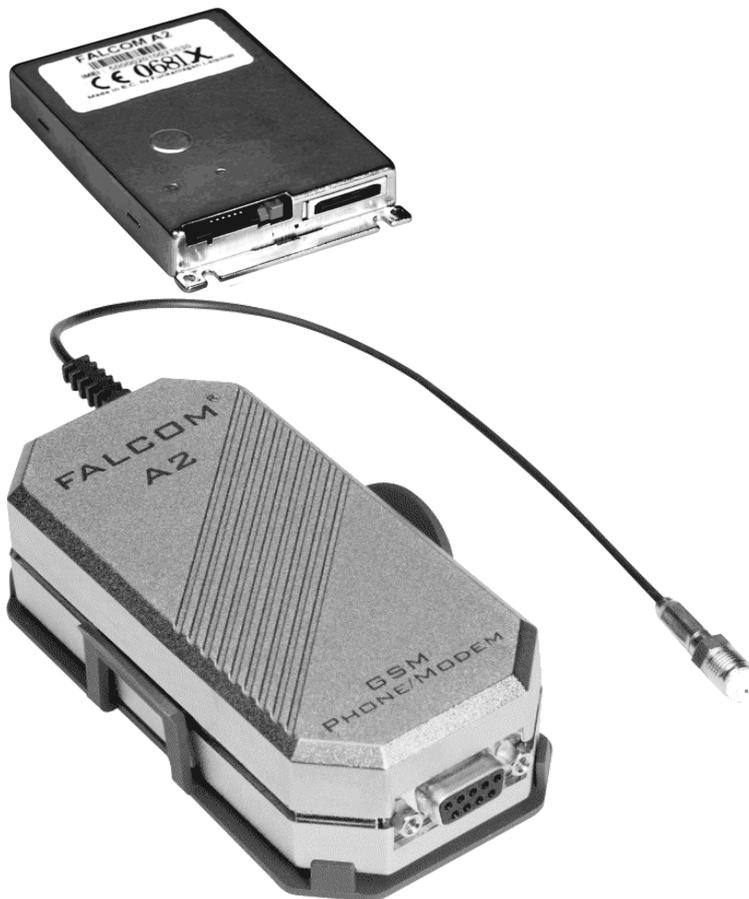


FALCOM A2

(INCLUDING A2-A, A2-B, A2-1 AND EVALUATION BOARD)

User Manual / Command List



Date: 08 March 1999

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0 Introduction

This manual is focussed on the GSM data solutions of the FALCOM A2 series from Funkanlagen Leopoldt OHG. It contains information about the FALCOM A2 embedded GSM module, the FALCOM A2-1 GSM modem and phone and the A2 evaluation board. 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 produced at Funkanlagen Leopoldt OHG.

Information furnished herein by Funkanlagen Leopoldt OHG 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 quickly proceed 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 Security

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.

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.

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 07.05 and 07.07 commands

1.1 Preface

In the following the <err> parameter is sometimes shown. This parameter and its possible values are described in chapter “ Error message handling and survey”.

1.2 Commands concerning modem hardware

1.2.1 AT+CGMI

Command gives manufacturer information.

Command	Possible responses
+CGMI	Funkanlagen Leipoldt OHG
+CGMI=?	OK

Remarks: none
Source: GSM 07.07/5.1
Implementation: not yet complete

1.2.2 AT+CGMM

Command gives GSM model information.

Command	Possible responses
+CGMM	GSM 900 Phone Falcom A2
+CGMM=?	OK

Remarks: none
Source: GSM 07.07/5.2
Implementation: not yet complete

1.2.3 AT+CGMR

Command gives firmware revision information.

Command	Possible responses
+CGMR	01.5f.01
+CGMR=?	OK

Remarks: none
Source: GSM 07.07/5.3
Implementation: not yet complete

1.2.4 AT+CGSN

Command gives IMEI information.

Command	Possible responses
+CGSN	500002010000000
+CGSN=?	OK

Remarks: none
Source: GSM 07.07/5.4
Implementation: not yet complete

1.3 Network registration commands

1.3.1 AT+CPIN

Command is used to send the PIN to the modem, which is needed to register into the GSM network.

After three unsuccessful attempts to enter the PIN the PUK is required. As second parameter the user should provide a new PIN.

Command	Possible responses	
+CPIN=<pin>	OK	+CME ERROR: <err>
+CPIN=<puk>,<new pin>	OK	+CME ERROR: <err>
+CPIN?	+CPIN: <code>	+CME ERROR: <err>
+CPIN=?	OK	

Defined values:

<pin>, <newpin>: 4 to 8 digits string type value

<puk>: 8 digits string type value

<code>:

READY	Modem is not pending for any password
SIM PIN	Modem is waiting SIM PIN to be given
SIM PUK	Modem is waiting SIM PUK to be given

Remarks:

CME ERROR: 13	shows up after 10 unsuccessful attempts to enter the PUK. SIM card is damaged then.
CME ERROR: 10	means that no SIM card is inserted.

Source: GSM 07.07/8.3
Implementation: yes

1.3.2 AT+CREG

Command is used to show the network registration status and to control the presentation of an unsolicited result code +CREG: <stat> when there is a change in the network registration status.

Command	Possible responses	
+CREG=[<n>]	OK	
+CREG?	+CREG: <n>,<stat>	+CME ERROR: <err>
+CREG=?	+CREG: (list of supported <n>s)	+CME ERROR: <err>

Defined values:

<n>:	0	disable network registration unsolicited result code
	1	enable network registration unsolicited result code
<stat>:	0	not registered, ME is not currently searching a new operator to register to
	1	registered, home network
	2	not registered, but ME is currently searching a new operator to register to
	3	registration denied
	4	unknown
	5	registered, roaming

Remarks: none
Source: GSM 07.07/7.2
Implementation: yes

1.3.3 AT+COPS

Command is used to show the current and the available PLMN's. It is also used to select a PLMN manually or automatically.

Command	Possible responses	
+COPS=[<mode> [,<format>[,<oper>]]]	OK	+CME ERROR: <err>
+COPS?	+COPS: <mode>[,<format>,<oper>]	+CME ERROR: <err>
+COPS=?	+COPS: list of supported(<stat>,<numeric oper>s)	+CME ERROR: <err>

Defined values:

<mode>:	0	automatic (<oper> field is ignored)
	1	manual (<oper> field shall be present)

<format>: 2 numeric <oper>

<oper>: string type; GSM Location Area Identification number which consists of a three BCD digit country code coded as in ITU-T E.212 annex A [10], plus a two BCD digit network code, which is administration specific

<stat>: 0 unknown
 1 available
 2 current
 3 forbidden

Remarks: none
Source: GSM 07.07/7.3
Implementation: yes

1.3.4 AT+CSQ

Command is used to ask for the networks field strength and the current bit error rate.

Command	Possible responses	
+CSQ	+CSQ: <rssi>,<ber>	+CME ERROR: <err>
+CSQ=?	+CSQ: (list of supported <rssi>s),(list of supported <ber>s)	

Defined values:

<rssi>: 0 -113 dBm or less
 1 -111 dBm
 2...30 -109... -53 dBm
 31 -51 dBm or greater
 99 not known or not detectable

<ber> (in percent): 0...7 as RXQUAL values in the table in GSM 05.08 [20] subclause 8.2.4
 99 not known or not detectable

Remarks: none
Source: GSM 07.07/8.5
Implementation: yes

1.4 Call control commands

1.4.1 ATD;

Command is used to establish a voice call, if the semicolon at the end of the number is applied.

Command	Possible responses
ATD<number>;	OK If call is established BUSY If called party is in another call NO ANSWER If called party does not accept a call NO CARRIER If there are problems to establish a call

Defined values:

<number>: telephone number to dial.

Remarks: In case of international number, the local international prefix (usually 00) could be replaced by the '+' character.
For phonebook dialling please see phonebook commands section.

Source: GSM 07.07/V.25ter/6.3.1

Implementation: yes

1.4.2 ATD

Command is used to establish a data call.

Command	Possible responses
ATD<number>	CONNECT<speed> If call is established BUSY If called party is in another call NO ANSWER If called party does not accept a call NO CARRIER If there are problems to establish a call

Defined values:

<speed>: link baud rate between modem and network

Remarks: Bearer type should be selected before (see at+cbst).
For phonebook dialling please see phonebook commands section.

Source: GSM 07.07/V.25ter/6.3.1

Implementation: yes

1.4.3 ATA

Command is used to accept an incoming call.

Command	Possible responses	
ATA	OK CONNECT <speed>	If incoming call is a voice call If incoming call is a data call
		ERROR

Defined values:

<speed> see ATD command.

Remarks: User should not use command, if ATSO does not equals zero.

Source: GSM 07.07/V.25ter/6.3.5

Implementation: yes

1.4.4 ATH

Command is used to end a call.

Command	Possible responses	
ATH	NO CARRIER	ERROR

Remarks: none

Source: GSM 07.07/V.25ter/6.3.6

Implementation: yes

1.4.5 AT+VGR

Command is used to set the amplification of the modules microphone.

Command	Possible responses
AT+VGR=<n>	OK
AT+VGR?	+VGR: <n>
AT+VGR=?	(list of supported <n>s)

Defined values:

<n> An integer <n>, range 0...255. Values larger than 128 indicate a larger gain than nominal. Values less than 128 indicate a smaller gain than nominal..

Remarks: none

Source: GSM 07.07/C.4

Implementation: not yet complete

1.4.6 AT+VGT

Command is used to set the amplification of the modules loudspeaker.

Command	Possible responses
AT+VGT=<n>	OK
AT+VGT?	+VGT: <n>
AT+VGT=?	(list of supported <n>s)

Defined values:

<n> An integer <n>, range 0...255. Values larger than 128 indicate a larger gain than nominal. Values less than 128 indicate a smaller gain than nominal..

Remarks: none
Source: GSM 07.07/C.5
Implementation: not yet complete

1.4.7 AT+VTS

Command is used to transmit DTMF tones.

Command	Possible responses
AT+VTS=<tone>	OK
AT+VTS=?	(list of supported <tone>s)

Defined values:

<tone> A single ASCII character in the set 0-9, #,*,A-D.

Remarks: In GSM this operates only in voice mode.
Source: GSM 07.07/C.11
Implementation: not yet complete

1.4.8 AT+VTD

Command is used to set the length of DTMF tones emitted.

Command	Possible responses
AT+VTD=<n>	OK
AT+VTD?	+VTD: <n>
AT+VTD=?	(list of supported <n>s)

Defined values:

<n> tone of duration <n>/10 seconds.

Remarks: none
Source: GSM 07.07/C.12
Implementation: yes

1.4.9 +++

Sequence is used to switch from on-line data mode to on-line command mode while in a data call.

Command	Possible responses
+++	OK

Remarks: No <CR> is needed after the sequence.
Source: Manufacturer defined
Implementation: yes

1.4.10 ATO

Command is used to switch back from on-line command mode to on-line command data while in a data call.

Command	Possible responses
ATO	CONNECT <speed> ERROR

Remarks: none
Source: GSM 07.07/V.25ter/6.3.7
Implementation: yes

1.4.11 AT+CBST

Command is used to select the bearer service type and the transparent or non-transparent mode for a data connection.

Command	Possible responses
+CBST=[<speed>,0,[<ce>]]	OK
AT+CBST?	+CBST=<speed>,0,<ce>
AT+CBST=?	+CBST: (list of supported <speed>s),0,(list of supported <ce>s)

Defined values:

<speed>:	0	autobauding (automatic selection of the speed)
	1	300 bps (V.21)
	2	1200 bps (V.22)
	4	2400 bps (V.22bis)
	6	4800 bps (V.32)
	7	9600 bps (V.32)
	65	300 bps (V.110)
	66	1200 bps (V.110)
	68	2400 bps (V.110)
	70	4800 bps (V.110)
	71	9600 bps (V.110)

<ce>: 0 transparent
 1 non-transparent

Remarks: none
Source: GSM 07.07/6.7
Implementation: not yet complete

1.4.12 Remote disconnection

When the called party has ended a call the modem shows the final result code NO CARRIER.

1.5 Call information commands

1.5.1 AT+CR

Command controls whether or not intermediate result code +CR: <serv> is returned from the modem during connect negotiation of a data call.

Command	Possible responses
+CR=[<mode>]	OK
AT+CR?	+CR=<mode>
AT+CR=?	+CR: (list of <modes>s)

Defined values:

<mode>: 0 disables reporting
 1 enables reporting

<serv>: ASYNC asynchronous transparent
 REL ASYNC asynchronous non-transparent

Remarks: none
Source: GSM 07.07/6.9
Implementation: yes

1.5.2 AT+CRC

Command controls whether or not the normal RING message of an incoming call is replaced by an extended call indication using unsolicited result code +CRING: <type>.

Command	Possible responses
+CRC=[<mode>]	OK
AT+CR?	+CR=<mode>
AT+CR=?	+CR: (list of <modes>s)

Defined values:

<mode>:	0	disables reporting
	1	enables reporting
<type>:	ASYNC	asynchronous transparent
	REL ASYNC	asynchronous non-transparent
	VOICE	normal voice

Remarks:	none
Source:	GSM 07.07/6.11
Implementation:	yes

1.6 Call setting commands**1.6.1 ATSO**

Command will be documented soon.

1.6.2 AT+CCFC

Command is used to set the call forwarding service.

Command	Possible responses	
+CCFC=<reason>,<mode> [,<number>]	OK When <mode>=2: +CCFC: <status>,<class>	+CME ERROR: <err>
AT+CCFC=?	+CCFC: (list of supported <reason>s)	

Defined values:

<reason>:	0	unconditional
	1	mobile busy
	2	no reply
	3	not reachable
	4	all call forwarding
	5	all conditional call forwarding
<mode>:	0	disable
	1	enable
	2	query status
	3	registration
	4	erasure
<number>:	telephone number to forward to	

<class> is a sum of integers each representing a class of information (default 7 equals to all classes):

1 voice
2 data
4 fax

<status>: 0 not active
1 active

Remarks: none
Source: GSM 07.07/7.10
Implementation: not yet complete

1.6.3 AT+CCWA

Command is used to set the call waiting supplementary service.

Command	Possible responses
+CCWA=[<n>[,<mode>[,<class>]]]	OK When <mode>=2: +CCWA: <status>,<class>
AT+CCWA?	+CCWA=<n>
AT+CCWA=?	+CCWA: (list of <n>s)

Defined values:

<n> (sets/shows the result code presentation status):

0 disable
1 enable

<mode> (when <mode> parameter is not given, network is not interrogated):

0 disable
1 enable
2 query status

<class> is a sum of integers each representing a class of information (default 7 equals to all classes):

1 voice
2 data
4 Fax

<status>: 0 not active
1 active

Remarks: not yet complete
Source: GSM 07.07/7.11
Implementation: yes

1.6.4 AT+CLIP

Command is used to set and request the status of the calling line identification presentation service. Depending on the setting the number of the calling party will be shown as result code +CLIP: <number>,<type> on incoming calls (after every RING).

Command	Possible responses
+CLIP=[<n>]	OK
AT+CLIP?	+CLIP=<n>,<m>
AT+CLIP=?	+CLIP: (list of supported <n>s)

Defined values:

<n> (parameter sets/shows the result code presentation status):

0 disable
1 enable

<m> (parameter shows the subscriber CLIP service status in the network):

0 CLIP not provisioned
1 CLIP provisioned
2 unknown (e.g. no network, etc.)

<number>: string type phone number of format specified by <type>.

<type>: type of address octet in integer format.

Remarks: none

Source: GSM 07.07/7.6

Implementation: yes

1.6.5 AT+CLIR

Command is used to set and request the status of the calling line identification restriction service. Depending on the setting the own number is presented to the called party or not.

Command	Possible responses
+CLIR=[<n>]	OK
AT+CLIR?	+CLIR=<n>,<m>
AT+CLIR=?	+CLIR: (list of supported <n>s)

Defined values:

<n>	(parameter sets the adjustment for outgoing calls):
0	presentation indicator is used according to the subscription of the CLIR service
1	CLIR invocation
2	CLIR suppression
<m>	(parameter shows the subscriber CLIR service status in the network):
0	CLIR not provisioned
1	CLIR provisioned in permanent mode
2	unknown (e.g. no network, etc.)
3	CLIR temporary mode presentation restricted
4	CLIR temporary mode presentation allowed

Remarks: none
Source: GSM 07.07/7.7
Implementation: yes

1.6.6 AT+COLP

Command is used to set and request the status of the connected line identification presentation. Depending on the setting the number of the called party will be shown as result code +COLP: <number>,<type> on outgoing calls.

Command	Possible responses
+COLP=[<n>]	OK
AT+COLP?	+COLP=<n>,<m>
AT+COLP=?	+COLP: (list of supported <n>s)

Defined values:

<n>	(parameter sets/shows the result code presentation status):
0	disable
1	enable
<m>	(parameter shows the subscriber COLP service status in the network):
0	COLP not provisioned
1	COLP provisioned
2	unknown (e.g. no network, etc.)

<number>: string type phone number of format specified by <type>.

<type>: type of address octet in integer format.

Remarks: not available in most networks

Source: GSM 07.07/7.8

Implementation: not yet complete

1.7 Phonebook commands

1.7.1 AT+CPBS

Command selects phonebook memory storage. The SIM card is the only storage in the A2 module.

Command	Possible responses	
+CPBS=<storage>	OK	+CME ERROR: <err>
+CPBS?	+CPBS: <storage>[,<used>,<total>]	+CME ERROR: <err>
+CPBS=?	+CPBS: (list of supported <storage>s)	

Defined values:

<storage>: "SM" SIM phonebook

<used>: integer type value indicating the number of used locations in selected memory.

<total>: integer type value indicating the total number of locations in selected memory.

Remarks: none

Source: GSM 07.07/8.11

Implementation: yes

1.7.2 AT+CPBR

Command is used to read a special entry or a range of entries from the phonebook memory storage.

Command	Possible responses	
+CPBR=<index1>[,<index2>]	+CPBR: <index1>,<number>,<type>,<text> <CR><LF> +CPBR: <index2>,<number>,<type>,<text>]	+CME ERROR: <err>
+CPBR=?	+CPBR: (list of supported <index>s),<nlength>,<tlength>	+CME ERROR: <err>

Defined values:

<index1>, <index2>, <index>:	integer type values in the range of location numbers of phonebook memory.
<number>:	string type phone number of format <type>.
<type>:	type of address octet in integer format.
<text>:	string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS.
<nlength>:	integer type value indicating the maximum length of field <number>.
<tlength>:	integer type value indicating the maximum length of field <text>.

Remarks: none
Source: GSM 07.07/8.12
Implementation: not yet complete

1.7.3 AT+CPBF

Command is used to find a phonebook entry using a search-string.

Command	Possible responses	
+CPBF=<findtext>	+CPBF: <index1>,<number>,<type>,<text> <CR><LF>+CPBF: <index2>,<number>,<type>,<text>]	+CME ERROR: <err>
+CPBF=?	+CPBF: <nlength>,<tlength>	+CME ERROR: <err>

Defined values:

<index1>, <index2>:	integer type values in the range of location numbers of phonebook memory.
<number>:	string type phone number of format <type>.
<type>:	type of address octet in integer format.

<findtext>,<text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS.

<nlength>: integer type value indicating the maximum length of field <number>.

<tlength>: integer type value indicating the maximum length of field <text>.

Remarks: none
Source: GSM 07.07/8.13
Implementation: yes

1.7.4 AT+CPBW

Command is used to write a phonebook entry to a special place in the phonebook memory storage.

Command	Possible responses	
+CPBW=[<index>] [,<number> [,<type>[,<text>]]]	OK	+CME ERROR: <err>
+CPBW=?	+CPBW: (list of supported <index>s), <nlength>, (list of supported <type>s),<tlength>	+CME ERROR: <err>

Defined values:

<index>: integer type values in the range of location numbers of phonebook memory.

<number>: string type phone number of format <type>.

<type>: type of address octet in integer format.

<text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS.

<nlength>: integer type value indicating the maximum length of field <number>.

<tlength>: integer type value indicating the maximum length of field <text>.

Remarks: none
Source: GSM 07.07/8.14
Implementation: yes

1.8 Message handling commands

1.8.1 AT+CSCA

Command is used to set the service centre address. Mobile originated messages are transmitted through these service centre.

Command	Possible responses
+CSCA=<sca>[,<tosca>]	OK
+CSCA?	+CSCA: <sca>,<tosca>
+CSCA=?	OK

Defined values:

<sca>: GSM 04.11 RP service centre address Address-Value field in string format

<tosca>: GSM 04.11 RP service centre address Type-of-Address octet in integer format

Remarks: In PDU mode (at+cmgf=0) this command is needed only when the length of the SMSC address coded into <pdu> parameter equals zero.

Source: GSM 07.05/3.3.1

Implementation: yes

1.8.2 AT+CMGL

Command is used to read selected messages from the SIM card storage.

- Text mode:

Command	Possible responses	
+CMGL[=<stat>]	+CMGL: <index>,<stat>,<oa/da> ,''',<scts>][,<tooa/toda>,<length>]<CR> <LF><data>[<CR><LF> +CMGL: <index>,<stat>,<da/oa> ,''',<scts>][,<tooa/toda>,<length>]<CR> <LF><data>[...]]	+CMS ERROR: <err>
+CMGL=?	+CMGL: (list of supported <stat>s)	

Defined values:

<stat>	string type (default "REC UNREAD"); indicates the status of message in memory: "REC UNREAD" received unread message (i.e. new message) "REC READ" received read message "STO UNSENT" stored unsent message "STO SENT" stored sent message "ALL" all messages
<index>	integer type; value in the range of location numbers supported by the associated memory
<oa>	GSM 03.40 TP-Originating-Address Address-Value field in string format
<da>	GSM 03.40 TP-Destination-Address Address-Value field in string format
<scts>	GSM 03.40 TP-Service-Centre-Time-Stamp in time-string format
<toda>	GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)
<tooa>	GSM 04.11 TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)
<length>	integer type value indicating the length of the message body <data> in characters
<data>	GSM 03.40 TP-User-Data in text mode responses

- PDU mode:

Command	Possible responses	
+CMGL[=<stat>]	+CMGL: <index>,<stat>,"",<length><CR><LF> <pdu> [<CR><LF>+CMGL:<index>,<stat>,"", <length><CR><LF><pdu>[...]]	+CMS ERROR: <err>
+CMGL=?	+CMGL: (list of supported <stat>s)	

Defined values:

<stat>	integer type (default 0) indicates the status of message in memory:
	0 received unread message (i.e. new message)
	1 received read message
	2 stored unsent message
	3 stored sent message
	4 all messages
<index>	see text mode
<length>	integer type value the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length);
<pdu>	GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format

Remarks:	none
Source:	GSM 07.05/3.4.2,4.1
Implementation:	yes

1.8.3 AT+CMGR

Command is used to read one messages from the SIM card storage.

- Text mode:

Command	Possible responses				
+CMGR=<index>	<table> <tr> <td>if SMS-DELIVER: +CMGR: <stat>,<oa>,"",<scts>[,<tooa>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length>] <CR><LF><data></td> <td>+CMS ERROR: <err></td> </tr> <tr> <td>if SMS-SUBMIT: +CMGR: <stat>,<da>,""[,<toda>,<fo>,<pid>,<dc>,<vp>],<sca>,<tosca>,<length>] <CR><LF><data></td> <td></td> </tr> </table>	if SMS-DELIVER: +CMGR: <stat>,<oa>,"",<scts>[,<tooa>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length>] <CR><LF><data>	+CMS ERROR: <err>	if SMS-SUBMIT: +CMGR: <stat>,<da>,""[,<toda>,<fo>,<pid>,<dc>,<vp>],<sca>,<tosca>,<length>] <CR><LF><data>	
if SMS-DELIVER: +CMGR: <stat>,<oa>,"",<scts>[,<tooa>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length>] <CR><LF><data>	+CMS ERROR: <err>				
if SMS-SUBMIT: +CMGR: <stat>,<da>,""[,<toda>,<fo>,<pid>,<dc>,<vp>],<sca>,<tosca>,<length>] <CR><LF><data>					
+CMGR=?	OK				

Defined values:

<stat>	string type (default "REC UNREAD"); indicates the status of message in memory:
	"REC UNREAD" received unread message (i.e. new message)
	"REC READ" received read message
	"STO UNSENT" stored unsent message
	"STO SENT" stored sent message
	"ALL" all messages

<index>	integer type; value in the range of location numbers supported by SIM memory
<oa>	GSM 03.40 TP-Originating-Address Address-Value field in string format
<da>	GSM 03.40 TP-Destination-Address Address-Value field in string format
<scts>	GSM 03.40 TP-Service-Centre-Time-Stamp in time-string format
<toda>	GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)
<toa>	GSM 04.11 TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)
<fo>	first octet of GSM 03.40 SMS-DELIVER or SMS-SUBMIT (default 17)
<pid>	GSM 03.40 TP-Protocol-Identifier in integer format (default 0)
<dcs>	GSM 03.38 SMS Data Coding Scheme (default 0)
<vp>	depending on SMS-SUBMIT <fo> setting: GSM 03.40 TP-Validity-Period either in integer format (default 167) or in time-string format
<length>	integer type value indicating the length of the message body <data> in characters
<data>	GSM 03.40 TP-User-Data in text mode responses

- PDU mode:

Command	Possible responses	
+CMGR=<index>	+CMGR: <stat>,"",<length><CR><LF><pdu>	+CMS ERROR: <err>
+CMGR=?	OK	

Defined values:

<stat>	integer type (default 0) indicates the status of message in memory:
	0 received unread message (i.e. new message)
	1 received read message
	2 stored unsent message
	3 stored sent message
	4 all messages
<index>	see text mode
<length>	integer type value the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length);
<pdu>	GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format

Remarks:	none
Source:	GSM 07.05/3.4.3,4.2
Implementation:	yes

1.8.4 AT+CMGS

Command is used to send a message to the service centre.

- Text mode:

Command	Possible responses	
+CMGS=<da>[,<toda>]<CR> text is entered<ctrl-Z/ESC>	+CMGS: <mr>	+CMS ERROR: <err>
+CMGS=?	OK	

Defined values:

<da>	GSM 03.40 TP-Destination-Address Address-Value field in string format
<toda>	GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)
<mr>	GSM 03.40 TP-Message-Reference in integer format

- PDU mode:

Command	Possible responses	
+CMGS=<length><CR> PDU is given <ctrl-Z/ESC>	+CMGS: <mr>	+CMS ERROR: <err>
+CMGS=?	OK	

Defined values:

<length> integer type value the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length);

<pdu> GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format
note: when the length octet of the SMSC address equals zero, the SMSC address set with command Service Centre Address +CSCA is used

<mr> see text mode

Remarks: none
Source: GSM 07.05/3.5.1,4.3
Implementation: yes

1.8.5 AT+CMSS

Command is used to send a message from the SIM card storage to the service centre.

Command	Possible responses	
+CMSS=<index>[,<da>[,<toda>]]	+CMSS: <mr>	+CMS ERROR: <err>
+CMSS=?	OK	

Defined values:

<index> integer type; value in the range of location numbers supported by SIM memory

<da> GSM 03.40 TP-Destination-Address Address-Value field in string format

<toda> GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)

<mr> GSM 03.40 TP-Message-Reference in integer format

Remarks: none
Source: GSM 07.05/3.5.2
Implementation: yes

1.8.6 AT+CMGW

Command is used to write a message to the SIM card storage.

- Text mode:

Command	Possible responses	
+CMGW=<oa/da>[,<tooa,toda>[,<stat>]] <CR>text is entered<ctrl-Z/ESC>	+CMGW: <index>	+CMS ERROR: <err>
+CMGW=?	OK	

Defined values:

<oa>	GSM 03.40 TP-Originating-Address Address-Value field in string format
<tooa>	GSM 04.11 TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)
<da>	GSM 03.40 TP-Destination-Address Address-Value field in string format
<toda>	GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)
<index>	integer type; value in the range of location numbers supported by SIM memory
<stat>	string type (default "REC UNREAD"); indicates the status of message in memory:
	"REC UNREAD" received unread message (i.e. new message)
	"REC READ" received read message
	"STO UNSENT" stored unsent message
	"STO SENT" stored sent message
	"ALL" all messages

- PDU mode:

Command	Possible responses	
+CMGW=<length>[,<stat>]<CR> PDU is given <ctrl-Z/ESC>	+CMGW: <index>	+CMS ERROR: <err>
+CMGW=?	OK	

Defined values:

<length> integer type value the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length);

<stat> integer type (default 0) indicates the status of message in memory:

0	received unread message (i.e. new message)
1	received read message
2	stored unsent message
3	stored sent message
5	all messages

<index> see text mode

<pdu> GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format
note: when the length octet of the SMSC address equals zero, the SMSC address set with command Service Centre Address +CSCA is used

Remarks: none
Source: GSM 07.05/3.5.3,4.4
Implementation: yes

1.8.7 AT+CMGD

Command is used to delete a message from the SIM card storage.

Command	Possible responses	
+CMGD=<index>	OK	+CMS ERROR: <err>
+CMGD=?	OK	

Defined values:

<index> integer type; value in the range of location numbers supported by SIM memory

Remarks: none
Source: GSM 07.05/3.5.4
Implementation: yes

1.9 Message setting commands

1.9.1 AT+CSMS

Command is used to select messaging services. It also shows supported services, where <mt> stands for mobile terminated messages, <mo> for mobile originated messages and <bm> stands for broadcast type messages.

Command	Possible responses
+CSMS=<service>	+CSMS: <mt>,<mo>,<bm> +CMS ERROR: <err>
+CSMS?	+CSMS: <service>,<mt>,<mo>,<bm>
+CSMS=?	+CSMS: (list of supported <service>s)

Defined values:

<service>: 0 GSM 03.40 and 03.41 (GSM standards for SMS, Cell Broadcast)
 1...127 reserved
 128... manufacturer specific

<mt>, <mo>, <bm>:
 0 type not supported
 1 type supported

Remarks: none
Source: GSM 07.05/3.2.1
Implementation: yes

1.9.2 AT+CPMS

Command is used to select memory storages that will be used for reading <mem1> and writing <mem2> short messages to and for writing broadcast <mem3> to. The Falcom A2 module supports SIM storage only.

Command	Possible responses
+CPMS=<mem1>[,<mem2>[,<mem3>]]	+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> +CMS ERROR: <err>
+CPMS?	+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> +CMS ERROR: <err>
+CPMS=?	+CPMS: (list of supported <mem1>s) ,(list of supported <mem2>s) ,(list of supported <mem3>s)

Defined values:

<mem1>	string type; memory from which messages are read and deleted (commands List Messages +CMGL, Read Message +CMGR and Delete Message +CMGD); defined value: "SM" SIM message storage
<mem2>	string type; memory to which writing and sending operations are made (commands Send Message from Storage +CMSS and Write Message to Memory +CMGW)
<mem3>	string type; memory to which received SMs are preferred to be stored (unless forwarded directly to TE; refer command New Message Indications +CNMI); refer <mem1> for defined values
<total1>	integer type; total number of message locations in <mem1>
<total2>	integer type; total number of message locations in <mem2>
<total3>	integer type; total number of message locations in <mem3>
<used1>	integer type; number of messages currently in <mem1>
<used2>	integer type; number of messages currently in <mem2>
<used3>	integer type; number of messages currently in <mem3>

Remarks: none
Source: GSM 07.05/3.2.2
Implementation: yes

1.9.3 AT+CMGF

Command is used to select format for incoming and outgoing messages.

Command	Possible responses
+CMGF=[<mode>]	OK
+CMGF?	+CMGF: <mode>
+CMGF=?	+CMGF: (list of supported <mode>s)

Defined values:

<mode>: 0 PDU mode (default when implemented)
 1 text mode

Remarks: none

Source: GSM 07.07/3.2.3

Implementation: yes

1.9.4 AT+CSMP

Command is used to set additional parameters for text mode messages.

Command	Possible responses
+CSMP=[<fo>[,<vp>[,<pid>[,<dc>]]]]	OK
+CSMP?	+CSMP: <fo>,<vp>,<pid>,<dc>
+CSMP=?	OK

Defined values:

<fo>: first octet of GSM 03.40 SMS-DELIVER, SMS-SUBMIT in integer format (default 17)

<vp>: GSM 03.40 TP-Validity-Period either in integer format (default 167) or in time-string format

<pid>: GSM 03.40 TP-Protocol-Identifier in integer format (default 0)

<dc>: GSM 03.38 SMS Data Coding Scheme (default 0) in integer format

Remarks: none

Source: GSM 07.05/3.3.2

Implementation: yes

1.9.5 AT+CSDH

Command controls whether detailed header information is shown in text mode result codes.

Command	Possible responses
+CSDH=[<show>]	OK
+CSDH?	+CSDH: <show>
+CSDH=?	+CSDH: (list of supported <show>s)

Defined values:

<show>:	0	do not show header values defined in commands +CSCA and +CSMP (<sca>, <tosca>, <fo>, <vp>, <pid> and <dc>) nor <length>, <today> or <toa> in +CMT, +CMGL, +CMGR result codes for SMS/PP text mode
	1	show the values in result codes

Remarks: none
Source: GSM 07.05/3.3.3
Implementation: yes

1.9.6 AT+CNMI

Command will be documented soon.

1.9.7 AT+CSCB

Command is used to set parameters of how broadcast messages are to be received.

Command	Possible responses
+CSCB=[<mode>[, <mids>[,<dcss>]]]	OK
+CSCB?	+CSCB: <mode>,<mids>,<dcss>
+CSCB=?	+CSCB: (list of supported <modes>s)

Defined values:

<mode>:	0	message types specified in <mids> and <dcss> are accepted
	1	message types specified in <mids> and <dcss> are not accepted
<mids>:		string type; all different possible combinations of CBM message identifiers (refer <mid>) (default is empty string); e.g. "0,1,5,320-478,922"
<dcss>:		string type; all different possible combinations of CBM data coding schemes (refer <dc>) default is empty string); e.g. "0-3,5"

Remarks: none
Source: GSM 07.05/3.3.4
Implementation: yes

Defined values:

<fac>	"SC" SIM lock "AO" Barr all outgoing calls "OI" Barr outgoing international calls "OX" Barr outgoing international calls except to home country "AI" Barr all incoming calls "IR" Barr incoming calls when roaming outside the home country "AB" All barring services "AG" All outgoing barring services "AC" All incoming barring services
<mode>:	0 unlock 1 lock 2 query status
<status>:	0 not active 1 active
<passwd>:	string type; shall be the same as password specified for the facility from the ME user interface or with command Change Password +CPWD
<class x>	is a sum of integers each representing a class of information (default 7 equals to all classes): 1 voice 2 data 4 fax
Remarks:	none
Source:	GSM 07.07/7.4
Implementation:	yes

1.10.4 AT+CPWD

Command is used to set or change passwords for the facility locks of the command AT+CLCK.

Command	Possible responses	
+CPWD=<fac>,<oldpwd> ,<newpwd>	OK	+CME ERROR: <err>
+CPWD=?	+CPWD: (list of supported <fac>,<pwdlength>s)	+CME ERROR: <err>

Defined values:

<fac> refer AT+CLCK

<oldpwd>, <newpwd>: string type; <oldpwd> shall be the same as password specified for the facility from the ME user interface or with command Change Password +CPWD and <newpwd> is the new password; maximum length of password can be determined with <pwdlength>.

<pwdlength>: integer type maximum length of the password for the facility.

Remarks: none
Source: GSM 07.07/7.5
Implementation: yes

1.10.5 AT+CFUN

Command is used to set the functionality of the modem. It switches between two power consumption levels.

Command	Possible responses	
+CFUN=[<fun>[,<rst>]]	OK	+CME ERROR: <err>
+CFUN?	+CFUN: <fun>	+CME ERROR: <err>
+CFUN=?	+CFUN: (list of supported <fun>s),(list of supported <rst>s)	+CME ERROR: <err>

Defined values:

<fun>: 0 minimum functionality (Transceiver off)
 1 full functionality

<rst>: 0 do not reset the ME before setting it to <fun> power level
 1 reset the ME before setting it to <fun> power level

Remarks: none
Source: GSM 07.07/8.2
Implementation: yes

1.10.6 AT+CPAS

Command is used to request the phone activity status.

Command	Possible responses	
+CPAS	+CPAS: <pas>	+CME ERROR: <err>
+CPAS=?	+CPAS: (list of supported <pas>s)	+CME ERROR: <err>

Defined values:

<pas>:	0	ready (ME allows commands from TA/TE)
	1	unavailable (ME does not allow commands from TA/TE)
	2	unknown (ME is not guaranteed to respond to instructions)
	3	ringing (ME is ready for commands from TA/TE, but the ringer is active)
	4	call in progress (ME is ready for commands from TA/TE, but a call is in progress)
	5	asleep (ME is unable to process commands from TA/TE because it is in a low functionality state)

Remarks: none
Source: GSM 07.07/8.1
Implementation: yes

1.11 Storing/restoring commands**1.11.1 AT&W**

Command is used to save modem settings. Stored settings will be available after reset or power off.

Command	Possible responses
&W	OK

Remarks: none
Source: GSM 07.07/V.25ter
Implementation: yes

1.11.2 AT&F

Command sets modem back to factory configuration.

Command	Possible responses
&F	OK

1.11.3 AT+CSAS

Command is used to save the settings of AT+CSCA, AT+CSMP and AT+CSCB especially.

Command	Possible responses
+CSAS	OK +CME ERROR: <err>
+CSAS=?	+CSAS: (0)

Remarks: none
Source: GSM 07.05/3.3.5
Implementation: yes

1.11.4 AT+CRES

Command is used to restore the settings saved by AT+CSAS.

Command	Possible responses
+CRES	OK +CME ERROR: <err>
+CRES=?	+CRES: (0)

Remarks: none
Source: GSM 07.05/3.3.6
Implementation: yes

1.12 Error message handling and survey

1.12.1 AT +CMEE

Command is used to set the indication of GSM functionality errors.

+CMEE=[<n>]	OK
+CMEE?	+CMEE: <n>
+CMEE=?	+CMEE: (list of supported <n>s)

Defined values:

<n>:	0	disable +CME ERROR: <err> result code and use ERROR instead
	1	enable +CME ERROR: <err> result code and use numeric <err> values

Remarks:	none
Source:	GSM 07.07/9.1
Implementation:	yes

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

<err> 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 synchronised ones
258	Lost cell

1.12.3 Message service failure result code: +CMS ERROR :<err>

<err> 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

Error cause values from GSM 04.11 are given below.

GSM 04.11 Annex E-2: Mobile originating SM-transfer:Cause no 1: "Unassigned (unallocated) number"

This cause indicates that the destination requested by the Mobile Station cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated).

Cause no 8: "Operator determined barring"

This cause indicates that the MS has tried to send a mobile originating short message when the MS's network operator or service provider has forbidden such transactions.

Cause no 10: "Call barred"

This cause indicates that the outgoing call barred service applies to the short message service for the called destination.

Cause no 21: "Short message transfer rejected"

This cause indicates that the equipment sending this cause does not wish to accept this short message, although it could have accepted the short message since the equipment sending this cause is neither busy nor incompatible.

Cause no 27: "Destination out of service"

This cause indicates that the destination indicated by the Mobile Station cannot be reached because the interface to the destination is not functioning correctly. The term "not functioning correctly" indicates that a signalling message was unable to be delivered to the remote user; e.g., a physical layer or data link layer failure at the remote user, user equipment off-line, etc.

Cause no 28: "Unidentified subscriber"

This cause indicates that the subscriber is not registered in the PLMN (i.e. IMSI not known)

Cause no 29: "Facility rejected"

This cause indicates that the facility requested by the Mobile Station is not supported by the PLMN.

Cause no 30: "Unknown subscriber"

This cause indicates that the subscriber is not registered in the HLR (i.e. IMSI or directory number is not allocated to a subscriber).

Cause no 38: "Network out of order"

This cause indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time; e.g., immediately re-attempting the short message transfer is not likely to be successful.

Cause no 41: "Temporary failure"

This cause indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time; e.g., the Mobile Station may wish to try another short message transfer attempt almost immediately.

Cause no 42: "Congestion"

This cause indicates that the short message service cannot be serviced because of high traffic.

Cause no 47: "Resources unavailable, unspecified"

This cause is used to report a resource unavailable event only when no other cause applies.

Cause no 69: "Requested facility not implemented"

This cause indicates that the network is unable to provide the requested short message service.

Cause no 81: "Invalid short message transfer reference value"

This cause indicates that the equipment sending this cause has received a message with a short message reference which is not currently in use on the MS-network interface.

Cause no 95: "Invalid message, unspecified"

This cause is used to report an invalid message event only when no other cause in the invalid message class applies.

Cause no 96: "Invalid mandatory information"

This cause indicates that the equipment sending this cause has received a message where a mandatory information element is missing and/or has a content error (the two cases are indistinguishable).

Cause no 97: "Message type non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message with a message type it does not recognise either because this is a message not defined or defined but not implemented by the equipment sending this cause.

Cause no 98: "Message not compatible with short message protocol state"

This cause indicates that the equipment sending this cause has received a message such that the procedures do not indicate that this is a permissible message to receive while in the short message transfer state.

Cause no 99: "Information element non-existent or not implemented"

This cause indicates that the equipment sending this cause has received a message which includes information elements not recognised because the information element identifier is not defined or it is defined but not implemented by the equipment sending the cause. However, the information element is not required to be present in the message in order for the equipment sending the cause to process the message.

Cause no 111: "Protocol error, unspecified"

This cause is used to report a protocol error event only when no other cause applies.

Cause no 127: "Interworking, unspecified"

This cause indicates that there has been interworking with a network which does not provide causes for actions it takes; thus, the precise cause for a message which is being send cannot be ascertained.

1.12.4 AT +CEER

Command is used to show the cause of a failure in the last call-setup or call-modification.

+CMER	+CEER: <report>
+CMEE=?	OK

Defined values:

<report>: cause as written below

Remarks: none
Source: GSM 07.07/6.10
Implementation: yes

1.12.5 Cause information element values from GSM recommendation 04.08

Cause value	Diagnostic
1	Unassigned (unallocated) number
3	No route to destination
6	Channel unacceptable
8	Operator determined barring
16	Normal call clearing
17	User busy
18	No user responding
19	User alerting, no answer
21	Call rejected
22	Number changed
26	Non selected user clearing
27	Destination out of order
28	Invalid number format (incomplete number)
29	Facility rejected
30	Response to STATUS ENQUIRY
31	Normal, unspecified
34	No circuit/channel available
38	Network out of order
41	Temporary failure
42	Switching equipment congestion
43	Access information discarded
44	requested circuit/channel not available
47	Resources unavailable, unspecified
49	Quality of service unavailable
50	Requested facility not subscribed
55	Incoming calls barred with in the CUG
57	Bearer capability not authorized

58	Bearer capability not presently available
63	Service or option not available, unspecified
65	Bearer service not implemented
68	ACM equal to or greater than ACMmax
69	Requested facility not implemented
70	Only restricted digital information bearer capability is available
79	Service or option not implemented, unspecified
81	Invalid transaction identifier value
87	User not member of CUG
88	Incompatible destination
91	Invalid transit network selection
95	Semantically incorrect message
96	Invalid mandatory information
97	Message type non-existent or not implemented
98	Message type not compatible with protocol state
99	Information element non-existent or not implemented
100	Conditional IE error
101	Message not compatible with protocol state
102	Recovery on timer expire
111	Protocol error, unspecified
127	Interworking, unspecified
252	Call barring on outgoing calls
253	Call barring on incoming calls
254	Call impossible
255	Lower layer failure

All other values in the range 0 to 31 shall be treated as cause 31.

All other values in the range 32 to 47 shall be treated as cause 47.

All other values in the range 48 to 63 shall be treated as cause 63.

All other values in the range 64 to 79 shall be treated as cause 79.

All other values in the range 80 to 95 shall be treated as cause 95.

All other values in the range 96 to 111 shall be treated as cause 111.

All other values in the range 112 to 127 shall be treated as cause 127.

2 A2-A / A2-B

2.1 Technical data

GSM capability:

GSM 900 Phase I including additional features of Phase II

GSM Teleservices:

TS11	Telephony
TS12	Emergency call
TS21	Short message, Point-To-Point, Mobile terminated
TS22	Short message, Point-To-Point, Mobile originated
TS23	Short message cell broadcast

GSM data services:

300 ... 9600 bps, asynchronous, transparent and non-transparent
(V.21, V.22, V.22bis, V.32, V.110)

Dimensions (L x W x H in mm):

83,0 x 50,5 x 10,5	for the A2-A (module with mounting brackets)
72,0 x 50,5 x 10,5	for the A2-B (module without mounting brackets)

Weight (in g):

53	for the A2-A
51	for the A2-B

Temperature range (in °C):

-25.....+ 55	in operation
-40.....+ 85	for storage

Power RF output (in W):

2	GSM Class 4 (33 dBm)
---	----------------------

Sensitivity (in dBm):

< -102

Supply voltage (in V):

5 (±5%) (consider peak current of 2A for GSM bursts !)

Average current (in mA at 5V nominal):

0,015	in SOFT OFF mode
36	in idle mode (base station sends at -85 dBm)
250	in transmit mode at power level 7
290	in transmit mode at power level 5 (Maximum)

SIM card Reader:

Internal, for small SIM cards (5/3V)

RS 232:

±12V	RX,TX only
3V	RX,TX,RTS,CTS,DTR,DSR,DCD,RI
300..19200	Baud rates for serial link

2.2 Possible external devices:**Audio:**

10KΩ differential	Microphone impedance
2,1Volts	Microphone bias voltage
56dB SPL/-36dbPA	Microphone sensitivity
0,4mA	Microphone input current
45dB	Microphone signal-to-noise-ratio

32Ω	Speaker impedance
100dB SPL/100mVRMS	Speaker volume
4% at 1.13 Volts RMS < 2% at 100 mV RMS	THD

Ringer:

1 kHz, 50 % duty cycle

Keypad:

5 x 4 matrix

Display:

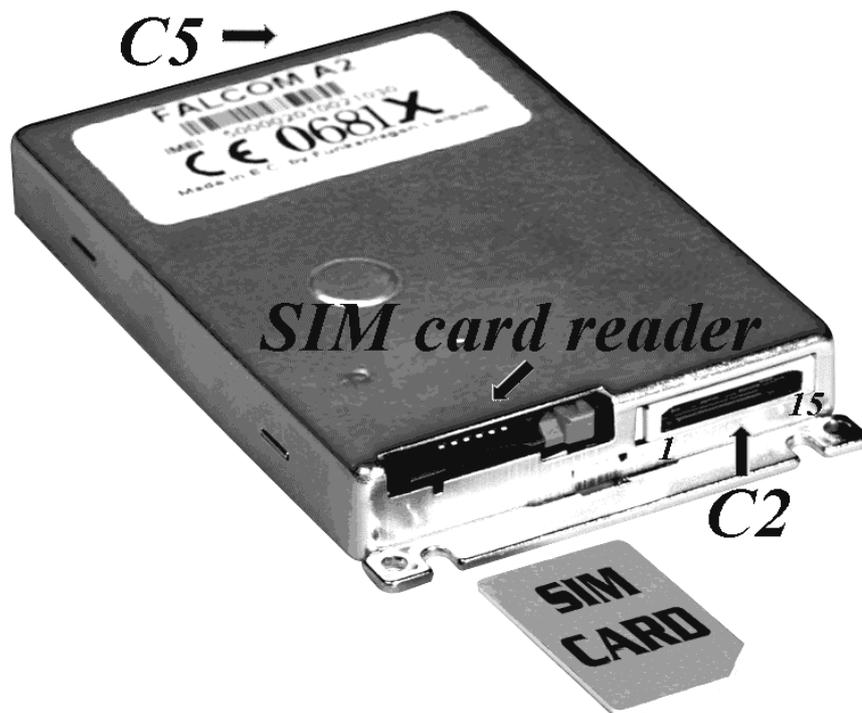
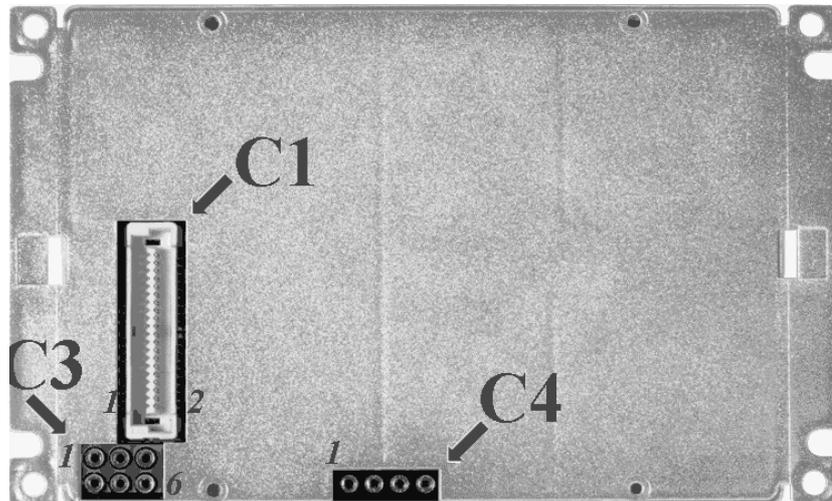
16 x 4, alphanumeric, with backlight

SIM card reader:

External, 10 .. 15cm maximum cable length

2.3 Connectors at the A2

In the following pictures the connectors of the A2 module are to be seen.



C1 :

40-pin connector SMD Type: FH (AMP-Part No.:0-177984-1)
 → Counterpart for application 0-177983-1

C2 :

15 pin connector Type: PCCC (AMP-Part No.:5-558556-1)
 → Counterpart for application 5-558556-1,
 0-558666-1,0-558665-1 and 0-558709-2

C3 :

6 pin connector; 2,54mm double row

0,45mm pin diameter

(CAB –Part No.:712-97-103)

→ Counterpart for application 1102-171-006

C4 :

4 pin connector; 2,45mm single row

0,45mm pin diameter

(CAB-Part-No.:315-97-104-41-003)

→ Counterpart for application 1101-191-004

C5:

RF-connector Type: MC-Card (RADIAL-Part No.: 199005801)

→ Counterpart for application 199005250

2.4 Pin-out of the A2 module

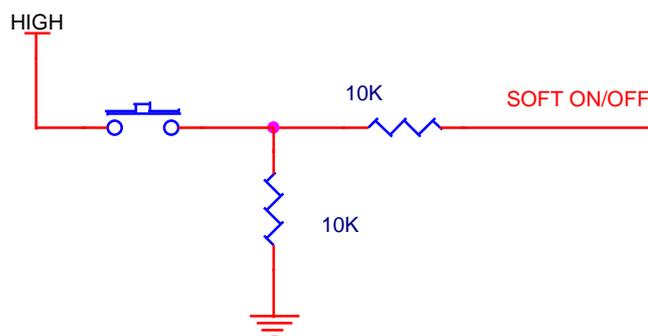
The pin-out of the A2 module you'll find in the appendix.

2.5 Special functionality pins

There are a few pins needed for the operation of the module. The handling of that pins is described as follows.

2.5.1 Pin 29 on C1, Pin 3 on C2 (SOFT ON/OFF)

Recommended external circuitry as shown below:



- For switching on the module (external power must be connected!) press the button for 3 sec.
- For switching off also press the button for 3 sec.
- Button could be replaced by a controller or a monostable, that takes it upon to do the 3 sec switching.

2.5.2 Pin 26 on C1 (RSTF)

Recommended external circuitry as shown below:



- Pressing the button resets the modem. SOFT ON then is needed for further operation.

2.5.3 Pin 5 on C2 (BRSF)

Recommended external circuitry as shown below:



- This switch has to be used in the firmware update procedure (see next chapter)
- It is strongly recommend to the customer, to make an update of the modem firmware possible, e.g. to make the BRSF switch reachable from an outside of the application. If there are problems, feel free to talk to the FALCOM support.

2.6 Firmware Download Procedure

Located on our FTP side ([ftp.falcom.de/pub/a2/firmware](ftp://falcom.de/pub/a2/firmware)), one can find a file called **a2_flash.exe**. It is a self-extracting archive containing the firmware download program of the latest version to be used with our A2 modules.

After starting the **a2_flash.exe** in a **win32** environment the user is allowed to choose the destination drive and directory for the extracted files. There he will find then the executable for the firmware download procedure and is called **flashburner.exe**. Using this executable and following the steps below the module's firmware could be updated:

- Disconnect the power supply or power off the module using SOFT ON/OFF.
- Connect the Falcom A2 to a free serial port of the computer where the firmware download program files were extracted to.

- Pull the BRSF pin to ground.
- Start the flashburner.exe. Don't change the MIPS Loader File Path and the MIPS Executable File Path!
- Select the serial port the modem is connected to and hit the START DOWNLOAD button. If the power supply was disconnected, reconnect it.
- Pull the SOFT ON pin to HIGH until the LOADER PROGRAM LOADING bar is filled (approx. 7 sec).
- Release the SOFT ON. The program continues with ERASING FLASH and BURNING FLASH.
- Wait until update process is finished (this takes approx. 2 min 14 sec, then all bars are filled blue and the buttons are changing from grey to black).
- Hit EXIT.
- Disconnect BRSF from ground.
- Reset the module by using RSTF or disconnect the power supply.

The new software version is now implemented. It should be investigated by using the AT+CGMR command.

3 A2-1 Module

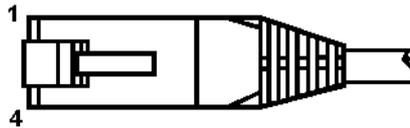
3.1 Technical Data

Dimensions: B x H x L 115mm x 54mm x 33mm
Weight: 160g
Power Supply: 10,8...31,2 V DC
 240mA (max.) 12V
 45mA (idle) 12V
 25mA (off) 12V

Temperature Range: Storage: -20°C to +70°C
 Use: -20°C to +55°C

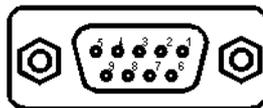
Interface A: Power supply, Cable Reference

pin 4 brown 10,8 .. 31,2V
 pin 3 green Ignition
 pin 2 yellow
 pin 1 white Gnd
 LED green Reset,Ring
 LED yellow Power



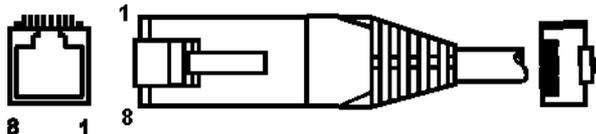
Interface B: RS232 / V24 9 pin D-Sub to DIN 41652

pin 1 DCD
 pin 2 TXD
 pin 3 RXD
 pin 4 DTR
 pin 5 GND
 pin 6 DSR
 pin 7 RTS
 pin 8 CTS
 pin 9 RI (optional 10,8 .. 31,2V/5V)



Interface C: RJ 45 8 pin shielded for Audio, RS232 and power supply.

pin 1 10,8 .. 31,2V (optional 5V)
 pin 2 TXD
 pin 3 RXD
 pin 4 GND
 pin 5 SPK +
 pin 6 SPK -
 pin 7 MIC +
 pin 8 MIC -

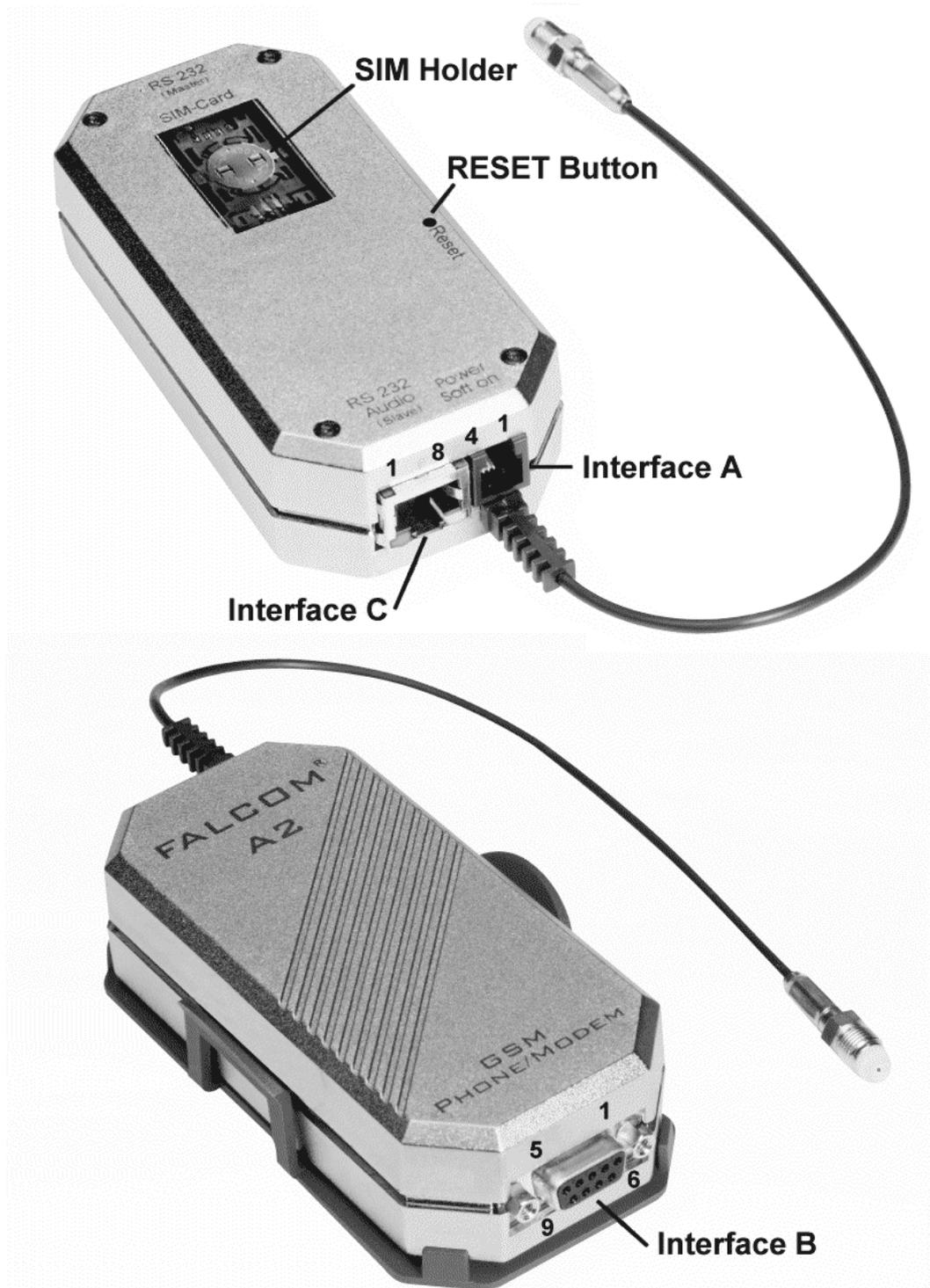


Interface D: Antenna 50Ω FME female

SIM-Card interface: for small SIM-Cards 3V and 5V

Audio interface: Electret-Microphone
Loudspeaker 150Ω
Ground

3.2 Connectors at the A2-1



3.3 Functional description

The GSM module FALCOM A2-1 is a mobile station for the transmission of voice, data and fax calls as well as SMS in GSM networks.

The GSM modem FALCOM A2-1 consists of the following components:

- GSM transceiver
- Power supply unit
- Serial link (V.24) for data transmission and control

If the GSM modem FALCOM A2-1 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. The two LED's on the Interface A are showing the state of the FALCOM A2-1. The yellow LED signals power connection and the green LED signals a "RESET" function, "SoftOn/Off" procedure or incoming calls. A incoming call will also be signalled with the internal piezo buzzer.

3.3.1 Ignition line

The ignition line on Interface A controls the „SoftOn/Off“ procedure of the GSM module. If the ignition line will be connected to a high voltage level, the GSM module powered on, and vice versa. The green LED on interface C shows the „SoftOn/Off“ procedure. After „SoftOn“ the GSM module is ready after 10s and the maximum timeout for the „SoftOff“ procedure is 20s. Connecting the ignition line permanent to input voltage that „SoftOn/Off“ handling will not be needed.

3.3.2 Serial handling

The GSM modem FALCOM A2-1 allows control of the GSM module over the interface B or interface C. The interface B is a implementation of a serial interface corresponding EIA-RS232-C. See table for details:

CCITT V24	Pin	Description	Direction
102	5	Signal Ground (GND)	
103	3	Transmitted Data (TxD)	IN
104	2	Received Data (RxD)	OUT
105	7	Request To Send (RTS)	IN
106	8	Clear To Send (CTS)	OUT
107	6	Data Set Ready (DSR)	OUT
108	4	Data Terminal Ready (DTR)	IN
109	1	Data Carrier Detect (DCD)	OUT
125	9	Ring Indicator (RI)	OUT

Both interface B and C are not independent usable. The interface B has the highest priority. If you don't want to use the interface B you must deactivate the signals RTS and DTR (or remove connection). With the interface C you have the audio and control functionality on one interface.

See table for connections:

Pin	Description	Direction
1	Power Supply (input voltage/option 5V)	OUT
2	Transmitted Data (TxD)	IN
3	Received Data (RxD)	OUT
4	Ground	
5	SPK+	
6	SPK-	
7	MIC+	
8	MIC-	

3.3.3 Reset configuration

In a case of malfunction the GSM modem FALCOM A2-1 offers various reset possibilities.

If the GSM modules currently running (not in SoftOff state) the green LED on interface C shows the reset procedure. For a reset of the GSM module please use the following ways:

- „RESET“ switch on the bottom of the GSM modem FALCOM A2-1
- „SoftOn/Off“ procedure of the GSM module
- serial break on interface B (Transmit Data (TX) “LOW” for >100ms)

3.3.4 Firmware update

For further firmware updates of the GSM module the GSM modem FALCOM A2-1 has a special update mode. To activate the update mode press the reset button during power on the device. The green LED on interface C lights permanently. After this you have to connect a personal computer to the interface B and run the utility „FLASHBURNER.EXE“. Please choose the correct COM and start the download. After finishing the update press the „RESET“ switch to start the download procedure.

For more information on updating the firmware please see A2 chapter.

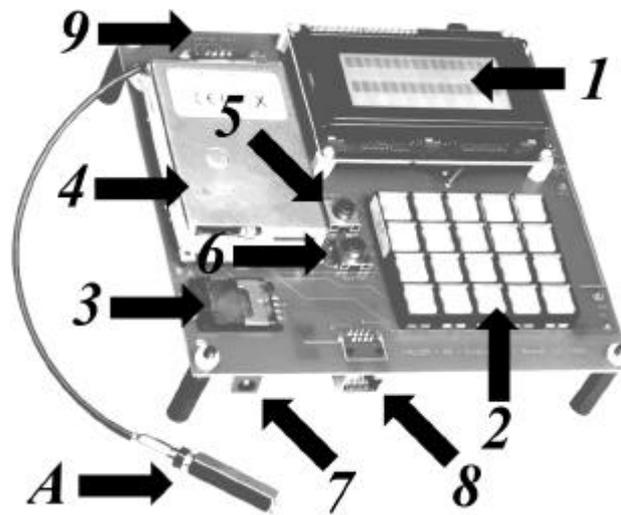
4 Evaluation Board

4.1 Technical data

- Dimensions: 157 x 144 x 50mm
- Power supply: 10.8 to 31V
- Current consumption: 72mA in idle mode
(at 12V) 190mA in normal power transmit mode
238mA in full power transmit mode
- Operational temperature : -0.....+ 40 degree Celsius
- Storage: -40.....+ 85 degree Celsius
- SIM card holder for small SIM cards
- Audio interface for loudspeaker and microphone:
- keypad 5 x 4 matrix
- 16 x 4 display unit
- RS 232/V24/12V

4.2 Connectors and units on the evaluation board

- Display unit (1)
- Keyboard unit (2)
- SIM card holder (3)
- Falcom A2 (4)
- Push buttons for Reset (5) and Soft On (6)
- Socket for power adapter (7)
- RJ-45 socket for the headset (8)
- 9pin SUB-D female socket (9)
- Antenna connector (A)



4.3 Evaluation board and accessories

Inside your evaluation board box you should find the following:

- FALCOM – A2 – Evaluation – Board
- Wall mount power adapter
- 9-pin serial cable (pin to pin direct, male to female)
- update and serial transmission cable (9-pin to 15-pin with switch)
- GSM antenna and cable (30cm) with coaxial plug
- Headset with RJ-45 plug
- Set of connectors (see appendix for details)
 - 2 pieces 40-pin stacking connector (plug and socket)
 - 2 pieces coaxial antenna plug (plug and socket)
 - 2 pieces 15-pin cable connector (plug and socket)
- 1.44 - disk of test software
- 1.44 - disk of layout data (PROTEL/GERBER format)
- Falcom A2 command list

4.4 Functional overview

The evaluation board consists of three main components. First is the Falcom A2 module. It has the GSM transmitter inside and provides access to it by use of two possible serial links and the GSM command set. The Falcom A2 module has its own SIM card holder, an antenna connector and two other connectors. One of them is a 15-pin plug-socket and the other one is a 40-pin board to board connector. The pin-out of them you can find in the appendix. The second main component is the display. It is a 16 x 4 character display with background lights. It is used to display the so called “handy functions” of the GSM module like phonebook, dial state and SMS texts. Third is the 5 x 4 push button matrix keyboard. From here many of the functions of the Falcom A2 could be controlled except the data services, because of their need of a full character terminal display and keyboard.

4.5 User MMI description

4.5.1 Make it work

After unpacking the evaluation board please check contents using the list given in chapter 1. Then check the connections from the board to the module, the display and the keypad. Put a valid SIM card into the holder (3). Plug the headset into its socket (8). Connect the serial link cable to the 9-pin SUB-D socket (9) to a computer communication port (COM1, COM2 etc.). At last put the antenna to a place where it could “see” a GSM network and plug its connector into the Falcom module. You are now ready to power the board up by connecting the power supply both to mains and to the evaluation board (7). Press the Soft On button for three seconds. After a short while “Hello” should appear on the screen. If that is true, please proceed to the next section. If nothing or something wrong happens, please check power and connections. The module should have a close connection

at the 6 and 4-pin connectors and at its 40-pin connector to the board. Don't use any other equipment than that what you got from us unless you have good experience in using the board and the module.

4.5.2 Keypad overview

1	2 ABC	3 DEF	RCL	Sel.
4 GHI	5 JKL	6 MNO	Clear	Menu
7 PQRS	8 TUU	9 WXYZ	↖	Send
* +	0 +	#	↘	End

UP/DOWN	Press to control the Key-tone Level, the Ringer Volume, and the Speaker Volume. Press to scroll forwards / backwards through the menus, submenus, and settings. Press to scroll up or down to different fields on the input screen.
Send	Press to the "dialled" number and make a call. Press to answer a call.
End	Press to end a phone call. Press and hold to turn on / off the power. Press to go to the previous display mode.
Clear	Press to delete characters or numbers one by one. Press and hold to clear entire field.
RCL	Press to recall the last dialled phone number. Press again to clear entire field.
Menu	Press to enter the menu mode.
Select	Press to choose the first option displayed in each menu and to find information in the phone book.

4.5.3 Display overview

i	Indicates that a Short Message has been received. When flashing the memory is full.
Bars	Display that the phone is registered on the network. If they aren't light up, then the phone is outside the network. Also they are showing current signal strength at the location of the phone. If there are more bars, the signal is better.

4.5.4 SIM card issues

Inserting a SIM Card

This SIM card fits into the SIM card holder under the plastic cover at the and close it by pushing the metal flap to "CLOSE".

Using the PIN Code PIN (Personal Identification Number)

The PIN code is a secret code to protect and control access to your personal SIM card. If the PIN code feature is enabled, you will be prompted to enter it after you turn on the phone. To enter your PIN code, use the number keys to enter the PIN digits, then press "#" key. If the PIN code is not entered correctly after three attempts, further PIN entry attempts will be blocked and the message "Unblk PIN" will be displayed. This feature protects your phone from unauthorised tampering. Enter the Personal Unblocking Key (see Personal Unblocking Key below), then enter your PIN Code to access your SIM. If you have more questions concerning PIN or SIM, contact the network operator who supplied the SIM.

PIN2 The second Personal Identification Number, PIN2 is used to control access to specific functions provided on your SIM. When you attempt to access these functions, you may be prompted to enter your PIN2 code. The method of entering PIN2 is the same as for your PIN code: Use the number keys to enter the PIN2 digits, then press the "#" key.

PUK (Personal Unblocking Key)

The PUK code is a secret code related to your SIM card. If the message "Unblk PIN" displays on the LCD, then you ,must enter the PUK before you access the SIM again with a PIN code. Enter the PUK and your new PIN code as follows.

****05*PUK*New PIN#**

If you enter the wrong PUK ten times, your SIM card will be disabled permanently. You will have to contact you network operator because you can't change your PUK by yourself.

4.5.5 Switching ON/OFF the Phone

Switching On To turn on the phone, plug in the power supply and press Soft On for three seconds. If there is no SIM, the phone

will ask to insert the SIM and will be displayed "Insert SIM" on the LCD. When this has happened, turn off the phone and insert the SIM. If PIN is enabled, the phone may ask to enter your PIN code and "Enter PIN" will be displayed on the LCD. After entering the correct PIN code, the network checks the validity of your SIM, and the phone registers on the network. If PIN is disabled, the network checks SIM's validity and the phone registers on the network. The phone is ready for use, then the RSSI bar indicators appear on the display.

Switching Off To turn off the phone, press and hold the END/PWR key or the Soft On button for three seconds or plug out the power supply.

4.5.6 Basic MMI functions

Emergency Call

Emergency calls "112" can usually be made from the phone in the network service areas. If you don't have the SIM card you can make an emergency call in the service areas. Other national service and emergency number differ from one country to another. You can obtain these numbers from the local service providers.

Making a call Key in the phone number including the area code. If the phone number on the display is correct, press the SEND key and wait for an answer. To end a call press the END/PWR key.

Making an international call

In order to make an international call the user needs to key in the "+" sign. This can be done by pressing and holding the "0" button for a second. Then, key in the number and press the SEND key. To end a call press the END/PWR key.

Correcting Keying

If you make a keying mistake, you can delete mistakes the last character or number on the display by pressing the CLEAR key. You can erase everything on the display by pressing and holding the CLEAR key for a second.

Last Number Redial

To redial the last number, press the RCL -"Recall" key and then the SEND key. You can scroll through the last 10

dialled phone numbers by repeatedly pressing the RCL key.

Speed Dialling You can dial phone number assigned to a speed key by pressing and holding the corresponding number key. Otherwise, you can enter the 2-digit memory number (01-99) and press the SEND key.

Answering a Call

If a call is incoming then "Incoming Call" text will be displayed on the LCD. Press the SEND key to answer a call. End the call by pressing the END/PWR key.

4.5.7 Other useful Functions

4.5.7.1 Call Forwarding

You can divert your incoming calls to another telephone number.

Call Forwarding Unconditional

This diverts all incoming calls to another telephone number.

Activation: *21*telephone# + SEND

Deactivation: #21*telephone# + SEND

Call Forwarding Busy

This diverts incoming calls if your phone is busy.

Activation: *67*telephone# + SEND

Deactivation: #67*telephone# + SEND

Call Forwarding No Reply

This diverts incoming calls if you don't answer them.

Activation: *61*telephone# + SEND

Deactivation: #61*telephone# + SEND

Call Forwarding Not Reachable

This diverts incoming calls if you cant answer (them i. e. when your phone is outside the service area or powered off).

Activation: *62*telephone# + SEND

Deactivation: #62*telephone# + SEND

4.5.7.2 Call Barring

If your network service provides this feature, you can restrict the calls made by your phone.

Barring of All Outgoing Calls

This restricts all outgoing calls.

Activation: *33*Password# + SEND

Deactivation: #33* Password + SEND

Barring of Outgoing International Call

This restricts all outgoing international calls.

Activation: *331*Passeword# + SEND

Deactivation: #331*Password# + SEND

Barring of Outgoing International Calls, except directed to the Home PLMN Country.

This restricts all outgoing international calls except directed to the home PLMN country.

Activation: *332*Password# + SEND

Deactivation: #332*Password# + SEND

Barring of All Incoming Calls

This restricts all incoming calls.

Activation: *35*Password# + SEND

Deactivation: #35*Password* + SEND

Barring of All Incoming Calls when Roaming

This restricts all incoming calls when the phone has roamed to another network outside the home PLMN.

Activation: *351*Password# + SEND

Deactivation: #351*Password# + SEND

4.5.8 Menu Functions

Press the Menu key then you will see the following OPTIONS Menu. To scroll through the OPTION menu press the UP/DOWN keys. To select in the OPTION menu press the corresponding number key.

OPTIONS	
Phone Bk	1
Text Msg	2
Call Info	3
Battery	4
Networks	5
Call Set	6
Phn Set	7
Security	8

Phone Bk

You can store, search, and dial phone numbers and their associated names in the memory of the phone.

Text Msg	This menu includes functions related to text (SMS) messages.
Call Info	This menu shows call duration.
Network	You can set the phone to select automatically one of the cellular networks available in your area, or you may select the desired network manually.
Call Set	You can configure call-related settings.
Phn Set	You can configure general phone and network settings.
Security	You can protect your phone and SIM card against unauthorised use using the functions within this menu.

4.5.8.1 Phone Bk (PHONE BOOK)

Select the Phone Bk and the following appears on the LCD.

PHONE BOOK	
Call	1
Fnd Name	2
Fnd Num	3
Find Rec	4
New Rec	5
Store No	6
FDN	7
Reply	8
Redial	9

Call A call stored in the memory location number can be made and the following message will appear.

Enter Loc :

Key in location number and press the SEND key or Sel. key, then You can make a call.

Fnd Name You can make a call from the stored names. If you select Fnd Name, the following message will be displayed.

Enter Name

Enter name and press the SEND key or Sel. key, then the following will be displayed.

```

Mem#: XX
Name: XXXXXX
Num: XXXXX
Ext: XXX

```

Mem # is the location number for this entry in the Phone Book.

Name is the name for this phone book entry.

Num is the phone number for this phone book entry.

Ext is the phone extension for this phone book entry.

Press the SEND key and you can make a call. If you only know the first character, you can find the name by using the UP/DOWN keys. Press MENU to edit, save, or delete the entry.

Find Num You can make a "stored phone number" call. If you select Find Num, the following message will be displayed.

```

Enter No. :

```

Enter number and press the SEND key or Sel. key, then you can see the following display.

```

Mem#: XX
Name: XXXXXX
Num: XXXXX
Ext: XXX

```

Press the SEND key to make a call. If you can only remember the first number, you can find the phone number by using the UP/DOWN keys. Press MENU to edit, save, or delete the entry.

Find Rec You can make a "stored memory location number" call. If you select Find Rec, the following message will be displayed.

```

Enter Loc:

```

Enter location number and press the SEND Key or Sel. key, then you can see the following display.

```

Mem#: XX
Name: XXXXXX
Num:  XXXXX
Ext:   XXX

```

Press the SEND key to make a call. Press MENU to edit, save, or delete the entry.

New Rec

If you select this, then the following message will be displayed.

```

Mem#:
Name:
Num:
Ext:

```

Mem # means the memory location number.

Name means the name of the person or company.

Num means the phone number that you would like to store.

Ext means other description.

Press and hold the key until the correct letter or number appears on the screen. If you make a mistake, press the clear button and move back to the previous position and retry. You can move to the next category using the UP/DOWN keys. Not entering the Memory Number will automatically assign the Memory Number filed to the next available location in the Phone Book. After inputting all these, press the MENU key, and you can see the following display.

```

EDIT OPT:
Edit:    1
Save    2
Delete  3
Cancel  4

```

When Edit is selected, you can change the contents of the memory.

When Save is selected, you can store the contents of the memory.

When Delete is selected, you can erase the contents of the memory.

When Cancel: is selected, you can cancel any changes you've made and return to the Phone Book menu.

Store No During a call if the other party gives you a phone number on the screen and after you finish your conversation, the number will remain on the screen. To save, go to the Phone Book menu (MENU 1), and select `Store No` option, and you can edit the information for the entry in the same way as for a new Record.

FDN (Fixed Dialling Number)

If you select the FDN you can only make calls to numbers stored in the FDN Phone Book. This option requires the entry of PIN2 if not previously entered.

FDN	
Enable	1
Disable	2

Press 1 to enable the FDN feature. Press 2 to disable FDN.

Reply In the menu, you can see the received calls, if you select a phone number you can call, save, or delete the number.

Redial In the menu, you can see the called calls, if you select a phone number you can call, save, or delete the number.

Keying in Method for Character, Number and Symbol

Character list for alphanumeric (phonebook and SMS). To select the desired character, press the corresponding key (0-9,*,#) and hold 1 second, the characters will appear on the screen at 1/2 second rate. Release the key when the desired character is displayed.

*Alphanumeric Keys

"1" —> [], [], [], [:], [;], [1]

"2" —> [A], [B], [C], [2]

"3" —> [D], [E], [F], [3]
 "4" —> [G], [H], [I], [4]
 "5" —> [J], [K], [L], [5]
 "6" —> [M], [N], [O], [6]
 "7" —> [P], [Q] [R], [S], [7]
 "8" —> [T], [U], [V], [8]
 "9" —> [W], [X], [Y], [Z], [9]
 "0" —> [+], [-], [<], [>], [=], [0]
 "*" —> [?], [!], [?], [!], [*]
 "#" —> ["], [""], [(), ()], [#]

Storing a phone number with a Name

- 1 Press Options, Phone Bk, New Rec
- 2 "Mem#" keying in memory number
 "Name" keying in name
 "Number" keying in phone number
 "Ext" keying in other information
- 2 Press Menu and select Save

Recalling a phone number and Name

- 1 Select Options, Phone Bk, Fnd Name or Find Num
- 2 Key in the first character(s) or memory number of the desired name or phone number.

Changing/Deleting a phone Book Entry

You can change / delete the contents of the memory. See New Rec. To change or delete displayed entry, press menu, select edit or delete.

4.5.8.2 Text MSG (Short Message Service)

If you select Text Msg, then the followings will be displayed.

```
TEXT MSG
Msg
New Msg
Svc Ctr
```

1 ...msg You can see the list of messages as follows.

```
STORED MSG
XXXXXX NS1
XXXXXX S 2
.
.
```

For outgoing messages:

NS means the message was not sent.

S means the message was sent.

For incoming messages:

NR means the message has not been read.

R means message was read.

Use the UP and DOWN keys to scroll through the list of messages. Press the number for the message you want to view, and one of the following will be displayed.

Outgoing message:

```
Num: XXXXXX
Msg: AAAAAA
```

Incoming message:

```
Date / time stamp
Phone number
Message
```

2...New Msg You can edit new message. If you select New Msg. the following Text will be displayed.

```
Num:
Msg:
```

Input the number and message and press the menu key. You can see the following on the display.

SMS Option	
Save	1
Send	2
Save/Snd	3
Cancel	4

When Save is selected, you can store the message to the SIM.

When Send is selected, you can transmit the message to the number.

When Save/Snd is selected, you can store and transmit the same time.

When Cancel is selected, you can omit the selection.

Press the number key you want to execute. If there is no more memory available on the SIM to save message, the "SIM Full" message is displayed.

3...Svc Ctr (Service Centre)

In this menu, you can enter the phone number for the service centre. Press SEND to save the number.

4.5.8.3 CALL INFO

In the option menu, when the number "3" key is pressed, the below menu is displayed.

CALL INFO	
Last	1
All	2
Reset	3
Set Max	4

Last If you select "Last", you can see the time of the last phone call.

Last Call: 00 : 00

00 : 00 is the duration of the last phone call. The first `00` means the minutes, the latter `00` means the second.

All You can see the time of all of the phone calls by selecting All. Then the following will be displayed.

All Calls:
00 : 00

00 : 00 is the cumulative duration of all phone calls since the last reset.

The first `00` means the minutes, the latter `00` means the second.

Reset Select this, then the following will be displayed. If PIN2 was not previously entered since power up, Enter PIN2 prompt.

Enter PIN2:

If you key in the PIN2, you can reset all of the time and the charges.

Set Max Select this, then the following will be displayed.

New Limit:

This feature is used for setting maximum call time. If you enter the time, and then press the MENU key and the following will be displayed.

EDIT OPT:
Save 1
Cancel 2

Save is to save the new maximum call time.

Cancel is the cancel changes.

4.5.8.4 Networks

If you select the network, you can see the lists of the networks as follows. Normally, the phone will automatically select a network. You can manually select a network form this list.

Select Net
XXXXXXXXX 1
XXXXXXXXX 2

Select the network you want. The phone will attempt to connect to this network.

4.5.8.5 Call Setup

If you select Call Setup, you can see the following on the display.

CALL SETUP	
DTMF	1
Auto Ansr	2
Ring Vol	3
Spkr Vol	4

DTMF

DTMF	
ON	
OFF	

This option is to enable or disable DTMF "touchtone" sounds when entering numbers during a call. Press 1 to enable DTMF sounds from the speaker and sent to the other party. Press 2 to disable DTMF sounds.

Auto Ansr

AUTO ANS	
ON	1
OFF	2

This menu is used for the user who wants to answer the phone call without pressing a key. Press the number "1" key to enable automatic answering. Press the number "2" key to disable automatic answering.

Ring Vol	
Press U/D Arrows	
>>>>>>>	

>>>>> indicates the ringer volume level, (up to 10 steps)- Adjust the volume of the ringer using the UP/DOWN keys.

Speaker Vol	
Press U/D Arrows	
>>>>>>>	

>>>>> indicates the speaker volume level. Adjust the volume of the speaker using the UP/DOWN keys.

4.5.8.6 Phn Setup

If you select Phone Setup, you can see the following on the display.

PHONE SETUP	
Key Vol	1
Bklight	2
SlctMode	3
Welcome	4
Language	5

Key Vol

Key Vol
Press U/D Arrows
>>>>>>>>

>>>>>>>> indicates the keypad beep volume level. Adjust the volume of the keypad using the UP/DOWN keys.

Bklight

Press U/D Arrows
>>>>>>>>

>>>>>>>> indicates the brightness level for the backlight. Adjust the brightness of backlight using the UP/DOWN keys.

Selection Mode

SELECTION MODE	
Automatic	1
Manual	2

When the number "1" key is pressed, the phone selects automatically the best Network in the present situation. When the number "2" key is pressed, the network list is displayed for the user to manually select a network.

Welcome

Welcome
Hello_

If you press this option you can change your welcome message and enter the new welcome message. Then, press the MENU key and the following display will be shown.

EDIT OPT.	
Save	1
Cancel	2

Save is to save the new welcome message.

Cancel is to cancel change.

Language

LANGUAGE	
English	1
French	2

Select the language. At present two languages are available. At full capacity, the phone can be programmed up to 12 languages.

4.5.9 Using the Menu key during a call

4.5.9.1 Security

If you select Security, you can see the followings on the display.

PIN	
Mod PIN 1	1
Mod PIN2	2
Ena PIN1	3
Dis PIN1	4

Press the number "1" or "2" keys to modify PIN. This shows the "Old PIN" message. Input the current PIN1 or PIN2. The display will prompt you to enter the new PIN twice. Press the number "3" or "4" Keys to enable or disable PIN1, the "Enter PIN" is displayed. Input the current PIN number.

(Caution!) If PIN is disabled is selected, the phone is activated without displaying the "Enter PIN" message when the SIM card is inserted. This mode is not recommended for users who want to prevent unauthorised use of the phone.

4.5.9.2 In the case one call is active

If the Menu key is pressed then the phone is in call mode, the below menu is displayed.

CALL	
End	1
Hold	2
Mute	3
DTMF	4
Phone Bo	5
Call Inf	6
Text Msg	7

Select "End" to end a phone call. Select "Hold" to hold a phone call in progress. Select "Mute" to silent the user's voice against the other user on the phone for the unwanted contents of a conversation. Refer to the past explanation for DTMF, Phone Bo, call Info, Text Msg.

When "Hold" is selected, the phone call in progress stops. At this time, press the "END" key, and the phone call is ended. To restart a phone call press the "Menu" key and press the number "1" key.

CALL	
Retrieve	1
Mute	2
DTMF	3
Phone Bo	4
Call Inf	5
Text Msg	6

4.5.9.3 *In the case two calls are active*

For the two call mode, dial a number to make a phone call or answer a incoming call after a call is in progress. The user can talk with the other user by turns. In this case, the phone is in call mode from the last call that the user had made or answered. Press the MENU key to show the below display.

CALL	
End	1
Swap	2
Multipar	3
Mute	4
DTMF	5
Phone Bo	6
Call Inf	7
Text Msg	8

Select the "End" to end the active phone call. Select the "Swap" to select between the two calls in progress. Select the "Multipar" so the multi-user can talk over a phone at a time. The following display will appear.

MULTIPARTY	
Build	1
Split	2

Select the "Build" to enter a multi user call mode. In this situation, there are two possibilities to end a call, First, if the user wants to end all calls in progress the "End" key. If the user wants to end calls selectively, press the "Split" option in the multiparty Menu. When one call is in progress and another call is incoming, the below message is displayed.

2:
Incoming

4.5.9.4 Call Waiting

At this time press the "Menu" key, and the below menu will be displayed

CALL	
Reject	1
Accept	2
Retrieve	3
Mute	4
DTMF	5
Phone Bo	6
Call Inf	7
Text Msg	8

Select "Reject" to disconnect an incoming call. Select "Accept" to answer an incoming call. Select "Retrieve" to get back to the last call.

5 Falcom A2 test software

5.1 Overview

Test software includes the main functional commands that could be used to control the FALCOM A2.

The program structure is as follows:

- Terminal emulation (**Terminal** tab, picture 1)
- Voice call function (**Voice-Call** tab, picture 2)
- Short message function (**SMS-Call** tab, picture 3)
- Optional functions (**Options** tab, picture 4)
- Manufacturer information (**Info** tab, picture 5)

(pictures are to be found in the test software appendix)

5.2 FALCOM.INI

Please notice that because of the great variety of GSM-functions the software will always be incomplete. But using the possibilities offered by the **falcom.ini** file the user could expand the amount of commands available in the terminal window. By changing the contents please do never change the structure of the falcom.ini file. There is a sample file in picture 8 in the test software appendix.

Also in the falcom.ini file the user could set parameters like the service centre number or an initialisation string for the modem.

Note: If you are not sure that the file is valid anymore after changing, you may delete it and start the **FALCOM-A2.EXE** to create a new one (it will include standard parameters only).

5.3 FALCOM.EXE

After starting the program some requests were set automatically by the system, i.e. field strength and registration status. The actual service centre number is taken from the ini file:

```
[SMS-Service-Center-Nr] → at+csca="00491722270000"  
"00491722270000"
```

(number is for german D2 net only)

The service centre number could be investigated by using the "read CSCA" button in the SMS-Call window. The program will then read out the SIM card concerning the service centre number.

After 5 unsuccessful attempts to connect to the module the software will show an error message like this:



Please check the power and the cabling. Using the RSSI-Network button you have the possibility to start a new initialisation routine.

All following services will be available only in the case the module is registered in the network. It is to be seen by a green line at the network display. If the module could not register the following will be shown:



Please use a cellular phone or another GSM modem to check if a network is available.

5.3.1 Voice-CALL and SMS – CALL

In these windows a voice call or a short message could be issued. Preset numbers (see ini file) will be used:

[SMS-CallNr]
"0123456789"

[VoiceCallNr]
"0123456789"

The used commands are to be seen at the terminal window where the software switches automatically to.

The SMS-Call window gives the additional possibility to read out the contents of the SIM card (AT+CMGL) and to delete messages (AT+CMGD).

Integrated in the SMS-Call window there is a demonstration on how to build and send PDU mode messages (7-bit and 8-bit coding schemes). After hitting the "Switch to PDU" button a window is opened for the input of the PDU parameters (**Picture 5**). They are described using a Tool-Tip-Help. The window for the coding scheme opens up by choosing the 7-Bit coding option. An example demonstrates the coding step by step.

The constructed string could be sent to the SMS-Call window by using the “**send to PDU-Creator**“ button at the 7-Bit coding window or the “**PDU to Host**“ button in the PDU window. Use “**send SMS**” to send the message to the network.

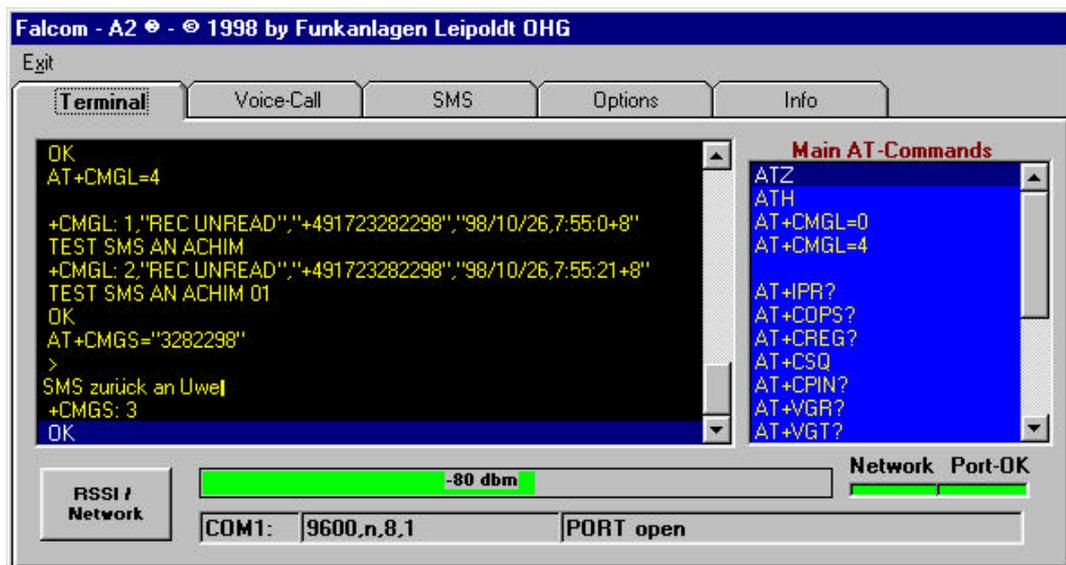
5.3.2 Options

The Options window demonstrates the setting of special parameters by setting the microphone and speaker levels. Also a special initialisation string could be constructed. A “**save Configuration**“ button stores the settings into the A2 module. That means they are available after the next power-up. The “**send Break to A2**“ and **buttons** was integrated especially for the A2-1 to issue a device reset. Command actions of all manipulations are shown in the terminal window.

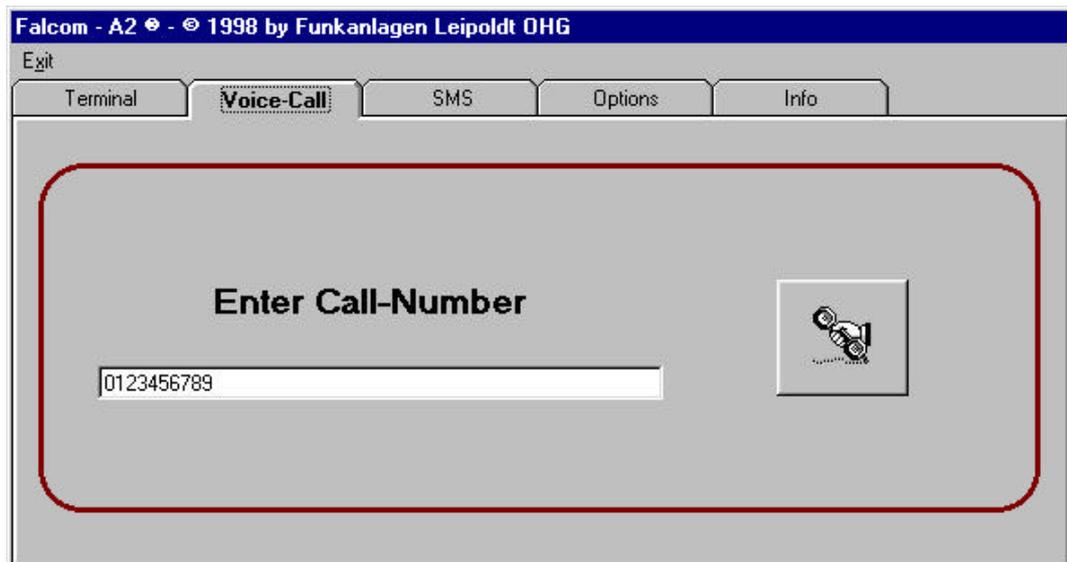
5.3.3 Info

The Info window could be used to access the Falcom A2 help documentation as well as the FALCOM homepage on the internet by simply clicking at the buttons.

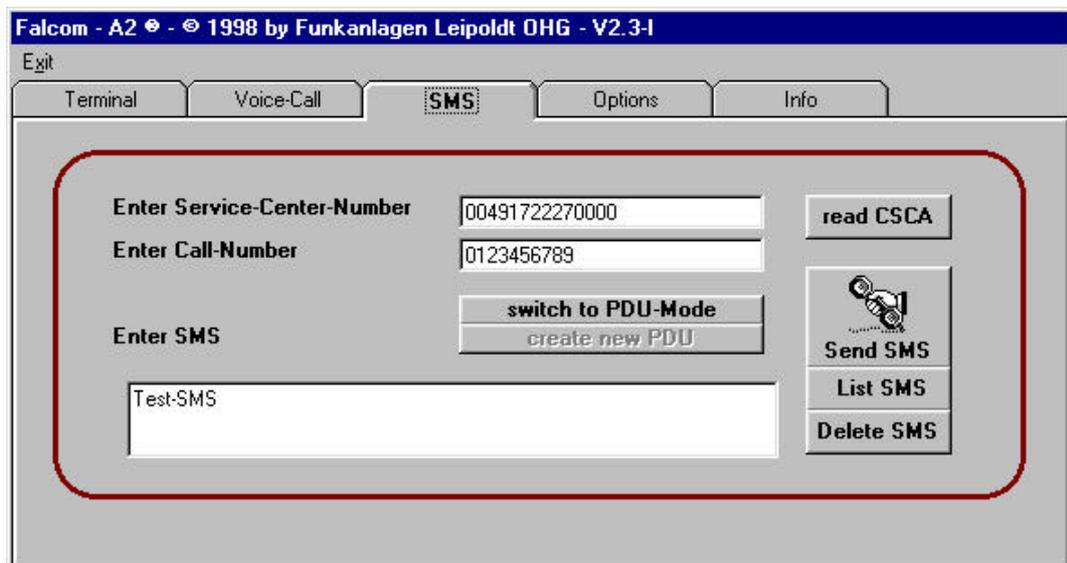
5.3.4 Test software appendix



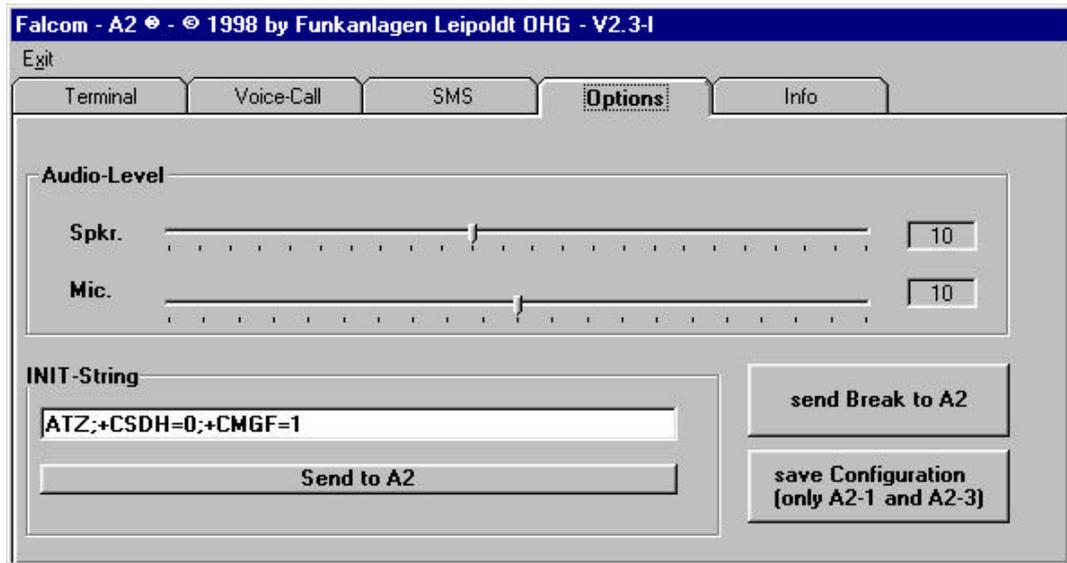
Picture 1



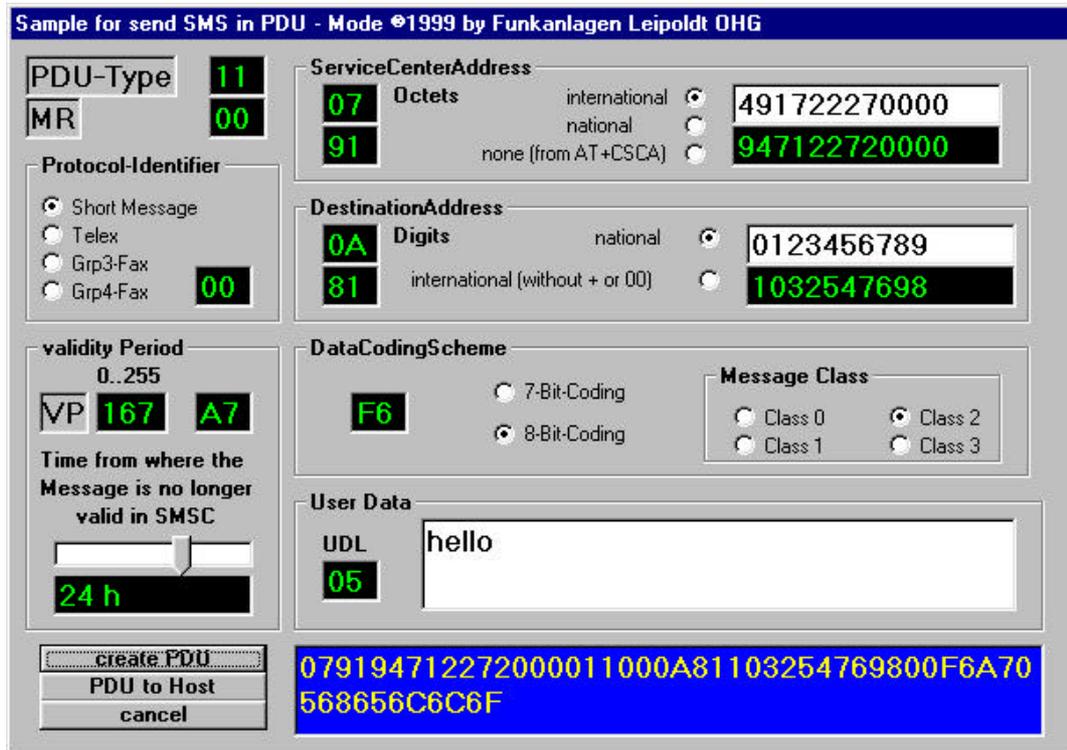
Picture 2



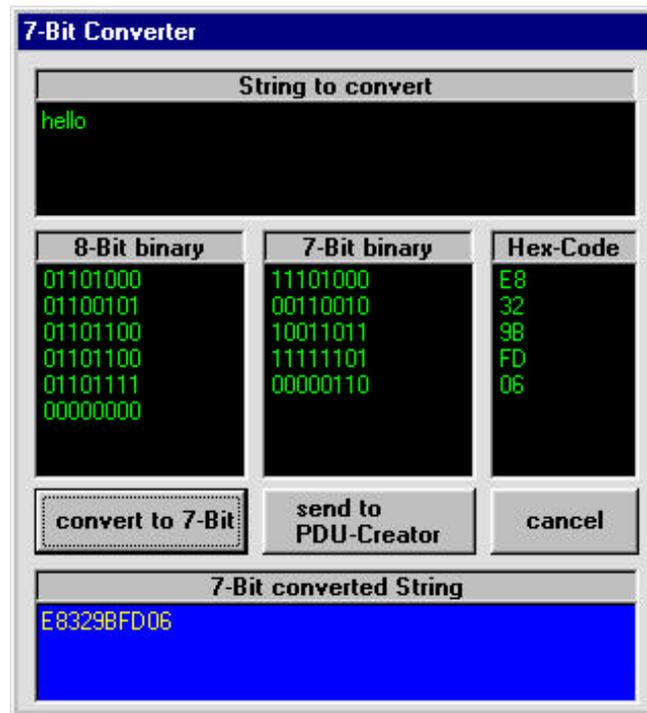
Picture 3



Picture 4



Picture 5



Picture 6



Picture 7

```
do not change the File-Structure !!!"  
[Port]  
1  
[SMS-Service-Center-Nr]  
00491722270000" & CHR(34)  
[SMS-CallNr]  
0123456789  
[VoiceCallNr]  
0123456789  
[A2-INIT-String]"  
ATZ;+CSDH=0;+CMGF=1  
[AT -Commands]  
ATZ  
AT&W  
  
ATA  
ATH  
  
AT+CMGF=0  
AT+CMGF=1  
  
AT+CMGL=0  
AT+CMGL=4  
AT+CMGL="REC UNREAD"  
AT+CMGL="ALL"  
  
AT+IPR?  
AT+COPS?  
AT+CREG?  
AT+CSQ  
AT+CPIN?  
AT+VGR?  
AT+VGT?  
AT+VGR=?  
AT+VGT=?  
  
AT+CGSN  
AT+CGMR  
AT+CGMI  
  
ATS0 = 0  
ATS0 = 1  
  
→ Here the user could append own  
GSM commands !!!!!
```

Picture 8

6 Appendix

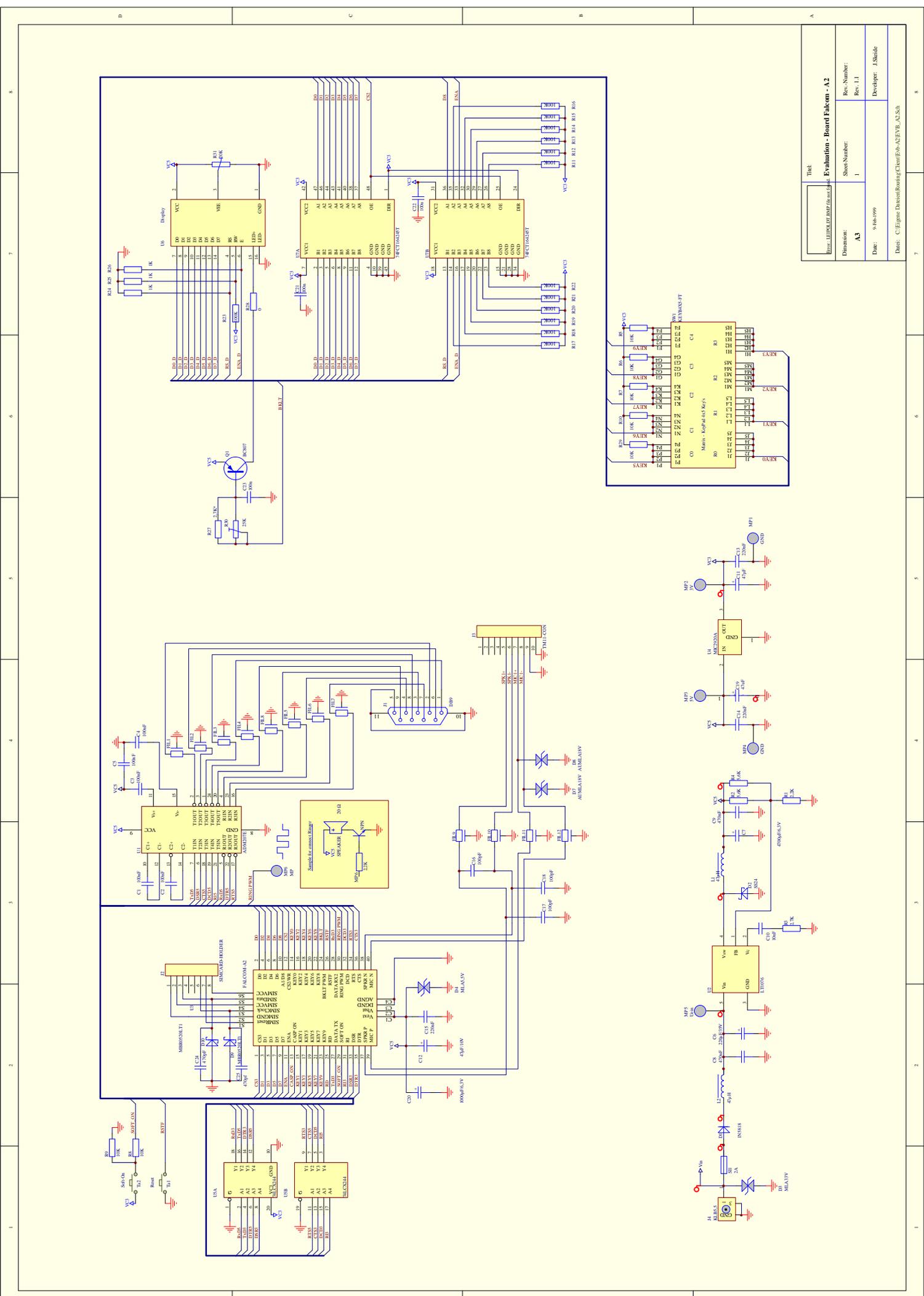
6.1 Recommendation for power supply layout

Because power supply for a GSM unit is a serious problem, we give a recommendation about how we did overcome the need of high peak current consumption. Our experience was that with a switching regulator that adds less than 150mV ripples at maximum load and a capacitance higher than 4700 μ F at its 5V side the modem works fine. On the other hand, without a proper power supply it is very difficult to decide whether there is a problem with connection of the modem and the network or a problem with the power consumption of the modem. Please see schematics of a proper working supply.

6.2 A2 pin description

Pin #	Signal Name	Signal Type	Signal Level	Signal Description	Currently Configured For	Other Uses (With different SW) ***
1	CS3	Output	CMOS	Chip Select 3 - (Active Low) ***	Not Supported in Current SW	Future Use - Intended to allow addition of general purpose bi-directional parallel port.
2	DATA0	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
3	DATA1	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
4	DATA2	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
5	DATA3	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
6	DATA4	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
7	DATA5	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
8	DATA6	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
9	DATA7	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
10	DATA8	Bi-directional	CMOS	Read / Write Data -	Character Display	Bi-directional parallel port ***
or	ADDR1	Output	CMOS	Address 1 (Not Jumpered)	Not Used	Memory Mapped Display
11	ENA	Output	CMOS	Read / Write Enable (Active High) -	Character Display	
12	CS2	Output	CMOS	Chip Select 2 - (Active Low) -	Character Display	
or	WR	Output	CMOS	Write - (Active Low) (Not Jumpered)	Not Used	Memory Mapped Display
13	CASP_ON	Bi-directional	CMOS	Turns Phone On / Off	Output - Phone On = Hi	
14	KEY0	Output	CMOS	Keypad Interface Row Select -		
15	KEY1	Output	CMOS	Keypad Interface Row Select		
16	KEY2	Output	CMOS	Keypad Interface Row Select		
17	KEY3	Bi-directional w Resistor	CMOS	Keypad Row / Column -	Row Select in SW (Output)	
18	KEY4	Bi-directional w Resistor	CMOS	Keypad Row / Column -	Row Select in SW (Output)	
19	KEY5	Bi-directional w Resistor	CMOS	Keypad Row / Column - debounce = 46ms	Column in SW (Input)	
20	KEY6	Bi-directional w Resistor	CMOS	Keypad Row / Column - debounce = 46ms	Column in SW (Input)	
21	KEY7	Bi-directional w Resistor	CMOS	Keypad Row / Column - debounce = 46ms	Column in SW (Input)	
22	KEY8	Bi-directional w Resistor	CMOS	Keypad Row / Column - debounce = 46ms	Column in SW (Input)	
23	KEY9	Bi-directional w Resistor	CMOS	Keypad Row / Column - debounce = 46ms	Column in SW (Input)	
24	BKLT_PWM	Output	CMOS	Back Lighting (Pulse Width Modulated)	Character Display	Memory Mapped Display
25	RD	Output	CMOS	External Device Read Enable - (Active Low)	12.8 kHz, duty cycle 90% On	
26	RSTF	Input	CMOS	Reset CASP only - Active Low	Not Supported in Current SW	
27	DATA_TX	Output	CMOS	RS-232 Transmit Data to Controller	300 to 9600 baud	38400 for Loader, 115200 for Burn Flash
28	DATA_RX2	Input	CMOS	RS-232 Receive Data from Controller	300 to 9600 baud	38400 for Loader, 115200 for Burn Flash
29	SOFT_ON	Input	CMOS	Toggle to turn phone on / off	Active High - Must be high for 3 seconds to toggle	
30	RING_PWM	Output	CMOS	Ringer Interface (Pulse Width Modulated)	1 kHz, 50 % duty cycle	
31	RI	Output	CMOS	RS-232 Ring Indicator (CMOS Levels)	RS-232 Flow Control	Ring indication
32	DCD	Output	CMOS	RS-232 Data Carrier Detect (CMOS Levels)	RS-232 Flow Control	Dial tone indication
				VDD for CMOS = 3.0 Vdc Outputs are 2.4 Vdc = 1, 0.4 Vdc = 0		

Pin #	Signal Name	Signal Type	Signal Level	Description	Currently Configured For	Other Uses
1	RS232Data_TX	Output	12 / -12 Vdc	RS-232 Transmit Data	300 to 9600 baud	38400 for Loader, 115200 for Burn Flash
2	RS232Data_RX	Input	12 / -12 Vdc	RS-232 Receive Data	300 to 9600 baud	38400 for Loader, 115200 for Burn Flash
3	SOFT_ON	See 40 Pin - Pin 29				
4	RING_PWM	See 40 Pin - Pin 30				
5	BRSF	Input with Resistor	CMOS	0 = power on bootstrap, 1 or float = Normal		
6	SPKR_P	See 40 Pin - Pin 37				
7	SPKR_N	See 40 Pin - Pin 38				
8	MIC1_P	See 40 Pin - Pin 39				
9	MIC1_N	See 40 Pin - Pin 40				
10	V_EXT	Power		Battery / Supply		
11	V_EXT	Power		Battery / Supply		
12	V_EXT	Power		Battery / Supply		
13	GND	Ground		Ground		
14	GND	Ground		Ground		
15	GND	Ground		Ground		



Title:		Evolution - Board Falcon - A2	
Revision:		Rev: 1.1	
Dimension:		A3	
Date:		9/16/1999	
Drawn:		J. Shields	
Checked:		J. Shields	