

FALCOM A2(D)-3

User Manual Firmware GPS/ALARM

Version 1.8

Contents

0	INTRODUCTION	3
0.1	USED ABBREVIATIONS.....	3
0.2	RELATED DOCUMENTS.....	3
0.3	SAFETY	4
0.4	SAFETY STANDARDS	7
1	GSM MODULE FALCOM A2(D)-3, A2(D)-3GPS	8
2	FUNCTIONAL OVERVIEW.....	9
2.1	SIM CARD	9
2.2	SERIAL INTERFACE	9
2.3	GPS CONNECTION.....	9
2.4	LED'S FOR FUNCTIONAL DISPLAY	10
3	FUNCTIONAL DESCRIPTION.....	11
3.1	COMMAND SUMMARY	11
3.2	OBTAINING GPS POSITION DATA &REQ POS, &REQ INT, &REQ FIX, &REQ LAST	14
3.3	REQUEST OR CLEAR STORED MESSAGES &REQ FAIL, &CLR FAIL.....	15
3.4	REQUEST OR CLEAR SMS MESSAGES &REQ SMS, &CLR SMS.....	15
3.5	REQUEST CONFIGURATION &REQ CNF, &REQ TM, &REQ HELP.....	16
3.6	DEVICE CONFIGURATION &CNF GSM, &CNF GPS, &RESET.....	17
3.7	MESSAGE CONFIGURATION &CNF MSG, &CNF MODE.....	18
3.8	POLL EVENT CONFIGURATION &CNF CLIP.....	20
3.9	SETUP INPUT EVENTS &CNF BOOT, &CNF KEY.....	21
3.10	INITIATE OUTPUT ACTIONS &CNF PORT.....	22
3.11	PASSING OR CHANGING THE PASSWORD &PASS.....	23
3.12	PASSING OF GPS COMMANDS &CNF NMEA.....	23
3.13	SETUP FIRMWARE LICENCE NUMBER &LICENCE.....	24
3.14	DEBUGGING AND UPDATE &SYSTEM, &DEBUG.....	24
4	TECHNICAL DATA	27

Version history

Version number	Author	Changes
1.4	R.Georgi	Latest version for GSM module A2-3
1.5	R.Georgi	A2D support, added new features and commands
1.6	R.Georgi	Support licence key
1.7	R.Georgi	GPS answer mode
1.8	R.Georgi	Bugfixes, Release Notes GPSV1.53

0 Introduction

This manual is focussed on the GSM data solutions of the FALCOM A2(D)-3 series from FALCOM GmbH. It contains information about the FALCOM A2(D)-3, A2(D)-3GPS GSM modem and phone with the GPS/ALARM firmware. It does not contain special information about the GSM related accessories, as there are the dial-handset, the hands free set, the external battery pack and the mobile data terminals, which are also sold by FALCOM.

Information furnished herein by FALCOM GmbH is believed to be accurate and reliable. However, no responsibility is assumed for its use. Also the information contained herein is subject to change without notice.

Users are advised to proceed quickly to the “Security” chapter and read the hints carefully.

0.1 Used abbreviations

ETSI	European Telecommunications Standards Institute
GSM	Global System for Mobile communications
IMEI	International Mobile station Equipment Identity
ME	Mobile Equipment
PLMN	Public Land Mobile Network
PIN	Personal Identification Number
PUK	Personal Unblocking Key
RP	Receive Protocol
RXQUAL	Received Signal Quality
SIM	Subscriber Identity Module
SMS	Short Message Service
SMS/PP	Short Message Service/Point-to-Point
TA	Terminal Adapter
TE	Terminal Equipment
TP	Transmit Protocol

0.2 Related documents

- ETSI GSM 07.05 “Use of Data Terminal Equipment - Data Circuit terminating Equipment interface for Short Message Service and Cell Broadcast Service“
- ETSI GSM 07.07 “AT command set for GSM Mobile Equipment”
- ITU-T V.25ter “Serial asynchronous automatic dialling and control”

0.3 Safety

IMPORTANT FOR THE EFFICIENT AND SAFE OPERATION OF YOUR GSM MODEM READ THIS INFORMATION BEFORE USE !

Your GSM modem is one of the most exciting and innovative electronic products ever developed. With it you can stay in contact with your office, your home, emergency services, and others, wherever service is provided.

GENERAL

Your modem utilises the GSM standard for cellular technology. GSM is a newer radio frequency (« RF ») technology than the current FM technology that has been used for radio communications for decades. The GSM standard has been established for use in the European community and elsewhere.

Your modem is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your modem, the cellular system handling your calls controls both the radio frequency and the power level of your cellular modem.

EXPOSURE TO RF ENERGY

There has been some public concern about possible health effects of using GSM modem. Although research on health effects from RF energy has focused for many years on the current RF technology, scientists have begun research regarding newer radio technologies, such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product is fit for use.

If you are concerned about exposure to RF energy there are things you can do to minimise exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your cellular modem efficiently by following the below guidelines.

EFFICIENT MODEM OPERATION

For your modem to operate at the lowest power level, consistent with satisfactory call quality :

If your modem has an extendible antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However your modem operates more efficiently with the antenna fully extended.

Do not hold the antenna when the modem is « IN USE ». Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

ANTENNA CARE AND REPLACEMENT

Do not use the modem with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician. Use only the supplied or approved antenna. Unauthorised antennas, modifications or attachments could damage the modem and may contravene local RF emission regulations or invalidate type approval.

DRIVING

Check the laws and regulations on the use of cellular devices in the area where you drive. Always obey them. Also, when using your modem while driving, please : give full attention to driving, pull off the road and park before making or answering a call if driving conditions so require. When applications are prepared for mobile use they should fulfil road-safety instructions of the current law!

ELECTRONIC DEVICES

Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However RF energy may affect some malfunctioning or improperly shielded electronic equipment.

VEHICLE ELECTRONIC EQUIPMENT

Check your vehicle manufacturer's representative to determine if any on board electronic equipment is adequately shielded from RF energy.

MEDICAL ELECTRONIC EQUIPMENT

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc...) to determine if they are adequately shielded from external RF energy.

Turn your modem **OFF** in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

AIRCRAFT

Turn your modem **OFF** before boarding any aircraft.

Use it on the ground only with crew permission.

Do not use in the air.

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your modem while the plane is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem whilst airborne.

CHILDREN

Do not allow children to play with your modem. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem, or make calls that increase your modem bills.

BLASTING AREAS

To avoid interfering with blasting operations, turn your unit **OFF** when in a « blasting area » or in areas posted : « turn off two-way radio ». Construction crew often use remote control RF devices to set off explosives.

POTENTIALLY EXPLOSIVE ATMOSPHERES

Turn your modem **OFF** when in any area with a potentially explosive atmosphere. It is rare, but your modem or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations ; below decks on boats ; fuel or chemical transfer or storage facilities ; and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle which contains your modem or accessories.

Before using your modem in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

NON-IONISING RADIATION

As with other mobile radio transmitting equipment , users are advised that for satisfactory operation and for the safety of personnel, it is recommended that no part of the human body be allowed to come too close to the antenna during operation of the equipment.

The radio equipment shall be connected to the antenna via a non-radiating 50Ohm coaxial cable.

The antenna shall be mounted in such a position that no part of the human body will normally rest close to any part of the antenna. It is also recommended to use the equipment not close to medical devices as for example hearing aids and pacemakers.

0.4 SAFETY STANDARDS

THIS CELLULAR MODEM COMPLIES WITH ALL APPLICABLE RF SAFETY STANDARDS.

This cellular modem meets the standards and recommendations for the protection of public exposure to RF electromagnetic energy established by governmental bodies and other qualified organisations, such as the following :

- Directives of the European Community, Directorate General V in Matters of Radio Frequency Electromagnetic Energy.

1 GSM module FALCOM A2(D)-3, A2(D)-3GPS

The GSM module (Global System for Mobile communication) FALCOM A2(D)-3, A2(D)-3GPS with the firmware GPS/ALARM is a mobile station for the transmission of voice and data calls as well as short messages (SMS - Short Message Service) in GSM networks. It also includes GPS functions (Global Positioning System) for the determination of position.

The GSM module FALCOM A2(D)-3 consists of the following components:

- GSM transceiver
- internal GPS receiver GPS-MS1 from μ -blox AG
(GSM module FALCOM A2(D)-3GPS)
- serial link (V.24) for data transmission and control
- controller for functional display and user interface
- data and power supply unit

If the GSM module FALCOM A2(D)-3 is registered in the network, it acts just like a regular fax/data modem. To control the GSM module there is an advanced set of AT commands according to GSM ETSI 07.07 and 07.05 implemented. A protocol for controlling the data unit is available after establishing a call to the module or via short messages.

2 Functional overview

Included into the GSM module FALCOM A2(D)-3 there are interfaces to the power supply, the antenna, to the voice equipment, external GPS receiver GARMIN GPS35 for control and a SIM card holder as well as a LED's for displaying the working state of the module. A detailed description of the connector signals you will find in chapter "Technical Data".

2.1 SIM card

The GSM module FALCOM A2(3)-3 uses a SIM card an activated or deactivated PIN(Personal Identification Number). This SIM card fits into the SIM card holder under the plastic cover at the bottom of the module. By turning the metal flap of the SIM card holder to "OPEN", one can insert the SIM card in and close it by turning the metal flap to "CLOSE". Do not forget to close the plastic cover.

2.2 Serial interface

The serial interface of the GSM module FALCOM A2(D)-3 is used for control and for data/voice/fax transmission.

Connector:	15-pin SubD (female) acc. DIN 41652 8-pin RJ45
Connector signals:	look at chapter "Technical data"
Logic:	V.24 asynchronous
Baud rate:	9600 Baud (programmable 1200..115.200 Baud)
Character format:	8 data bits
Parity:	None
Stop bits:	1
Signal levels:	CCITT Recommendation V.28

2.3 GPS connection

The GSM module FALCOM A2(D)-3 may be connected to an external GPS receiver GARMIN GPS35, which allows it to act as a GPS navigation unit. The „Interface C“ allows a direct connection of the GARMIN GPS35 and is configured for 19200 Baud and 8N1. This connection may be used to configure and access the GPS receiver. As an option we are offering the FALCOM A2(D)-3GPS with an internal GPS receiver. To use that internal GPS receiver we suggest to use a GPS antenna with LNA (low noise amplifier) with technical data correspondent with the recommendation in the

chapter “Technical Data”. Technical specifications for the GPS receiver GARMIN GPS35 or GPS-MS1 you will find under the following address:

Garmin Europa Ltd.
Unit 5, The Quadrangle
Abbey Park, Romsey
Hampshire SO51 9AQ
UK
Tel. (+44) 794.519944

Garmin International
9875 Widmer Road
Lenexa, Kansas 66215
USA
Tel. (+1) 913/599.1515

μ-blox AG
Gloriastrasse 35
CH-8092 Zürich, Switzerland
Fax: +41 1 632 1210
Phone: +41 1 632 7642 (Marketing)
Phone: +41 1 632 7535 (Technical)
WWW: <http://www.u-blox.ch>

2.4 LED's for functional display

The actual state of the FALCOM A2(D)-3 is displayed by two of LED's at the connector on the interface C of the transceiver unit.

Orange LED

lights
flashes

(State of power supply or Initialization)

Power supplied
Initialization

Green LED

lights
flashes(slowly)
flashes(quickly)

(State of registration of the device into network)

Network registration is not successful
Network registration is successful
Call is in progress

3 Functional description

3.1 Command Summary

The transceiver of the GSM module FALCOM A2(D)-3 is controlled by an advanced set of AT commands. In the following list there is a short overview of these commands. For further information it is recommended to read the ETSI GSM recommendation or have a look at the FALCOM A2(D) user manual.

- General AT Commands

+++	Switch to command mode when connected
ATA	Answer call
ATDx	Dial data number "x"
ATDx;	Dial voice number "x"
ATE0	Disable command echo
ATE1	Enable command echo
ATH	Disconnect existing connection
ATO	Return to data mode
ATS0=n	Go off-hook after n-th ringing signal (n = "1"- "5")
ATS0=0	No automatic answering of calls
ATZ	Load stored profile
AT&C0	DCD always ON
AT&C1	DCD matches state of the remote modem's data carrier
AT&D0	Ignore DTR signal
AT&D1	At DTR-> OFF: Switches from data to command mode
AT&D2	At DTR-> OFF: Clear down the call
AT&W	Store current configuration
AT+IPR	Select the modem's data rate
AT+IFC	Select the modem's local flow control setting
AT+VGR	Tune the receive gain
AT+VGT	Tune the transmit gain
AT+VTD	Define DTMF tone duration
AT+VTS	Send DTMF tone

- GSM AT Commands (GSM 07.07)

AT+CBST	Select the bearer type
AT+CCFC	Control the call forwarding supplementary service
AT+CCWA	Control the call waiting supplementary service
AT+CFUN	Select the functionality level in the modem
AT+CGMI	Display manufacturer ID
AT+CGMM	Display model ID
AT+CGMR	Display version of GSM module
AT+CGSN	Display serial number (IMEI)
AT+CLCK	Change the PIN state or the call barring supplementary service

AT+CREG	Display network registration status
AT+COPS	Commands relating to network operator selection
AT+CPAS	Display the activity state of the mobile
AT+CPIN	Enter PIN and query blocks
AT+CPWD	Change PIN or the supplementary password
AT+CSQ	Display signal quality information
AT+CR	Select connection service report
AT+CRC	Select call service report
AT+CLIP	Calling line identification presentation
AT+CLIR	Control the calling line identification presentation
AT+COLP	Control the connected line identification presentation
AT+GCAP	Display the complete capability list
AT+CMEE	Report mobile equipment errors
AT+CEER	Extend error report

- SMS AT Commands (GSM 07.05)

AT+CSCA	Service centre address
AT+CSCS	Select TE character set
AT+CSDH	Show text mode parameter
AT+CSMP	Select text mode parameter
AT+CSMS	Select message service
AT+CPMS	Preferred message storage
AT+CMGF	Text mode / PDU Mode
AT+CMGR	Read message
AT+CMGS	Send message
AT+CMGD	Delete message
AT+CMGL	List messages
AT+CNMI	New message indication
AT+CSAS	Save SMS Settings
AT+CRES	Restore SMS Settings

- Mobile equipment error result code : +CME ERROR: xxx

xxx is defined as below :

0	Phone failure
3	Operation not allowed
4	Operation not supported
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
16	Incorrect password
22	Not found
24	Text string too long
26	Dial string too long
30	No network service
256	Protocol stack bad state
257	Bad cell (not in the synchronized ones)
258	Lost cell (due to DSF...)

- **Message service failure result code: +CMS ERROR : xxx**

xxx is defined as below :

1 to 127	error cause values from the GSM recommendation 04.11 Annex E-2
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
305	Invalid text mode parameter
313	SIM failure
321	Invalid memory index
322	SIM memory full
330	SC address unknown

- **GPS/ALARM firmware extensions**

&req pos	Print GPS snapshot
&req int	Print GPS positions
&req last	Print last valid GPS snapshot
&req fix	Initiate message
&req fail	Print stored messages
&clr fail	Delete stored messages
&cnf nmea	Input command to GPS
&req sms	Print all SMS stored on the simcard
&clr sms	Delete all SMS stored on the simcard
&req cnf	Print configuration
&req tm	Print copyright and release notes
&req time	Print time
&cnf time	Set time
&cnf gsm	Set GSM initialisation
&cnf gps	Set GPS protocol and earth datum
&cnf msg	Set message configuration
&cnf boot	Set power on message
&cnf key	Set response for input events
&cnf port	Set output configuration
&cnf clip	Set message for incoming calls
&cnf mode	Set mode and message counter
&pass	Set or change password
&licence	Enter licence key
&system	Enter Mon186 service mode
&debug	Set debug level

The controller in the FALCOM A2(D)-3 can handle the „Interface B“ for user inputs. This interface uses standard parameters, that means 9600 Baud, 8-bit characters, no parity and 1 stop bit. By using „Interface B“ an application on a terminal equipment is able to acquire the GSM transceiver and to configure the special functions of the FALCOM A2(D)-3. For a full functionality of the FALCOM A2(D)-3 a valid SIM card must be inserted. After initialization and registration into the network the FALCOM A2(D)-3

shows the actual registration state. Configuration of the FALCOM A2(D)-3 can be done by using a local interface connection. It also can be done by a remote connection from another modem via data call or SMS transmissions. Next there are the commands to control the unit:

3.2 Obtaining GPS Position Data &REQ POS, &REQ INT, &REQ FIX, &REQ LAST

These commands are used for obtaining GPS navigational data from the GARMIN GPS 35 or internal GPS receiver. The data are given in the format specified during the initialisation or as specified manually. &REQ POS returns a single set of positional data, while &REQ INT continuously obtains positional data, until the next command is entered. Using &REQ FIX one can generate a message to check the message configuration or to poll data from the FALCOM A2(D)-3. The latest valid single shoot of positional data will be returned by using &REQ LAST. The &REQ FIX and &REQ LAST command can have an additional parameter which named a receiver number. If this parameter is missing the requested message will be delivered to the standard message receiver. The message number setting follow the guidelines for the phone number parameter (Please see details in chapter 3.7 “Message Configuration”).

Example

```

Input : &REQ POS
Answer : $GPGGA,104220,5040.3711,N,01058.8452,E,1,06,2.1,489.6,M,
         46.8,M,,*48
Input : &REQ POS
         $GPGGA,104250,5040.3626,N,01058.8435,E,1,06,2.1,484.1,M,
         46.8,M,,*48
Input : &REQ INT
Answer : $GPGGA,114244,5040.3617,N,01058.8437,E,0,03,2.0,483.4,M,
         46.8,M,,*46
         $GPGGA,114245,5040.3619,N,01058.8436,E,0,03,2.0,483.6,M,
         46.8,M,,*4A
         $GPGGA,114246,5040.3621,N,01058.8436,E,0,02,2.1,483.7,M,
         46.8,M,,*42
         $GPGGA,114247,5040.3623,N,01058.8436,E,0,02,2.1,483.8,M,
         46.8,M,,*4E
         $GPGGA,114248,5040.3624,N,01058.8436,E,0,02,2.1,484.0,M,
         46.8,M,,*49
         $GPGGA,114248,5040.3624,N,01058.8436,E,0,02,2.1,484.0,M,
         46.8,M,,*49
Input : &REQ LAST
         $GPGGA,104250,5040.3624,N,01058.8436,E,1,06,2.1,484.0,M,
         46.8,M,,*49
Input : &REQ FIX,s01715543007
         OK

```

3.3 Request or Clear Stored Messages &REQFAIL, &CLRFAIL

Outgoing messages will be stored in message memory first. Both commands are used to print or clear these stored messages. Messages that could not be sent because of low field strength or malfunction remain in that message memory until a transmission was successful. The memory for that function is calculated for a maximum of 16 messages with 160Byte length. &REQFAIL is implemented to ask for the stored messages. The memory can be erased with the command &CLRFAIL.

Example

```
Input:  &REQ FAIL
Answer: 7982573,$ALARM, alarm extension button2,05.47.52,
        $GPRMC,054752,A,5040.4213,N,1058.8680,E,001.1,000.0,140400,
        000.8,E*71
        7982573,$ALARM,alarm extension button2,05.47.54,
        $GPRMC,054754,A,5040.4213,N,1058.8680,E,001.1,000.0,140400,
        000.8,E*71
        OK
Input:  &CLR FAIL
Answer:  OK
```

3.4 Request or Clear SMS Messages &REQSMS, &CLRSMS

All SMS messages from the SIMCARD storage can be displayed or deleted with these two simple commands. The command &REQSMS is implemented to ask for the stored messages. The SIMCARD storage memory for SMS can be erased with the command &CLRSMS.

Example

```
Input:  &REQ SMS
Answer: [01]GPRMC,213323.420,V,5042.0064,N,01101.7744,E,,,180201,,*1A
        [02]$GPRMC,213911.502,V,5042.1459,N,01101.5351,E,,,180201,,*19
        [03]$GPRMC,214225.941,V,5042.1459,N,01101.5351,E,,,180201,,*19
        [04]$GPGGA,215604.899,5042.2133,N,01101.1644,E,1,03,2.1,0.0,M,,,,
        0000*05
        [05]$GPGGA,221909.261,5042.1506,N,01101.5471,E,1,03,3.1,0.0,M,,,,
        0000*02
        [06]$GPGGA,222656.669,5042.1568,N,01101.5250,E,1,05,3.9,0.0,M,,,,
        0000*0F
        [07]$GPGGA,224519.856,5042.1568,N,01101.5308,E,1,05,3.7,0.0,M,,,,
        0000*01
        [08]$GPGGA,070042.811,5040.4188,N,01058.8347,E,1,07,1.1,0.0,M,,,,
        0000*06
        [09]Das_ist_ein_Test_String,09.50.16
        [10]Das_ist_ein_Test_String,10.06.27
        OK
Input:  &CLR SMS
Answer:  OK
```

3.5 Request Configuration &REQCNF, &REQTM, &REQHELP

Using &REQCNF the user can get the configuration data out of the GSM module FALCOM A2(D)-3, &REQTM prints the copyright and version data and &REQHELP shows a short help index.

Syntax

&REQ CNF	
\$CNFGPS,gps_protocol,gps_datum,time	- GPS configuration
\$CNFGSM,pin,init	- GSM configuration
\$CNFMSG,password,SCSA,recipient,interval,mode	- message configuration
\$CNFNAME,name	- name configuration
\$CNFBOOT,recipient,"message",flags	- start-up message
\$CNFKEY1,recipient,"message",flags	- key1 event message
\$CNFKEY2,recipient,"message",flags	- key2 event message
\$CNFKEY3,recipient,"message",flags	- key3 event message
\$CNFCLIP,central,number1,number2,...	- incoming call event settings

Example

```

Input: &REQ CNF
Answer: $CNFGPS,GPGGA:GPRMC,100,0
        $CNFGSM,1111,at+cbst=7,0,1
        $CNFMSG, s01701234567,"my modem",0,G
        $CNFBOOT,s01701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension button1",LP
        $CNFKEY2,d01701234567,"alarm extension button2",LP
        $CNFKEY3,v036778042230,"hallo",L
        $CNFCLIP,d01701234568,+491727982572,+49367780420
        OK

Input: &REQ TM
Answer: FALCOM A2D-GPS V1.53 - 06.07.01 (c) 2001 FALCOM WIRELESS
        COMMUNICATION
        OK

Input: &REQ HELP
Answer: FALCOM A2D-GPS V1.53 - 06.07.01 (c) 2001 FALCOM WIRELESS
        COMMUNICATIONS
        commands for communication
        &req pos/int/last - print gps snapshot/positions
        &req/clr fail - print/delete pending messages
        &req/clr sms - print/delete sms from simcard
        &req fix - sending gps message
        &req time - print time
        &req cnf - print configuration
        &req tm - print copyright
        &cnf gsm=pin,gsm_init - set gsm initialization
        &cnf gps=protocol,zone - set gps protocol,zone
        &cnf msg=recv,name,timer - set message configuration
        &cnf boot=recv,name,flags - set power on message
        &cnf key=recv,name,flags - set response for key changes
        &cnf port=mode,time1,time2 - set output signals
        &cnf clip=recv,num,... - set response for incoming calls
        &cnf mode=mode,counter - set mode and message counter
        &cnf time=time,date - set time

```

```

&pass=passwd           - set password
&licence=number        - set firmware licence number
&system[=pwd,recv]     - enter MON186 interactive mode
OK

```

3.6 Device Configuration &CNF[GSM], &CNF[GPS], &RESET

These commands are used to configure the GPS receiver and the GSM module inside the FALCOM A2(D)-3. &CNF GSM sets the pin number of the SIM card and an additional AT command is used during the initialisation and &RESET is used to restart the GSM module. &CNF GPS sets the GPS protocol and the required geographical earth datums of the GARMIN GPS35. The GPS receiver can be configured to report different protocols. To enable different GPS protocol sequences a user should combine the necessary NMEA protocol names with a colon as delimiter. This settings are used after start-up of the GSM module FALCOM A2(D)-3 to initialise the GARMIN GPS35 or the internal GPS receiver. In connection with the FALCOM A2(D)-3 the GARMIN GPS35 will be used on a higher baud rate setting. Make sure that the GARMIN GPS35 will be initialised and later powered off/on. The baud rate setting of the GARMIN GPS35 will be changed only after this sequence.

Syntax

```

&CNF GSM,pin,command           - GSM configuration
    pin:                        0000 ... 9999, pin number of the SIM card
    command:                    additional initialisation for the GSM module

&RESET                          - restart GSM module

&CNF GPS,protocol,zone         - GPS configuration
    protocol:                   Initialised NMEA protocols
    zone:                       earth datums (100 means WGS 84)

```

Example

```

Input : &CNF GPS,GPGGA:GPRMC,100
Answer: OK
Input : &CNF GSM,1234,at+cbst=7,0,1
Answer: OK
Input : &REQ CNF
Answer: $CNFGSM,1234,at+cbst=7,0,1
        $CNFMSG,s01723651777,"my modem",0,pwd,D
        $CNFBOOT,01701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension BTN1",LP
        $CNFKEY2,d01701234567,"alarm extension BTN2",LP
        $CNFKEY3,v036778042230,"hallo",L
        $CNFCLIP,s01701234568,+49367723456
        OK
Input : &RESET
Answer: OK

```

3.7 Message Configuration &CNF MSG, &CNF MODE

These commands are used to configure the GSM module FALCOM A2(D)-3. The command &CNF MSG sets receiver phone number, and device name, &CNF MODE sets the functional mode and a configuration counter. By setting a password within the configuration data access to the module will be restricted for further data communication. The recipient number setting holds as first character additional information about the message transmission. If the first character of the recipient number is **D** or **d** the message will be sent as data transmission. If the first character of the recipient number is **S** or **s** the message will be sent as SMS transmission. If the first character of the recipient number is **G** or **g** the GPS/ALARM firmware try to call these number and will sent GPS data to the recipient. These setting is similar to the automatic GPS mode (mode setting **G**) and the GPS data can be stopped by inputting a valid command sequence. In all other cases the recipient number will be treated as a phone number for a SMS transmission. The SMS service center setting will be used from the SIM-CARD and could be changed by using the AT command-set for the SMS functions. By using the command **AT+SCSA** you change the current SMS service center number, and by **AT+CSAS** you can save this setting. The name of the unit could contain format sequences which begins with the backslash \ character. See below possible format sequences:

```

\r      - carriage return
\n      - newline
\t      - linefeed (carriage return and newline)
\\      - backslash
\o      - comma
\xx     - hexadecimal character code (00 to ff)

```

Additionally the name setting can be enclosed with ' or " apostrophe marks. In that case all character enclosed in apostrophes will be used as string for the name setting (including enclosed commas).

Syntax

```

&CNF MSG,receiver,"name",period           - message configuration
receiver:                                  call number of recipient for SMS or data
name:                                       device name setting
period:                                    0 ... 9999 min. 0 means no periodical message
&CNF MODE,mode,time                       - mode configuration
mode:                                       functionality mode
D – automatically answers data calls (similar to ATS0=1)
G – automatically answers data calls and reports GPS protocols
T – automatically append time to input messages
V – automatically answers voice calls
C – configuration counter
B – break reset mode
Counter:                                   0 ... 255

```

In the configuration counter mode every command will increase the configuration counter. The value of this counter will be set in a position message and can be used to check the configuration of the GSM module FALCOM A2(D)-3. A checksum of a command will be automatically calculated and compared if a checksum sequence „*XX“ appended to the contents of a command. The checksum will be calculated as a XOR summary of all characters of these command. There are two answer modes as reaction to data calls. If the mode setting contains a **D** character then the unit answers automatically incoming data calls. This mode is identical to the **S0** parameter of the GSM module (**ATS0=1**). If the mode setting contains an **G** character then the data of the connected GPS receiver are responsible over a GSM data connection. The streaming of the GPS protocols over the GSM data connection can be stopped by inputting a valid command of the GPS/ALARM firmware command-set. If both modes are configured the **G** mode will be the preferred mode. In all other cases the terminal equipment on the DB15 must answer the incoming calls, and it has the possibility to receive specific data over the GSM network (tracking, map or delivery information). Please change the **ATS0** register for automatic data transmissions or use the configuration with the additional features by the **&CNF MODE** command.

Example

```

Input:  &REQ CNF
Answer: $CNFGPS,GPGGA,100,0
        $CNFGSM,1234,at+cbst=7,0,1
        $CNFMSG,01723651777,"my name",0,pwd,D
        $CNFBOOT,01701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension BTN1",LP
        $CNFKEY2,d01701234567,"alarm extension BTN2",LP
        $CNFKEY3,v0367712349,"hallo",L
        $CNFCLIP,s01701234568,+49367723456
        OK
Input:  &CNF MSG,d01723344555,CAR100,5           - data message
Answer: OK
Input:  &REQ CNF*00                               - command without checksum
Answer: ERROR
Input:  &REQ CNF*0A                               - checksum ok
Answer: $CNFGPS,GPGGA,100
        $CNFGSM,1234,at+cbst=7,0,1
        $CNFMSG,d01723344555,"CAR100"5,pwd,D   - data message 5 min period
        $CNFBOOT,01701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension BTN1",LP
        $CNFKEY2,d01701234567,"alarm extension BTN2",LP
        $CNFKEY3,v0367712349,"hallo",L
        $CNFCLIP,s01701234568,+49367723456
        OK
Input:  &CNF MSG,s01723344555,CAR100,5*50       - SCSA and SMS recipient
Answer: OK
Input:  &CNF MODE,D*06                           - answering only data calls
Answer: OK
Input:  &REQ CNF*0A
Answer: $CNFGPS,GPGGA,100
        $CNFGSM,1234,at+cbst=7,0,1
        $CNFMSG,s01723344555,"CAR100",5,pwd,D - SMS message 5min period
        $CNFBOOT,0701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension BTN1",LP

```

```

$CNFKEY2,d01701234567,"alarm extension BTN2",LP
$CNFKEY3,v0367712349,"hallo",L
$CNFCLIP,s01701234568,+49367723456
OK

```

3.8 Poll Event Configuration &CNF CLIP

This command is used to configure the GSM module FALCOM A2(D)-3 to trigger a message as answer to an incoming call. By the command **&CNF CLIP** valid phone numbers can be entered which enable to poll the GSM module FALCOM A2(D)-3. The memory for storing the valid phone numbers is limited up to 15 numbers. The message could be sent via data or SMS transmission depending on the recipient setting. If the first character of the recipient number contains **D** or **d** the message will be sent as data transmission. If the first character of the recipient number contains **S** or **s** the message will be sent as SMS transmission. If the first character of the recipient number is **G** or **g** the GPS/ALARM firmware tries to call this number and it will send GPS data to the recipient. These setting is similar to the automatic GPS mode (mode setting **G**) and the streaming of the GPS protocols over the GSM data connection can be stopped by inputting a valid command of the GPS/ALARM firmware command-set. In all other cases the recipient number is treated as phone number for SMS transmission. Please note that the phone numbers for incoming calls are displayed as international numbers and must be configured in the same way. If the receiver field is empty a message (data or SMS) will be generated and sent back to the incoming caller number. For that case the kind of message must be included as first character to every caller number in the same way like the extensions for the receiver number.

Syntax

&CNF CLIP,receiver,numbers,... - poll message configuration
 receiver: call number of recipient for SMS or data
 numbers: activated phone numbers, amount 1..15

Example

```

Input : &CNF CLIP,d01701234568,+497654 3212,+49367723456
Answer : OK
Input : &REQ CNF
Answer : $CNFGPS,GPGGA,100,0 - GPS konfiguration
        $CNFGSM,1234,at+cbst=7,0,1 - GSM konfiguration
        $CNFMSG,s01723344555,"CAR100",5,pwd,D - SMS message 5min period
        $CNFBOOT,01701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension BTN1",LP
        $CNFKEY2,d01701234567,"alarm extension BTN2",LP
        $CNFKEY3,v036778042230,"hallo",L
        $CNFCLIP,s01701234568,+49367723456 - polling enabled
OK

```

3.9 Setup Input Events &CNF BOOT, &CNF KEY

These commands configure the handling for start-up or input events. With the command &CNF KEY the inputs for the alarm functions can be configured. The command &CNF BOOT defines an event that will be sent after switch on the FALCOM A2(D)-3. If the first character of the recipient number is **D** or **d** the message will be sent as data. If the first character of the recipient number is **S** or **s** the message will be sent as SMS. If the first character of the recipient number is **V** or **v** the event triggers a voice call to the recipients number. If the first character of the recipient number is **G** or **g** the GPS/ALARM firmware tries to call this number and will send GPS data to the recipient. This setting is similar to the automatic GPS mode (mode setting **G**) and the streaming of the GPS protocols over the GSM data connection can be stopped by inputting a valid command of the GPS/ALARM firmware command-set. In all other cases the recipient number is treated as phone number for SMS transmission. Please refer to chapter 4 "TECHNICAL DATA" for the electrical characteristics of the input driver of the GSM module FALCOM A2(D)-3. The text of the input event could contain format sequences wich begins with the backslash '\ ' character. See below possible format sequences:

'r' - carriage return
 'n' - newline
 't' - linefeed (carriage return and newline)
 '\' - backslash
 'o' - comma
 '\xx' - hexadecimal character code ('00' to 'ff')

Additionally the text setting can be enclosed with ' or " apostrophe marks. In that case all character enclosed in apostrophes will be used as string for the text setting (including enclosed commas).

Syntax

&CNF KEY, key number, receiver, text, flagsP - configuration input key events

key number: 1..3 correspond to input GIO1..GIO3
 text: text message that is sent with an input event, in addition a time mark is appended and an optional GPS protocol
 receiver: call number of receiptient for SMS or data
 flags: kind of input trigger: **H** means a Low/High input change, **L** means a High/Low input change, **E** means any input changes (**H** or **L**), and **P** adds a GPS protocol to the message text.

&CNF BOOT, receiver, text, flagsP - configuration start event

text: text message that is sent with after start, in addition a time mark is appended and an optional GPS protocol
 receiver: call number of receiptient for SMS or data
 flags: kind of input trigger, **H** means a Low/High input change, **L** means a High/Low input change, **P** added a GPS protocol to the message text.

Example

```

Input:  &REQ CNF
Answer: $CNFGPS,GPGGA,100           - GPS konfiguration
        $CNFGSM,1234,at+cbst=7,0,1   - GSM konfiguration
        $CNFMSG,s01723344555,"CAR100",5,pwd,D - SMS message 5min period
        $CNFBOOT,01701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension BTN1",LP
        $CNFKEY2,d01701234567,"alarm extension BTN2",LP
        $CNFKEY3,v0367712349,"hallo",L
        $CNFCLIP, s01701234568,+49367723456 - polling enabled
OK
Input:  &CNF BOOT,d01701234567,startup A2GPS,hp
Answer: OK
Input:  &CNF KEY,3,d01701234567,alarm input BTN3,hp
Answer: OK
Input:  &REQ CNF
Answer: $CNFGPS,GPGGA,100,0       - GPS konfiguration
        $CNFGSM,1234,at+cbst=7,0,1   - GSM konfiguration
        $CNFMSG,s01723344555,"CAR100",5,pwd,D - SMS message 5min period
        $CNFBOOT,01701234567,"boot message",L
        $CNFKEY1,s01701234567,"alarm extension BTN1",LP
        $CNFKEY2,d01701234567,"alarm extension BTN2",LP
        $CNFKEY3,d01701234567,"alarm input BTN3",HP
        $CNFCLIP,s01701234568,+49367723456 - polling enabled
OK

```

3.10 Initiate Output Actions &CNF PORT

This command configures the GIO4 output with different signals. With this command a static high or low state as well as a single output impulse or a continuously cycle can be switched. Please refer to chapter 4 "TECHNICAL DATA" for the electrical characteristics of the output driver of the GSM module FALCOM A2(D)-3.

```

&CNF PORT,signal,time1,time2           - configuration output action GPIO4
signal:                                kind of output signal. E means output active, A means output
                                        inactive, I means an impulse of time1 delay and Z means a
                                        cyclic active/inactive output wave with time1 and time2 delays
                                        duration.
time1,time2:                            timer settings in steps of 10msec for impulse or cyclic output
                                        signal configuration

```

Example

```

Input:  &CNF PORT,z,100,100           -flash output with 2sec duration
Answer: OK
Input:  &CNF PORT,i,100,0             -generate 1sec output impulse
Answer: OK

```

3.11 Passing or changing the password &PASS

This command enables communications with the GSM module FALCOM A2(D)-3 for local access, data connections or in a configuration via SMS if a password has been set in the configuration. To change an existing password the command must be configured with the new password and with the actual password.

Syntax

&PASS,NewPassword,OldPassword - set the password

Example

```
Input:  &REQ CNF                - no communication possible
Output: ERROR
Input:  &PASS,Test
Output: OK
Input:  &REQ CNF
Answer: $CNFGPS,GPGGA,100          - display configuration
        $CNFGSM,1234,at+cbst=7,0,1
        $CNFMSG,TEST, +4901722270000,s01723344555,5,D
        $CNFNAME,CAR100
        $CNFBOOT,01701234567,boot message,L
        $CNFKEY1,s01701234567,alarm extension BTN1,LP
        $CNFKEY2,d01701234567,alarm extension BTN2,LP
        $CNFKEY3,d01701234567,alarm input BTN3,HP
        $CNFCLIP,d01701234567,+4976543212,+493667723456
        OK
```

3.12 Passing of GPS Commands &CNF NMEA

This command is used to pass GPS commands to the GARMIN GPS 35 receiver. The GPS commands must be sent without checksum. The required checksum is appended by the GSM module FALCOM A2(D)-3. For a description of the various GPS commands please refer to the GARMIN 35 or the GPS-MS1 documentation.

Syntax

&CNF NMEA,gps_input_command

Example

```
Input:  &REQ POS                - show GPS position
Output: $PGRMF,,,,,,,,,A,0,,,,*13
Input:  &CNF NMEA,$PGRMO,,2    - do not output any GPS protocols
Output: OK
Input:  &MODE,$PGRMO,GPGGA,1  - output GPS protocol GPGGA
Output: OK
Input:  &REQ POS                - show GPS position
Output: $GPGGA,072049,2458.4410,N,12132.9510,E,0,00,,M,,M,,*51
```


Both parameters are only necessary in a configuration via SMS and mean a receiver modem that are able to answer a data call and a password limiting the access for the communication. The next example demonstrates an upgrade of an existing application.

Example

```
&system

Welcome to AMD186 Monitor (? <Enter> for help)

mon186: h

A2x86 Monitor V3.38 14.06.00 Copyright (C) 2000 Funkanlagen Leopoldt OHG

Commands:      @ WarmBoot          U [time] [date]      Set Time Date
B addr         Set breakpoint      M range address     Move memory
C range addr   Compare memory      N [arglist]         command arguments
D[WA] [range] Dump memory      O[W] word byte|word Output[word]
E addr [list] Enter memory      P[BA] [name value] Boot Parameters
F range list   Fill memory        R [reg name or '?'] Display/alter regs
G [[=]addr]   Go to address           S range list        Search for string
H [word word] Hex math or help  T [=address] [word] Trace 'n' steps
I              Info about system  W [mnemonic name]  Write .EXE to flash
I[W] word     Input[word]           X sectnum|Z         Exterminate flash
J              Autobaud again   Z                   Upgrade monitor
L [decimal]   Load RAM from ROM      :                   Begins download

Parameter:
byte 1-2 hex digits
word 1-4 hex digits
addr word:word or 5 hex digits for absolute address
range addr addr OR addr L length
list list of hex bytes or quoted characters
decimal 1-9 decimal digits

mon186: l ; show applications
1 80000 TEST
mon186: xz ; delete flash
Erasing flash sector(s) ... 8000 9000
mon186: w CARBUG ; write application GPS
Begin file download ... Press ESC to abort ; send text File GPS.HEX
.....
.....
Device programmed successfully
mon186: l ; show applications
1 80000 CARBUG
mon186: p BOOT "18432000,1,1" ; set GPS as autostart
mon186: lg1 ; run GPS
at ; GPS running
OK
&req tm
FALCOM A2D-GPS V1.52 - 20.02.01 (c) 2001 FALCOM WIRELESS COMMUNICATIONS
OK
&system ; back to the mon186

Welcome to AMD186 Monitor ( ? <Enter> for help )
mon186:<ENTER> ; Enter for restart
```

For using the built-in debug facilities of the GPS/ALARM firmware the command &DEBUG can be used. With this command the current debug level of the application can be changed to produce more or less useful additional messages while the application is running. The debug level equal 0 is standard setting after restart the FALCOM A2(D)-3 with the GPS/ALARM firmware and means all debug messages are disabled.

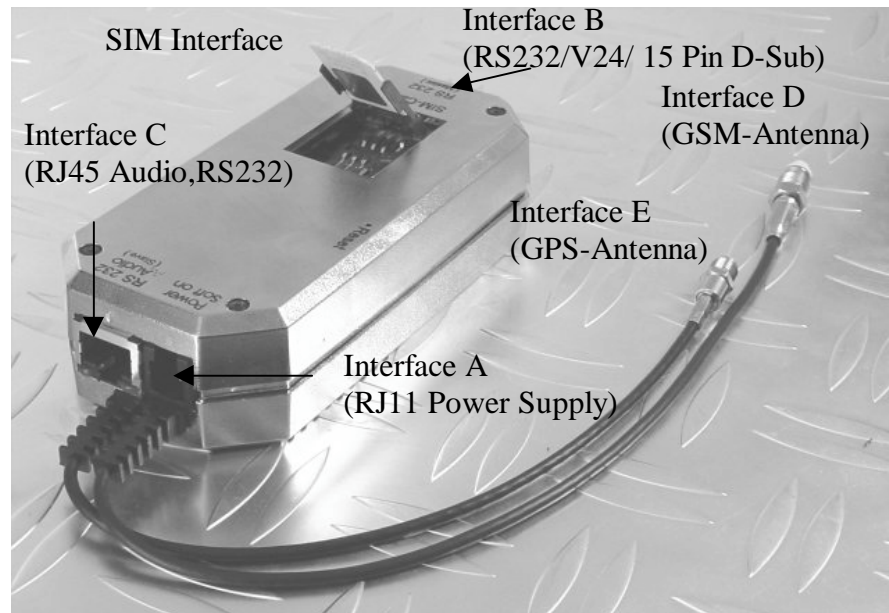
Syntax

```
&DEBUG=debuglevel          - set debug level of the firmware
debuglevel:                 - debuglevel from 0..255
```

Example

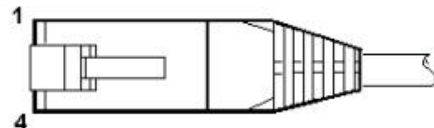
```
Input:  &req tm              - print copyright an release note
Output:  FALCOM A2D-GPS V1.52 - 20.02.01 (c) 2001 FALCOM WIRELESS
        COMMUNICATIONS
        OK
Input:  &debug=255
Output:  OK
Input:  &req tm
process_cmd 8975468 '&req tm' (311A,0000)
FALCOM A2D-GPS V1.52 - 20.02.01 (c) 2001 FALCOM WIRELESS COMMUNICATIONS
OK
gsm_cmd 8981772(38ms) 'AT+CCED=0,5','+CCED:
262,01,5518,1a02,30,37,32,,,0,,,0,4,'OK' mode(24)
gsm_cmd 8991750(37ms) 'AT+CCED=0,5','+CCED:
262,01,5518,1a02,30,37,32,,,0,,,0,4,'OK' mode(24)
gsm_cmd 9001133(16ms) 'AT+CPAS','+CPAS: 0','OK' mode(24)
gsm_cmd 9001161(15ms) 'AT+CPIN?','+CPIN: READY','+CPIN: READY' mode(24)
gsm_cmd 9001191(17ms) 'AT+CREG?','+CREG: 0,1','OK' mode(24)
gsm_cmd 9001221(17ms) 'AT+CSQ','+CSQ: 17,0','OK' mode(24)
gsm_cmd 9001251(24ms) 'AT+CPMS?','+CPMS: "SM",0,15,"SM",0,15','OK' mode(24)
gsm_sms_delete 9001251(41ms) sms <0,15> error 1
gsm_signal 9001133(183ms) gsm_mode 0x24
```

4 Technical data



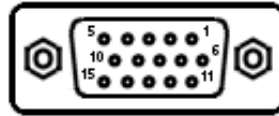
- **Dimensions:** 115mm x 54mm x 33mm (B x W x H)
- **Weight:** 200g
- **Power supply:** 10,8...31,2 V DC
275 mA at 12V (max. without GPS receiver)
75 mA at 12V (idle.)
305 mA at 12V (max. with GPS-MS1)
155 mA at 12V (idle.)
- **Temperature limits:** -25°C to +70°C (Storage)
-20°C to +55°C (Operating)
- **Interface A:** RJ11 power supply, Cable reference

pin 4 brown 10,8 .. 31,2V
pin 3 green Ignition
pin 2 yellow Mute
pin 1 white GND



- **Interface B:** RS232 / V24 and 4 IO ports, 15 pin D-Sub

pin 1 TXD
 pin 2 CTS
 pin 3 DSR
 pin 4 DCD
 pin 5 RI
 pin 6 RXD
 pin 7 DTR
 pin 8 RTS
 pin 9 GND
 pin 10 GND



pin 15 10,8 .. 31,2V (optional 5V)
 pin 11 IO1
 pin 12 IO2
 pin 13 IO3
 pin 14 IO4

Electrical parameter general IO ports:

Iout max = 200mA VinH >= 4,5V
 Vout < = 31,2V VinL < = 1,2V (or left open)
 Rin = 470K?

Cable reference for connector 9 pin D-Sub (modem cable):

<u>DB15</u>	to	<u>DB9</u>	
pin 4 -----		pin 1	DCD
pin 1 -----		pin 2	TXD
pin 6 -----		pin 3	RXD
pin 7 -----		pin 4	DTR
pin 9,10 -----		pin 5	GND
pin 3 -----		pin 6	DSR
pin 8 -----		pin 7	RTS
pin 2 -----		pin 8	CTS
pin 5 -----		pin 9	RI

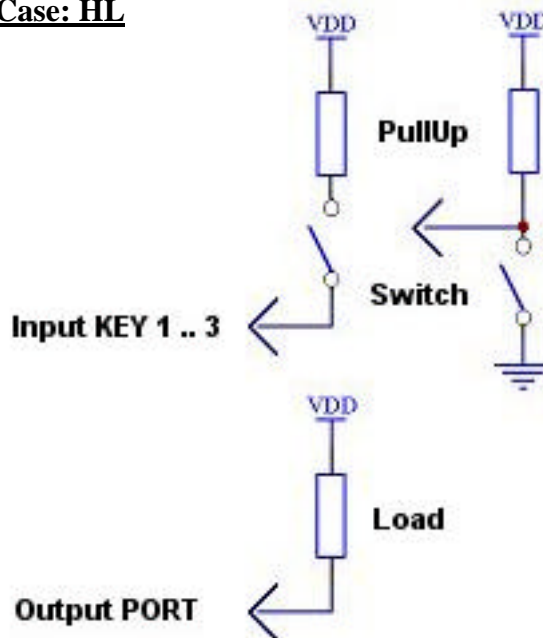
Cable reference for input/output connection:

DB15	pin 11	input KEY1	(switch to supply voltage
	pin 12	input KEY2	or by pullup to ground)
	pin 13	input KEY3	
	pin 14	output PORT	(connect load to supply voltage)
	pin 15	VDD	
	pin 9,10	GND	

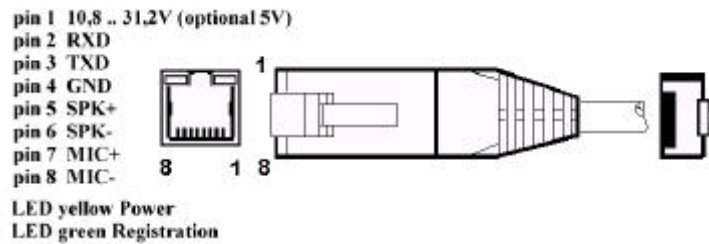


Case: HL

Case: LH



- **Interface C:** RJ 45 8 pin shielded (Audio,RS232)
- **Interface D:** Antenna 50? FME female GSM
- **Interface E:** Antenna 50? SMA female GPS (option)



Antenna description: GPS antenna with LNA (low noise amplifier)
 Frequency range: 1575,42 ? 1,023 MHz
 LNA gain: ? 25 dB
 Power requirements: 5V ? 0,5V max. 50 mA

- **SIM interface:** SIM card holder for small SIM cards
- **Digital interface:** V.24 (D-Sub 15pin)
- **Data protocol:** asynchronous, transparent and non transparent
 GSM 07.01, 07.02, 04.21
 - 2400 bps V22bis
 - 2400 bps V26ter
 - 4800 bps V32
 - 9600 bps V32
 - 9600 bps V34
 - 2400 bps V110
 - 4800 bps V110
 - 9600 bps V110
- **Short Message Service:** GSM 03.40, 07.05
 - SMS mobile originated
 - SMS mobile terminated
- **Audio interface:**
 - Electret microphone
 - Loudspeaker 150?
 - Ground