

G-4500 Series

User Manual

Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

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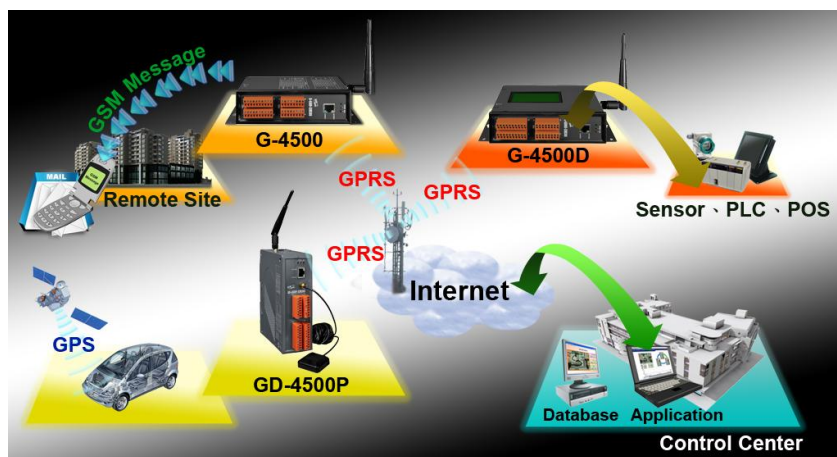
Chapter 1 Introduction

The G-4500 series provided by ICP DAS are M2M (Machine to Machine) embedded controller with a cellular transceiver can monitoring industrial equipment that sends live data to the monitoring system, providing real-time status. With optional GPS model, the G-4500 can also be a GPS tracking system. It can be used in vehicle management system or maritime system.

Within the high performance CPU, the G-4500 series can handle a large of data and are suit for the hard industrial environment. The G-4500 series feature GPRS/GSM module, Ethernet interface, optional GPS module, 3 digital inputs, 3 digital outputs, 8 analog inputs, 2 RS-232 and 1 RS-485 port. That can be used in various application fields to transfer data by GPRS, SMS, Ethernet or serial bus. In traditional application, users need a master controller to integrate a GPRS/GSM modem with developing GPRS or SMS programs into the host. That would waste much time to integrate the various communication interfaces. Now, we have G-4500 series to solve the hardware integration problems with easy-to-used libraries. The G-4500 series built-in MiniOS7 provide the same development environment with I-7188/I-7186 series. It is more easy for I-7188/I-7186 users to apply the G-4500 series.

Using G-4500 M2M communications, a machine can be installed virtually anywhere but still be connected to a support centre to signal performance or need for service. M2M data will improve the service quality and reduce operating costs. Many application areas can be improved using G-4500.





The G-4500 series applications can be divided into 2 parts: One part is the fixed intelligent remote management equipment such as water monitor system, vending machine system, remote machine monitor, home security, POS system, power measurement system and etc. Another kind of application is movement management equipment such as vehicle management system, maritime system, taxi dispatch system, and etc. Anyway, the G-4500 can save the cost and development time for users.







Chapter 2 Hardware specifications

2.1 G-4500 Hardware


2.1.1 G-4500-SIM300 Series

			
G-4500-SIM300	G-4500D-SIM300	G-4500P-SIM300	G-4500PD-SIM300





2.1.2 G-4500-SIM340 Series

			
G-4500-SIM340	G-4500D-SIM340	G-4500P-SIM340	G-4500PD-SIM340

2.1.3 GD-4500-SIM340 Series

			
GD-4500-SIM340	GD-4500D-SIM340	GD-4500P-SIM340	GD-4500PD-SIM340

2.1.4 G-4500-2G Series

			
G-4500-2G	G-4500D-2G	G-4500P-2G	G-4500PD-2G

2.2 G-4500 specifications

2.2.1 G-4500-SIM300 Specifications

Item		G-4500-SIM300	G-4500D-SIM300	G-4500P-SIM300	G-4500PD-SIM300
CPU		80 MHz internal microprocessor			
SRAM/Flash		512K/512K , real time clock, watchdog timer			
NVRAM		31 bytes, battery backup, data valid up to 10 years			
EEPROM		16 KB, retention > 40 years. 1,000,000 erase/write cycles			
Comm. Interface					
COM ports		COM1:5-wire RS-232; COM2: RS-485; COM3:3-wire RS-232			
Ethernet		10/100 Base-TX Ethernet controller			
GPRS Interface					
Frequency Band		Tri-band 900/1800/1900 MHz			
GPRS connectivity		GPRS class 10/8; GPRS station class B			
DATA GPRS		Downlink transfer: Max. 85.6 kbps; Uplink transfer: Max 42.8kbps			
SMS		MT, MO, CB, Text and PDU mode			
GPS Interface					
Support Channels		-		32	
Sensitivity		-		Tracking = up to -159 dBm (with external LNA)	
				Cold start = up to -146 dBm (with external LNA)	
Acquisition Time		-		Hot start (Open Sky) = 2 s(typical)	
				Cold start (Open Sky) = 36 s(typical)	
Protocol Support		-		NMEA 0183 version 3.01	
LCD Interface					
General	Effective display area	-	80.61 mm x 14.37 mm (W x H)	-	80.61 mm x 14.37 mm (W x H)
	Module Dimension	-	93 mm x 70 mm x 1.6 mm (W x H x T)	-	93 mm x 70 mm x 1.6 mm (W x H x T)
Life Time		-	Expected life is	-	Expected life is more

		more than 100,000 hours under normal operation		than 100,000 hours under normal operation
Digital Output				
Output Channel	3			
Output Type	Open Collector (Sink/NPN)			
Load Voltage	+30 VDC max.			
Load Current	100 mA max.			
Isolated Voltage	Non-isolated			
Digital Input				
Input Channel	3			
Input Type	Source(Dry Type), Common Ground			
Off Voltage Level	+1 V max.			
On Voltage Level	+3.5 ~ +30 V			
Isolated Voltage	Non-isolated			
Analog Input				
Input Channel	8			
Resolution	12 - bit			
Input Range/Type	0 ~ 20 mA			
Sample Rate	1 KHz max. (Read one channel)			
Accuracy	+/- 2 LSB (+/- 0.01 mA)			
Power				
Protection	Power reverse polarity protection			
Frame Ground Protection	ESD, Surge, EFT, Hi-Pot			
Power Requirement	15W; Unregulated +10 VDC ~ +30 VDC			
Power Consumption	Idle: 75 mA @ 24 VDC; Data Link: 150 ~ 400 mA (peak) @ 24 VDC			
LED Indicators				
System	Red			
GPRS	Yellow			
GPS	Green	Yes		
Mechanical				
Casing	Metal			
Dimensions	47 mm x 142 mm x 168 mm (W x L x H)			

Installation	DIN-Rail and wall mount			
Environment				
Operating Temperature	-20 ~ +70 °C	-15 ~ +55 °C	-20 ~ +70 °C	-15 ~ +55 °C
Storage Temperature	-40 ~ +80 °C	-20 ~ +70 °C	-40 ~ +80 °C	-20 ~ +70 °C
Humidity	5~90% RH, non-condensing			

2.2.2 G-4500-SIM340 Specifications

Item		G-4500-SIM340	G-4500D-SIM340	G-4500P-SIM340	G-4500PD-SIM340
CPU		80 MHz internal microprocessor			
SRAM/Flash		512K/512K , real time clock, watchdog timer			
NVRAM		31 bytes, battery backup, data valid up to 10 years			
EEPROM		16 KB, retention > 40 years. 1,000,000 erase/write cycles			
Comm. Interface					
COM ports		COM1:5-wire RS-232; COM2: RS-485; COM3:3-wire RS-232			
Ethernet		10/100 Base-TX Ethernet controller			
GPRS Interface					
Frequency Band		Quad-band 850/900/1800/1900 MHz			
GPRS connectivity		GPRS class 10/8; GPRS station class B			
DATA GPRS		Downlink transfer: Max. 85.6 kbps; Uplink transfer: Max 42.8kbps			
SMS		MT, MO, CB, Text and PDU mode			
GPS Interface					
Support Channels		-		32	
Sensitivity		-		Tracking = up to -159 dBm (with external LNA)	
				Cold start = up to -146 dBm (with external LNA)	
Acquisition Time		-		Hot start (Open Sky) = 2 s(typical)	
				Cold start (Open Sky) = 36 s(typical)	
Protocol Support		-		NMEA 0183 version 3.01	
LCD Interface					
General	Effective display area	-	80.61 mm x 14.37 mm (W x H)	-	80.61 mm x 14.37 mm (W x H)
	Module Dimension	-	93 mm x 70 mm x 1.6 mm (W x H x T)	-	93 mm x 70 mm x 1.6 mm (W x H x T)
Life Time		-	Expected life is more than 100,000 hours under	-	Expected life is more than 100,000 hours under normal

		normal operation		operation
Digital Output				
Output Channel	3			
Output Type	Open Collector (Sink/NPN)			
Load Voltage	+30 VDC max.			
Load Current	100 mA max.			
Isolated Voltage	Non-isolated			
Digital Input				
Input Channel	3			
Input Type	Source(Dry Type), Common Ground			
Off Voltage Level	+1 V max.			
On Voltage Level	+3.5 ~ +30 V			
Isolated Voltage	Non-isolated			
Analog Input				
Input Channel	8			
Resolution	12 - bit			
Input Range/Type	0 ~ 20 mA			
Sample Rate	1 KHz max. (Read one channel)			
Accuracy	+/- 2 LSB (+/- 0.01 mA)			
Power				
Protection	Power reverse polarity protection			
Frame Ground Protection	ESD, Surge, EFT, Hi-Pot			
Power Requirement	15W; Unregulated +10 VDC ~ +30 VDC			
Power Consumption	Idle: 75 mA @ 24 VDC; Data Link: 150 ~ 400 mA (peak) @ 24 VDC			
LED Indicators				
System	Red			
GPRS	Yellow			
GPS	Green	Yes		
Mechanical				
Casing	Metal			
Dimensions	47 mm x 142 mm x 168 mm (W x L x H)			
Installation	DIN-Rall and wall mount			

Environment				
Operating Temperature	-20 ~ +70 °C	-15 ~ +55 °C	-20 ~ +70 °C	-15 ~ +55 °C
Storage Temperature	-40 ~ +80 °C	-20 ~ +70 °C	-40 ~ +80 °C	-20 ~ +70 °C
Humidity	5~90% RH, non-condensing			

2.2.3 GD-4500-SIM340 Specifications

Item		GD-4500-SIM340	GD-4500D-SIM340	GD-4500P-SIM340	GD-4500PD-SIM340
CPU		80 MHz internal microprocessor			
SRAM/Flash		512K/512K , real time clock, watchdog timer			
NVRAM		31 bytes, battery backup, data valid up to 10 years			
EEPROM		16 KB, retention > 40 years. 1,000,000 erase/write cycles			
Comm. Interface					
COM ports		COM1:5-wire RS-232; COM2: RS-485; COM3:3-wire RS-232			
Ethernet		10/100 Base-TX Ethernet controller			
GPRS Interface					
Frequency Band		Quad-band 850/900/1800/1900 MHz			
GPRS connectivity		GPRS class 10/8; GPRS station class B			
DATA GPRS		Downlink transfer: Max. 85.6 kbps; Uplink transfer: Max 42.8kbps			
SMS		MT, MO, CB, Text and PDU mode			
GPS Interface					
Support Channels		-		32	
Sensitivity		-		Tracking = up to -159 dBm (with external LNA)	
				Cold start = up to -146 dBm (with external LNA)	
Acquisition Time		-		Hot start (Open Sky) = 2 s(typical)	
				Cold start (Open Sky) = 36 s(typical)	
Protocol Support		-		NMEA 0183 version 3.01	
LCD Interface					
General	Effective display area	-	80.61 mm x 14.37 mm (W x H)	-	80.61 mm x 14.37 mm (W x H)
	Module Dimension	-	93 mm x 70 mm x 1.6 mm (W x H x T)	-	93 mm x 70 mm x 1.6 mm (W x H x T)
Life Time		-	Expected life is more than 100,000 hours under normal operation	-	Expected life is more than 100,000 hours under normal operation

Digital Output		
Output Channel	3	
Output Type	Open Collector (Sink/NPN)	
Load Voltage	+30 VDC max.	
Load Current	100 mA max.	
Isolated Voltage	Non-isolated	
Digital Input		
Input Channel	3	
Input Type	Source(Dry Type), Common Ground	
Off Voltage Level	+1 V max.	
On Voltage Level	+3.5 ~ +30 V	
Isolated Voltage	Non-isolated	
Analog Input		
Input Channel	8	
Resolution	12 - bit	
Input Range/Type	0 ~ 20 mA	
Sample Rate	1 KHz max. (Read one channel)	
Accuracy	+/- 2 LSB (+/- 0.01 mA)	
Power		
Protection	Power reverse polarity protection	
Frame Ground Protection	ESD, Surge, EFT, Hi-Pot	
Power Requirement	15W; Unregulated +10 VDC ~ +30 VDC	
Power Consumption	Idle: 75 mA @ 24 VDC; Data Link: 150 ~ 400 mA (peak) @ 24 VDC	
LED Indicators		
System	Red	
GPRS	Yellow	
GPS	Green	Yes
Mechanical		
Casing	Plastic	
Dimensions	60 mm x 140 mm x 172 mm (W x L x H)	
Installation	DIN-Rall and wall mount	
Environment		

Operating Temperature	-20 ~ +70 °C	-15 ~ +55 °C	-20 ~ +70 °C	-15 ~ +55 °C
Storage Temperature	-40 ~ +80 °C	-20 ~ +70 °C	-40 ~ +80 °C	-20 ~ +70 °C
Humidity	5~90% RH, non-condensing			

2.2.4 G-4500-2G Specifications

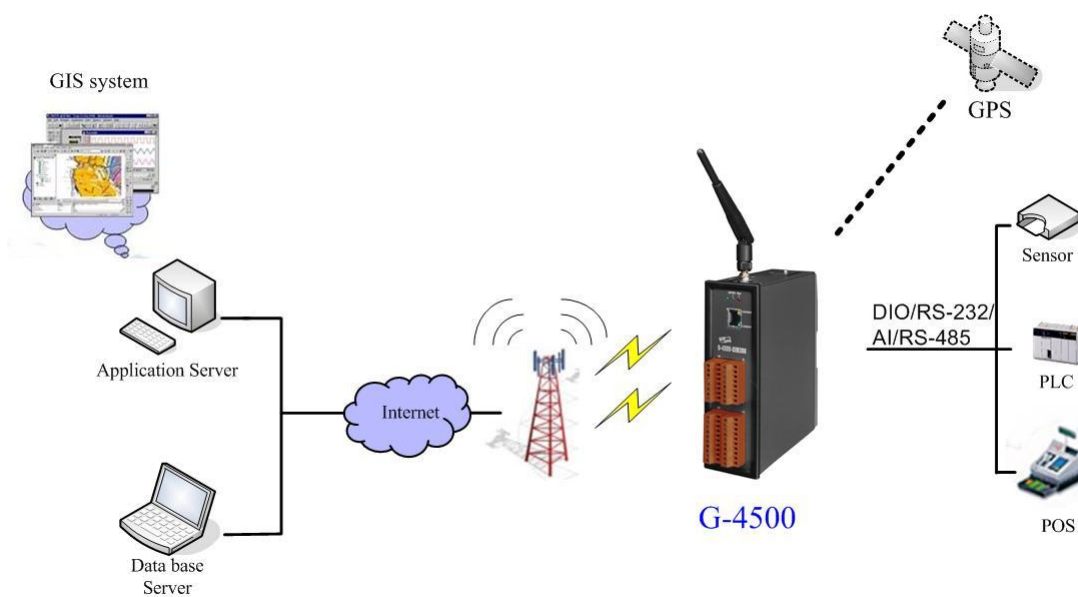
Item		G-4500-2G	G-4500D-2G	G-4500P-2G	G-4500PD-2G
CPU		80 MHz internal microprocessor			
SRAM/Flash		512K/512K , real time clock, watchdog timer			
NVRAM		31 bytes, battery backup, data valid up to 10 years			
EEPROM		16 KB, retention > 40 years. 1,000,000 erase/write cycles			
Comm. Interface					
COM ports		COM1:5-wire RS-232; COM2: RS-485; COM3:3-wire RS-232			
Ethernet		10/100 Base-TX Ethernet controller			
GPRS Interface					
Frequency Band		Quad-band 850/900/1800/1900 MHz			
GPRS connectivity		GPRS class 10/8; GPRS station class B			
DATA GPRS		Downlink transfer: Max. 85.6 kbps; Uplink transfer: Max 42.8kbps			
SMS		MT, MO, CB, Text and PDU mode			
GPS Interface					
Support Channels		-		32	
Sensitivity		-		Tracking = up to -159 dBm (with external LNA)	
				Cold start = up to -146 dBm (with external LNA)	
Acquisition Time		-		Hot start (Open Sky) = 2 s(typical)	
				Cold start (Open Sky) = 36 s(typical)	
Protocol Support		-		NMEA 0183 version 3.01	
LCD Interface					
General	Effective display area	-	80.61 mm x 14.37 mm (W x H)	-	80.61 mm x 14.37 mm (W x H)
	Module Dimension	-	93 mm x 70 mm x 1.6 mm (W x H x T)	-	93 mm x 70 mm x 1.6 mm (W x H x T)
Life Time		-	Expected life is more than 100,000 hours under	-	Expected life is more than 100,000 hours under normal

		normal operation		operation
Digital Output				
Output Channel	3			
Output Type	Open Collector (Sink/NPN)			
Load Voltage	+30 VDC max.			
Load Current	100 mA max.			
Isolated Voltage	Non-isolated			
Digital Input				
Input Channel	3			
Input Type	Source(Dry Type), Common Ground			
Off Voltage Level	+1 V max.			
On Voltage Level	+3.5 ~ +30 V			
Isolated Voltage	Non-isolated			
Analog Input				
Input Channel	8			
Resolution	12 - bit			
Input Range/Type	0 ~ 20 mA			
Sample Rate	1 KHz max. (Read one channel)			
Accuracy	+/- 2 LSB (+/- 0.01 mA)			
Power				
Protection	Power reverse polarity protection			
Frame Ground Protection	ESD, Surge, EFT, Hi-Pot			
Power Requirement	15W; Unregulated +10 VDC ~ +30 VDC			
Power Consumption	Idle: 75 mA @ 24 VDC; Data Link: 150 ~ 400 mA (peak) @ 24 VDC			
LED Indicators				
System	Red			
GPRS	Yellow			
GPS	Green		Yes	
Mechanical				
Casing	Metal			
Dimensions	47 mm x 142 mm x 168 mm (W x L x H)			
Installation	DIN-Rail and wall mount			

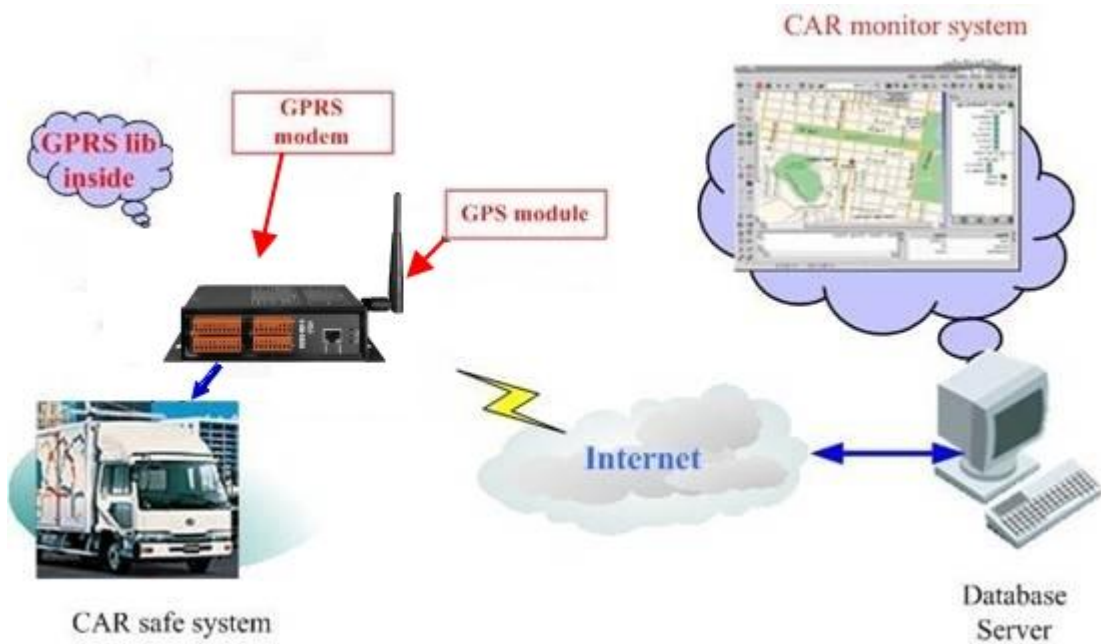
Environment				
Operating Temperature	-20 ~ +70 °C	-15 ~ +55 °C	-20 ~ +70 °C	-15 ~ +55 °C
Storage Temperature	-40 ~ +80 °C	-20 ~ +70 °C	-40 ~ +80 °C	-20 ~ +70 °C
Humidity	5~90% RH, non-condensing			

Chapter 3 Application architecture

- On motion type equipment application
 - ✧ Motorcade management
 - ✧ The police usage the equipment.
- On stationary equipment application
 - ✧ Remote POS (Point Of Sale) terminals
 - ✧ Automatically trading machine
 - ✧ Water quality monitor



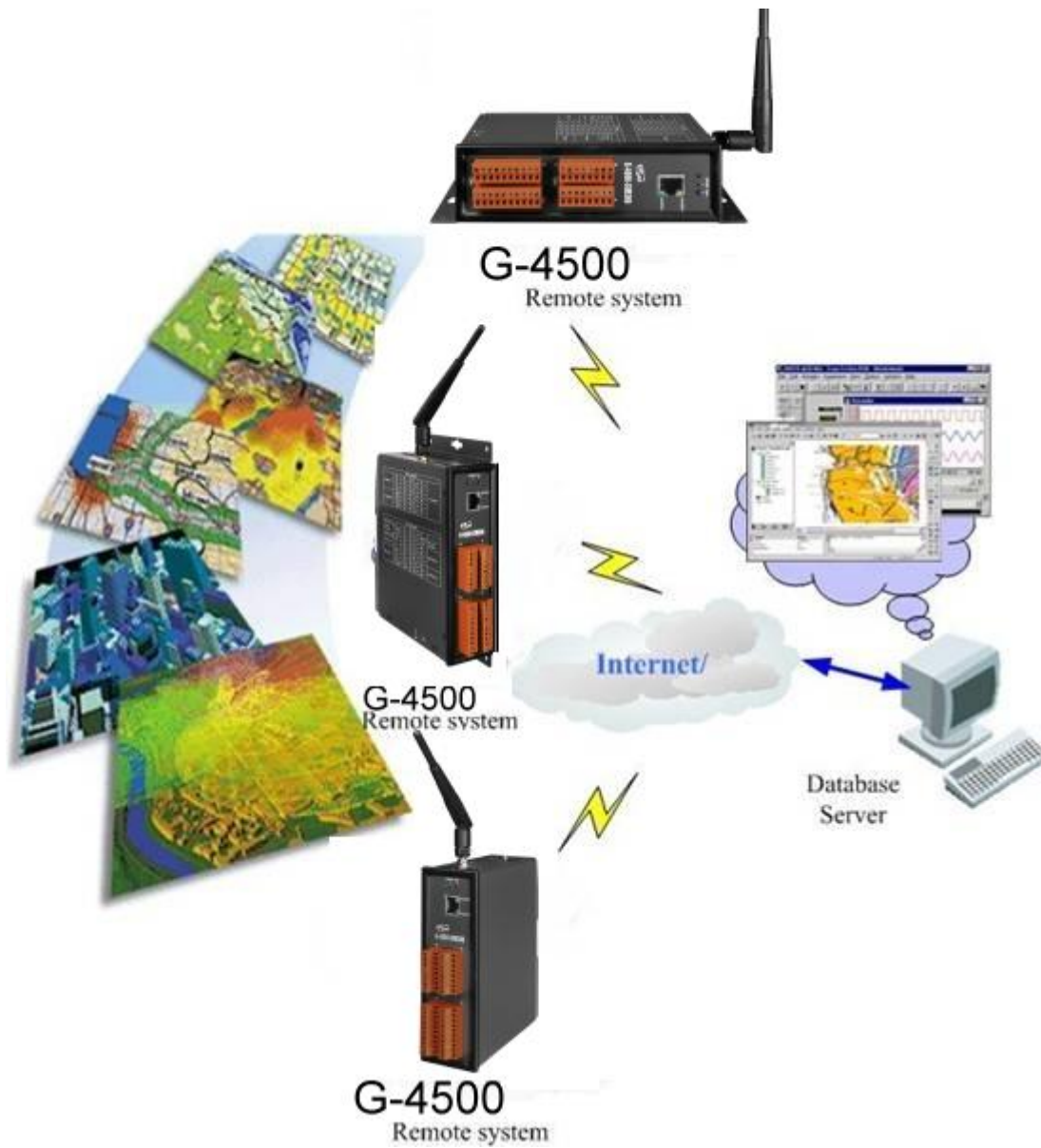
3.1 Car Monitor System



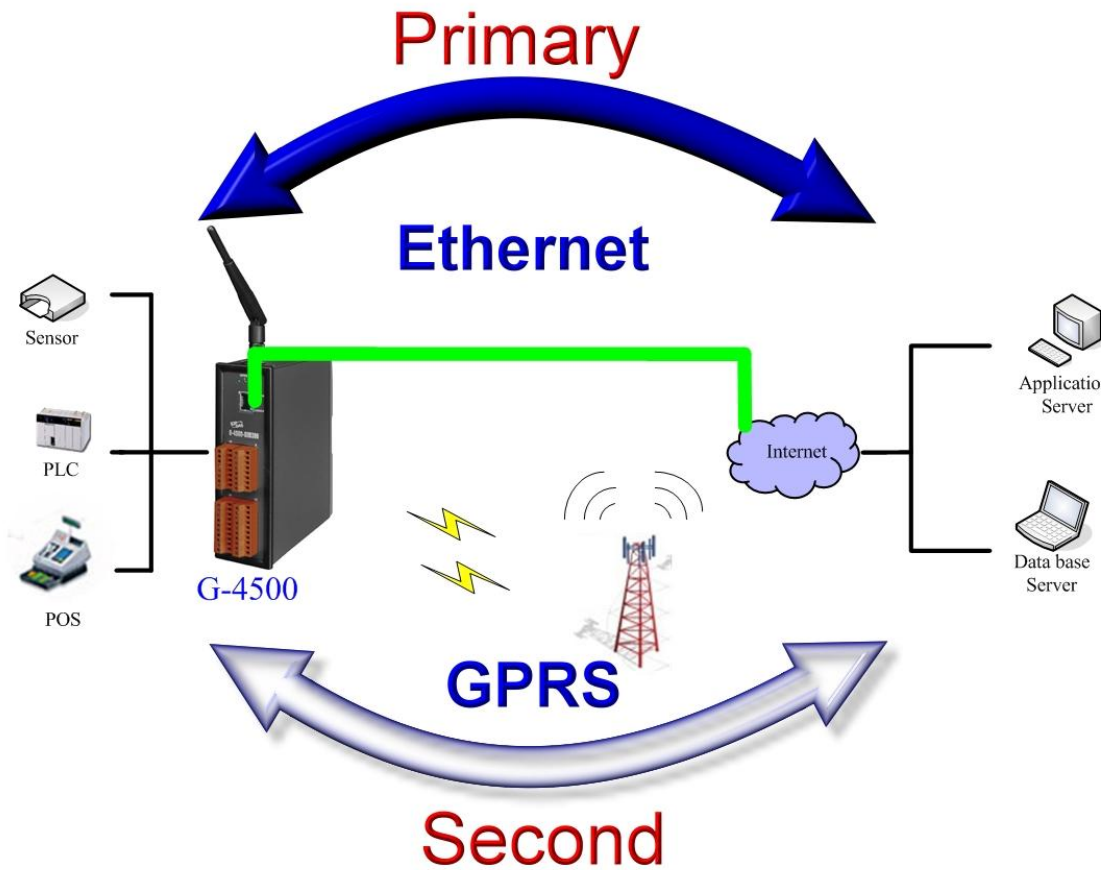
3.2 Remote Control/Monitor System



3.3 GIS system

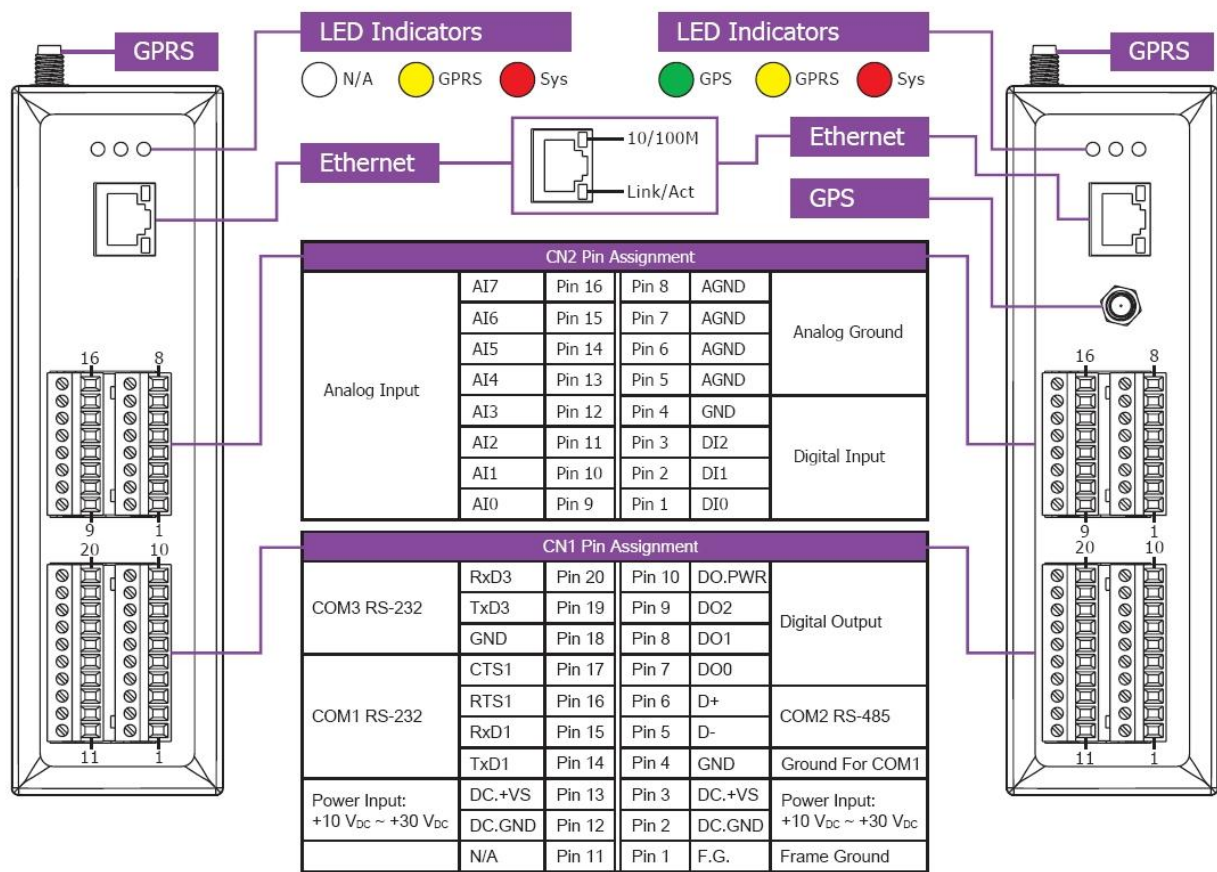


3.4 Redundance Communication system



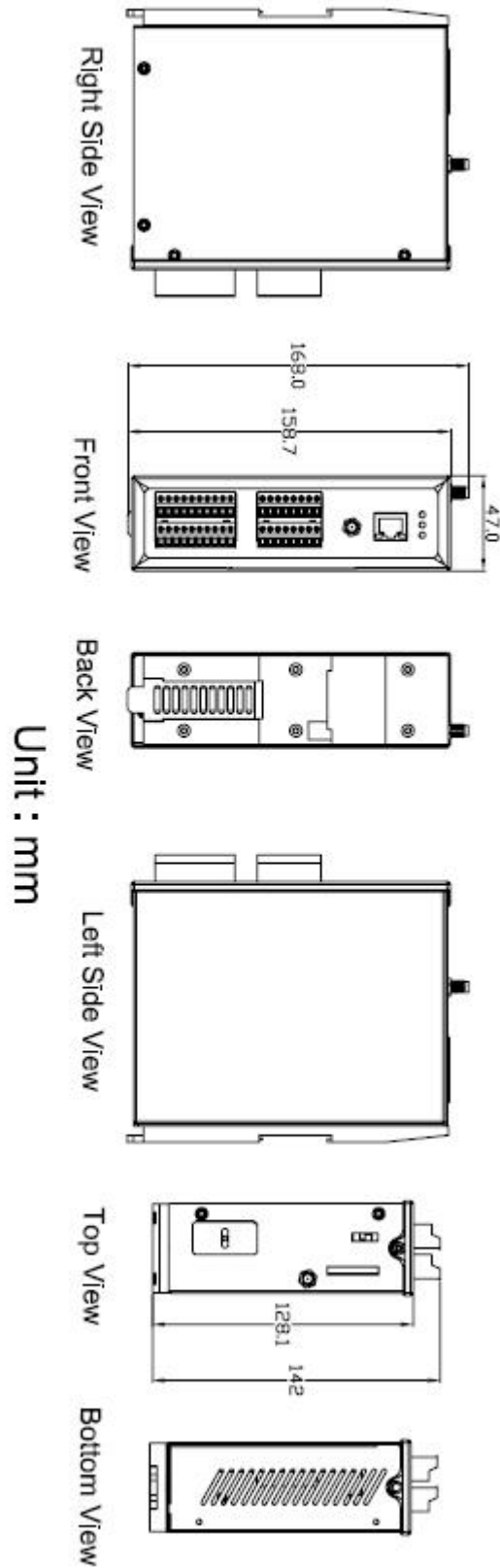
Chapter 4 Hardware Appearance

4.1 Pin Assignments

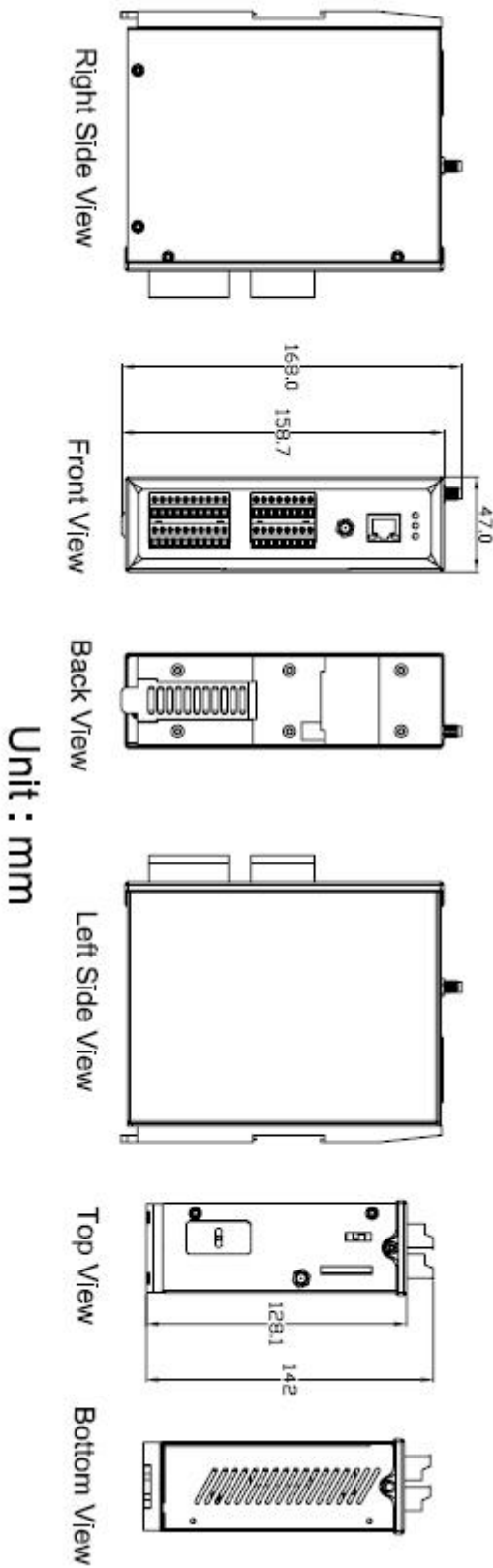


4.2 Hardward Dimensions

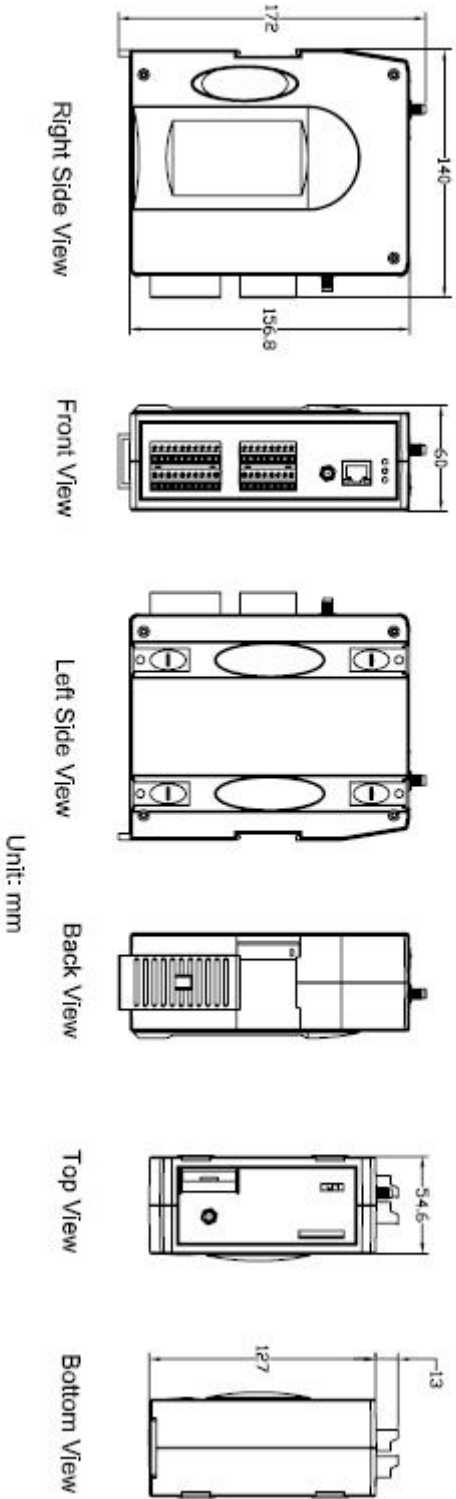
● G-4500-SIM300 Series



● G-4500-SIM340 Series



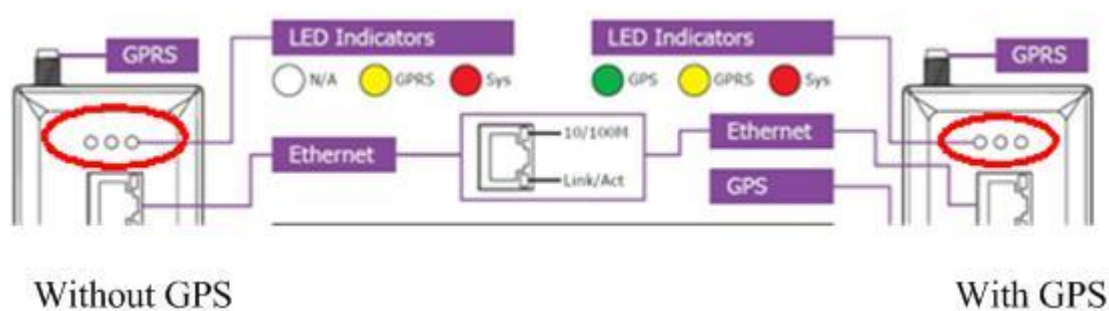
● GD-4500 Series



4.3 Operation Mode Switch

Operation Mode Switch	
RUN	OS can execute autoexec.bat
	Flash can be read/wirte.
LRun	OS can execute autoexec.bat
	Flash is read only (lock).
INIT	OS can not execute autoexec.bat
	Flash can be read/wirte.

4.4 LED indicators



There are three LED indicators to help users to judge the various conditions of G-4500. The description is as follows :

SYS(Red) : System LED is users programmable.

GSM (Yellow) : The modem LED can indicate the status of GSM module.

Modem normal	Modem fail
Blanking (3 sec)	Off or Blanking (not 3 sec)

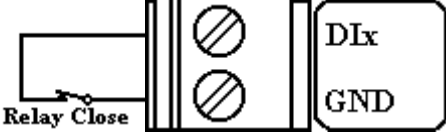
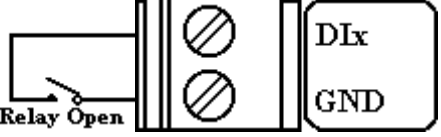
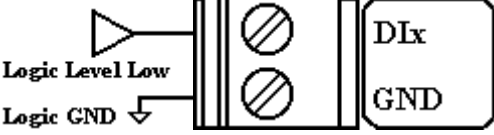
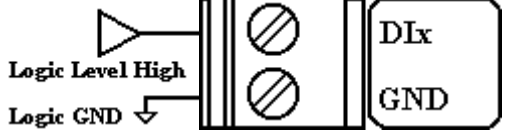
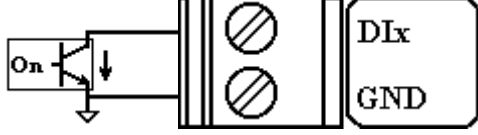

GPS (Green)(Option) : The GPS LED can indicate the status of GPS module.

GPS Fail	Search GPS	Receive GPS data
Always off	Always on	Blanking (1 sec)

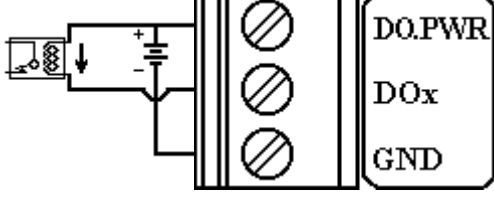
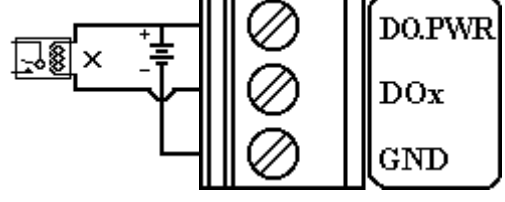
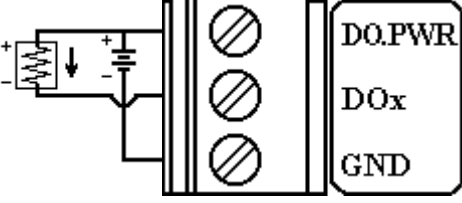
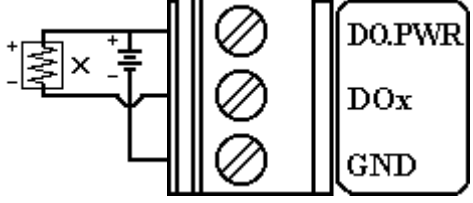
Chapter 5 Hardware Wire Connection

5.1 Wire Connection

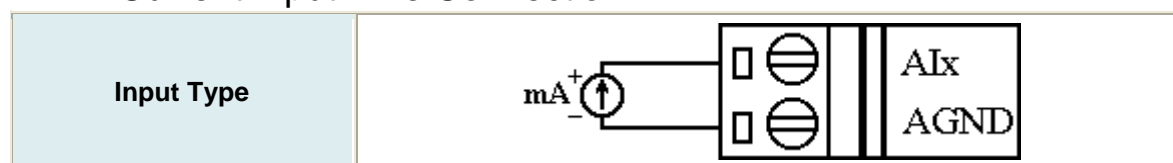
➤ Digital Input Wire Connection

Input Type	ON State DI value as 0	OFF State DI value as 1
Relay Contact		
TTL/CMOS Logic		
Open Collector		

➤ Digital Output Wire Connection

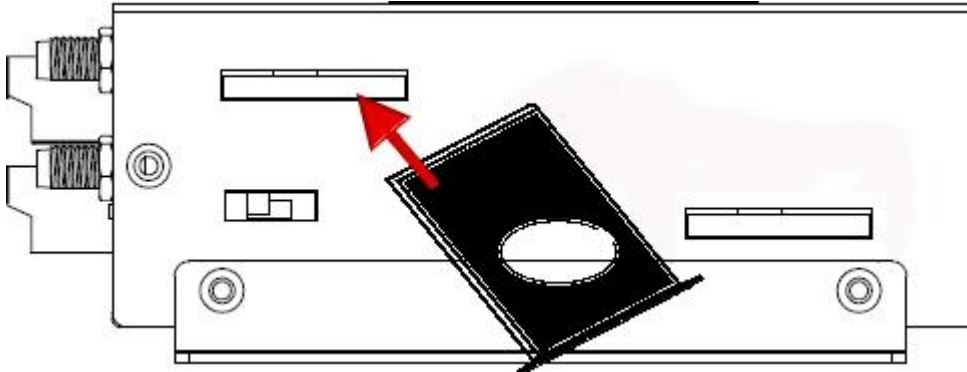
Input Type	ON State DO value as 1	OFF State DO value as 0
Drive Relay		
Resistance Load		

➤ Current Input Wire Connection

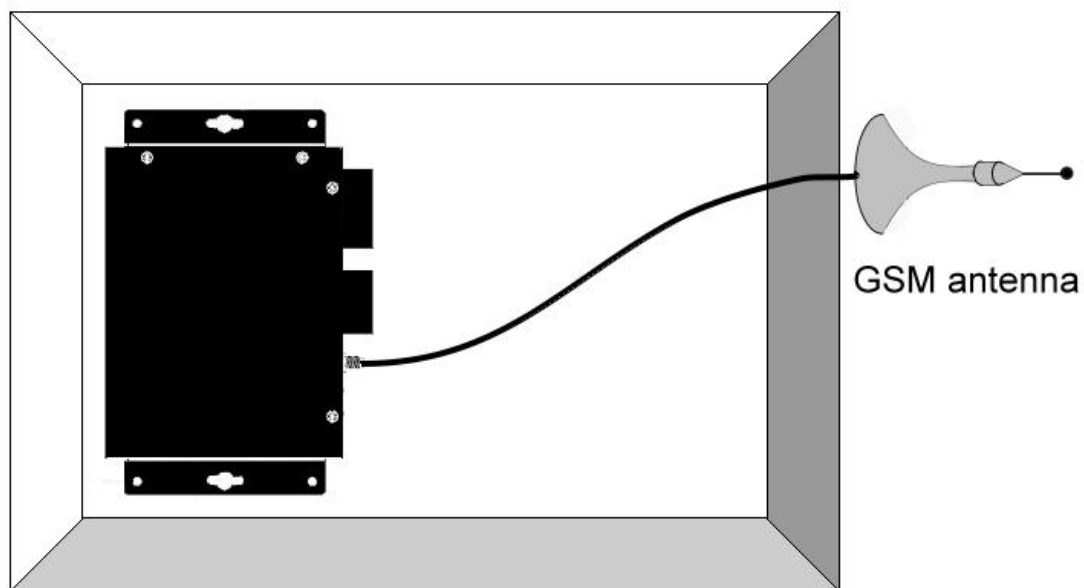


5.2 GPRS/GSM Installation

SIM Card Installation

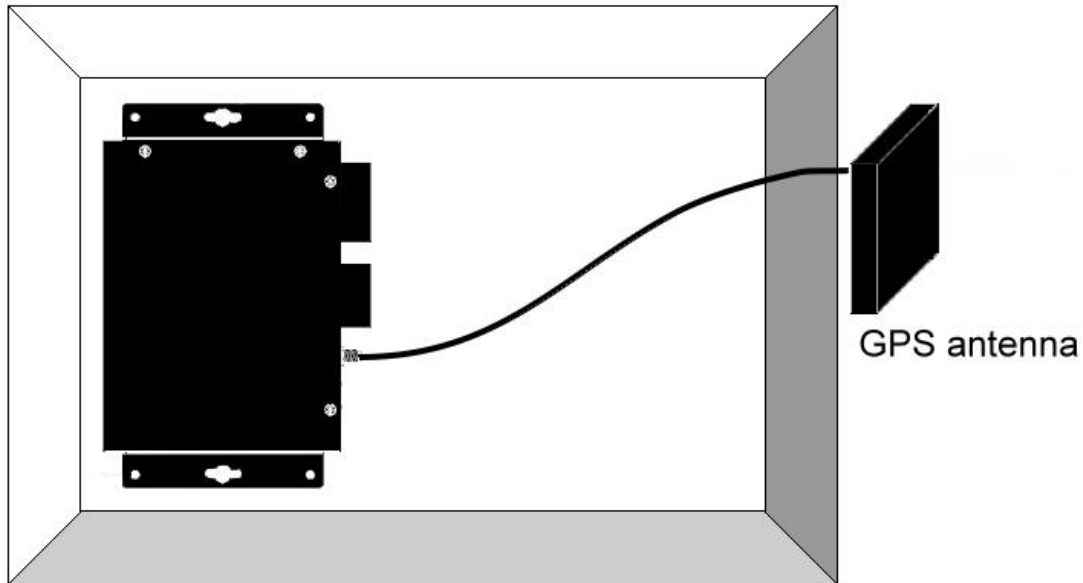


GPRS/GSM Antenna Installation



5.3 GPS Installation

GPS Antenna Installation



Chapter 6 Function Introduction

6.1 IO Library Function Definition and Description

Function definition	Description
X305IO_Init	Initial I/O
X305IO_GetLibVersion	Get X305IO_LIB Version
X305IO_Read_AD_CalibrationGain	Read AD Calibration Gain
X305IO_Read_AD_CalibrationOffset	Read AD Calibration Offset
X305IO_AnalogIn	Read value from assign AI channel
X305IO_Read_All_DI	Read All DI
X305IO_Read_One_DI	Read the value form assign DI channel
X305IO_Write_All_DO	Write All DO
X305IO_Write_One_DO	Write the value to the assign DO channel
X305IO_Read_All_DO	Read All DO state
X305IO_Read_One_DO	Read the DO state form the assign DO channel.
X305IO_AnalogIn_SetChannel	Set the AI channel that users want to read.
X305IO_AnalogIn_Hex	Read the value from the specific A/D channel (12 bits)
X305IO_AnalogIn_HexToFloat	Transfer the AI value from 12 bits to float

6.1.1 X305IO_Init

- **Description:**
Initial X305IO.
- **Syntax:**
int X305IO_Init(void)
- **Parameter:**
None
- **Return:**
Return value: 0 ==> success
 <>0 ==> error

6.1.2 X305IO_GetLibVersion

- **Description:**
Get X305IO_Lib Version.
- **Syntax:**
unsigned X305IO_GetLibVersion(void)
- **Parameter:**
None
- **Return:**
Version Number

6.1.3 X305IO_Read_AD_CalibrationGain

- **Description:**
Read the A/D Calibration Gain.
- **Syntax:**
float X305IO_Read_AD_CalibrationGain(void)
- **Parameter:**
None
- **Return:**
Calibration Gain of the AD channels

6.1.4 X305IO_Read_AD_CalibrationOffset

- **Description:**
Read the A/D Calibration Offset.
- **Syntax:**
float X305IO_Read_AD_CalibrationOffset (void)
- **Parameter:**
None
- **Return:**
Calibration Offset of the AD channels

6.1.5 X305IO_AnalogIn

- **Description:**
Read the value from the assign AI channel.
- **Syntax:**
`float X305IO_AnalogIn(int iChannel)`
- **Parameter:**
iChannel = 0~7 ----> ch0~ch7
- **Return:**
0.0mA ~ 20.0mA

6.1.6 X305IO_Read_All_DI

- **Description:**
Read all DI values of the G-4500.
- **Syntax:**
`int X305IO_Read_All_DI(void)`
- **Parameter:**
None
- **Return:**
0x00~0x07
- **Example:**
When DI0 Ground
 DI1 Open
 DI2 Open

`value = X305IO_Read_All_DI();`

`value=0x6`

6.1.7 X305IO_Read_One_DI

- **Description:**
Read the value from the assign DI channel.
- **Syntax:**
int X305IO_Read_One_DI(int iChannel)
- **Parameter:**
iChannel = 0~2----> ch0~ch2
- **Return:**
Return 1 => open
Logic high level (+3.5V ~ +30V)
Return 0 => close to GND
Logic low level (0V ~ +1V)

6.1.8 X305IO_Write_All_DO

- **Description:**
Write to all DO values of the G-4500 series.
- **Syntax:**
`void X305IO_Write_All_DO(int iOutValue)`
- **Parameter:**
`iOutValue = 0x0~0x7`
- **Return:**
None
- **Example:**
`X305IO_Write_All_DO(6);`

After function execute

DO0 OFF

DO1 ON

DO2 ON

6.1.9 X305IO_Write_One_DO

- **Description:**
Write the specific value to the assign DO channel.
- **Syntax:**
`void X305IO_Write_One_DO(int iChannel, int iStatus)`
- **Parameter:**
iChannel = 0~2----> ch0~ch2

iStatus = 1 => Status is ON
iStatus = 0 => Status is OFF
- **Return:**
None

6.1.10 X305IO_Read_All_DO

- **Description:**
Read all DO values of the G-4500 series.
- **Syntax:**
int X305IO_Read_All_DO(void)
- **Parameter:**
None
- **Return:**
0x0~0x7
- **Example:**
When DO0 OFF
DO1 ON
DO2 ON

Value= X305IO_Read_All_DO();

Value=0x6

6.1.11 X305IO_Read_One_DO

- **Description:**
Read the state from the assign DO channel.
- **Syntax:**
`int X305IO_Read_One_DO(int iChannel)`
- **Parameter:**
iChannel = 0~2----> ch0~ch2
- **Return:**
Return 1 => ON
Return 0 => OFF

6.1.12 X305IO_AnalogIn_SetChannel

- **Description:**
Set the specific AI channel that users want to read.
- **Syntax:**
int X305IO_AnalogIn_SetChannel(unsigned iChannel)
- **Parameter:**
iChannel = 0~7----> ch0~ch7
- **Return:**
Return 0 => Set up success
Return -1 => Set iChannel number error

6.1.13 X305IO_AnalogIn_Hex

- **Description:**
Read the value of the assign AI channel assigned by X305IO_AnalogIn_SetChannel function.
- **Syntax:**
`int X305IO_AnalogIn_Hex(void)`
- **Parameter:**
None
- **Return:**
After Read assign AI channel value.
- **Example:**
`X305IO_AnalogIn_SetChannel(0); // Set channel 0`
`X305IO_AnalogIn_Hex();`

6.1.14 X305IO_AnalogIn_HexToFloat

- **Description:**
Set the AI value from 12 bits to float format.
- **Syntax:**
`float X305IO_AnalogIn_HexToFloat(int iValue)`
- **Parameter:**
A value want to 12 bits transform float.
- **Return:**
The transferred AI value by float format
- **Example:**
Set the channel 0 to read, and then transform the value to float.

`float AdValue;`

`X305IO_AnalogIn_SetChannel(0);`
`AdValue=X305IO_AnalogIn_HexToFloat(X305IO_AnalogIn_Hex());`

6.2 MMC/SD Library Function Definition and Description

Function definition	Description
PC_Ertfs_Init	Configure ERTFS drive letter/device mapping and initialize device drivers.
PC_Open	Open a file
PC_Read	Read bytes from the file
PC_Write	Write Bytes to the file
PC_Close	Close the file and flush the file allocation table
Get_ErrNo	Get Error code
PC_lseek	Move file pointer
PC_MKDir	Create a subdirectory
PC_RMDir	Delete a directory
PC_deltree	Delete a directory tree
PC_MV	Rename a file or directory
PC_IsDir	Test if a path is a directory
PC_Pwd	Return the current working directory
PC_Get_Attributes	Get File Attributes
PC_Set_Attributes	Set File Attributes

Note: Before using these functions, users must format the MMC/SD card as FAT16 from the PC.

6.2.1 PC_Ertfs_Init

- **Description:**
Configure ERTFS drive letter/device mapping and initialize device drivers.
- **Syntax:**
BOOLEAN pc_ertfs_init(void)
- **Parameter:**
None
- **Return:**
Return value: True ==> success
 Fail ==> no success

6.2.2 PC_Open

- **Description:**

Open/Create the file from MMC/SD card with the specific mode.

- **Syntax:**

PCFD pc_open(char *name, word flag, word mode)

- **Parameter:**

Name :

The file path in MMC/SD card

Flag :

PO_APPEND - Seek to eof on each write.
 PO_BINARY - Ignored. All file access is binary.
 PO_TEXT - Ignored.
 PO_RDONLY - Open for read only
 PO_RDWR - Read/write access allowed.
 PO_WRONLY - Open for write only.
 PO_CREAT - Create the file if it does not exist.
 PO_EXCL - If flag has (PO_CREAT | PO_EXCL) and the file already exists,
 fail and set get_errno() to PEEXIST.
 PO_TRUNC - Truncate the file if it already exists.
 PO_NOSHAREANY - Fail if the file is already open.
 PO_NOSHAREWRITE - Fail if the file is already open for write.

Mode :

PS_IWRITE - Write permitted.
 PS_IREAD - Read permitted. (Always true anyway)

- **Return:**

Returns a non-negative integer to be used as a file descriptor for calling po_read, po_write, po_lseek, po_flush, po_truncate, and po_close, otherwise it returns -1 and get_errno.

- **Example:**

This example below would show to open test1 file and set the file allowing read or write.

```
char *fname="test1\\test1.txt";
```

```
pc_ertfs_init();
```

```
pc_open(fname,
```

```
    (word) (PO_BINARY|PO_RDWR|PO_CREAT|PO_APPEND),
```

```
    (word) (PS_IWRITE | PS_IREAD) );
```

6.2.3 PC_Read

- **Description:**
Read bytes from a file.
- **Syntax:**
`int pc_read(PCFD fd, byte *buf, word count)`
- **Parameter:**
`fd` - file desc

`*buf` - data buf

`Count` - data length
- **Return:**
Returns the actual number of bytes read or 0xffff on error. If the return value is 0xffff, `get_errno` will return one of the following :
PEBADF - Invalid file descriptor
PENOSPC - Write failed. Presumably because of no space
- **Example:**

```
char *fname="test1\\test1.txt";
PCFD out_fd;
char bff[129];

pc_ertfs_init();
out_fd = pc_open(fname,
                (word) (PO_BINARY|PO_RDWR|PO_CREAT|PO_APPEND),
                (word) (PS_IWRITE | PS_IREAD) );

pc_read(out_fd, bff, 512);
```


6.2.4 PC_Write

- **Description:**

Write Bytes to a file.

- **Syntax:**

int pc_write(PCFD fd, byte *buf, word count)

- **Parameter:**

fd - file desc

*buf - write data buf

Count - data length

- **Return:**

Returns the actual number of bytes read or 0xffff on error. If the return value is 0xffff, get_errno will return one of the following :

PEBADF - Invalid file descriptor

PENOSPC - Write failed. Presumably because of no space

- **Example:**

This example will open test1 file, and set read/write is allowed. And write a data.

```
char *fname="test1\\test1.txt";
```

```
PCFD out_fd;
```

```
char bf[129],bff[129];
```

```
long testcnt=0;
```

```
int len;
```

```
pc_ertfs_init();
```

```
out_fd = pc_open(fname,
```

```
    (word) (PO_BINARY|PO_RDWR|PO_CREAT|PO_APPEND),
```

```
    (word) (PS_IWRITE | PS_IREAD) );
```

```
len=sprintf(bf,"Line:%09lu\r\n",testcnt++);
```

```
pc_write(out_fd,bf,len);
```

6.2.5 PC_Close

- **Description:**
Close a file.
- **Syntax:**
`int pc_close(PCFD fd)`
- **Parameter:**
`fd` - file desc
- **Return:**
Returns 0 if all went well, otherwise -1. If -1 is returned, `get_errno` will return one of these values:
 - PEBADF - Invalid file descriptor
 - PENOSPC - Write failed. Presumably because of no space

6.2.6 Get_ErrNo

- **Description:**
Get error code.
- **Syntax:**
`int get_errno(void)`
- **Parameter:**
None
- **Return:**
 - 2 ==> PENOENT - File not found or path to file not found.
 - 9 ==> PEBADF - Invalid file descriptor.
 - 13==> PEACCESS - Attempt to open a read only file or a special (directory).
 - 17 ==> PEEXIST - Exclusive access requested but file already exists.
 - 22 ==> PEINVAL - Seek to negative file pointer attempted.
 - 24 ==> PEMFILE - No file descriptors available (too many files open).
 - 28 ==> PENOSPC - Write failed. Presumably because of no space.
 - 30 ==> PESHARE - Open failed do to sharing.
 - 31 ==> PEDVICE - No Valid Disk Present.
 - 32 ==> PEBADDIR - DELTREE -- Directory structure corrupt.

6.2.7 PC_lseek

- **Description:**

Move file pointer.

- **Syntax:**

long pc_lseek(PCFD fd, long offset, int origin)

- **Parameter:**

fd - file desc

offset –offset value

origin:

PSEEK_SET - offset from beginning of file

PSEEK_CUR - offset from current file pointer

PSEEK_END - offset from end of file

- **Return:**

If success, Returns new offset value, otherwise -1. If -1 is returned, get_errno will return one of these values:

PEBADF - Invalid file descriptor

PEINVAL - Seek to negative file pointer attempted

6.2.8 PC_MKDir

- **Description:**
Create a subdirectory.
- **Syntax:**
BOOLEAN pc_mkdir(char *name)
- **Parameter:**
Name : Name of directory to be created.
- **Return:**
Returns TRUE if the subdirectory was created, otherwise FALSE. If FALSE is returned, get_errno will return one of these values:
 PENOENT - Directory not found
 PEEXIST - File or directory already exists
 PENOSPC - Write failed
- **Example:**
pc_mkdir("USR\\LIB");

6.2.9 PC_RMDir

- **Description:**

Delete the directory specified in path. Fails if path is not a directory, is read only or is not empty.

- **Syntax:**

BOOLEAN pc_rmdir(char *name)

- **Parameter:**

Name : Name of directory to be deleted.

- **Return:**

TRUE if the directory was successfully removed, otherwise FALSE. If FALSE is returned, get_errno will return one of these values:

PENOENT - Directory not found

PEACCES - Not a directory, not empty or in use

PENOSPC - Write failed

6.2.10 PC_deltree

- **Description:**
Delete the directory specified in name, all subdirectories of that directory, and all files contained therein. Fail if name is not a directory, is read only or is currently in use.
- **Syntax:**
BOOLEAN pc_deltree(char *name)
- **Parameter:**
Name : Name of directory tree to be deleted.
- **Return:**
Returns TRUE if the directory was successfully removed. If FALSE is returned, get_errno will return one of these values:
 - PENOENT - Directory not found or path to file not found
 - PEACCES - Not a directory, not empty or in use
 - PENOSPC - Write failed

6.2.11 PC_MV

- **Description:**

Renames the file oldpath to newname. Fails if newname is invalid, already exists or oldpath is not found.

- **Syntax:**

BOOLEAN pc_mv(char *name, char *newname)

- **Parameter:**

Name : the file oldpath

Newname : New the file name

- **Return:**

Returns TRUE if the file was renamed, otherwise FALSE.

If FALSE is returned, get_errno will return one of these values:

PENOENT - Directory not found

PEEXIST - File or directory already exists

PENOSPC - Write failed

- **Example:**

```
if (!pc_mv("TEXT\\LETTER.TXT","TEXT\\NEWLETTER.TXT"))  
    Print("Can't rename LETTER.TXT\n");
```


6.2.12 PC_IsDir

- **Description:**
Test if a path is a directory.
- **Syntax:**
BOOLEAN pc_isdir(char *path)
- **Parameter:**
Path: The file path in MMC/SD card
- **Return:**
Returns TRUE if path points to a valid existing directory, otherwise FALSE.

6.2.13 PC_Pwd

- **Description:**
Return the current working directory.
- **Syntax:**
BOOLEAN pc_pwd(char *drive, char *path)
- **Parameter:**
Drive : ""

Path : return the current working directory.
- **Return:**
Returns TRUE if a valid path was returned in path, otherwise no if the current working directory could not be found.
- **Note:**
Return buffer must contain enough space to hold the full path.

6.2.14 PC_Get_Attributes

- **Description:**

Get File Attributes. Give a file name. Return the directory entry attributes associated with the entry.

One or more of the following values will be or'ed together:

BIT Nemonic

- 0 ARDONLY
- 1 AHIDDEN
- 2 ASYSTEM
- 3 AVOLUME
- 4 ADIRENT
- 5 ARCHIVE

- **Syntax:**

BOOLEAN pc_get_attributes(char *path, byte *p_return)

- **Parameter:**

Path: The file path in MMC/SD card

p_return: Return the directory entry attributes.

- **Return:**

Returns TRUE if successful, otherwise it returns FALSE and get_errno returns one of these values:

PENOENT

- **Example:**

byte attribs;

```
if(pc_get_attributes("test\\test1.txt", &attribs) {  
    if(attribs & ARDONLY)  
        Print("File is ARDONLY");  
    if(attribs & AHIDDEN)  
        Print("File is AHIDDEN");  
    if(attribs & ASYSTEM)  
        Print("File is ASYSTEM");  
    if(attribs & AVOLUME)  
        Print("File is AVOLUME");  
}
```

```
if(attrs & ADIRENT)
    Print("File is ADIRENT");
if(attrs & ARCHIVE)
    Print("File is ARCHIVE");
if(attrs & ANORMAL)
    Print("File is ANORMAL")
}
```

6.2.15 PC_Set_Attributes

- **Description:**

Set File Attributes. Given a file or directory name set the directory entry attributes associated with the entry. One or more of the following values may be or'ed together

BIT	Nemonic
0	ARDONLY
1	AHIDDEN
2	ASYSTEM
5	ARCHIVE

- **Syntax:**

BOOLEAN pc_set_attributes(char *path, byte attributes)

- **Parameter:**

Path: The file path in MMC/SD card

attributes: Set the directory entry attributes.

- **Return:**

Returns TRUE if successful, otherwise FALSE and get_errno will return one of these values:

PENOENT - Couldn't find the entry
PENOSPC - Write failed

- **Example:**

```
byte attribute;  
char *fname="test1\\test1.txt";  
attribute= ARDONLY | AHIDDEN;  
  
pc_set_attributes(fname,attribute);
```

6.3 LCD Library Function Definition and Description

Function definition	Description
LCD_Init	Initialize the library
LCD_BackLight_On	Turn on the LCD backlight
LCD_BackLight_Off	Turn off the LCD backlight
LCD_ShowText	Display one character on the LCD panel
LCD_DisplayNumber	Display number on the the LCD panel
LCD_SetNumber	Display one number on the specified position
LCD_ClrNumber	Clear the displayed number by one character position
LCD_ClrScrn	Clear the LCD panel
LCD_StandByMode	Enter the stand by mode
LCD_NormalMode	Restore the LCD to normal mode
LCD_GotoPosition	Move the cursor to the specified position
LCD_CursorDisplay	Set the Cursor display status
LCD_LineReverse	Select one of four line and reverse the display
LCD_LineRestore	Select one of four line and restore the display
LCD_GetLibDate	Gets the create date of funciton library
LCD_GetLibVersion	Gets the version number of function library

6.3.1 LCD_Init

- **Description:**
Initialize parameters about LCD functions in the library.
- **Syntax:**
void LCD_Init(void)
- **Parameter:**
None
- **Return:**
None

6.3.2 LCD_BackLight_On

- **Description:**
Turn on the LCD backlight.
- **Syntax:**
`void LCD_BackLight_On(void)`
- **Parameter:**
None
- **Return:**
None

6.3.3 LCD_BackLight_Off

- **Description:**
Turn off the LCD backlight.
- **Syntax:**
void LCD_BackLight_Off(void)
- **Parameter:**
None
- **Return:**
None

6.3.4 LCD_ShowText

- **Description:**
Display one character on the LCD panel, and the cursor will right-shifted by one character position automatically.
- **Syntax:**
void LCD_ShowText(uchar Text)
- **Parameter:**
Text: Display character
- **Return:**
None

6.3.5 LCD_DisplayNumber

- **Description:**

After calling either the LCD_SetNumber or LCD_ClrNumber, it is necessary to call LCD_DisplayNumber to display number on the the LCD panel.

- **Syntax:**

void LCD_DisplayNumber(void)

- **Parameter:**

None

- **Return:**

None

6.3.6 LCD_SetNumber

- **Description:**
Display one number on the specified position.
- **Syntax:**
`void LCD_SetNumber(int Line, int Offset, int Number)`
- **Parameter:**
Line: One of two line numbers (1 to 2)
Offset: Cursor position (1 to 5)
Number: Display number
- **Return:**
None
- **Example:**
`LCD_SetNumber(1, 1, 0);`
`LCD_SetNumber(1, 2, 1);`
`LCD_DisplayNumber();`

6.3.7 LCD_ClrNumber

- **Description:**
Clear the displayed number by one character position.
- **Syntax:**
`void LCD_ClrNumber(int Line, int Offset)`
- **Parameter:**
Line: One of two line numbers (1 to 2)
Offset: Cursor position (1 to 5)
- **Return:**
None
- **Example:**
`LCD_ClrNumber(2, 3);`
`LCD_DisplayNumber();`

6.3.8 LCD_ClrScrn

- **Description:**
Clear the LCD panel.
- **Syntax:**
void LCD_ClrScrn(void)
- **Parameter:**
None
- **Return:**
None

6.3.9 LCD_StandByMode

- **Description:**
Enter the stand by mode, and it can be terminated by either LCD_NormalMode() or other function.
- **Syntax:**
void LCD_StandByMode(void)
- **Parameter:**
None
- **Return:**
None

6.3.10 LCD_NormalMode

- **Description:**
Restore the LCD to normal mode when it is in the stand by mode.
- **Syntax:**
void LCD_NormalMode(void)
- **Parameter:**
None
- **Return:**
None

6.3.11 LCD_GotoPosition

- **Description:**
Move the cursor to the specified position.
- **Syntax:**
`void LCD_GotoPosition(int Line, int Offset)`
- **Parameter:**
Line: One of four line numbers (1 to 4)
Offset: Cursor position (1 to 8)
- **Return:**
None

6.3.12 LCD_CursorDisplay

- **Description:**
Set the Cursor display status.
- **Syntax:**
void LCD_CursorDisplay(int Display, int Blink)
- **Parameter:**
Display: Cursor display on/off
 1: Display on
 0: Display off
Blink: Character blink on/off
 1: Display on
 0: Display off
- **Return:**
None

6.3.13 LCD_LineReverse

- **Description:**
Select one of four line and reverse the display.
- **Syntax:**
`void LCD_LineReverse(int Line)`
- **Parameter:**
Line: One of four line numbers (0 to 4)
- **Return:**
None

6.3.14 LCD_LineRestore

- **Description:**
Select one of four line and restore the display.
- **Syntax:**
`void LCD_LineRestore(int Line)`
- **Parameter:**
Line: One of four line numbers (0 to 4)
- **Return:**
None

6.3.15 LCD_GetLibDate

- **Description:**
Gets the create date of function library.
- **Syntax:**
`void LCD_GetLibDate(unsigned char *LibDate)`
- **Parameter:**
LibDate: Gets the create date of function library
- **Return:**
None

6.3.16 LCD_GetLibVersion

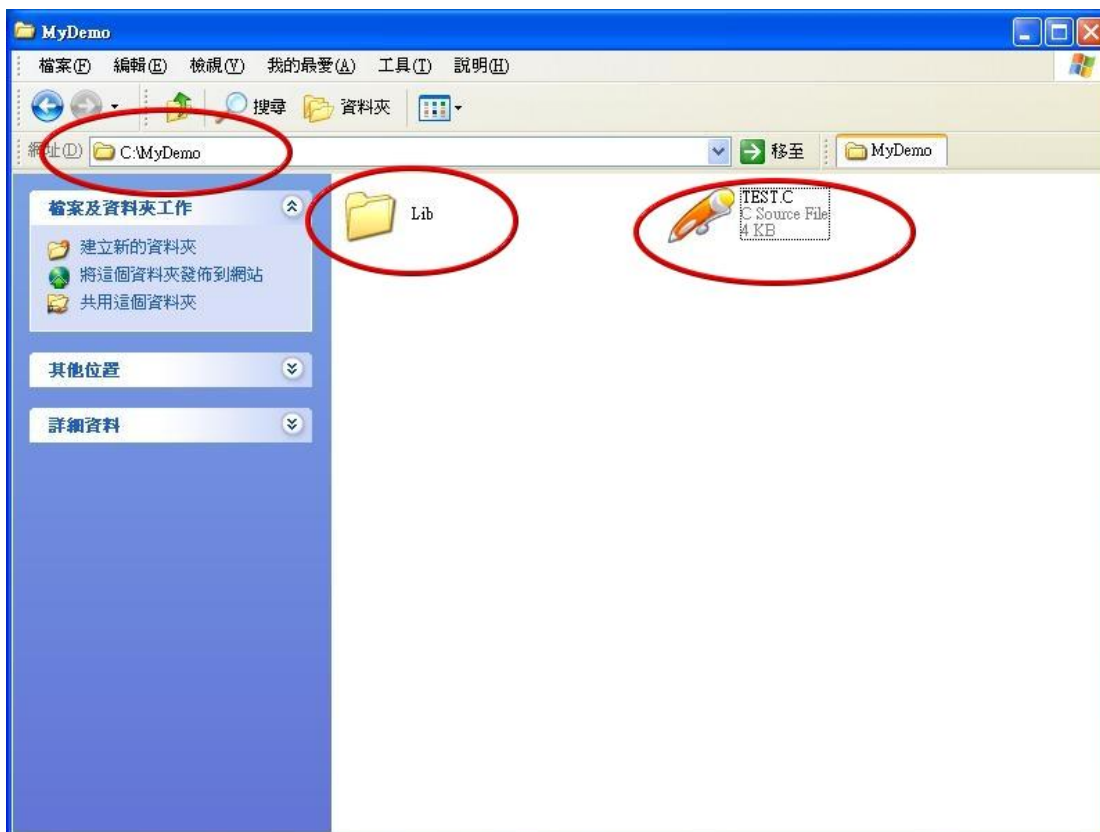
- **Description:**
Get the version number of function library.
- **Syntax:**
unsigned LCD_GetLibVersion(void)
- **Parameter:**
None
- **Return:**
Return the current version number.

Chapter 7 Program Download Procedure

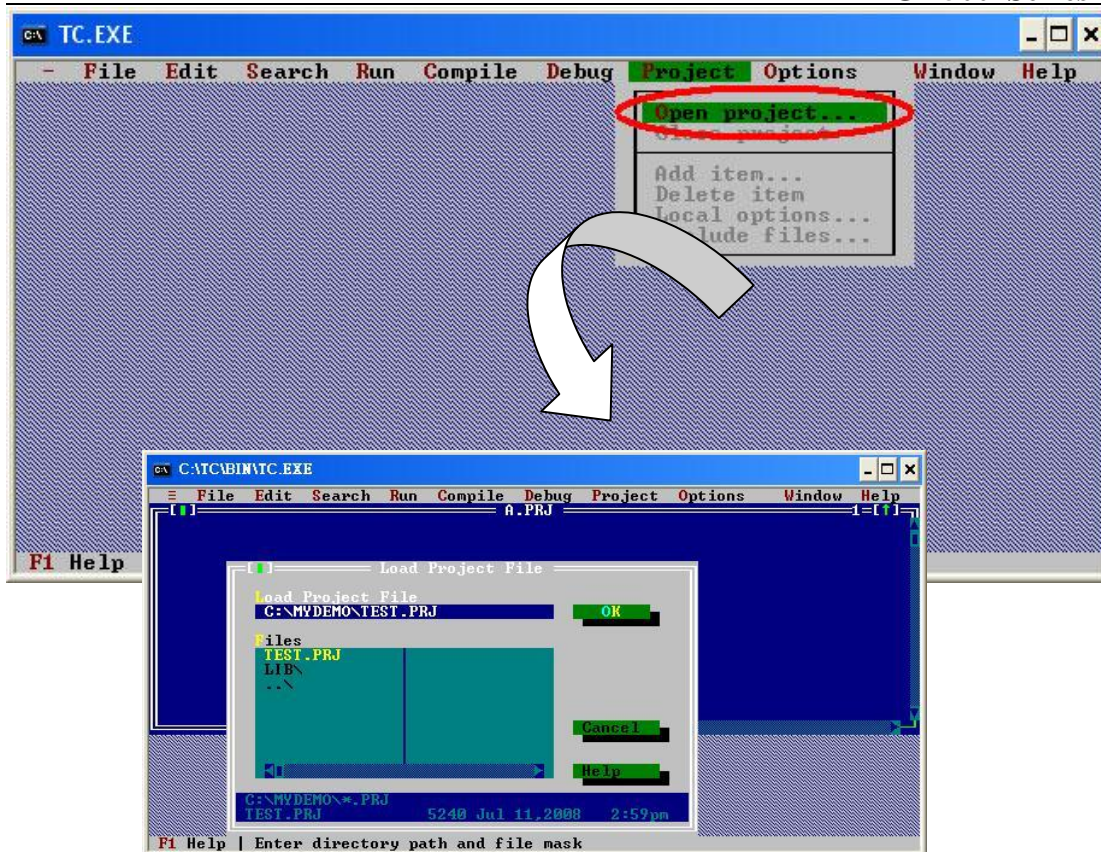
Here, it is considered that how to build an execution file and how to run this program on the G-4500 series.

Library	Description	Remark
G4500.LIB	G-4500 and DI/O 、AI functions	
GPRS.LIB	GPRS functions	
MMC_FS4.LIB	MMC/SD functions	
TCP_DM32.LIB	Ethernet functions	
LCD.LIB	LCD functions	

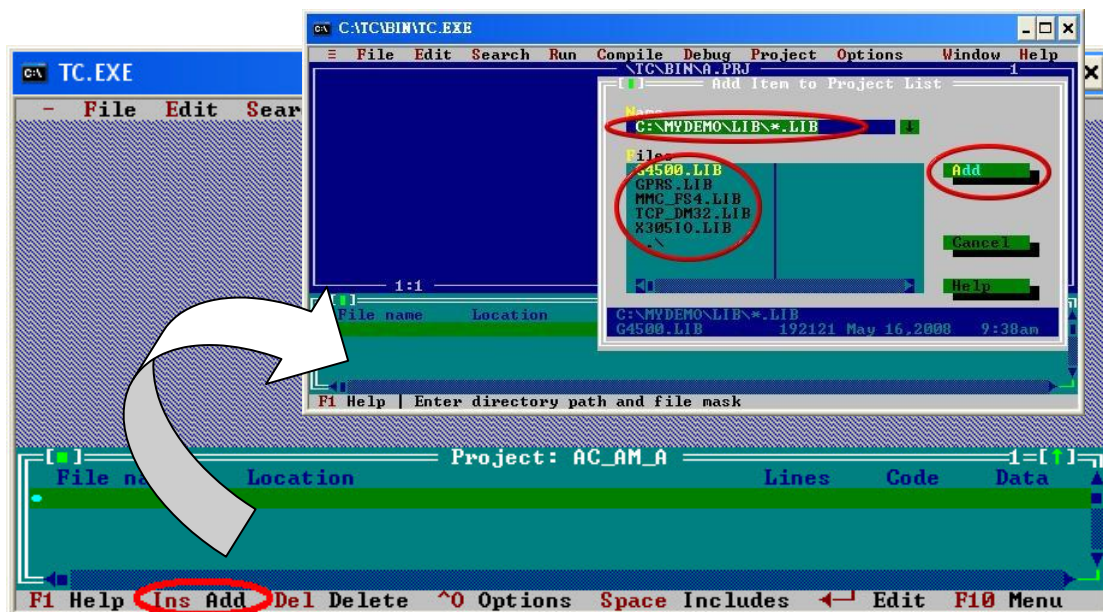
Step1: Create a folder name “MyDemo” in the C disk, and copy the lib folder and users program into the MyDemo folder.



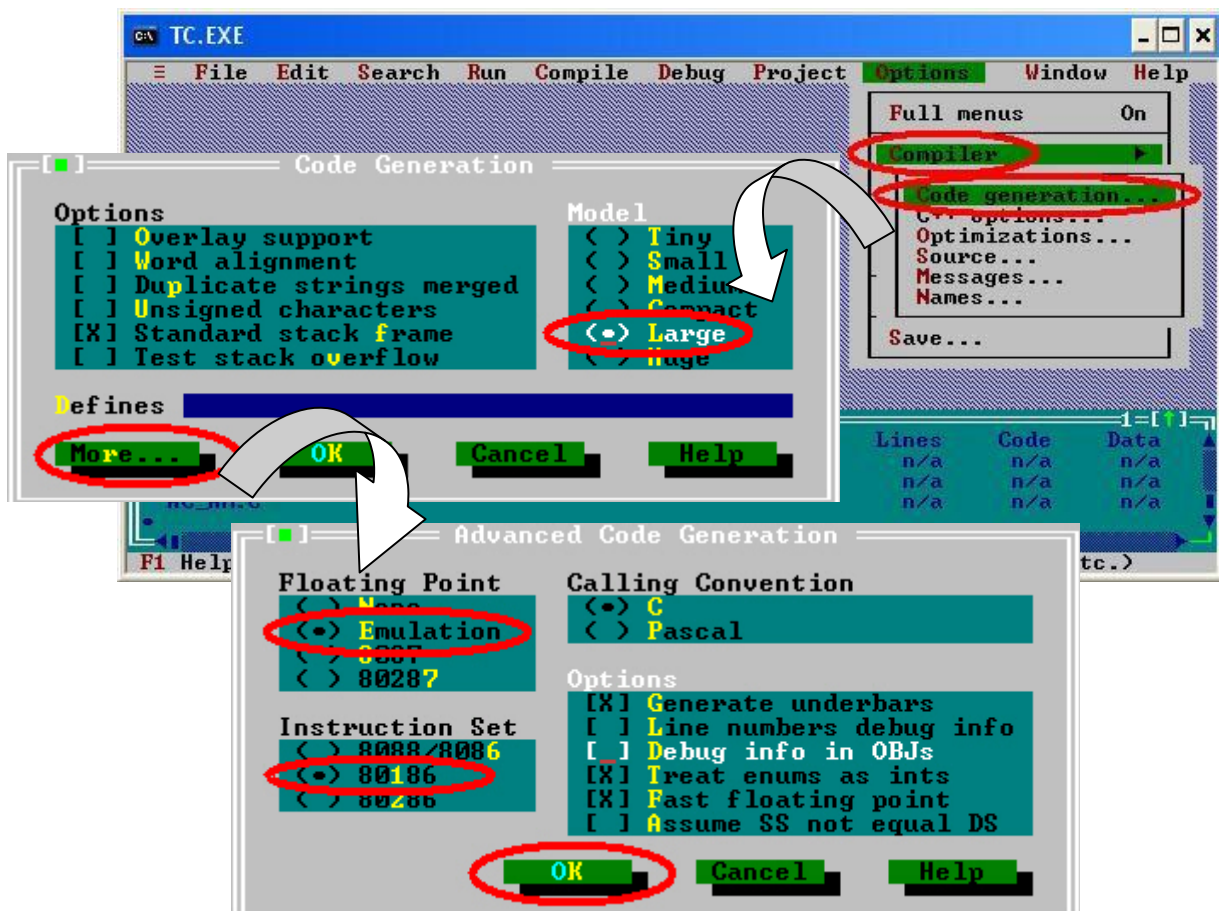
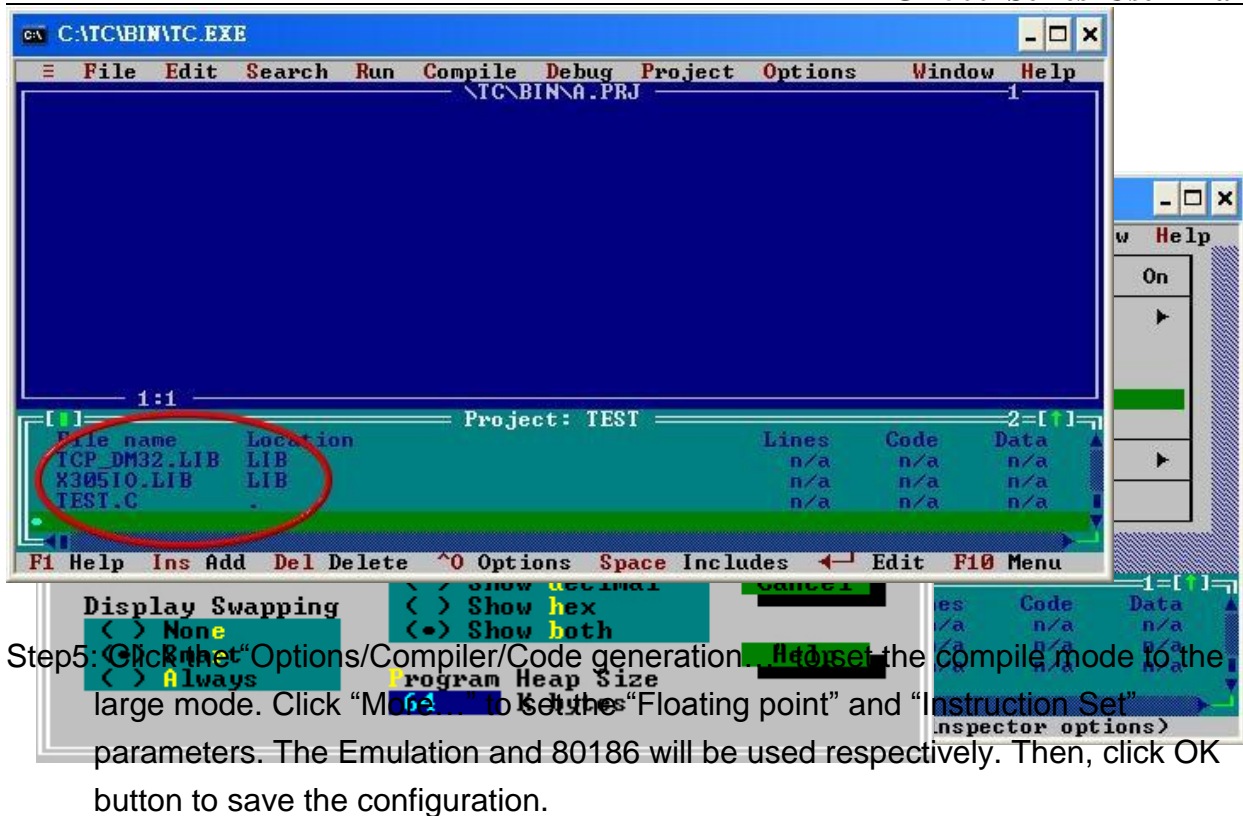
Step2: Run the TC++1.01 development. Click the “Project\Open project...” create new project named “TEST.PRJ”.



Step3: Use the “Add” function to add the library file into MyDemo project ◦

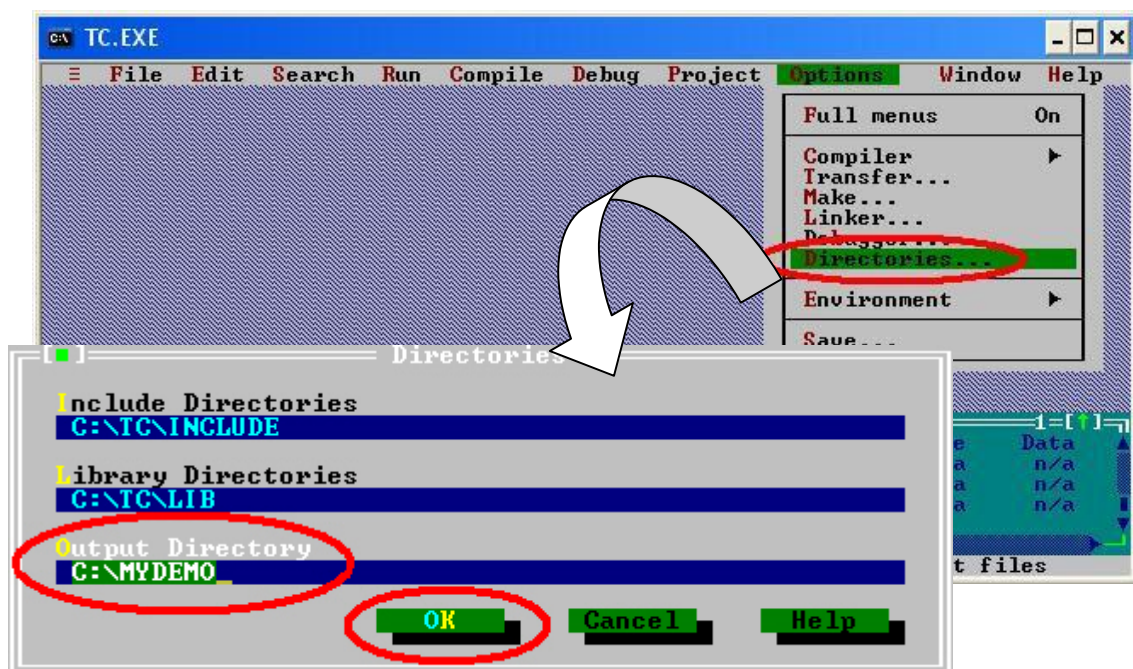


Step4: Following the step3, add another library and TEST.C into MyDemo project.

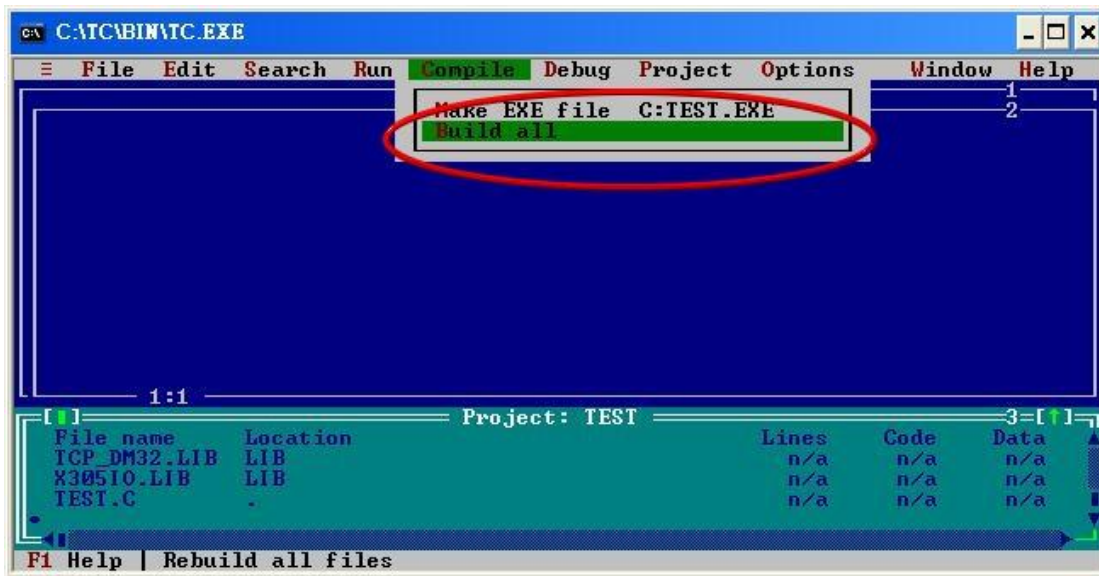


select the “None” for the “Source Debugging”.

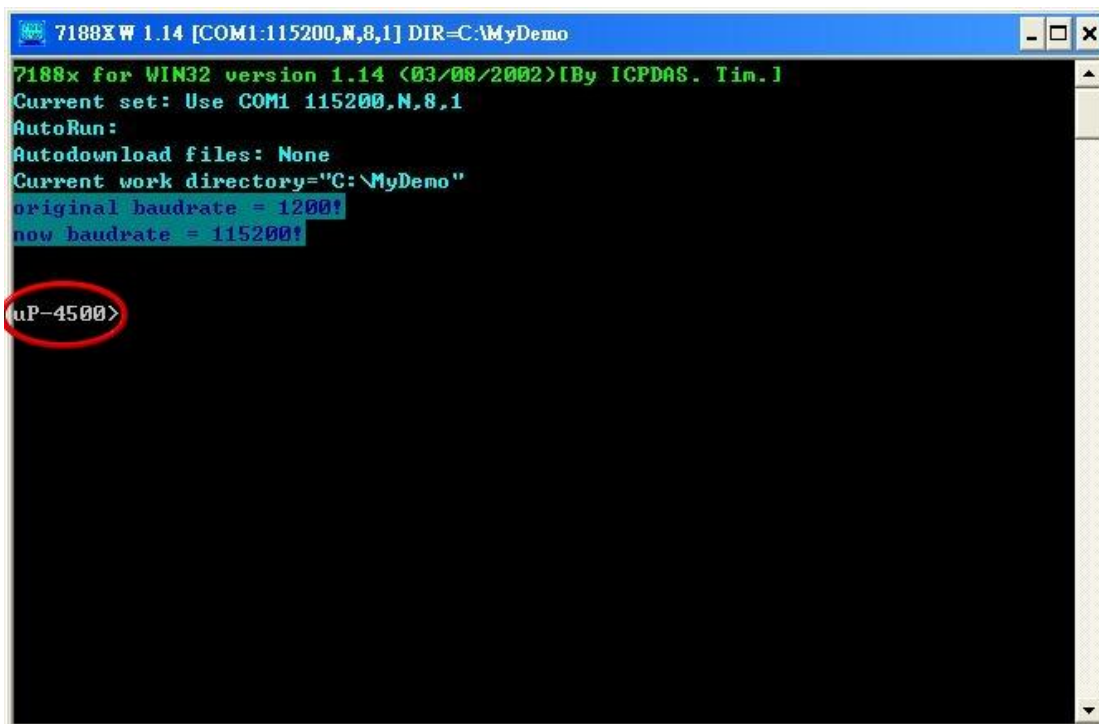
Step7: Click the “Option/Directories...” to set the “Output Directory” parameter. Here, set the “C:\MyDemo” for the “Output Directory” parameter.



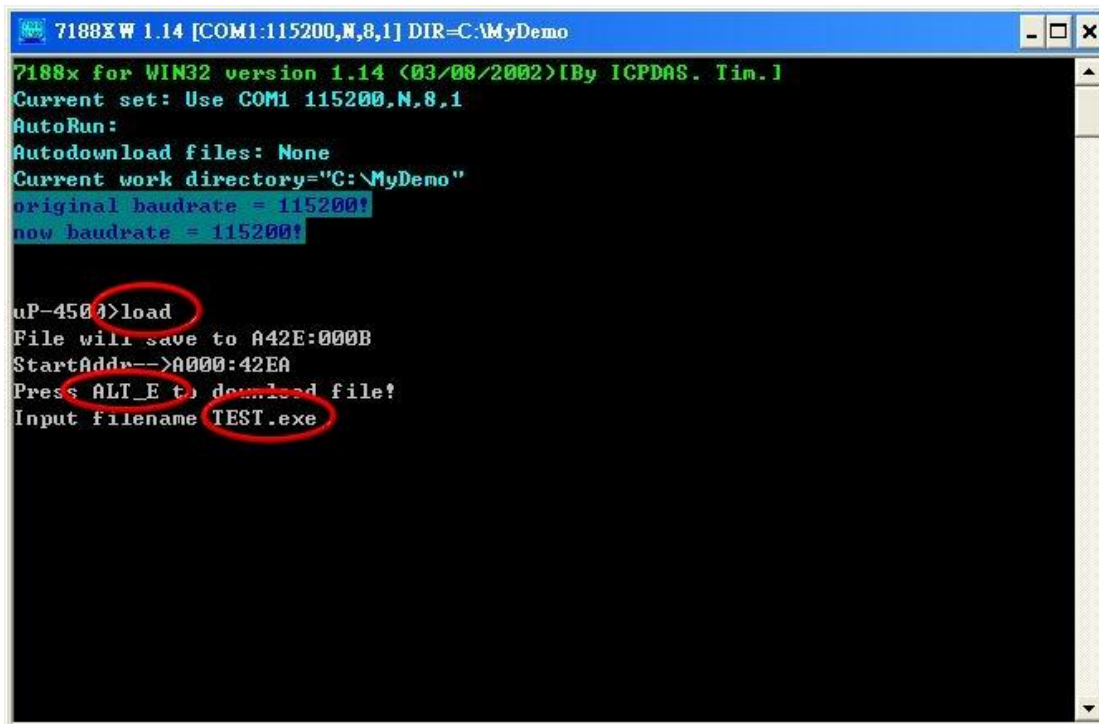
Step8: After finishing all the parameters setting, click the “Compile/build all” to produce the execution file name “TEST.exe”.



Step9: Copy the file 7188XW.exe into the MyDemo folder. Then, double-click the 7188XW.exe file. The 7188XW.exe can be found in the Osimage folder. And G-4500 series COM1 connected to the PC RS-232 .



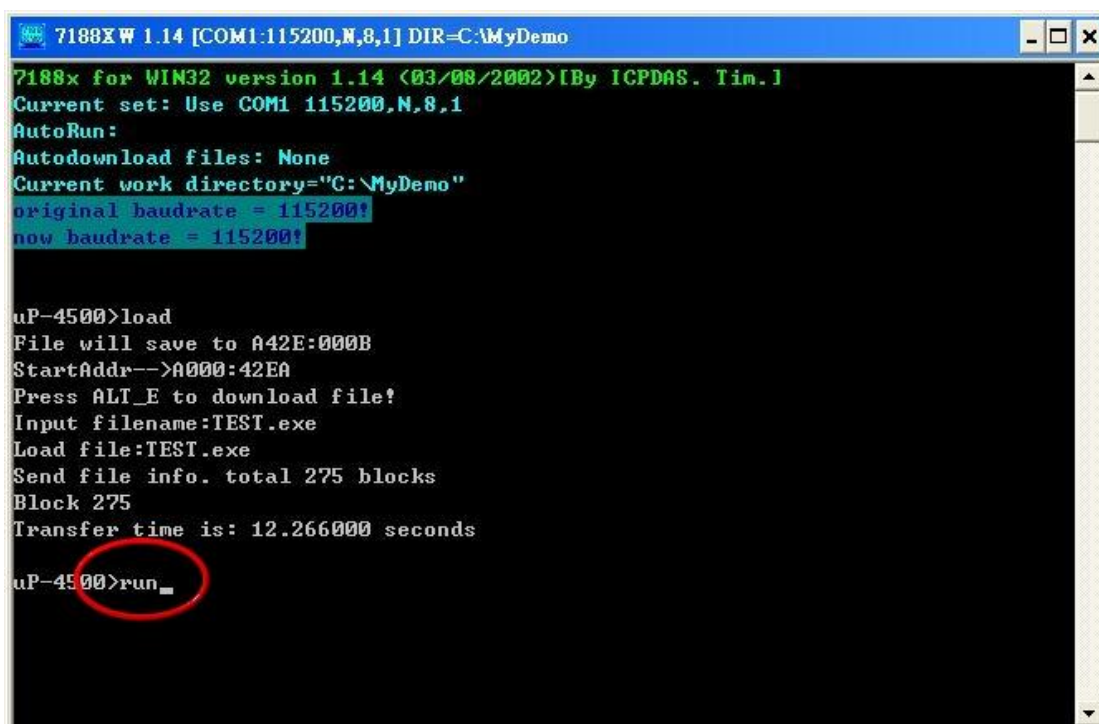
Step10: Key the command, "load" in the 7188xw.exe program. Then, follow the hint command to press "Alt+E" and input the file name, "TEST.exe ", to download the execution file.



```
7188XW 1.14 [COM1:115200,N,8,1] DIR=C:\MyDemo
7188x for WIN32 version 1.14 (03/08/2002)[By ICPDAS. Tim.]
Current set: Use COM1 115200,N,8,1
AutoRun:
Autodownload files: None
Current work directory="C:\MyDemo"
original baudrate = 115200!
now baudrate = 115200!

uP-4500>load
File will save to A42E:000B
StartAddr-->A000:42EA
Press ALT_E to download file!
Input filename TEST.exe
```

Step11: After finishing the download procedure, key in the command, “run”, to implement the execution file, “TEST.exe”.



```
7188XW 1.14 [COM1:115200,N,8,1] DIR=C:\MyDemo
7188x for WIN32 version 1.14 (03/08/2002)[By ICPDAS. Tim.]
Current set: Use COM1 115200,N,8,1
AutoRun:
Autodownload files: None
Current work directory="C:\MyDemo"
original baudrate = 115200!
now baudrate = 115200!

uP-4500>load
File will save to A42E:000B
StartAddr-->A000:42EA
Press ALT_E to download file!
Input filename:TEST.exe
Load file:TEST.exe
Send file info. total 275 blocks
Block 275
Transfer time is: 12.266000 seconds

uP-4500>run
```

Version Record

Version	By	Date	Description
1.0.1	Yide	2008/07/14	
1.0.2	Yide	2008/09/12	
1.0.3	Yide	2008/10/08	
1.0.4	Yide	2008/10/15	
1.05	Yide	2009/04/09	
1.06	Yide	2009/05/13	
1.07	Yide	2009/10/08	
1.08	Yide	2009/11/30	
1.09	Yide	2009/12/29	
1.10	Yide	2010/06/10	
1.11	Yide	2010/07/26	
1.12	Yide	2010/08/24	
1.13	Yide	2010/11/10	