU=MV