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GUARDLINE MCT



Technical Description

Version 4.0 of 25.11.2000

Firmware Version: 1.62

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2 Introduction

The product name GUARDLINE MCT stands for a universal communication computer which can be used for a variety of applications in stationary or mobile operation. The basic hardware is a 32-bit processor with several serial interfaces and a number of digital and analog inputs/outputs. The hardware is contained in a housing which is closed on all sides and which is not fitted with any operating elements. This housing can also be used to accommodate other communication equipment (GPS receiver, GSM module) as an option. GUARDLINE MCT is controlled, operated and configured by means of an extended Hayes-compatible AT command set, not unlike a commercially available telephone modem.

The GUARDLINE MCT box is a stand-alone unit which makes functions such as GSM, GPS and analog value acquisition available on a universally accessible interface. The emergency call function is implemented as a standard application and can be used without additional interface modules, a PC etc. Customers can implement applications on this basis using connected PCs, palmtops etc.

3 Hardware

3.1 General information

The basic components of the MCT hardware are the 68332 processor, the peripheral devices for operating the interfaces and the options GPS receiver and GSM module.

The Siemens A1 module was selected as the optional GSM module.

A Rockwell modules can be fitted as the optional GPS module, i.e. Jupiter.

Any external GSM device (mobile telephone) with an AT-Cellular GSM 7.05/7.07 interface can be used (e.g. Siemens S35). It is connected via the external RS-232 interface, which is normally used for operating the internal module.

Only 1:1 connections are possible between the interfaces. Parallel connections of several devices are not possible.

3.1.1 Serial interfaces

The TPU channels are used for data circuits. 16 of these are configured. At least two channels are required for the operation of one interface such as RS-232, for example, i.e. RX and TX.

Two interfaces (X11 and X12) are permanently configured as RS-232 with full control and signalling capability. Signals RX/TX, CTS/RTS, DTR/DSR/DCD are supported. Interface X11 is a DTE interface (data terminal equipment interface) and is fitted with a 9-pin D-SUB connector (female). Interface X12 is designed for the connection of data communications equipment (modem) and is fitted with a 9-pin D-SUB connector (male).

Another RS-232 interface (X21) with reduced capability only supports RX/TX signals.

Two further RS-232 interfaces (X31 and X32) with reduced capability only support RX/TX signals. These interfaces can be reconfigured to RS-485 using 0 Ω resistors.

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Serial interface signals

Interface	Interface type	Number of TPU channels	Number of assigned ports	Description
X11	EIA-RS-232-C	2	5	External
X21	EIA-RS-232-C	2	0	External
X31	EIA-RS232-C/ EIA-RS485-A	2	1	External
X32	EIA-RS232-C/ EIA-RS485-A	2	1	External
X12	EIA-RS232-C/ TTL	2	5	External as RS-232, internal as TTL
X41	TTL	2		Internal (GPS module)
X42	TTL	2		External (tachometer) not connected
X43	TTL	2		External (gyroscope) not connected
X51	EIA-RS-232-C	-	-	Configuration interface

3.1.2 Analog inputs

The MCT makes a total of 8 analog inputs available. These are directly connected to an A/D converter. These inputs are protected from overvoltages up to the maximum operating voltage. The inputs must be operated with reference to ground. They are configured using the software. A total of 2 analog inputs are available via connector ST3 in the standard configuration. A further 6 inputs can be made available via connector ST4, which can be configured as an option.

Inputs 1 to 8 are designed for voltage range 0 to 12 V, inputs 9 to 12 for voltage range 0 to 36 V.

3.1.3 Digital I/O ports

A total of 8 digital inputs and 8 digital outputs are available. The inputs are TTL ports which are interpreted as "High" when open and as "Low" at 0 V (< 0.3 V). The outputs are open collector outputs which connect to ground. Each output channel can be charged with 100 mA/36 V. 4 digital inputs and 2 digital outputs are available via connector ST3 in the standard configuration. A further 4 inputs and 6 outputs can be made available via connector ST4, which can be configured as an option.

3.1.4 Power supply

The basic module is fitted with an integrated power supply unit. The operating voltage is applied via connector ST5.

The permissible input voltage range is from 9 to 36 V. The rated input voltage range is 12 V or 24 V.

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3.2 Connector pin assignments

The data directions are specified from the point of view of GUARDLINE MCT.

Connector	Interface	Number	Signal name	Data direction
ST 1 COM 1	X11	3	V24_PC_TX	Input
		2	V24_PC_RX	Output
		7	V24_PC_RTS	Input
		8	V24_PC_CTS	Output
		6	V24_PC_DSR	Output
		4	V24_PC_DTR	Input
		1	V24_PC_DCD	Output
		5	V24_PC_GND	
		9	V24_PC_RI	Output
ST2 Assignments for external GSM module DCE	X12	3	V24_GSM_TX	Output
		2	V24_GSM_RX	Input
		7	V24_GSM_RTS	Output
		8	V24_GSM_CTS	Input
		6	V24_GSM_DSR	Input
		4	V24_GSM_DTR	Output
		1	V24_GSM_DCD	Input
		5	V24_GSM_GND	
9	V24_GSM_RI	Input		
ST2 Assignments for internal GSM module VOICE	X51	1	GNDA	
		2	Radio Mute	Digital out
		3	Off Hook	Digital in
		4	GND - I/O and power	
		5	GND-MICRO	
		6	AUDO – AF output	Analog out
		7	External alarm	Digital out
		8	POWER + (V_{batt})	
		9	HF-MICRO	Analog in
ST3 MULTI I/O	X21	1	X21_TX	Output
		14	X21_RX	Input

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		2	X21_GND		
	X31	15	X31_TX	Output	
		3	X31_RX	Input	
		16	X31_GND		
	X32	4	X32_TX	Output	
		17	X32_RX	Input	
		5	X32_GND		
	Tacho	18	TACHO_IN_1		
		6	TACHO_IN_2		
		19	TACHO_GND		
	GYRO	7	GYRO_IN_1		
		20	GYRO_IN_2		
		8	GYRO_GND		
	Digital input	21	DG_IN_1	Input	
		9	DG_IN_2	Input	
		22	DG_IN_3	Input	
		10	DG_IN_4	Input	
	Digital output	23	DG_OUT_1	Output	
		11	DG_OUT_2	Output	
		24	DG_GND		
	Analog input	12	AN_GND	Input	
		25	AN_IN1	Input	
		13	AN_IN2	Input	
	ST 4 EXTENDED I/O	Analog input	1	AN_IN3	Volt main batterie
			14	AN_IN4	Temp main batterie
2			AN_IN5	Volt motor batterie	
15			AN_IN6	Temp generator batterie	
3			AN_IN7	keypad condition	
16			AN_IN8	Temp motor batterie	
4			AN_IN_GND		
Digital input		18	DG_GND	Input	
		6	DG_IN_5	Break in loop n.c.	
		19	DG_IN_6	Bilge n.o.	
		7	DG_IN_7	Shore power loop n.c.	
		20	DG_IN_8	Free loop n.c.	
		8	DG_GND		
Digital output		21	DG_OUT_3	Sirene	

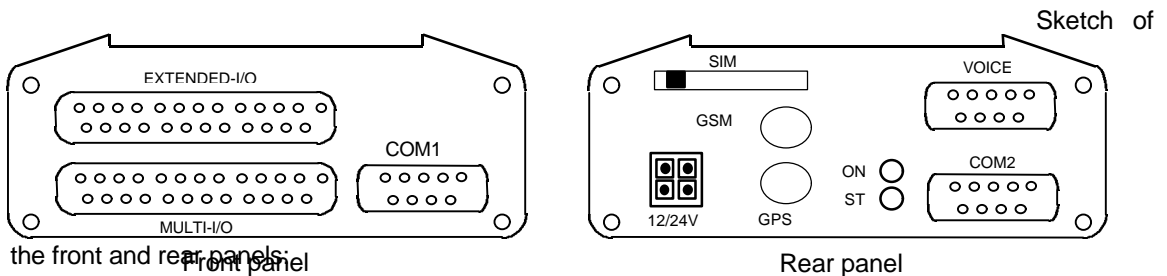


		9	DG_OUT_4	Relay1
		22	DG_OUT_5	Relay2
		10	DG_OUT_6	Emergency power
		23	DG_OUT_7	Pin on circuit board
		11	DG_OUT_8	Output
		24	DG_GND	
ST5 COM 2	Configuration	3	V24_CFG_TX	Input
		2	V24_CFG_RX	Output
		5	V24_CFG_GND	
		9	MCT_Factory_Default	Input
		1	GPS_SDIO2	Input
ST6 12/24 V	Power	4	+ main batterie	
		3	-	
		2	+ Generator	
ST7	GPS antenna			
ST8	GSM antenna			

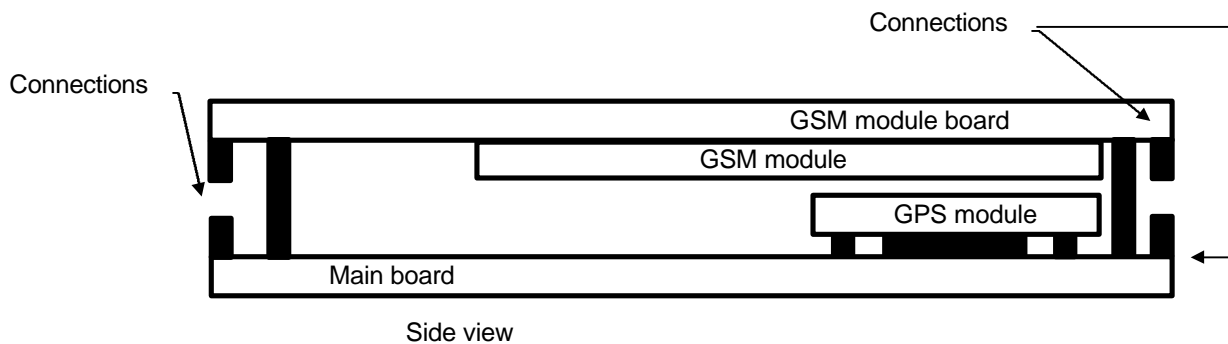
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3.3 Housing

The module is installed in a hollow extruded aluminium section and can be fixed mounted using the bracket which is fitted to the housing. The front and rear panels, which bear openings for connections, are secured to the housing by screws.



3.4 Mechanical design

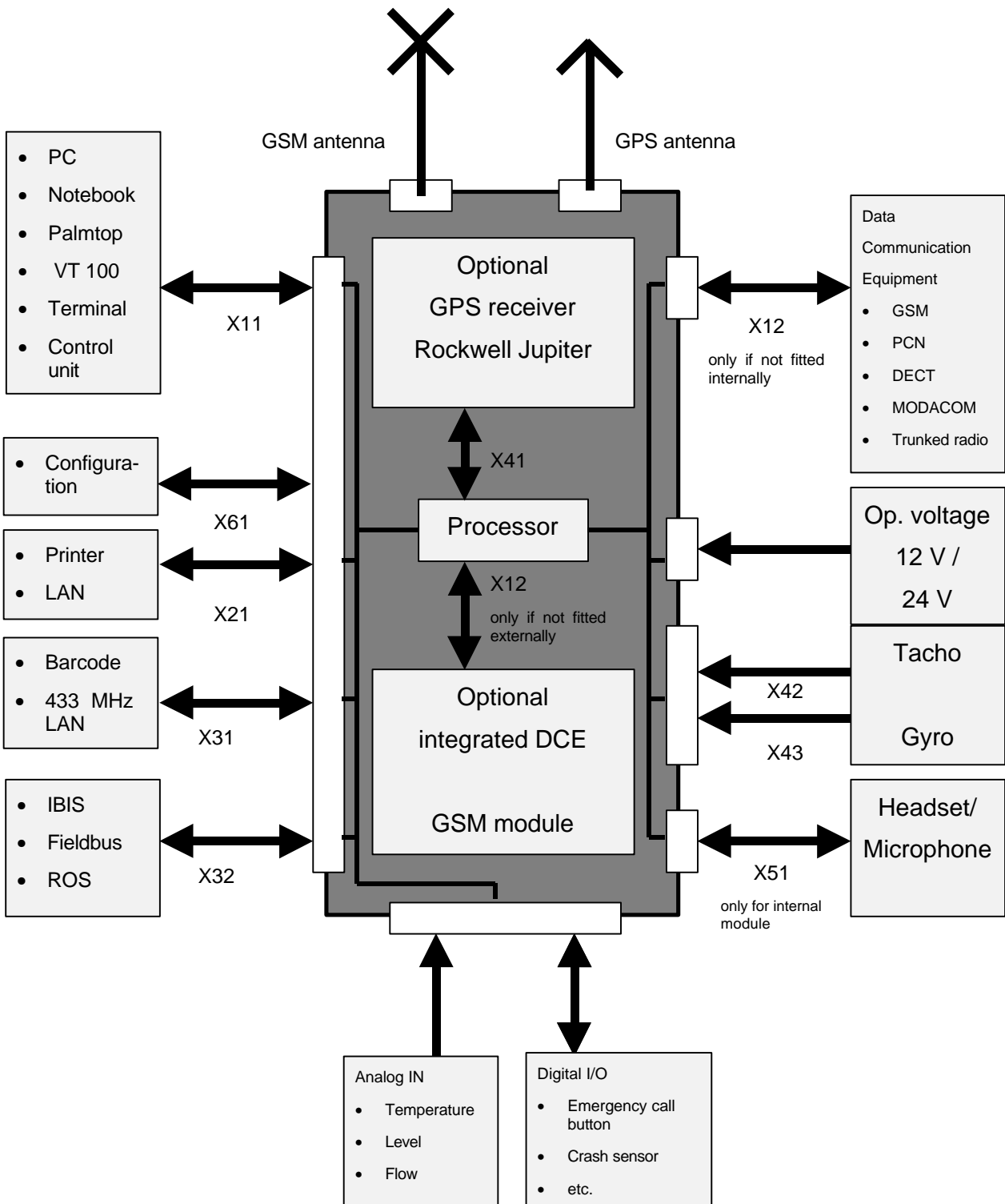


3.5 Housing inscriptions

The connectors are labelled as follows:

Connector name	Inscription	Connector type
ST1	COM1	9-pin D-SUB, female
ST2 external GSM module	DCE	9-pin D-SUB, male
ST2 internal GSM module	VOICE	9-pin D-SUB, female
ST3	Multi-I/O	25-pin D-SUB, female
ST4	Extended-I/O	25-pin D-SUB, female
ST5	COM2	9-pin D-SUB, female
ST6	12/24 V	
ST7	GPS	SMA socket
ST8	GSM	TNC socket

3.6 Block diagram





- X1: RS-232 interface with full capability, signals RX/TX, CTS/RTS, DSR/DTR, DCD
- X2: RS-232 interface with reduced capability, signals RX/TX
- X3: Interchangeable RS-232/RS-485 interface, signals RX/TX
- X4: TTL ports
- X5: Option-dependent ports
- X6: RS-232 configuration interface with reduced capability, signals RX/TX

3.6.1 Use as mobile telephone

It is possible to use the MCT as a mobile telephone if the optional internal GSM module supports the connection of a headset/handsfree telephone. The necessary lines are wired directly from the housing connector to the module. The MCT does not support this function if an external module/mobile telephone is used.

3.6.2 GPS receiver

Slots are currently configured on the main board for Rockwell GPS receivers Jupiter and Micro Tracker. The ports for selecting the message format can be selected using the software.

The main board is designed for active antennae with a 5 V supply.

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4 Software

The MCT is primarily designed as an intelligent communication computer. Communication mainly consists of switching interfaces. This software is referred to as basic software in the following. It includes interface switching, the preparation of GPS data when the GPS receiver is installed, and status message functions.

Extensions include the adaptation to another GPS receiver, for example, or customer-specific applications which are to run on board in the event of stand-alone systems.

The system operates like a modem from the point of view of interfaces. It can be completely controlled and configured using an extended AT command set.

4.1 Function overview

The software supports the following components:

- Internal Rockwell GPS receiver:
 - Position and status polling
- Internal GSM module:
 - Message traffic via SMS
 - Setup of speech communication
- External GSM mobile telephone (AT command set):
 - Communication setup
 - Message traffic via SMS
- External AT Hayes modem (wire-based):
 - Communication setup
 - Message traffic via data channel
 - Setup of speech communication
 - Setup of data links and looping through via PC port <==> modem
- Digital IO
 - Status polling
 - Setting digital outputs
- Analog IN
 - Polling of measured values
- Status and alarm functions
 - Definition of status/alarm messages (input status, measured value threshold or GPS position), time conditions
 - Automatic call to one or more control centres in the event of an alarm

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4.2 System

When the system is powered up, it performs a self-test. If a user-specific configuration was defined as the switch-on state before the system was switched off, this is activated. The system is then in the initial state. Command input is permitted from any interface in the basic configuration. The state in which the MCT processes commands input via the interface is referred to as command mode in the following.

If a situation should occur in which the user can no longer address the MCT (unfavourable interface connection etc.), it is possible to set the factory default using a hardware signal. The user configurations, of which three are available, are not deleted.

Two interfaces can be connected using an MCT command. The resulting connection is referred to as transparent mode in the following. The data are exchanged between these two interfaces without the necessity for any further commands to the MCT or special frames.

4.3 Interface handling

When a command is identified on an interface, this becomes the master interface for the duration of processing. It is possible to define a master interface explicitly using the software. This suppresses mutual interference between interfaces as every other interface is then automatically defined as a slave. During this period, the slave interfaces continue to operate such that incoming data streams are forwarded to the assigned output interfaces without any interpretation of data. Any commands entered there have no effect on the MCT. A master interface can only be reset from the master interface.

All the serial interfaces automatically detect the baud rate, with the exception of COM2, which as the service or configuration interface is set to 9600 baud at the factory. The baud rate is detected via the incoming command. The baud rate is synchronized by means of the start sequence. Only when a connection to another interface is set up, is the baud rate fixed for the duration of that connection. This connection also effects a changeover to a transparent mode, which can differ depending on the type of connection. There are three possible methods of disconnecting interfaces, which must be defined when setting up the connection:

1. Disconnection by hardware signal
2. Disconnection by command sequence
3. Time-controlled disconnection

All three methods of disconnection are possible in the case of a connection to an X1 interface (full configuration). With all other interfaces, only types 2 and 3 are possible. Disconnection by hardware signal is designed for fast connections in which the CPU does not interpret the data in any way. Loss of the DCD signal is an indication of the disconnection and the transfer to AUTO mode. As an escape or command sequence always arrives at the terminal unit, time-controlled disconnection is useful in the case of a printer connection, for example. In this case, disconnection takes place when a specified delay is exceeded and both interfaces go into AUTO mode.

The maximum possible baud rate is currently 19200 baud.

4.4 Configuration

The MCT is configured using AT commands. The command and one or more parameters is preceded by AT*M. Data storage is a 2-level procedure due to the scope of configuration. The data are copied from the flash memory into the RAM after the system is booted. All changes occur there. Only when a special command is issued are the data permanently stored. This blocking is useful as the flash memory cannot be written byte by byte. All other actions are interrupted during the write procedure.

The configuration parameters are classified into several levels, each of which is password-protected, to prevent them from being overwritten inadvertently. This is especially important in the case of the status message configuration.

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4.5 Commands

The commands can be divided into the following classes:

- MCT configuration
- Connecting and disconnecting communication paths
- Save/load ConFiGuration
- Status message configuration
- Escape sequences
- Polling the GPS module
- Polling inputs
- Setting outputs

4.6 Command syntax

During command implementation, it was important to avoid any conflicts with the official GSM guideline and any overlap with the module commands. The "+C" character string is reserved for GSM. The "^S" string is defined as an escape sequence for the Siemens A1 module. "*M" (asterisk M) is defined as the specific sequence for the MCT. This sequence precedes the actual command. The command is terminated by a <CR>, at which point interpretation begins. A <CR> may be followed by an <LF>.

The general command structure is described here. The definitions are closely related to the AT-Cellular GSM 07.05 and 07.07 standard.

Test command	AT*MXXX=?	The MCT responds by returning the list of parameters and their value ranges which are defined using the appropriate write command or by internal events.
Read command	AT*MXXX?	This command returns the current value(s) of the defined parameter(s).
Write command	AT*MXXX=<...>	This command defines settable parameters.
Execute command	AT*MXXX	The execute command reads non-definable parameters which are affected by internal events.



4.6.1 Overview of commands

Self-defined commands	Function
###	Escape sequence
AT	ATtention
CADIAL	Configure Automatic DIALling
CAI	Configure Analog Input
CAIP	Configure Analog Input Port (*)
CCMDACK	Configure Comando Acknowledge
CCUM	Configure Control Unit Mode
CDA	Configure DAta communications
CDI	Configure Digital Input
CDIP	Configure Digital Input Port (*)
CDO	Configure Digital Output
CDOP	Configure Digital Output Port (*)
CDSTA	Configure Device Status
CEMAIL	Configure e-mail
CFG	Save/load ConFiGuration
CHARGSM	Configure GSM Character
CIFCHW	Configure Interface Hardware
COM	Set COM interface parameters
CON	CONnect/disconnect interface
CPIN	Configure PIN number
CPRCU	Configure program PRiority for Control Unit
CSMC	Configure Status Message Conditions
CSMG	Configure Status MessaGe
CSMOUT	Configure Status Message OUTput
CSMPR	Configure Status Message PRiority
CSMS	Configure SMS setup string
CSMSND	Configure Status Message SeND procedure
CSMSSC	Configure SMS Service Centre number
DIAL	DIAL number
DSTA	Change device status
EEACK	EEPROM Error Acknowledgement
EMAIL	Send e-mail
ERR	Define ERRor messages
FAC	FACTory default
GETAIP	GET Analog Input Port



GETAIP2	GET Analog Input Port, short form
GETALL	GET ALL input data (RMC message for GPS data)
GETALLGGA	GET ALL GGA input data (GGA message for GPS data)
GETCHARGSM	GSM - Character reading
GETDIP	GET Digital Input Port
GETDIP2	GET Digital Input Port, short form
GETDOP	GET Digital Output Port
GETDOP2	GET Digital Output Port, short form
GETGA	Status data: GET GPS Altitude
GETGD	Status data: GET GPS Date
GETGH	Status data: GET GPS Heading
GETGLA	Status data: GET GPS LATitude 1
GETGLA1	Status data: GET GPS LATitude 1
GETGLL	Status data: GET GPS Longitude and Latitude 1
GETGLL1	Status data: GET GPS Longitude and Latitude 1
GETGLO	Status data: GET GPS LONGitude 1
GETGLO1	Status data: GET GPS LONGitude 1
GETGRAW	Status data: GET GPS RAW data
GETGS	Status data: GET GPS Status
GETGT	Status data: GET GPS Time
GETGV	Status data: GET GPS Velocity
GETSMC	Get Status configuration
GETSMG	Get Status MessaGe
GETUSA	Get User SMS contents
GETUSAM	Get number of User SMS messages stored on the PCMCIA card.
GETUSD	Get User SMS Date
GETUSOA	Get User SMS Transmit Address
GETUSSC	Get User SMS Service Centre
GETUST	Get User SMS Time
GETX	Get all input data (GPS data from RMC), compressed
GMI	Get Manufacturer ID
GMM	Get Manufacturer Model
GPS	GPS protocol
HANGUP	HANG UP
HELP	HELP (outputs all available commands)
LCK	LoCK (password)
MST	MaSTer function

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NAME	Configure NAME for MCT
OWNCH	OWN CHannel number
QST	Quit SStatus
RESETSM	RESET Status Message conditions
RST	Software ReSeT
SADIAL	Activate and deactivate automatic dialling
SCUM	Set Status of Control Unit
SDOP	Set Digital Output Port (*)
SDP	Set Digital Port
SDOP2	Set Digital Output Port, short form (*)
SDP2	Set Digital Port, short form
SDSTA	Activate device status output
SGDT	Set GPS Date and Time
SGLL	Set GPS Longitude and Latitude
SGPWR	Set GPS PoWeR
SHO	Set Hardware Options
SMA	Status Message Acknowledge
SMS	Send SMS
SMS1	Send SMS
SNR	Serial number
SOEM	Set OEM ID
STA	Command SStatus
STC	Send To COM
SWLOAD	SoftWare LOAD
SYS	SYStem status
USACK	User SMS Acknowledgement
VER	VERsion

The commands marked with a (*) were introduced for command conformity reasons

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5 Firmware update

To load the firmware for the GUARDLINE MCT onto the unit, or to update the unit, you must install the MCT-Install program.

To run the MCT-Install program, please start the file "SETUP.EXE".

This file is stored in the \GUARDLINE\MCTINSTALL directory on the GUARDLINE CD. Then follow the instructions of the installation program.

When you start the program for the first time, you are prompted to enter a registration number.

Please enter your eight-digit customer number.

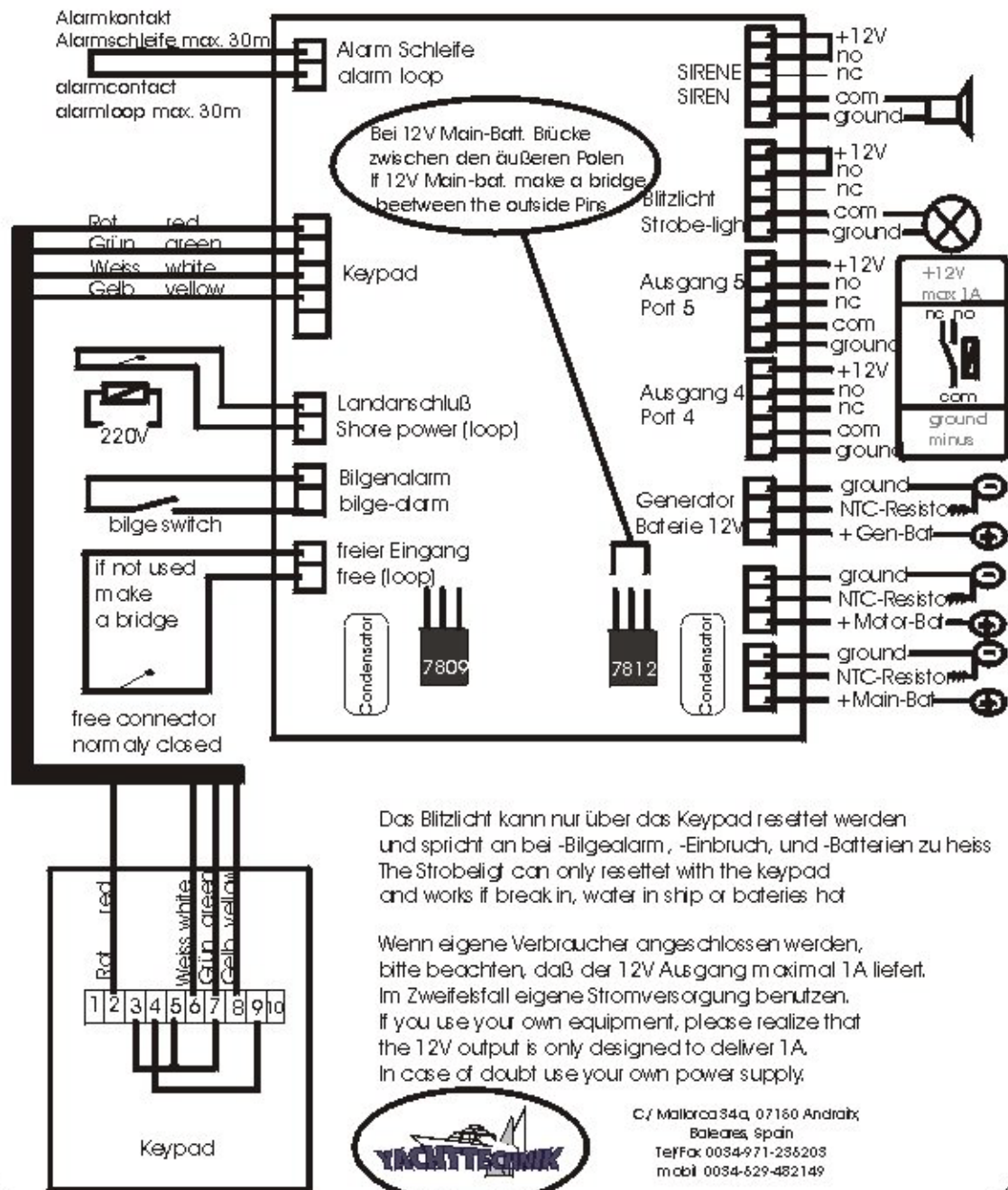
You will find the current firmware for the GUARDLINE MCT in the \GUARDLINE\FIRMWARE directory.

ATTENTION: The firmware can only be loaded via the COM 2 port of the MCT.

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GUARDLINE

I/O Connections



Das Blitzlicht kann nur über das Keypad resettet werden und spricht an bei -Bilgealarm, -Einbruch, und -Batterien zu heiss
The Strobe light can only be reset with the keypad and works if break in, water in ship or batteries hot

Wenn eigene Verbraucher angeschlossen werden, bitte beachten, daß der 12V Ausgang maximal 1A liefert. Im Zweifelsfall eigene Stromversorgung benutzen.
If you use your own equipment, please realize that the 12V output is only designed to deliver 1A. In case of doubt use your own power supply.



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