Normarc®

NORMARC 7050

MARKER BEACON

User Manual

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USER MANUAL

NORMARC 7050

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PART I INTRODUCTION

1 GENERAL INFORMATION

This paragraph gives a description of a typical ILS installation and the Normarc Marker Beacon system. Conventions and abbreviations used in this manual are also given.

1.1 Introduction

This is an overview of Normarc's NM 7050 ILS marker beacons systems.

1.1.1 ILS Overview

A complete Instrument Landing System comprises:

- A *LOCALIZER* SYSTEM, producing a radio course to furnish lateral guidance to the airport runway.
- A GLIDE PATH SYSTEM, producing a radio course to furnish vertical guidance down the correct descent angle to the runway.
- MARKER BEACONS, to provide accurate radio fixes along the approach course.

The layout of a typical ILS airport installation is shown below.

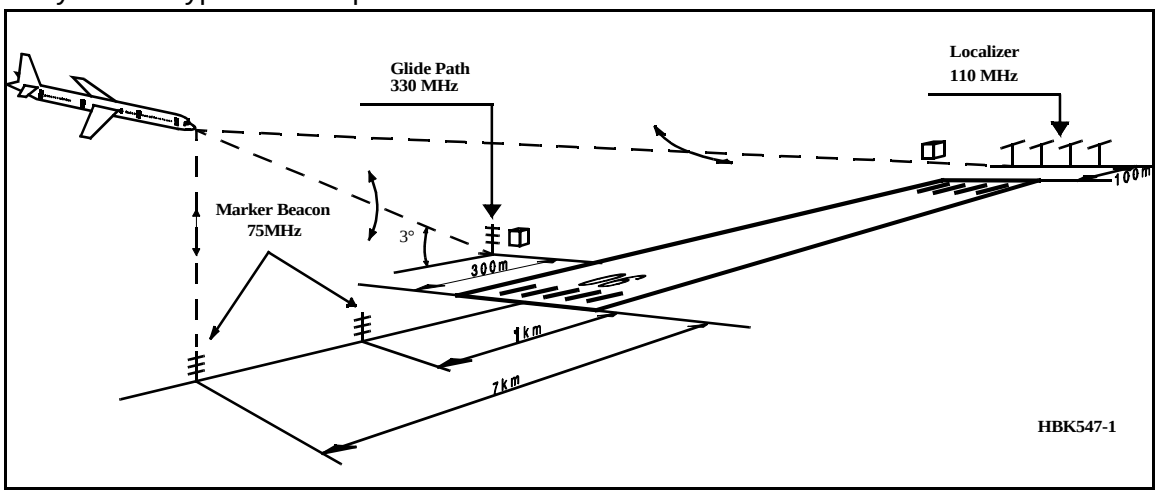

Figure 1-1Typical ILS airport installation

1.1.2 Marker Beacons Overview

The complete ILS marker beacons system comprises:

- A Marker Beacon transmitter/monitor cabinet
- A Marker Beacon antenna
- A remote control
- An Remote Maintenance Monitor (RMM) program to be installed on a PC
- Optional slave panel
- Optional backup battery

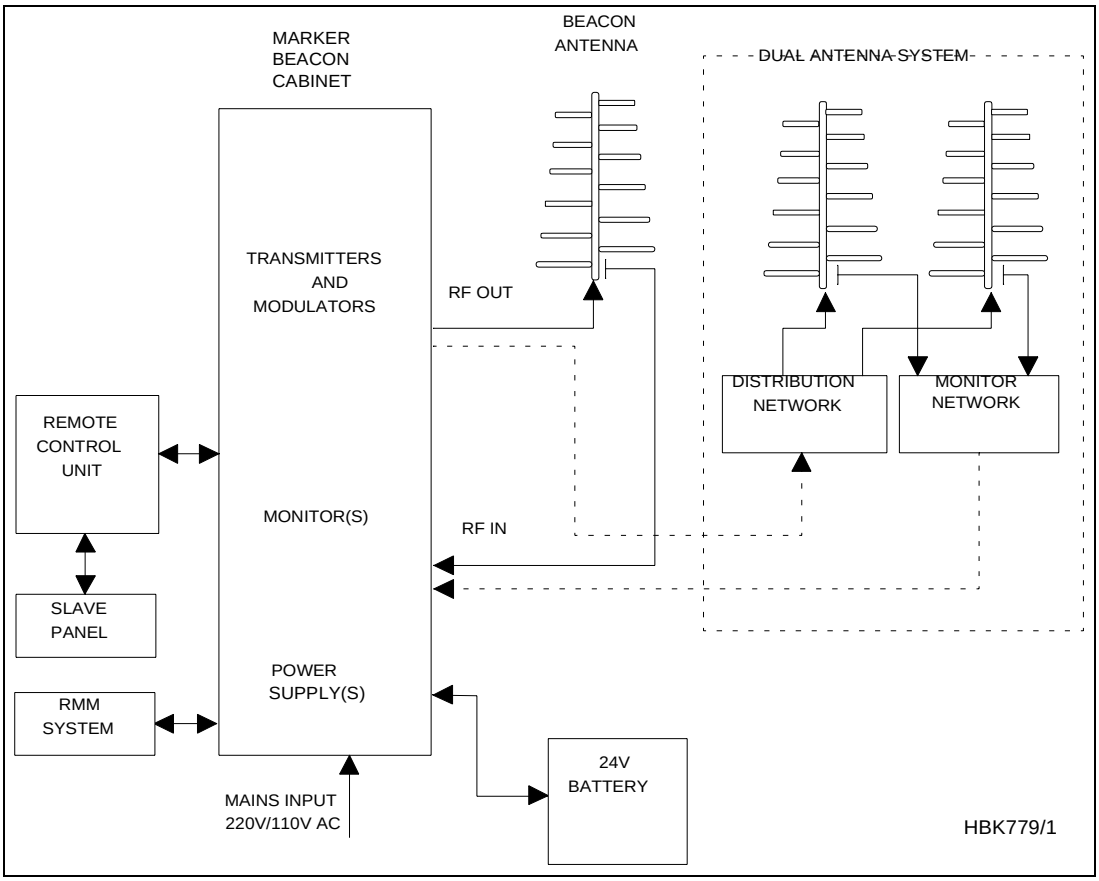

Figure 1-2 Marker beacon block diagram

1.1.3 Marker Beacons Description

The marker beacons are located vertically beneath the localizer course line at distance 150m (inner marker), 1km (middle marker) and 7km (outer marker) from the runway threshold.

The beacons radiate a 75MHz radio signal with an audio Morse code. The Morse code and modulation frequency differ for the outer, middle and inner marker. Outer marker transmits dash code 400Hz, middle marker transmits dash dot code 1300Hz and inner marker dot code 3000Hz.

1.2 Product Type Numbers

The Normarc product numbering system is based on the following three levels:

- System
- Assembly
- Module

Systems have type numbers starting with NM, for example NM7050. Systems consist of assemblies, modules and parts.

Assemblies have type numbers consisting of three letters, a three- or four- digit number and a letter, for example CAA 1370A. CAA is an abbreviation of *CA*binet *A*ssembly, 1370 is a running number, and the last letter is the variant designator. Assemblies can consist of assemblies, modules and parts.

Modules have type numbers consisting of two letters, a three- or four- digit number and a letter, for example MO 1374A. MO is an abbreviation of *MO*nitor, 1374 is a running number, and the last letter is the variant designator. Modules consist of parts.

1.3 Abbreviations

AC	:	Alternating Current
ADC	:	Analog to Digital Converter
AGC	:	Automatic Gain Control
CPU	:	Central Processing Unit
DAC	:	Digital to Analog Converter
DC	:	Direct Current
DM	:	Depth of Modulation
EEPROM	:	Electrically Erasable Programmable Read Only Memory
EMC	:	Electro Magnetic Compatibility
EMI	:	Electro Magnetic Interference
EPROM	:	Erasable Programmable Read Only Memory
FIFO	:	First In First Out
FPGA	:	Field Programmable Gate Array
I/F	:	Inter Face
ILS	:	Instrument Landing System
IM	:	Inner Marker
LED	:	Light Emitting Diode
LF	:	Low Frequency
LRU	:	Line Replaceable Unit
MCU	:	Monitor Combiner Unit
MM	:	Middle Marker
NAV	:	NAVigation signals
NF	:	Near Field
OM	:	Outer Marker
PC	:	Personal Computer
RAM	:	Random Access Memory
RF	:	Radio Frequency
RMM	:	Remote Maintenance Monitor
RMS	:	Remote Monitoring System
ROM	:	Read Only Memory
RTC	:	Real Time Clock
SC	:	Station Control
SRAM	:	Static Random Access Memory
STB	:	STandBy
SW	:	Soft Ware
TX	:	Transmitter

2 Physical organisation

This chapter describes the physical outline of the NM 7050

2.1 Configurations

2.1.1 Module and Assembly Location

The figures on the following pages show the locations of the modules in the main cabinet.

Figure 2-1 shows the front panel of the cabinet, with the control panel, on/off switch and local PC connection.

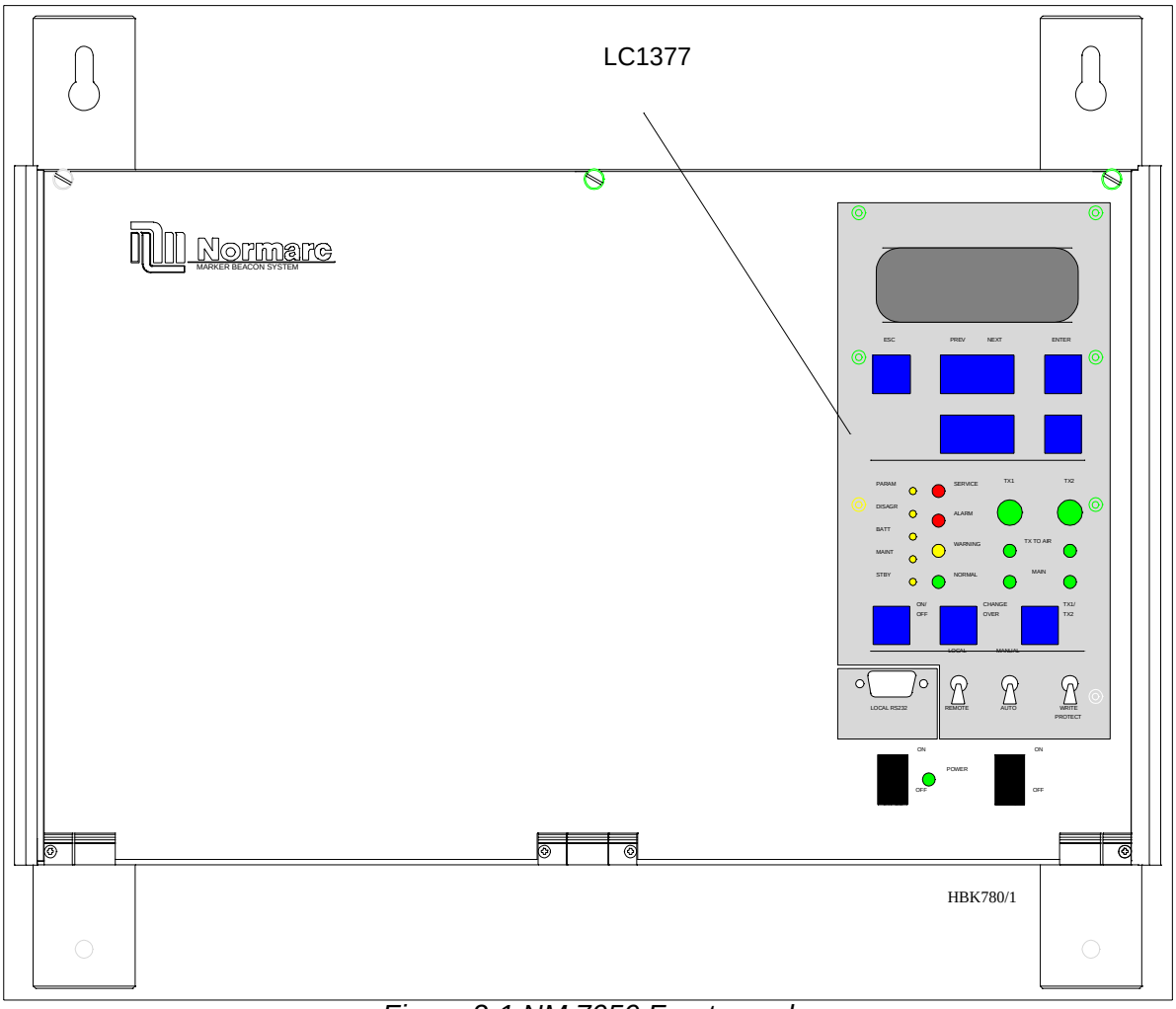

Figure 2-1 NM 7050 Front panel

Figure 2-2 shows the open cabinet in front view with indication of plug in board location.

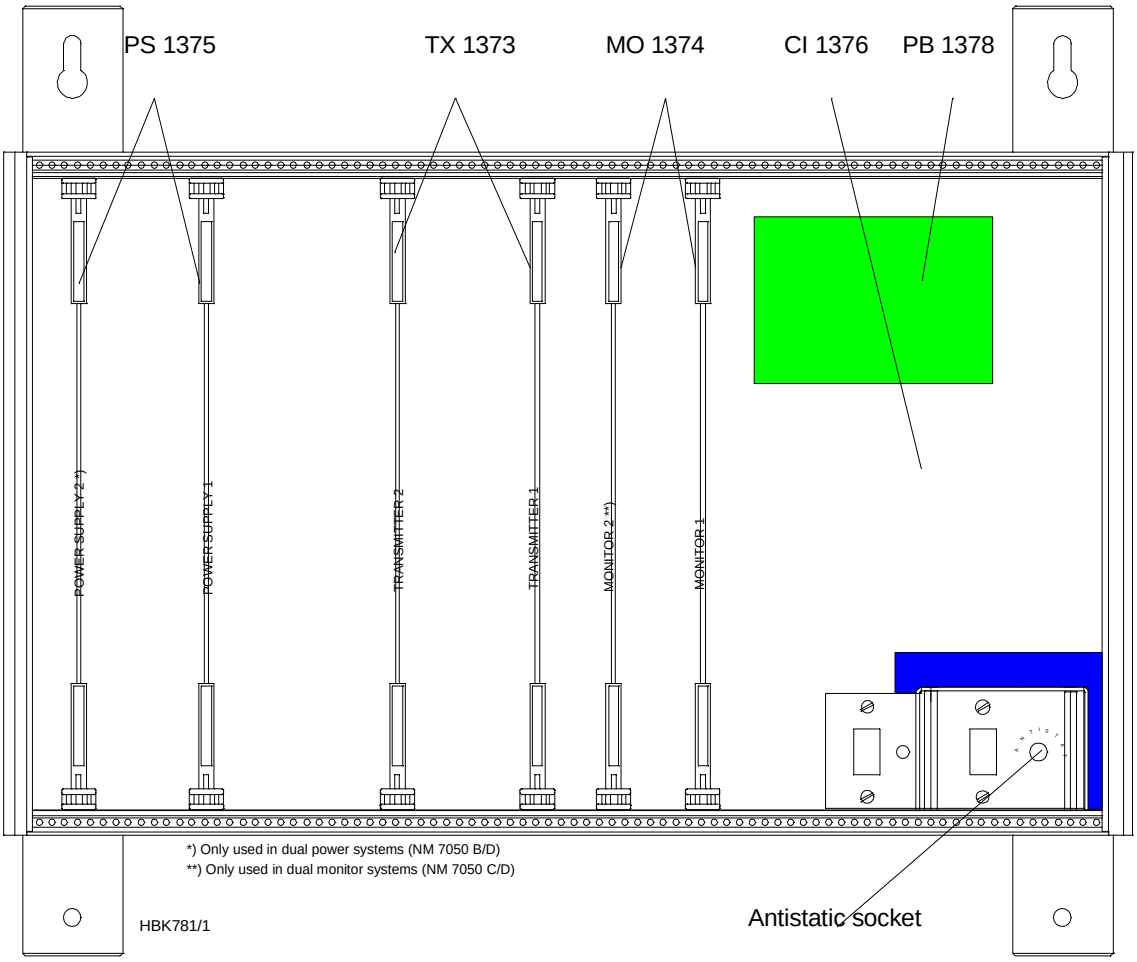

Figure 2-2 NM 7050 Module Location

Notice the location of the different plug in boards. It is essential for the MB to function, that the cards are placed in these locations. If your MB is configured with only one plugin board of each type, they must be placed in the number one locations. The backplane is however , marked with notifications of where each boards place is..

The electronic devices inside NM 7050 are sensitive to Electro Static Discharge (ESD). Please follow the instructions given in the preface of this manual to avoid damage during servicing and transportation.

3 System Description

3.1 Introduction / Overview

The system is housed in a compact cabinet. There are four models/configurations of the NM 7050.

Variant	Monitor	Power Supply
NM7050A	**1**	**1**
NM7050B	**1**	**2**
NM7050C	**2**	**1**
NM7050D	**2**	**2**

Table3-1 Models / Configurations

As shown in Table 3-1, the beacon can have one or two monitor units and one or two power supply units. Figure 3-1 shows a block diagram of the MB system.

The monitor and transmitter control function is based on software. The system is based on modern technology with extensive Remote Monitoring and Maintenance capabilities, and very high reliability and integrity.

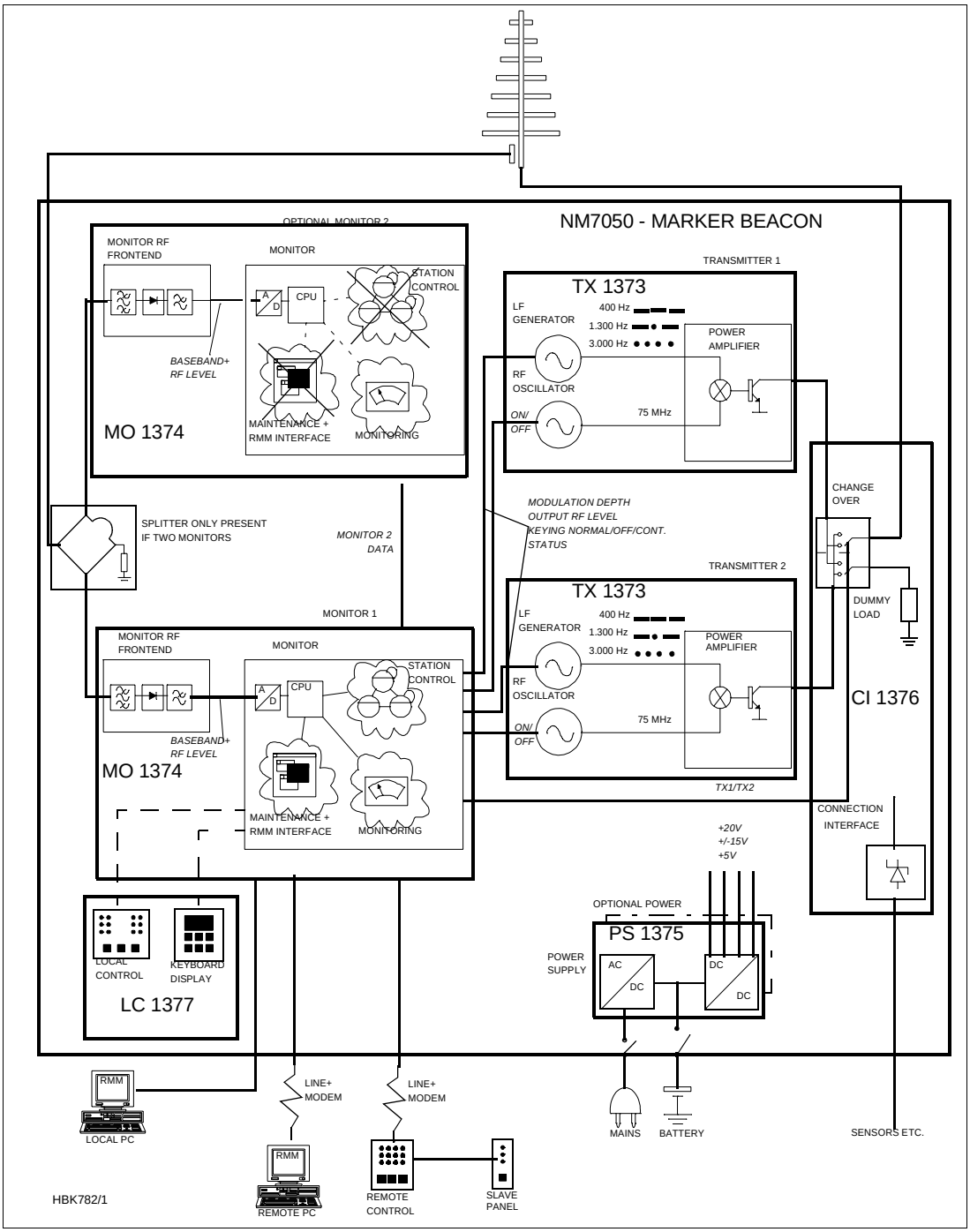

Figure 3-1 MB block diagram

3.2 Transmitters / Modulators

The NM7050 consists of two TX1373A transmitters. The main transmitter is connected to the antenna, while the standby transmitter is connected to dummy load. A failure in the main transmitter will cause an automatic change over to the standby transmitter.

The audio signals are generated in the LF circuitry mainly by a Field Programmable Gate Array (FPGA). A strap field selects Inner, Middle or Outer Marker settings.

An onboard oscillator generates a 75MHz carrier wave which is amplitude modulated with the

audio signal in the Power Amplifier (PA). The PA is capable of delivering up to 4W power at 97% depth of modulation.

Unwanted frequencies are removed by a lowpass filter after the PA.

3.3 Monitors / Transmitter Control

The marker beacon has one or two MO1374 monitor modules depending on model (Table 3-1).

The MO1374 is mainly a microprocessor based module. It contains the MB software and forms the basis of the monitor, station control, system maintenance handling and RMS user interface.

A detection of error in the transmitter signal causes change-over to the standby transmitter. Failure of the standby transmitter leads to an alarm and optional shutdown of the standby transmitter.

On a system with two monitor units, both must report error for alarm to be generated (2 of 2 voting). If the monitors disagree, the WARNING and DISAGR LEDs on the front panel is lit.

The MO1374 consists of two submodules:

The RF frontend receives a RF signal from the antenna (or recombining network for dual antenna system). It demodulates the signal into analogue values propotional to the RF power, the modulation depth and the morse code envelope. These parameters are digitized and monitored by the CPU section.

The CPU section includes an 80CI88 CPU, memory, communication ports and an AD converter system.

3.4 Power Systems

The marker beacon can have either one or two PS1375 power modules depending on model (Table 3-1). The PS1375 is 100W with 120V or 230V AC input voltage and +28V/3.5 A, +20/ 2.5A, ±12V/1.25A and 5V/6A DC output voltages. Outputs are short circuit protected. On the NM7050 B/D the two modules operate in parallel.

The 28V output is temperature compensated to ensure optimum battery charging. It gives 26.4V at 50°C and linearly increase to 29.6V at -30°C.

The backup battery is an external 24V battery. The battery gives a backup time of 6 hours, and have external charging possibilities for longer backup time. This battery is automatically brought into circuit on mains power failure. The charging time is approximately eight hours with one PS1375 and five hours with two PS1375.

3.5 Remote control system

The remote control unit is used in the tower or in the technical control room. It has indicators for operating status as well as detailed warnings and an aural alarm device with reset. It can control equipment on/off and change over, and has an Access Grant switch to allow/inhibit remote control from the RMM system.

The Remote Control Unit is connected to the MB by one pair telephone cable.

3.6 Remote Maintenance Monitoring (RMM)

The NM7000 series has a built-in Remote Maintenance Monitoring system. This system consists of the RMS system, remote PC terminals with the RMM program installed, and the local keyboard/display. Figure 3-2 illustrates the RMM/RMS systems.

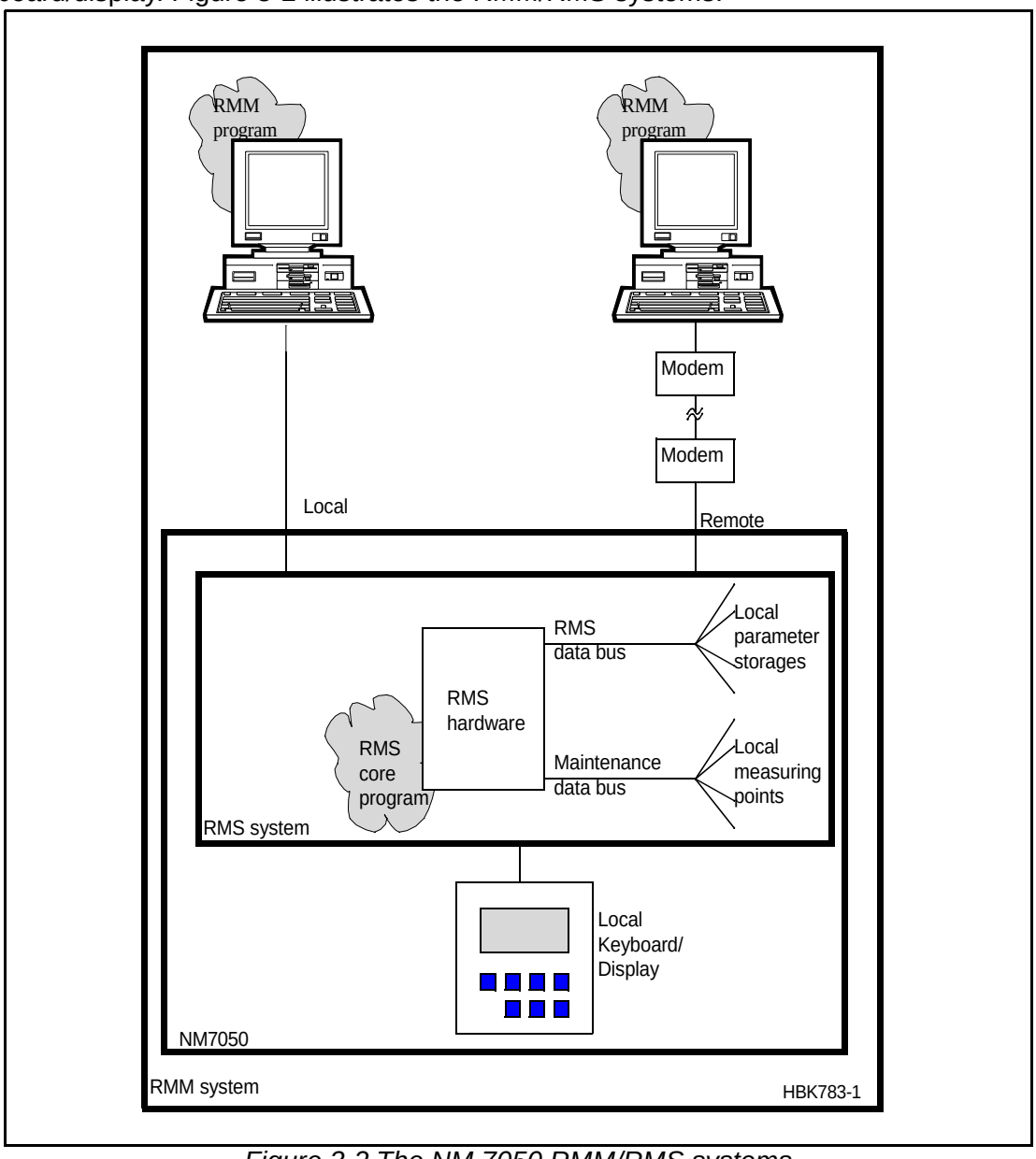

Figure 3-2 The NM 7050 RMM/RMS systems

The centre of the RMM system is a CPU with the RMS core program. The RMS collects measurements and diagnostic data, and makes them available to the user. The collected information allows easy and cost effective maintenance, fault finding and routine reporting. In addition, system settings are distributed and parameter readings are collected via the RMS/ CPU.

External Personal Computers are used for a user friendly interface to the RMM system. The equipment has two serial output ports, typically used to connect a local PC and a connection to a central maintenance facility.

The local keyboard/display allows readings and controls through an LCD display and a seven-button keypad. This gives access to the RMM functionality without the need for a PC.

3.7 RMM Access

Access to the RMM system is controlled by multiple hardware and software access controls. One password is required for each access level, i.e. one password for level 1, two for level 2 and three for level 3. Optional hardware controls may inhibit writing in the upper access levels.

Access level 1
- Readout of all the monitor values, warning and alarm limits.
- Readout of all the maintenance values and warning limits.
- Readout of all the delays.

Access level 2
- TX1 and TX2 : morse normal, continuous or off.
- TX1 and TX2 : test signals 50% depth of mod. and 50% RF level.
- Diagnostics.

Access level 3
- Settings of all the monitor warning and alarm limits.
- Settings of all the maintenance warning limits.
- Settings of all the delays.

3.8 Storage Functions

The RMS has the following storage functions:

Alarm Storage:

8 alarm logs can be stored. One log consists of a CURRENT LOG and a HALF MIN LOG. Current log is a continuous 2 seconds log of monitoring and maintenance parameters. Half min log is a 30 seconds log of monitoring and maintenance parameters sampled at 5 second intervals. A log is stored when a *SHUT-DOWN* or *CHANGE-OVER* alarm occurs.

Periodic Storage:

Stores 16 data sets of monitored data on configurable periodic intervals.

Event Storage:

Stores the last 50 events. Each event is stored with a TIME_STAMP and a USER_ID (of the user executing the command). Stored events are; change in WARNING and ALARM states, excution of STATION CONTROL COMMANDS, changes in WARNING and ALARM LIMITS on logout from access level 3, SYSTEM ADMINISTRATION, and log-in and log-out at access level 2 and 3.

3.9 Local Keyboard/Display Functions

Through a menu based interface all main commands, adjustments and monitor limits are accessible from the front panel keypad and LCD display. In addition a quick read function gives readout of all main monitor parameters at a glance.

3.10 Diagnostic functions

The system contains internal measuring points and diagnostic functions to isolate faults to failed modules. The values measured are referred to as *maintenance parameters*. Refer to Chapter 10.

3.11 Document structure

In Figure 3-3 the document structure is shown. The upper tree is the contents of the cabinet, while the lower tree is additional tower equipment.

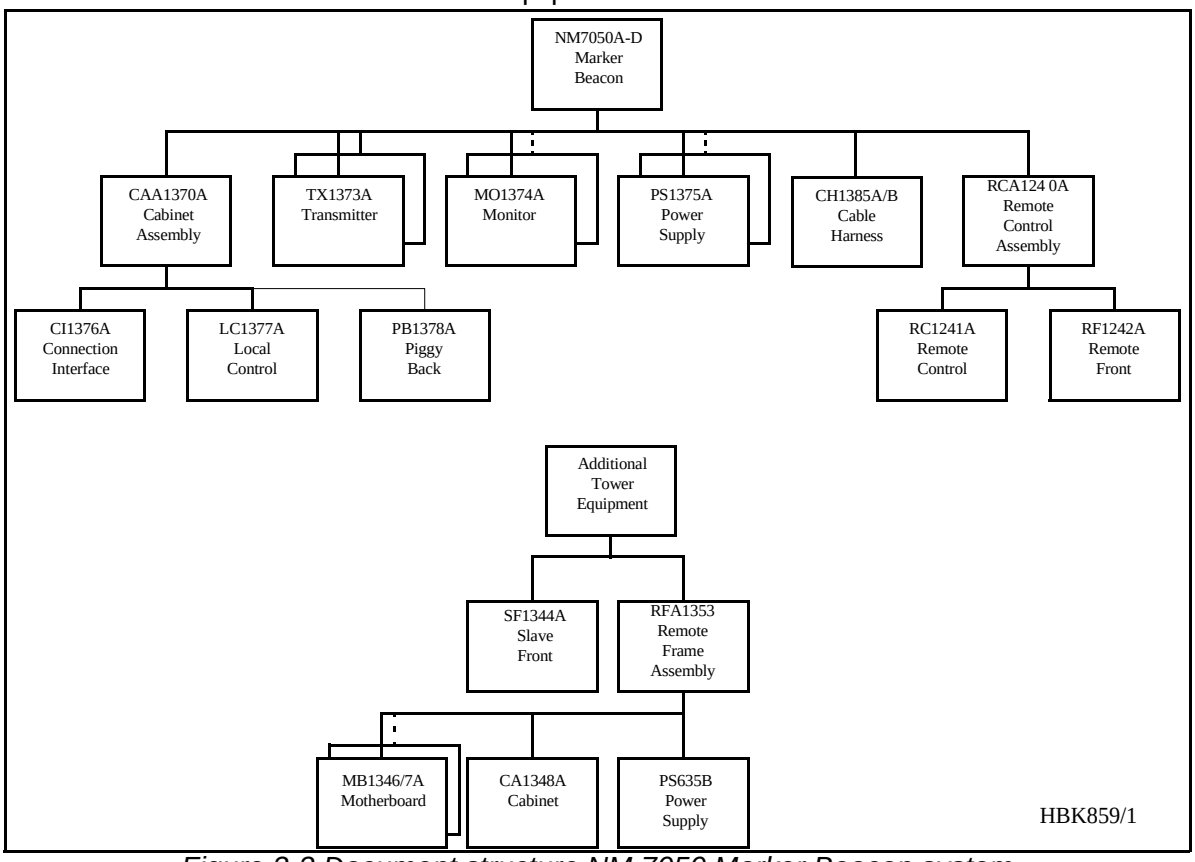

Figure 3-3 Document structure NM 7050 Marker Beacon system

4 Technical Specifications

NM 7050 Marker Beacon Cabinet.

4.1 Signal Requirements

4.1.1 Transmitter

Frequency range	75 MHz
Frequency tolerance	±0,005 %
Output power range	0,005 – 4 W adjustable. Fixed attenuator optional in lower range
Harmonic radiation	2,5 uW maximum
spurious radiation	25 uW maximum
OUTPUT POWER STABILITY	±0.5dB
Test function	Preset adjustable RF level

4.1.2 *Modulator*

MODULATION TYPE	AM	
Modulation alternatives		
	KEYED	
	CONTINUOUS	
	OFF	
MODULATION FREQUENCY AND IDENTIFICATION		
INNER MARKER	3000 Hz	● ● ● ● ● ● ●
MIDDLE MARKER	1300 Hz	— ● — ●
Outer marker	400 Hz	— — —
Modulation depth	95%	
adjustable range	45-97 %	
MAX. STEP SIZE	0,5 % Depth of Modulation	
stability	±4 % Depth of Modulation	
Frequency tolerance	±2,5 %	
Total harmonic dist.	8 %maximum	
Keying		
Speed	125 MS/DOT APPROX.	
PAUSE TO DOT RATIO	1:1	
PAUSE TO DASH RATIO	1:3 dots/SEC	
	2 dashes/sec	
Test function	Preset adjustable Depth of Modulation, normal, continous or no keying	

4.1.3 Monitoring

4.1.3.1 Alarm Functions

RF power reduction	1,5-3 dB adjustable
Change of modulation depth	50-70 % Depth of Modulation
Keying absence	
Alarm identification to automatic transmitter change over	
SENDERUMSCHALTUNG	2-5 sec.
LINE BREAK	MB - Remote Control
	(DISABLE OPTIONAL) Standby alarm identification to transmitter shutdown shall be configurable.

4.1.3.2 Monitor input levels

Adjustment range, nominal level	+1 TO -25 dBm (strap settings for IM, MM and OM sensitivity)

4.1.3.3 Monitor stability at nominal levels

RF POWER VALUES	±0,5 dB
MODULATION DEPTH VALUES	±1,0 % *Depth of Modulation* @ 10 – 30 ºC
	±3,0 % *Depth of Modulation* @ full temp. range
	±2,0 % *Depth of Modulation variation for 3dB RF reduction @ 10-30°C.*

4.1.3.4 Warning funktion

RF POWER REDUCTION	40-75 % *of alarm limit*
Change of modulation depth	40-75 % *of alarm limit*
Maintenance parameter outside limits	
Mains failure	

4.1.3.5 Protocols

Monitor 1 to monitor 2 communication	SERIAL DATA PROTOCOL (not RS 232)
RMM DATA PROTOCOL	RS232

4.1.4 Remote Control

Either

Data Transmission Medium	2-wire line, 600 ohm
Data modulation	SERIAL, FSK
Transmitter level	-10 DBM ± 2 DB
Receiver dynamic range	-10 DBM... -34 DBM OR RS232

or

RS-232 interface in both Marker Beacon and remote control

4.2 Environmental characteristics

Operating temperature	-40 TO +55 ºC	
		(main cabinet except display)
	-10 TO +55 ºC	
		(display, remote control and slave panel)
Storage temperature	-40 TO +60 ºC	
HUMIDITY	*95% TO +35 °C*	
		DECREASING LINEARLY TO 60% AT +55 °C
VIBRATION	*0.15MM OR 19.6M/S2 (2G)*	
		*VERTICAL,*10Hz to 500Hz

4.3 EMV-charakteristics

GENERAL SPECIFICATIONS FOR EMC	ETS 300 339
	EN50081-1 (emmission)
	EN50082-2 (immunity)
	EN61000-3-2 (harmonic current emmission)
	EN61000-3-3 (voltage fluctuations and flicker)
SPURIOUS AND HARMONICS	CISPR 22
SAFETY	EN 60950

4.4 Mechanical characteristics

Dimensions (hxwxd):	
MB CABINET	267 X 450 X 343 MM
REMOTE CONTROL	71 X 132 X 200 MM
SLAVE PANELS	51 X 132 X 200 MM

The MB rack is wall mounted. The remote control and slave panel fit a 19" shelf.

4.5 Power supply

OPERATING VOLTAGE:		
MAIN SUPPLY		230 V +15 %/-20 %, 45-65 HZ,
	OR	120 V +15 %/-20 %, 45-65 HZ
STAND-BY BATTERY		24 V DC *NOMINAL,* float charged by the main Supply. The battery is able to use an external charger. The equipment is able to operate without battery.
POWER CONSUMPTION:		
MB CABINET:		< 50 W
REMOTE CONTROL		< 5 W
BATTERY CHARGER		*ADAPTED TO 5 HOURS (NM 7050 B/D)* or 8 hours (NM 7050 A/C) charging time to 90% battery capacity for a battery giving 6 hours operation. External battery charges may be connected for longer operation, and shorter charging time.

PART II INSTALLATION

5 Mechanical Installation

This chapter gives a brief instruction on the mechanical installation of the Marker Beacon cabinet and antenna. See the *Engineering and Commissioning Handbook* for further details.

5.1 Marker beacon Cabinet

The NM7050 cabinet is constructed for mounting on a wall. For easy operation, the keyboard and display section should be in eye/shoulder height (140-160cm).

The ventilation holes at the bottom of the cabinet should be kept uncovered to ensure proper cooling.

The cabinet is 45 cm wide, 34 cm deep and 27 cm height and weighs about 5 kg.

When mounting the cabinet on a wall, do the following:
- First drill the holes according to Figure 5-1.
- Mount the upper screws. Leave 6 mm distance from the screw head to the wall.
- Hang the cabinet on these screws, using the key holes on the mounting rails
- Mount the lower screws
- Tighten all screws

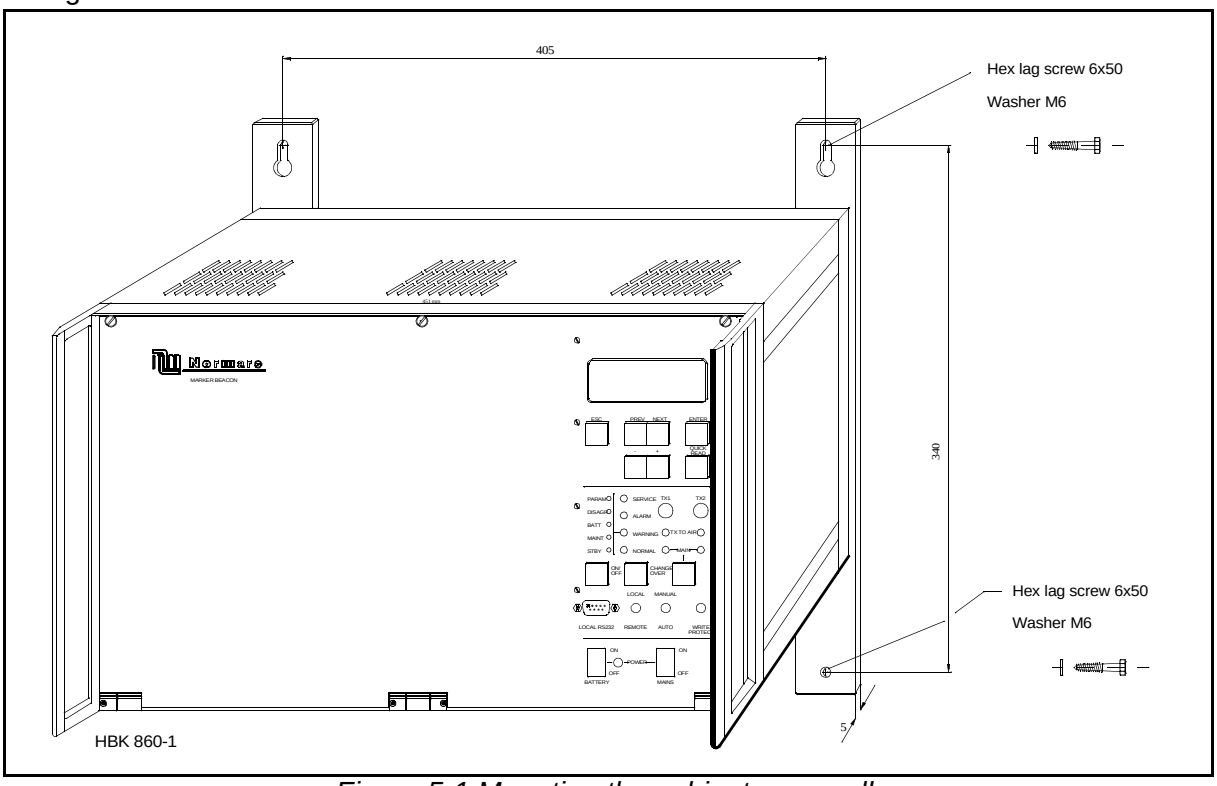

Figure 5-1 Mounting the cabinet on a wall.

5.2 Remote control

The Remote Controls are normally organised in 19" subracks three units high. Normarc offers such a subrack called RFA 1353 (Remote Control Frame) shown in Figure 5-2. Maximum five Remote Controls and one power supply (like PS 635) fit into RFA 1353 which is 33 cm deep.

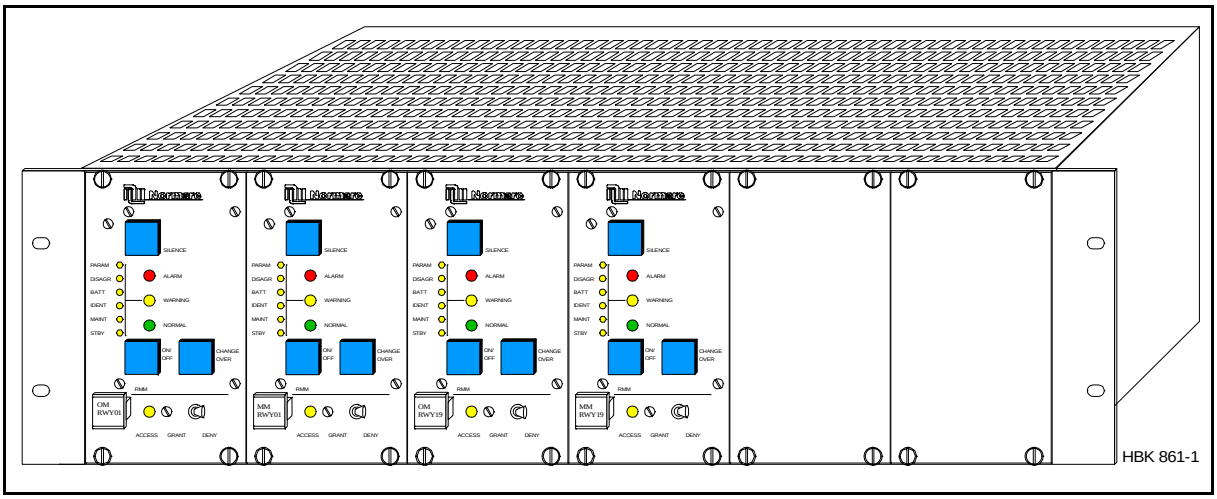

Figure 5-2The Remote Control Frame RFA 1353

5.3 Antenna

The marker beacon antennas should be mounted on poles, with the dipoles parallel to the course line. The rear end of the antenna should at least be 2.2 meters above the ground.

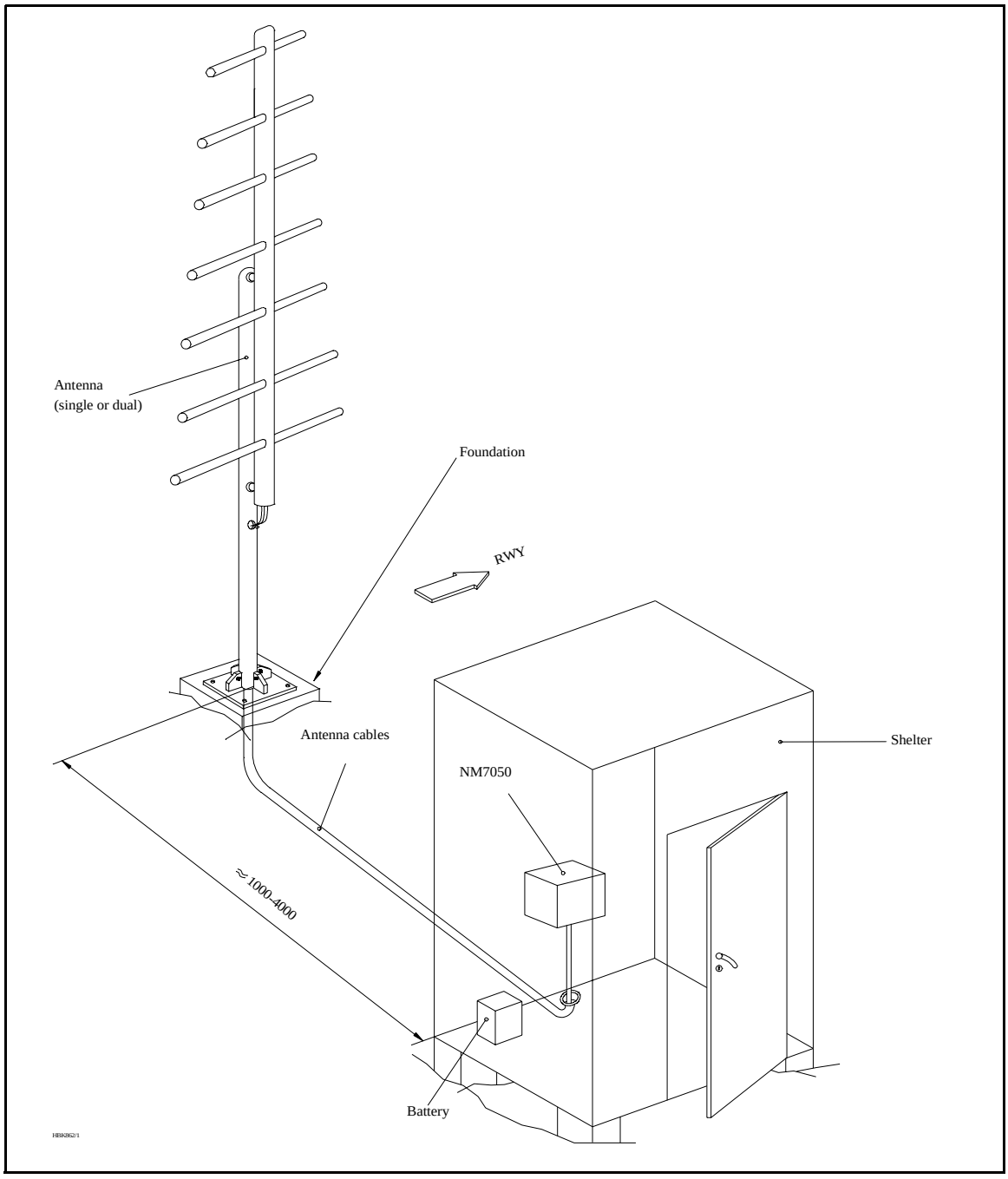

Figure 5-3 The antenna

6 Electrical installation

6.1 Marker beacon cabinet

6.1.1 Connection Overview

All electrical connections except the local PC connection, the mains connection and the RF IN and OUT connections are on the CI1376 connection interface board inside the cabinet.

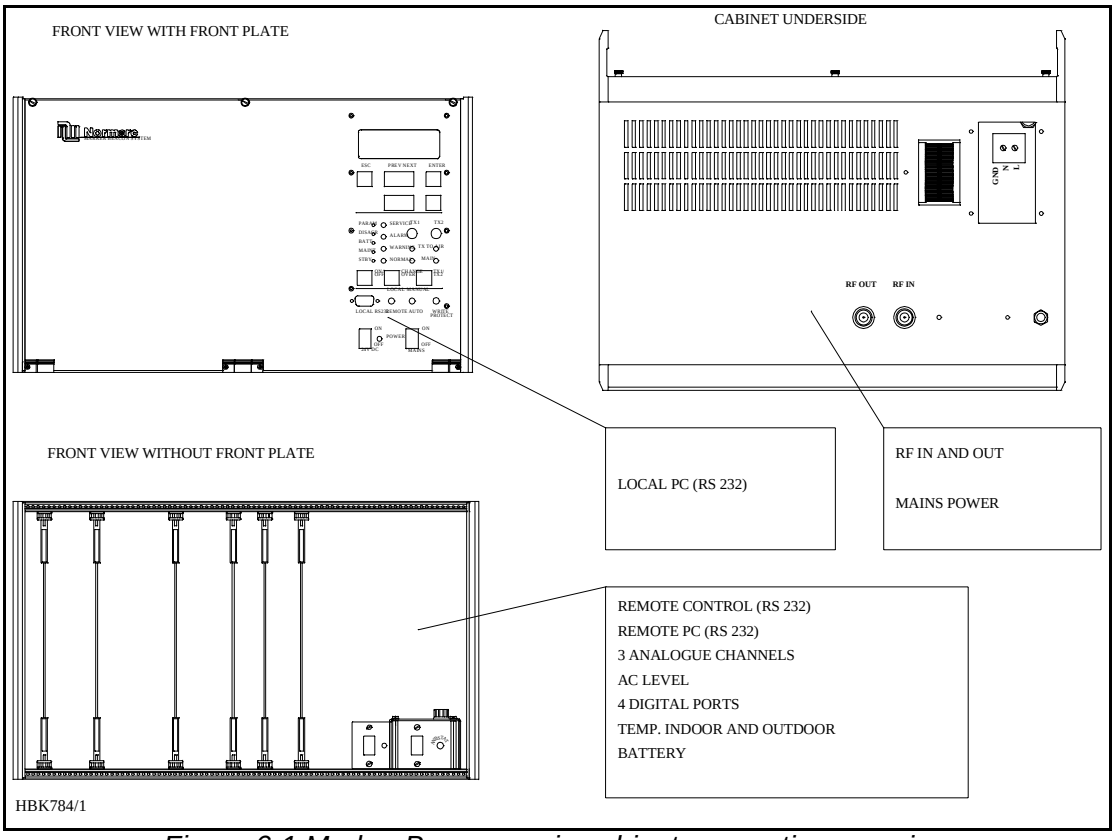

Figure 6-1 Marker Beacon main cabinet connection overview

6.1.2 RF In and Out

- The output signal RF OUT is connected to the antenna with N-connectors and 50 Ω coaxial cable.

The input signal RF IN is connected to the antenna probe with N-connectors and 50 Ω coaxial cable.

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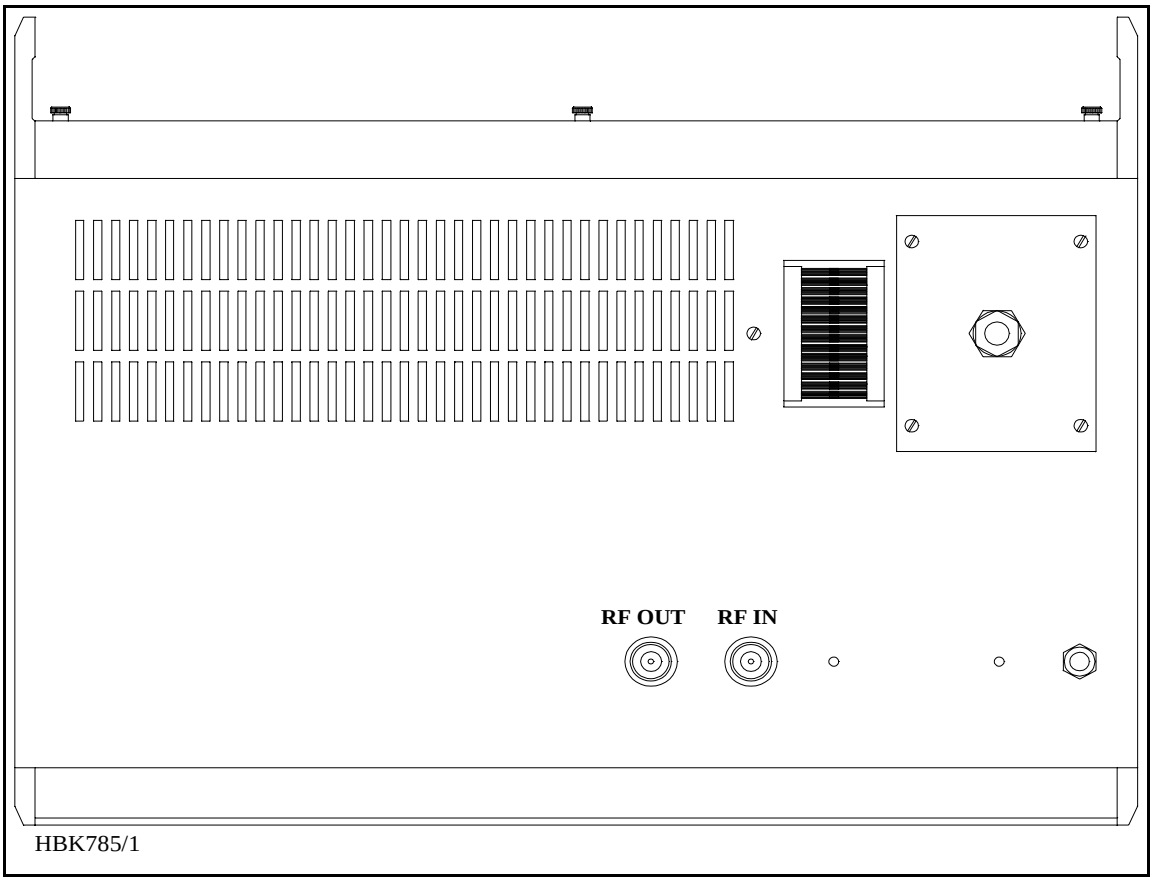

Figure 6-2 RF cable connection

6.1.3 Battery

The external backup battery is connected between BATT GND (-) and BATT +24V (+) on the connector marked BATTERY on **CI 1376**.

A 16Ah battery gives approximately six hours backup time with 5-8 hours charging time dependent on model. For longer backup time an external charger is required to be able to charge the battery within a reasonable time. An external battery protection circuit (like Normarcs **BP 543**) has to be connected between the EXT. CHARGER (+) and BATT GND (-) input. In addition MAINS directly on **NM 7050** has to be disconnected. Figure 6-4 shows the connections schematically.

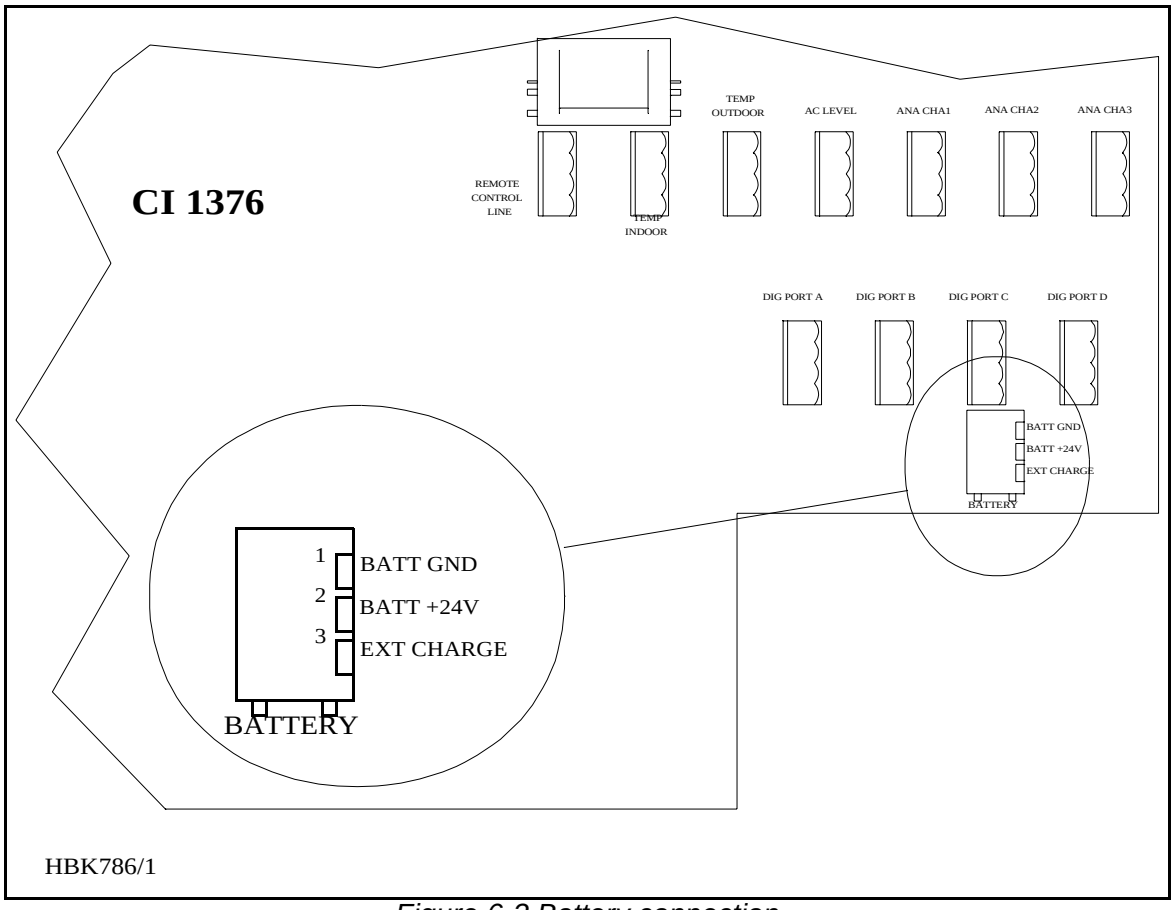

Figure 6-3 Battery connection

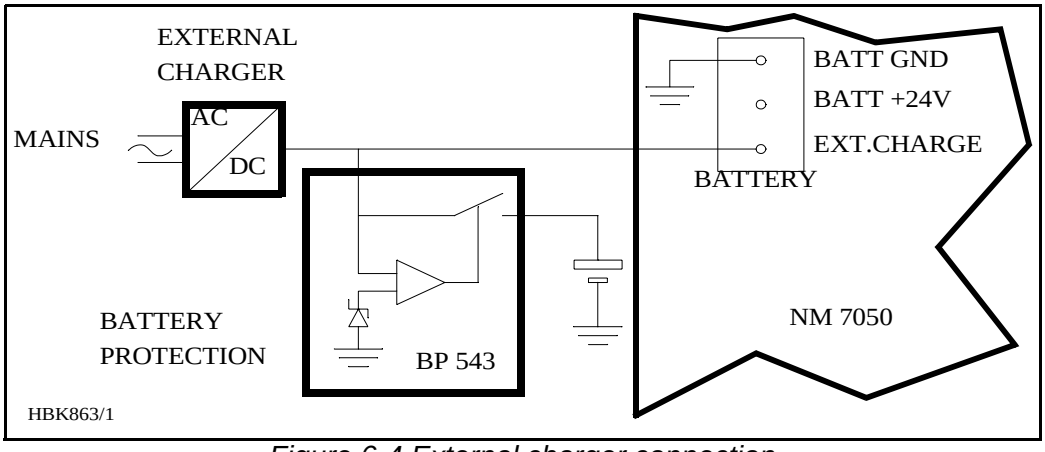

Figure 6-4 External charger connection

6.1.4 Mains

The mains power cable connections are underneath the cabinet. They are covered by a aluminium plate fastened with four screws. The cable itself is threaded through the cable gland and the three wires are connected to the terminals N, L and GND shown below in figure 6-4.

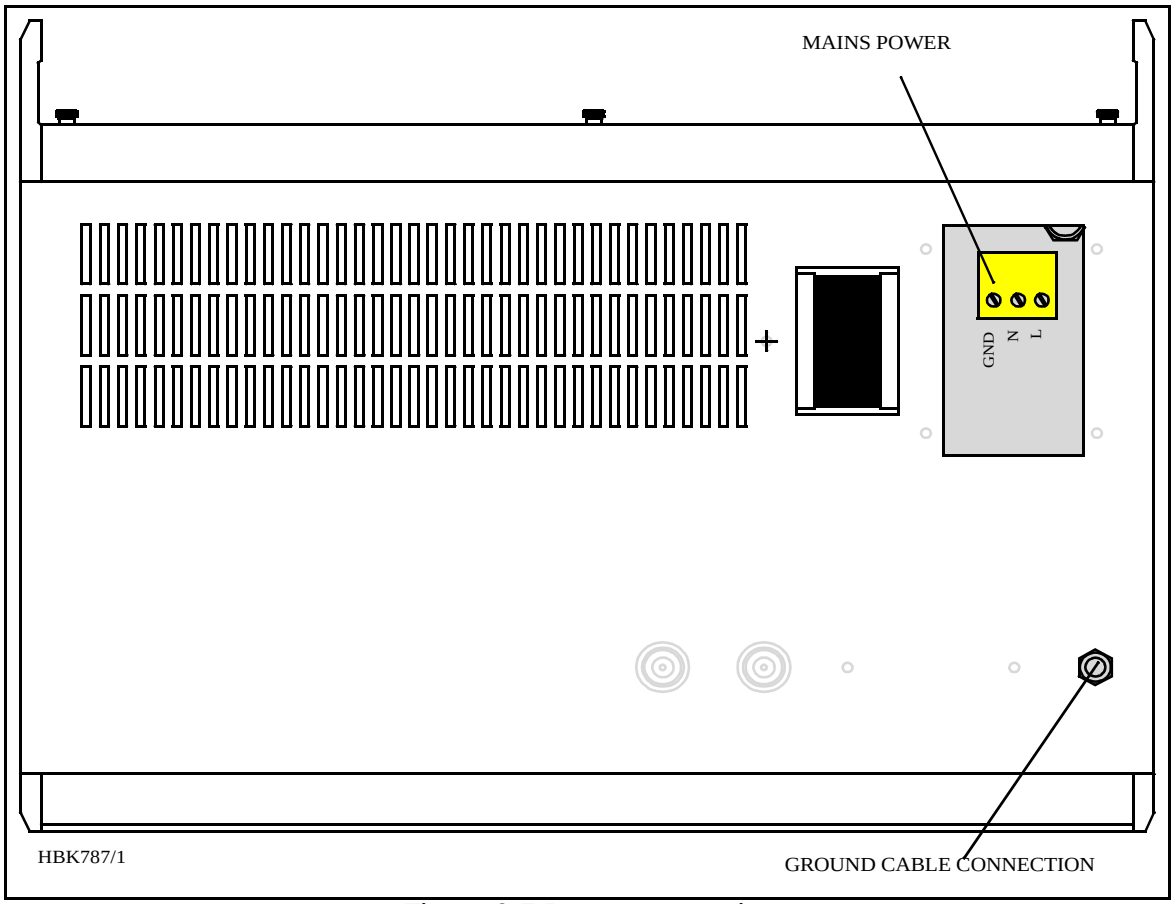

Figure 6-5 Power connection

6.1.5 Modem Power

A DC powered modem or other external equipment designed for 22V-27V DC can be connected to the terminal block marked MODEM POWER. Maximum current consumption should be 800 mA.

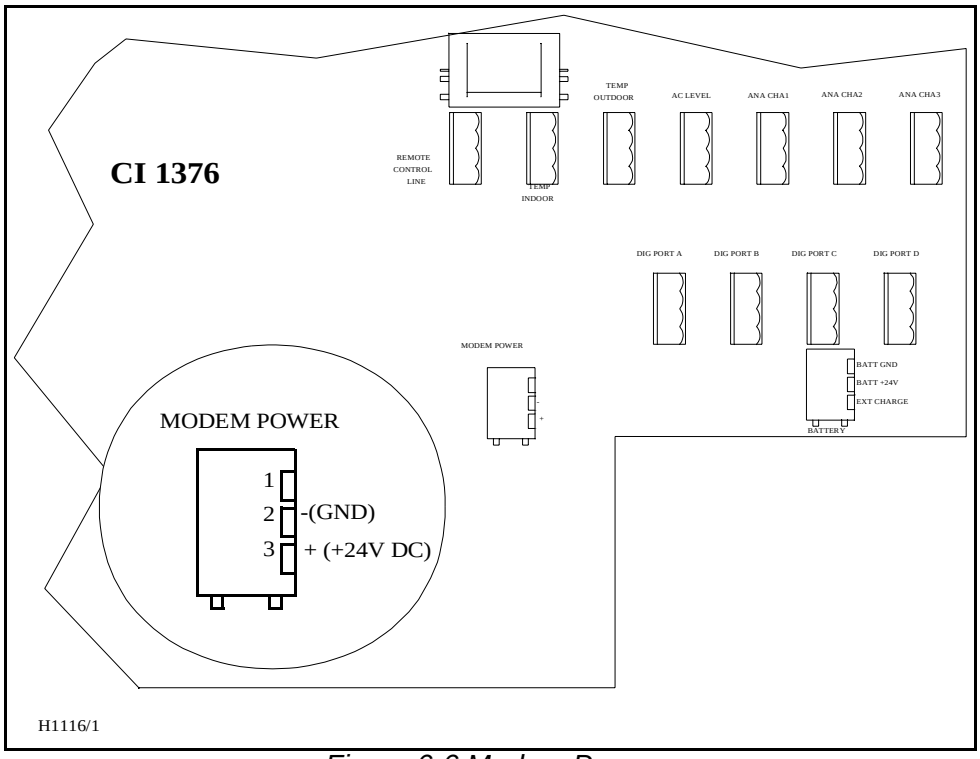

Figure 6-6 Modem Power

6.1.6 Remote Control

The remote line and remote control is connected to the CI 1376 connection interface board as illustrated in Figure 6-7.

- FSK_[A,B] is the modem line pair.
- GND is main cabinet ground

A suitable female connector for the remote line is Weidemüller *BLZ-5.08/4* or equivalent.

Alternatively the remote control connection is done with a RS 232 interface. The mode is configured on MO 1374, refer to 7.2.3.

Note: The position of RXD and TXD is interchanged from the normal RS-232 layout in the Remote Control connector. Therefore a special cable must be used for connection to external equipment.

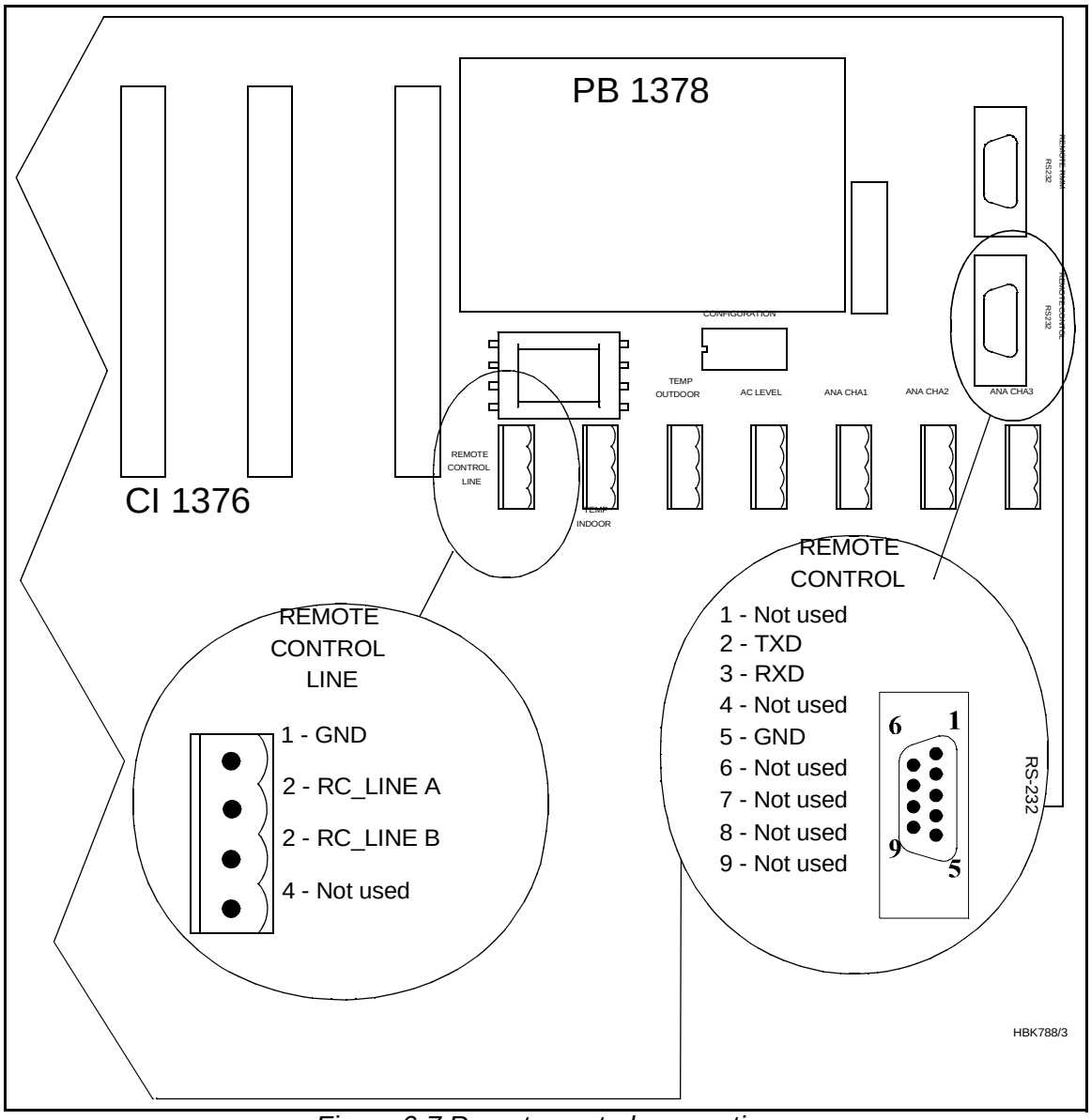

Figure 6-7 Remote control connection

6.1.7 PC and Modem

Modem connections for remote PC are the standard pin out RS232, 9 pins DSUB connector on the CI1376 connection interface board marked remote-rmm as illustrated in Figure 6-8.

For local PC connection use the RS232 on front panel Figure 6-9.

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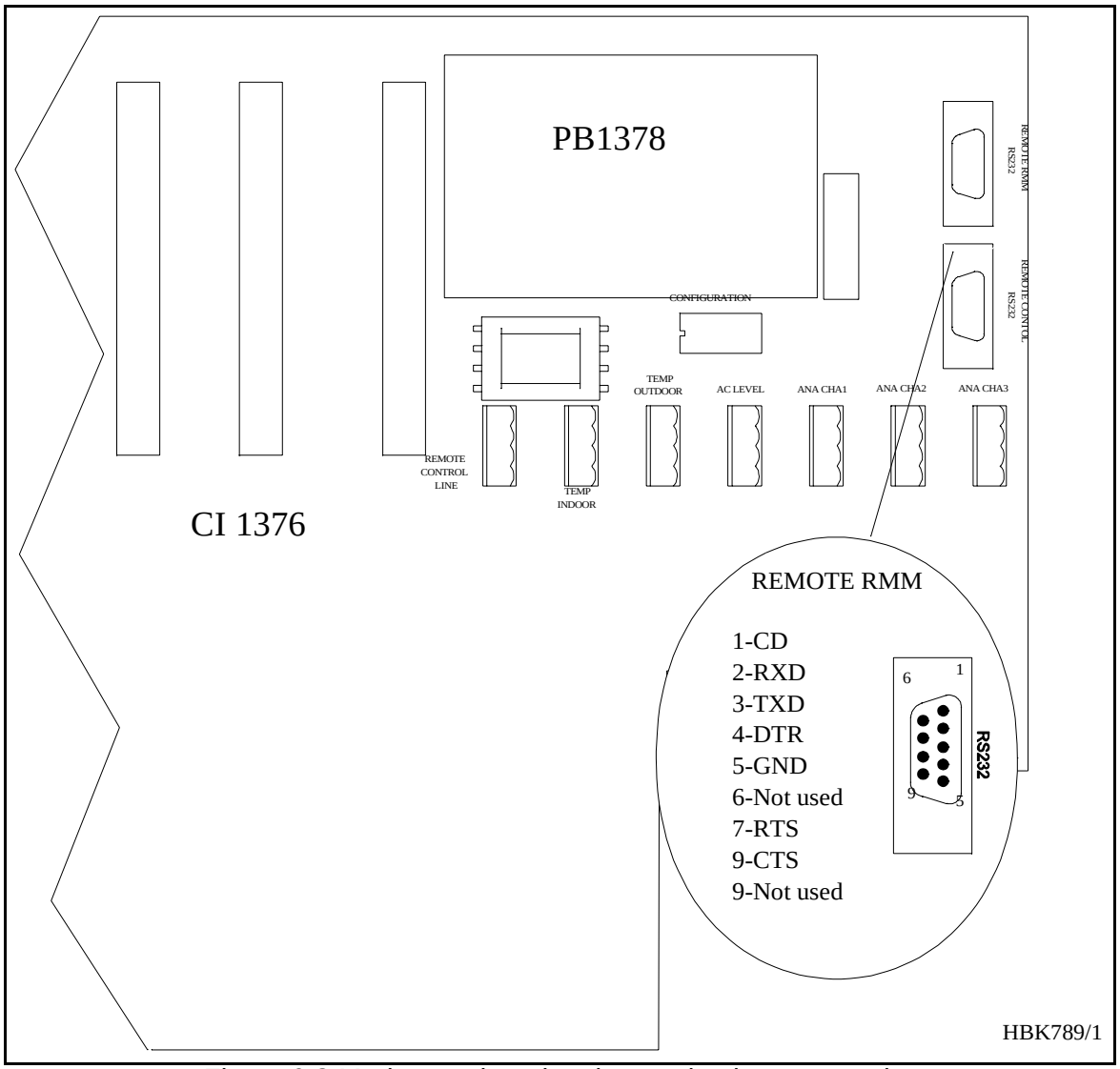

Figure 6-8 Modem and modem battery backup connection

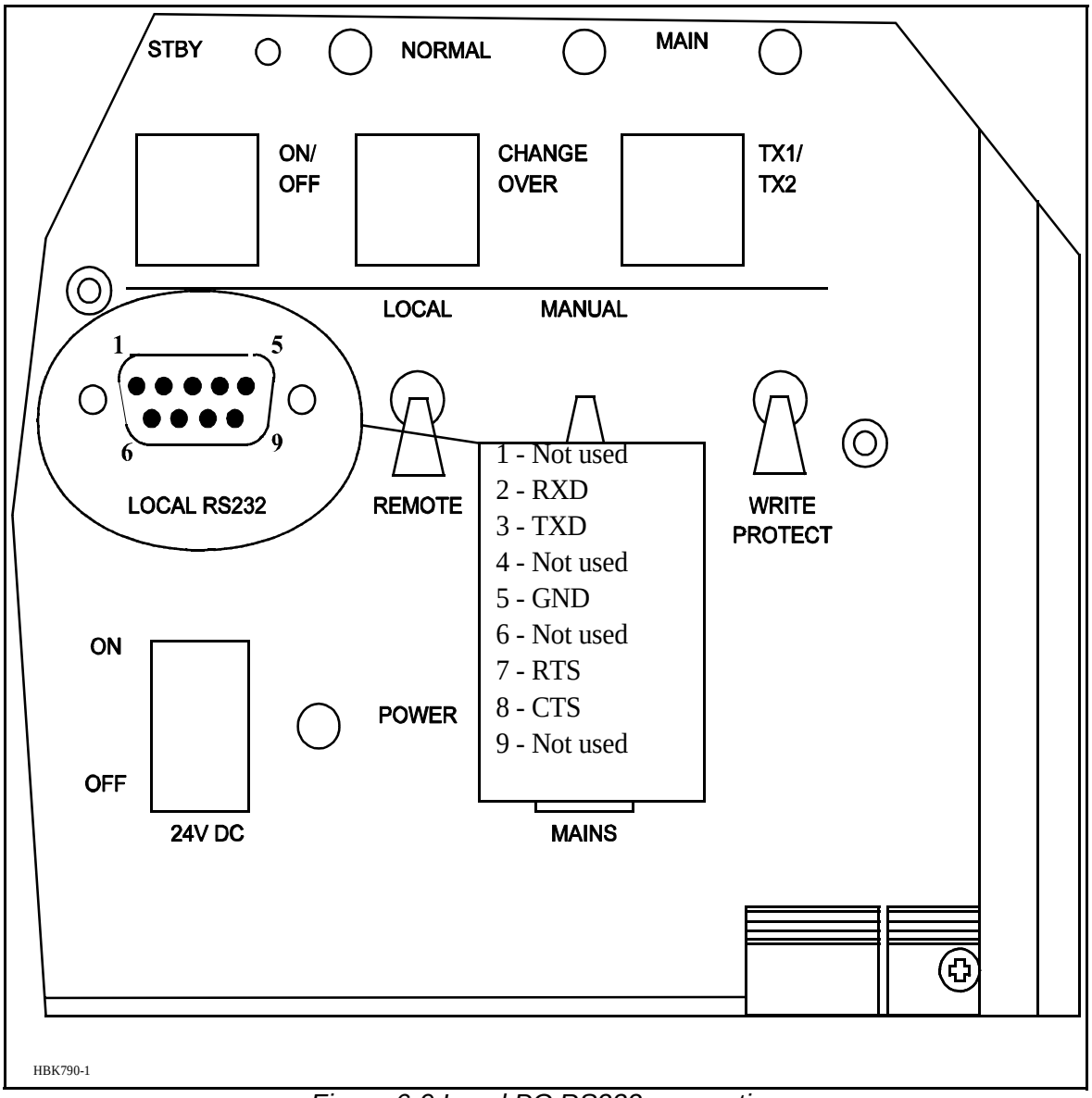

Figure 6-9 Local PC RS232 connection

6.1.8 Analogue Inputs

The analogue inputs are connected to the CI1376 connection interface board as illustrated in Figure 6-10.

The inputs are:

- Analogue Channel 1-3 - three differential DC analogue inputs, P (pin-1) is the positive and N (pin-3) is the negative terminal, and pin 2 is GND.
  Maximum voltage: ±15V
  Input impedance: 10kΩ
- Temp Indoor and Outdoor - temperature measurement inputs with interface to an LM35 temperature sensor.
  Maximum voltage: ±15V
  Input impedance: 10kΩ
- AC Level - AC level measurement input. Intended for use with a battery eliminator to monitor the mains voltage.
  Maximum voltage: 24Vpp

Input impedance: 10 kΩ

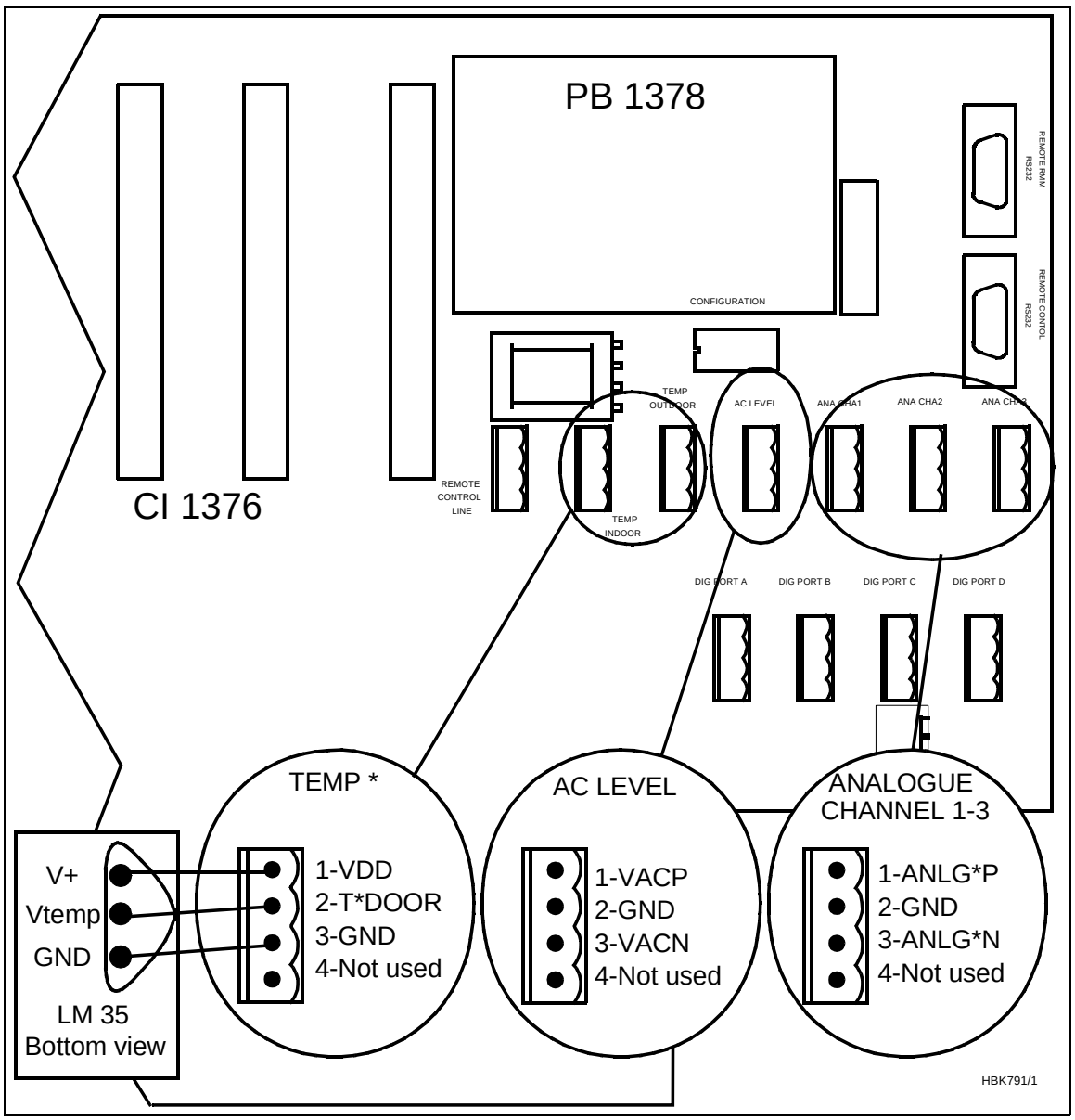

Figure 6-10 Analogue input connections

6.1.9 Digital Inputs and Outputs

Eight bi-directional digital channels (numbered 0-7) are sited on the CI1376 connection interface board as illustrated in Figure 6-11.

Logical levels: TTL
Input impedance: 560Ω.

A suitable female connector is Weidemüller *BLZ-5.08/4* or equivalent.

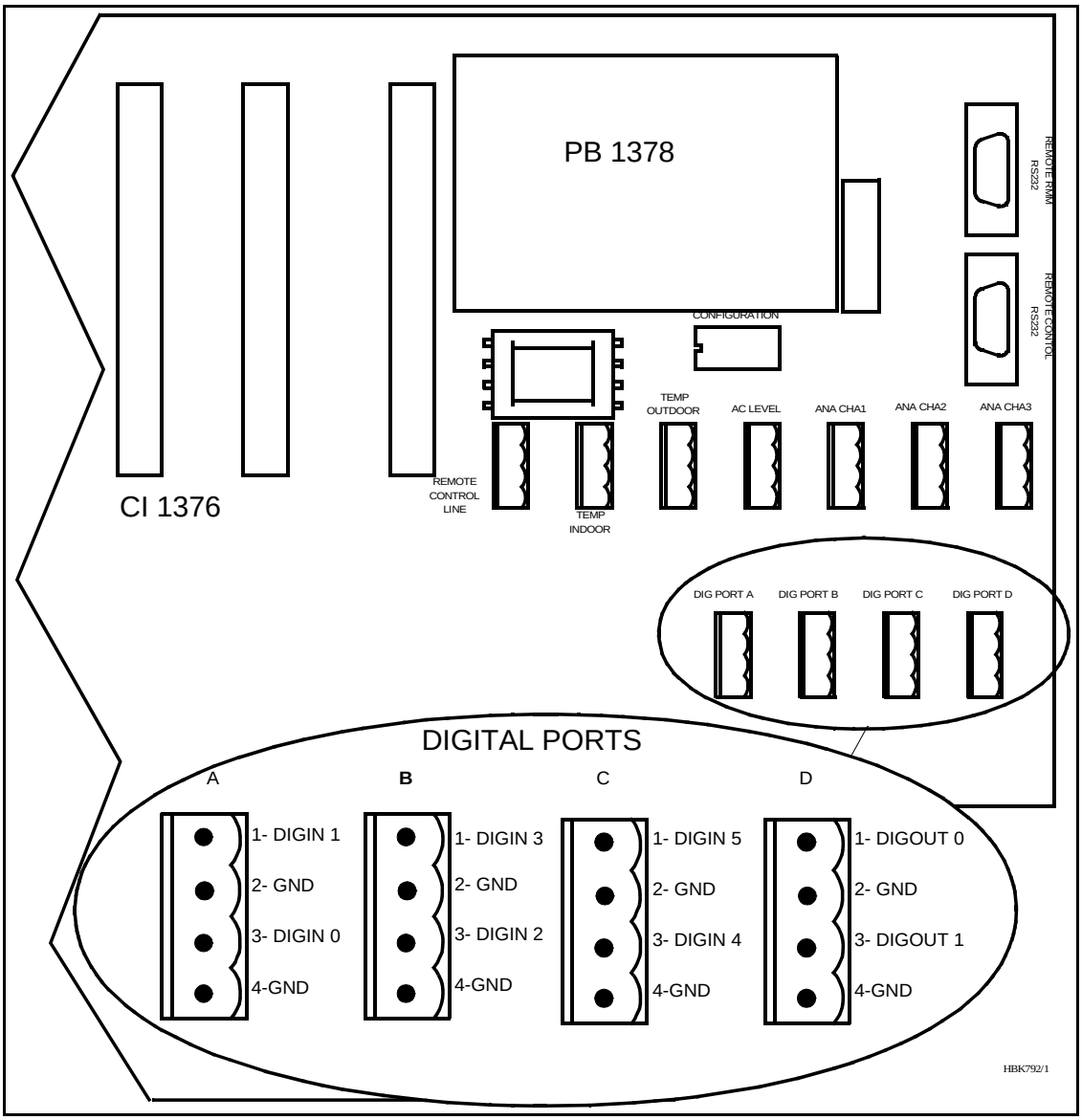

Figure 6-11 Digital input/output connections

6.1.10 Power for Modem or other external devices

A DC powered modem or other external equipment designed for 22V - 27V DC can be connected to the screw terminal J30. Maximum current consumption should be 0.8A.

The terminal marked OUT+ is 22V - 27V DC, OUT- is ground

6.1.11 Remote Control Interface (MB rack)

The transmission medium (telephone line (FSK modem) or RS 232) to the Remote Control can be selected by plugs and link straps S700 and S701 on the MO1374 module:

S700 pins connected	S701 pins connected	Function	Connector on CI 1376:
1-2	1-2	Telephone line	P3 Remote Control Line
3-4	3-4	RS 232	P4 Remote Control RS232
5-6	5-6	Not used	Not used

6.2 Tower equipment

6.2.1 Remote Control Connection

The remote control is connected to the corresponding MB by connecting the REMOTE CONTROL connector on CI1376 to P9 on MB1346, as shown in Figure 6-12.

Suitable female connectors are Weidemüller *BLZ-5.08/4* or equivalent. 600 Ω cable should be used.

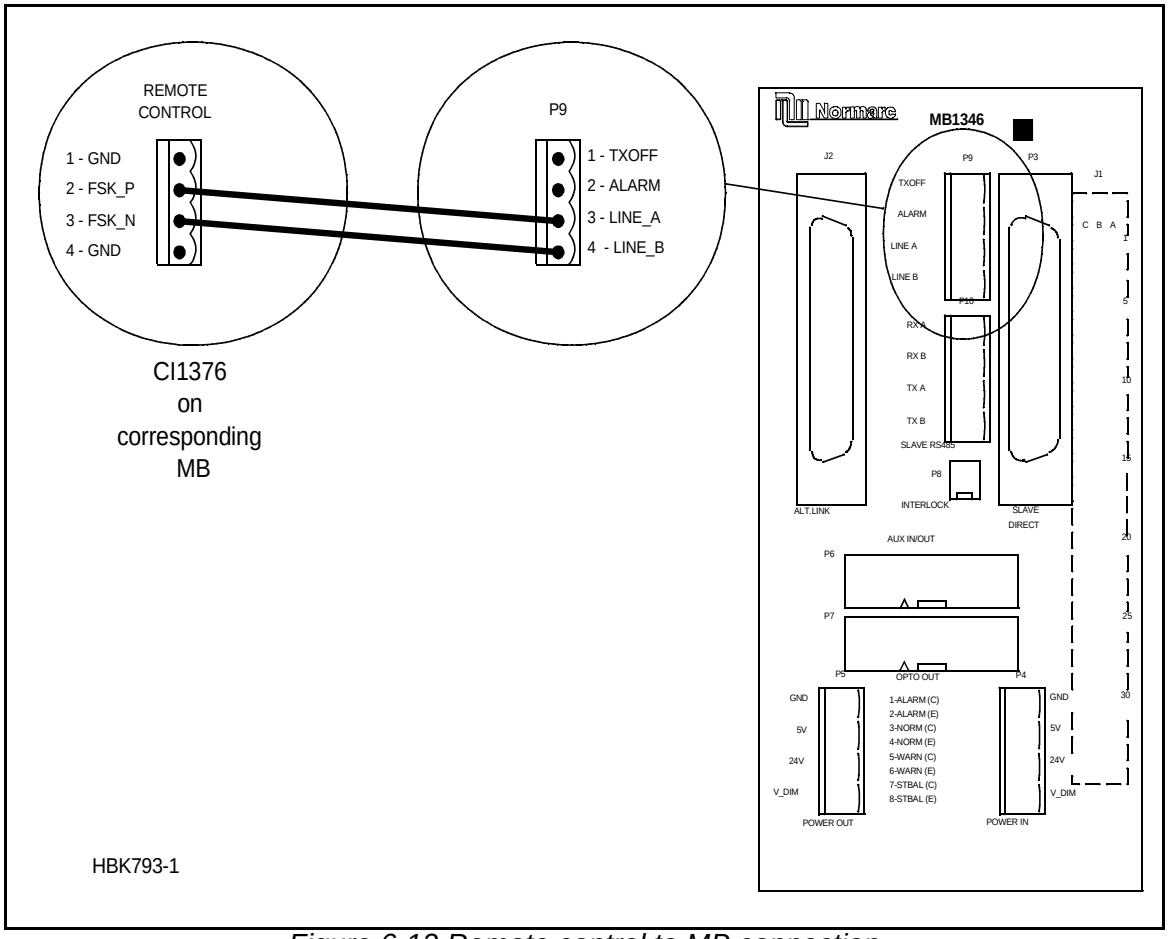

Figure 6-12 Remote control to MB connection

The power supply to the remote control is connected according to Figure 6-13. The battery charger is connected to P2 on the MB1347 - power supply motherboard. Output connector P3 on MB1347 is connected to input connector P4 on MB1346 - remote control motherboard. Several MB1346's are serial linked by connecting P5 on one board to P4 on the next.

Suitable female connectors are Weidemüller *BLZ-5.08/4* or equivalent.

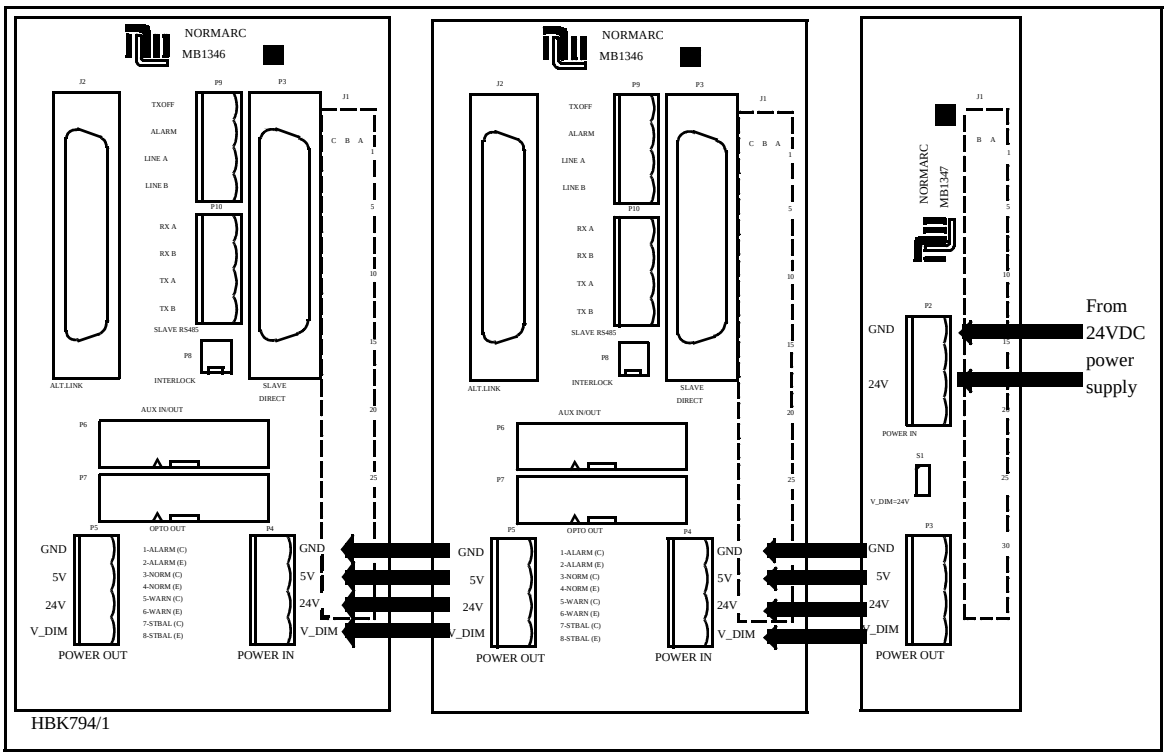

Figure 6-13 Remote control power supply connections

6.2.2 Remote Slave Connection

The remote slave panel SF1344 is connected to the corresponding remote control's mother-board by connecting P3 on MB1346 to P1 on SF1344. P10 on MB1346 is not used. See Figure 6-14.

Suitable connectors are standard 25 pins female DSUB (Harting 0967 025 0442 and 0967 225 4704 or equivalent), connected by a 10 wire 1:1 cable.

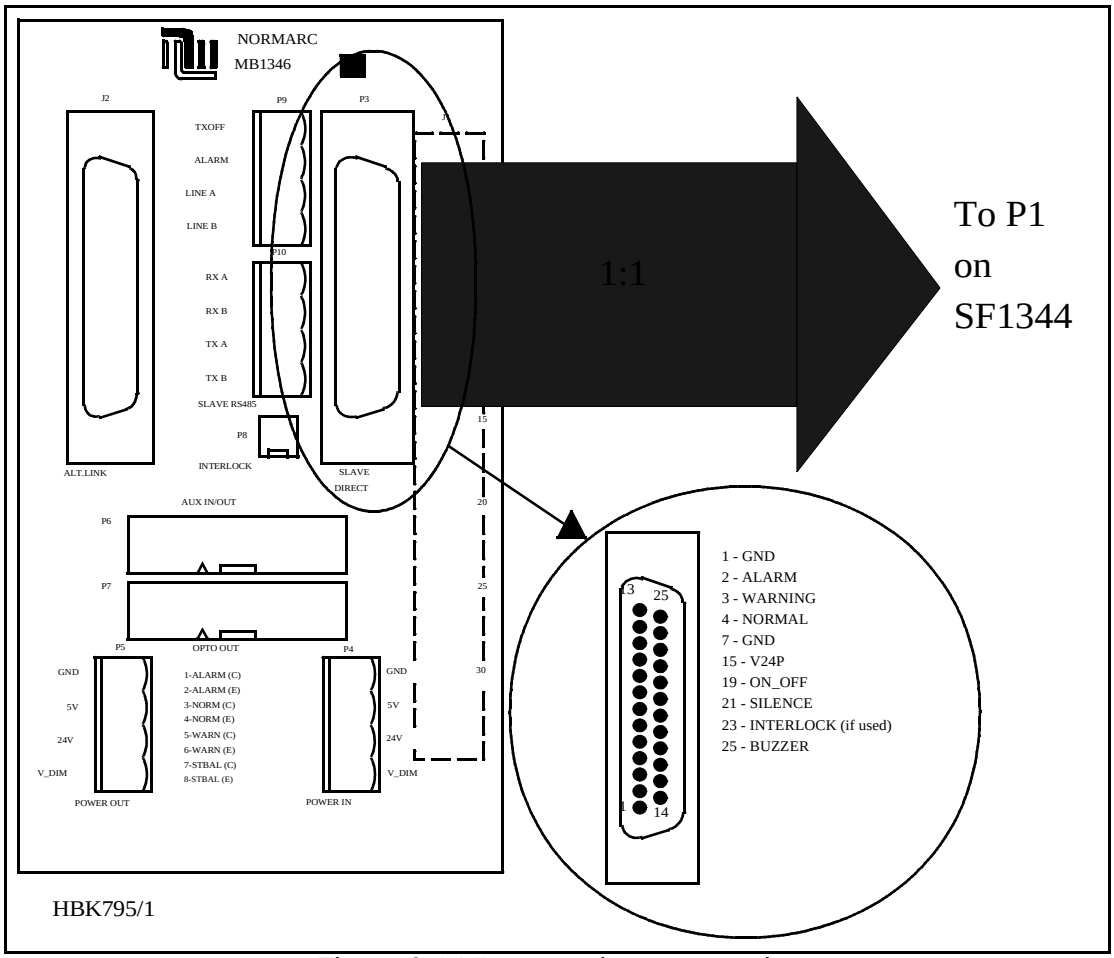

Figure 6-14 Remote slave connection

6.2.3 Interlock switch connection

The interlock switch (IL 1379 or IL 1380) is either connected to P8 on MB1346 (remote control motherboard) or to P2 on SF1344 (remote slave panel), see Figure 6-15..

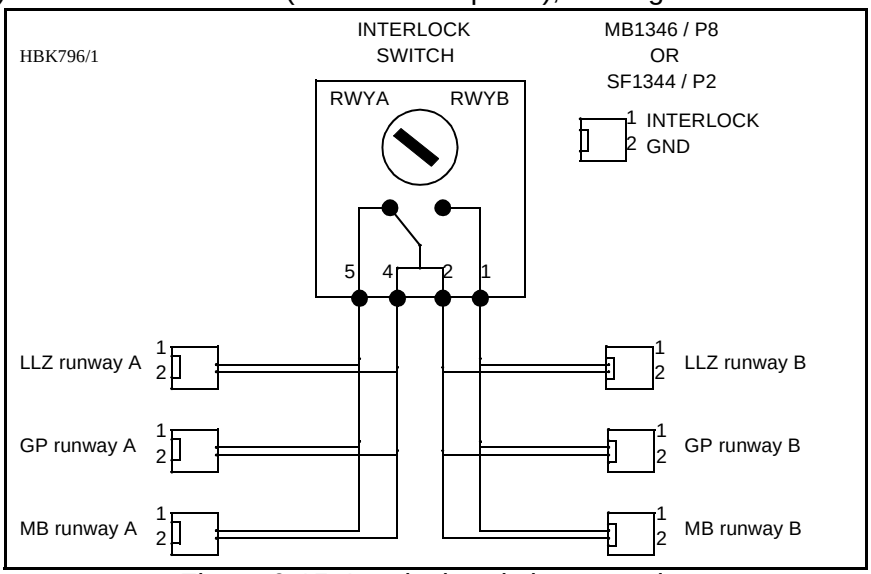

Figure 6-15 Interlock switch connection

6.2.4 Remote Control configuration

The Aural Alarm / Warning functions and transmission medium (telephone line or RS 232) in the Remote Control can be selected by link straps:

The strap links S6 to S12 will give Aural Warning for the following warning parameters when connected:

Strap	Warning Parameter
S6	Standby Alarm (Hot Standby racks only)
S7	Parameter Warning
S8	Ident Warning
S9	Battery Warning
S10	Standby on Air
S11	Monitor Disagree Warning
S12	Maintenance Warning

Warning reset (Silence):

Strap	Function
S1 in	Silence on Remote Control resets Remote Control buzzer only
S1 out	Silence on Remote Control resets both Remote Control and Slave Panel buzzer
S5 in	Silence on Slave Panel resets Slave Panel buzzer only
S5 out	Silence on Slave Panel resets both Remote Control and Slave Panel buzzer

Buzzer:

Strap	Function
S4 in	Buzzer connected
S4 out	Buzzer disconnected

Telephone Line / RS 232 / TTL logic:

S2 pins connected	S3 pins connected	Function	Input used on MB 1346A
1-2	1-2	Telephone line	P9 Line A and Line B
3-4	3-4	RS 232	J2 Alt. link
5-6	5-6	TTL logic	Not supported

6.3 System Installation

Diagrams showing the system installation is included on the following pages.

7 Tests and adjustments

7.1 Preparations

Terminate the RF OUT terminal with a 50Ω load (antenna or dummy). The transmitters are factory adjusted to 2 watt output power. Let both transmitters run for ½ hour at this power to achieve a stable working temperature before any fine tuning is carried out.

7.2 Configuration settings

Follow this procedure to set the configurations in the Marker Beacon according to desired system configuration.

7.2.1 General Configuration

The static control strap on the Connection interface board sets hardware configuration, remote access configuration and shutdown configuration. Figure 7-1 shows where the static control strap is located on CI 1376.

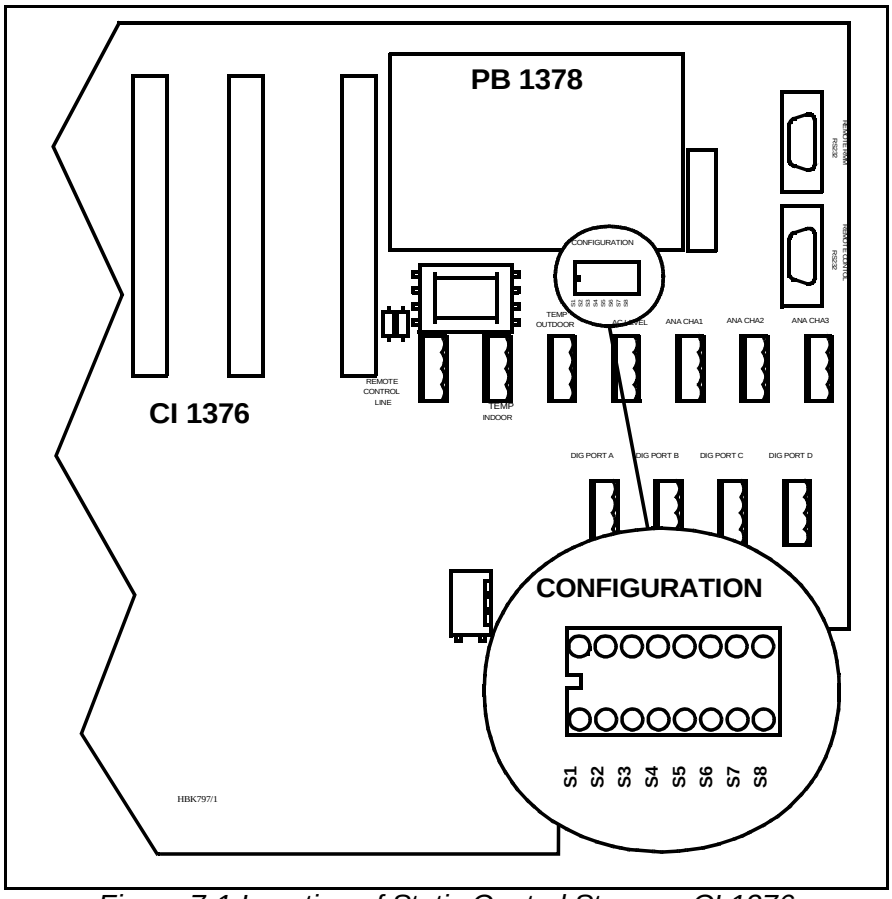

Figure 7-1 Location of Static Control Strap on CI 1376

Set the configuration for the MB according to Table 7-1.

.

Strap no	State	Function
S1	Strap **IN**	2 power supplies *(NM 7050 B/D)*
	Strap **OUT**	1 power supply *(NM 7050 A/C)*
S2	Strap **IN**	Access Grant disabled
	Strap **OUT**	Access Grant enabled
S3	Strap **IN**	2 monitor units *(NM 7050 C/D)*
	Strap **OUT**	1 monitor unit *(NM 7050 A/B)*
S4	Strap **IN**	Lost contact with remote control will NOT cause shutdown
	Strap **OUT**	Lost contact with remote control will cause shutdown
S5	Strap **IN**	Standby transmitter failure will NOTcause shutdown
	Strap **OUT**	Standby transmitter failure will cause shutdown
S6	Strap **IN**	Access level 2 on RMM remote port enabled
	Strap **OUT**	Access level 2 on RMM remote port disabled
S7	Strap **IN**	Access level 3 on RMM remote port enabled
	Strap **OUT**	Access level 3 on RMM remote port disabled
S8		Should always be left open.

Table 7-1 MB Configuration settings

S1 and S3 will decide the model (NM 7050 A, B, C or D) and show up in the **Link Status** window in the RMM program and the **Initial Window** in the LCD menu. A disagreement between the settings and the actual number of modules will cause a *MAINTENANCE WARNING* on the **Front Panel** and an *ERROR* in the **Maintenance** window.

With S2 = *IN* the ACCESS GRANT switch on the **Remote Control** will have no effect. You may still acquire *ACCESS LEVEL 2* and *3* on the **RMM remote port** if the settings of S6 and S7 permits.

S4 decides weather lost communication with the **Remote Control** will cause shutdown (no TX to air) or not.

S5 instructs the transmitter control software weather a failed standby transmitter will be shut down or continue to transmit.

S6 and S7 decides the highest ACCESS LEVEL permitted on the **RMM remote port**. All access levels are available on the RMM local port regardless of S6 and S7.

7.2.2 Setting inner, outer or middle marker

To configure the beacon for outer, middle or inner marker set the straps (S1-S4) on the transmitter board(s) according to Table 7-2.

Strap	Function with strap in
S1	Beacon is INNER marker
S2	Beacon is MIDDLE marker
S3	Beacon is OUTER marker
S4	Beacon is FAN marker

Table 7-2 Marker function configuration

Figure 7-2 shows where the straps are located on the transmitter board(s).

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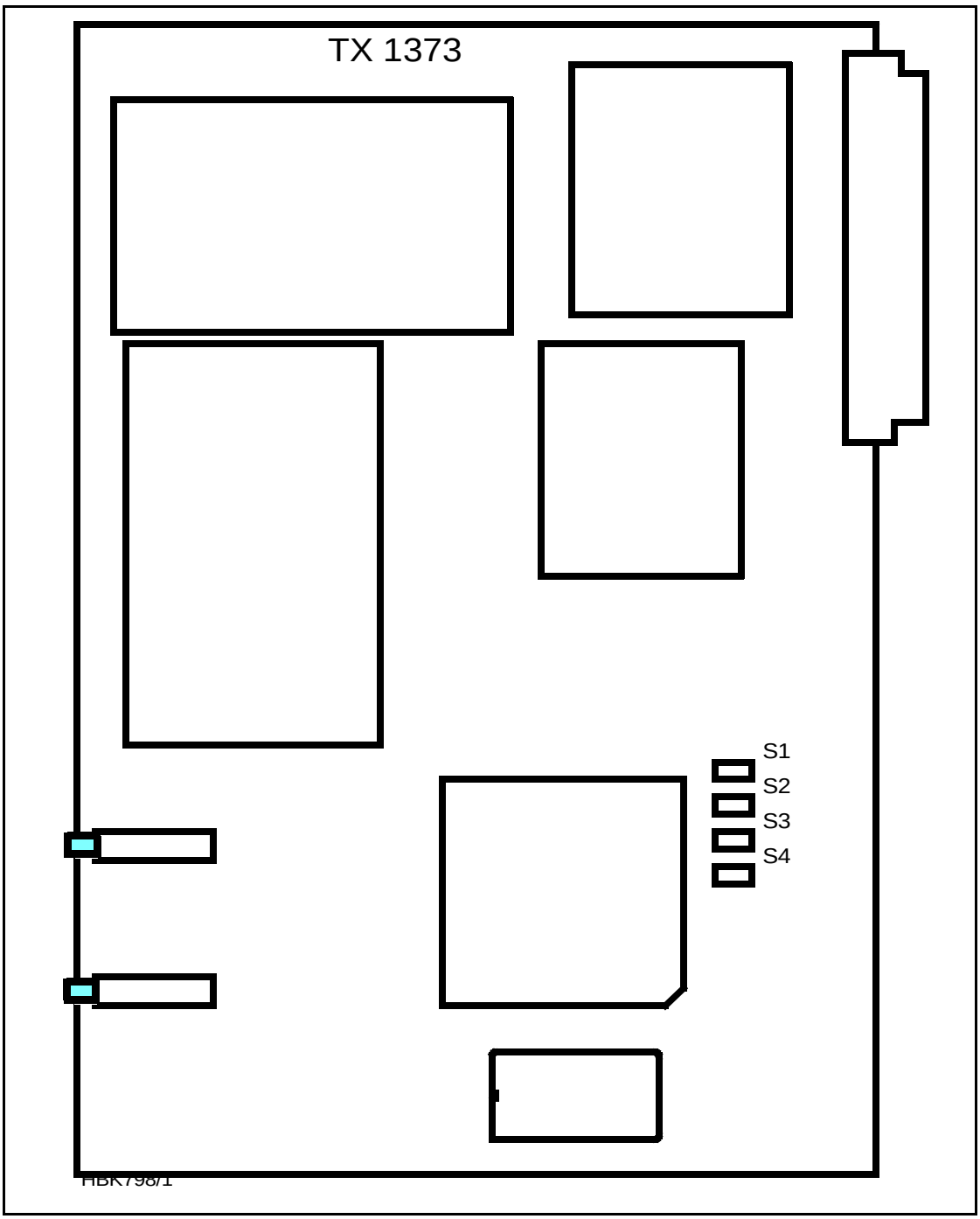


Figure 7-2 Location of Marker Beacon type straps on transmitter board

7.2.3 Remote Control Interface (CI 1210)

The transmission medium (telephone line (FSK modem) or RS 232) to the Remote Control can be selected by link straps S700 and S701 on the MO 1374A module in MON 1 position:

S700 pins connected	S701 pins connected	Function
1-2	1-2	RS 232
3-4	3-4	Telephone line

7.2.4 Remote Control configuration

The Aural Alarm / Warning functions and transmission medium (telephone line or RS 232) in the Remote Control can be selected by link straps:

The strap links S6 to S12 will give Aural Warning for the following warning parameters when connected::

Strap	Warning Parameter
S6	Standby Alarm (Hot Standby racks only)
S7	Parameter Warning
S8	Ident Warning
S9	Battery Warning
S10	Standby on Air
S11	Monitor Disagree Warning
S12	Maintenance Warning

Warning reset (Silence):

Strap	Function
S1 in	Silence on Remote Control resets Remote Control buzzer only
S1 out	Silence on Remote Control resets both Remote Control and Slave Panel buzzer
S5 in	Silence on Slave Panel resets Slave Panel buzzer only
S5 out	Silence on Slave Panel resets both Remote Control and Slave Panel buzzer

Buzzer:

Strap	Function
S4 in	Buzzer connected
S4 out	Buzzer disconnected

Telephone Line / RS 232 / TTL logic:

S2 pins connected	S3 pins connected	Function	Input used on MB 1346A
1-2	1-2	Telephone line	P9 Line A and Line B
3-4	3-4	RS 232	J2 Alt. link
5-6	5-6	TTL logic	Not supported

7.3 Adjustment points

The adjustment points are shown in Figure 7-3 and explained below. The figure shows a fully equipped system, NM 7050D, see chapter 3 for configuration details:

1. Battery charging voltage (nom 27.4V@20°C)
1. Bias for power transistor (use factory settings)
1. Battery protection cut-off voltage (nom. 22V)
1. Tx Detected Rf level (nom. 2.5V@4W carrier)
1. Monitor RF level (nom. 3V@nominal output power)
1. Monitor frontend input filter centre frequency (use factory settings)
2. Real time clock fine tuning(use factory settings)

The adjustment points marked *Use Factory Settings* should not be touched.
The baseband level has to be adjusted at installation.
The other are factory pre-set but may be adjusted.

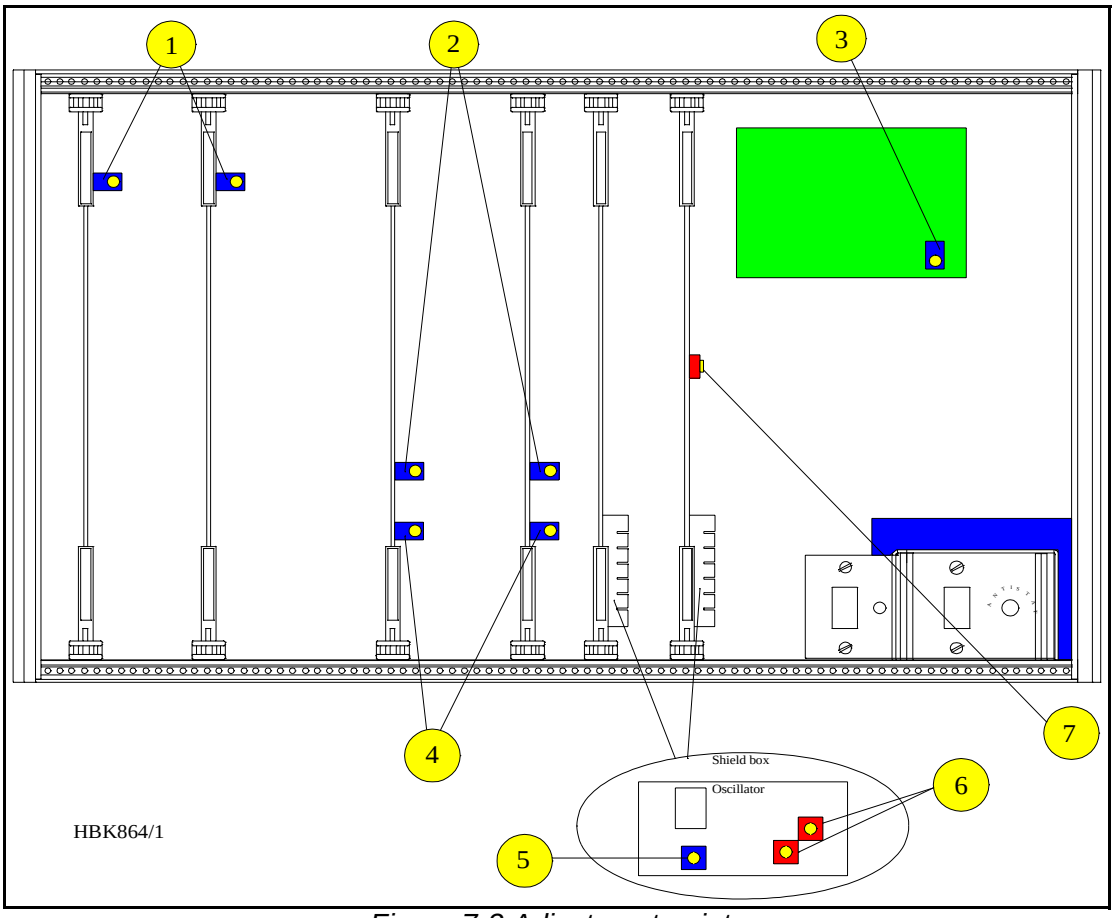


Figure 7-3 Adjustment points

7.4 Adjustments at installation

These procedures have to be carried out at installation in order to set up your equipment right.

7.4.1 Transmitter output power adjustment

This adjustment is most easily done with the RMM PC program but the local keyboard/display may be used.

- Make sure the output signal RF OUT is terminated with a 50Ω load (antenna or dummy load).
- If this is an Inner Marker make sure the external attenuator is installed.
- Start the RMM program on the PC (see chapter 10)
- Open the **TX settings** window, RF LEVEL for TX1 and TX2 are to be adjusted.
- Open the **Maintenance** window. RF LEVEL for TX1 and TX2 are to be watched.
- Set *LOCAL* mode with the REMOTE/LOCAL switch.
- Set *MANUAL* mode with the AUTO/MANUAL switch.
- Set *TX1* to air with the CHANGEOVER button
- Adjust RF LEVEL in **TX settings** until you read the desired output power on RF LEVEL in **Maintenance**.
- Check that you read the desired modulation depth in **Maintenance**.
- Set *TX2* to air and repeat the two previous steps.

7.4.2 Monitor calibration

The software adjustments are most easily done with the RMM program, but may be carried out from the front panel.

- This procedure requires that the output power is already adjusted
- Set the input attenuation straps on MO1374 according to the marker type. Start out with 22dB attenuation for outer marker, 18dB for middle marker and 12dB for inner marker.
- Watch the Monitor parameter RF LEVEL.
- Adjust the potentiometer R850 until RF LEVEL is *3V* at the nominal output power.
- (Ref. fig. 7-4)
- If this is impossible to achieve, try another strap setting and readjust R850.

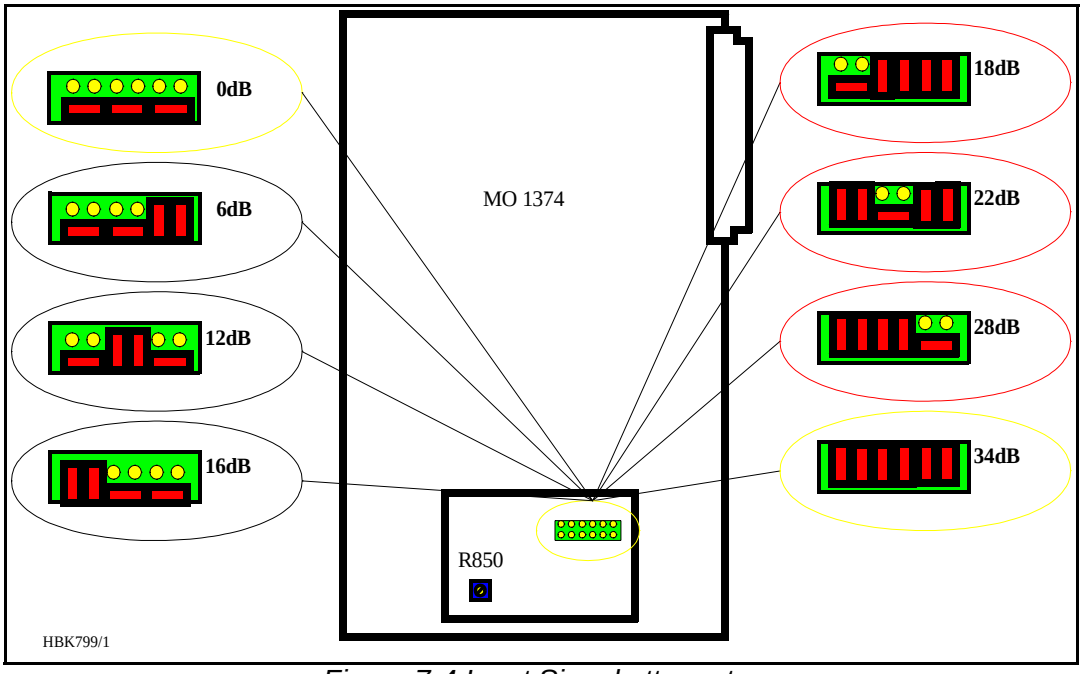


Figure 7-4 Input Signal attenuator

7.5 Other adjustments

These adjustments are normally not required, the factory settings should be sufficient.

7.5.1 Output power readout calibration

The CARRIER POWER parameter in the RMM **Maintenance** window is the internal wattmeter. It is factory calibrated, but may be recalibrated by following this procedure. The software adjustments are most easily done with the RMM program, but may be carried out from the front panel.

- Connect a reference wattmeter to the output signal RF OUT.
- Set TX1 to air.
- Watch the maintenance parameter CARRIER POWER
- Adjust the **TX settings** parameter RF LEVEL until the watt meter shows *2W*
- Check that the **Maintenance** parameter CARRIER POWER on TX1 is accurate to within 5%.
- If not, adjust the **Carrier Power** potentiometer on TX1 until the parameter shows 2.00W
- Repeat for 1W and 0.5W
- Repeat for TX2..

Inner Marker uses an external 10 dB attenuator, use 0.2W, 0.1W and 50mW to calibrate. CARRIER POWER is measured prior to the attenuator, but the software will automatically compensate for the 10dB.

7.5.2 Battery protection cut-off voltage

The purpose of this circuit is to avoid deep discharge and thereby reduced life time of the backup battery. For normal lead acid accumulators 22V (1.83V/cell) is a reasonable cut-off voltage.

- Turn *OFF* the MAINS switch
- Connect a DC supply, preadjusted to the desired cut-off (REFERENCE) VOLTAGE and deactivated, to the external charger input on CI 1376. This is called the REFERENCE SUPPLY.
- Connect a multimeter in DC volt position to the battery input.
- Turn the REFERENCE SUPPLY On.
- If you measure 0V on the battery adjust the potentiometer on PB1378 until the relay toggles and you measure the REFERENCE VOLTAGE.
- If you measure the REFERENCE VOLTAGE, adjust the potentiometer until the relay disconnects and you measure 0V.

7.5.3 Battery charger voltage

The cells of a lead acid battery has an optimal voltage when they are fully charged. This voltage is greatly dependent on the temperature. The battery life time will decrease if this rule is not followed. To meet the demand, the internal battery charger(s) in NM 7050, the PS 1375, has a temperature compensated charging voltage.

Due to current limiting in PS 1375, a discharged battery will firstly be charged with a constant current, ≈2A with one PS1375 and ≈6A with two PS1375. When the battery draws less than the current limit, the battery will be charged with a constant voltage (U_{BATT}). The factory setting for the internal battery charger is:

U_{BATT20} = 27.6V @ 20°C with $k = \frac{\Delta U_{BATT}}{\Delta T} = -40 \left| \frac{mV}{^\circ C} \right|$.

This is the normal final voltage for lead acid accumulators. If your batteries require a different final voltage, the adjustment procedure is as follows:

- Turn the BATTERY switch *OFF* and have one TX on .
- Measure the environment temperature T_{ENV} (in °C)
- Compute the temperature deviation $\Delta T = T_{ENV} - 20°C$
- Compute the new expected final voltage at your environment temperature as $U_{BATT} = U_{BATT20} + k \cdot \Delta T$
- Adjust the potentiometer on PS1375 until you measure U_{BATT} on the 27V test point on CI 1376.

Example:

Your battery requires a final voltage of 26V at 20°C, and you have measured an environmental temperature of 25°C. You should then adjust the charger to give

U_{BATT} = 26 + (-0.04)(25 - 20) = 25,8 V

PART III OPERATION

8 Operation Main Cabinet

8.1 Power On/off

The power switches for MAINS and BATTERY are located on the lower right side of the cabinet front (Figure 8-1). A lit POWER LED indicates that the system has power, the source may be either mains or battery as shown in Figure 8-2.

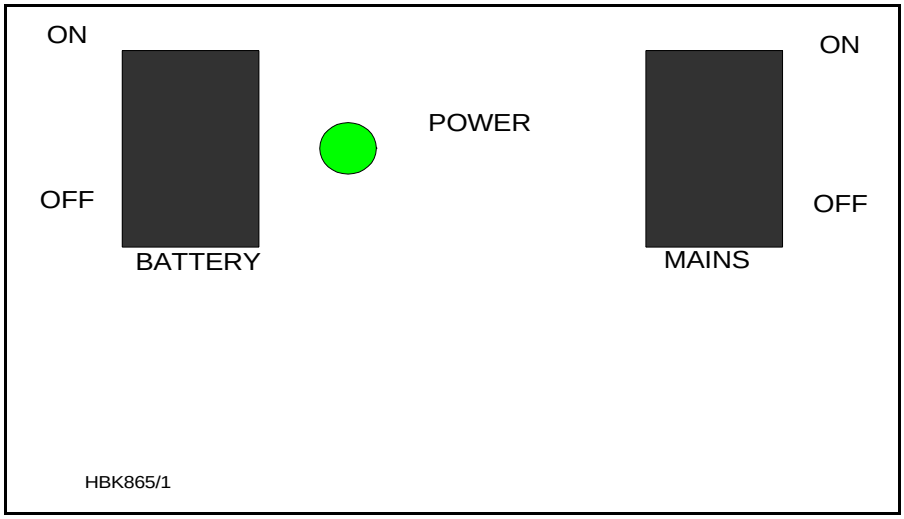


Figure 8-1 The power switches and indicator

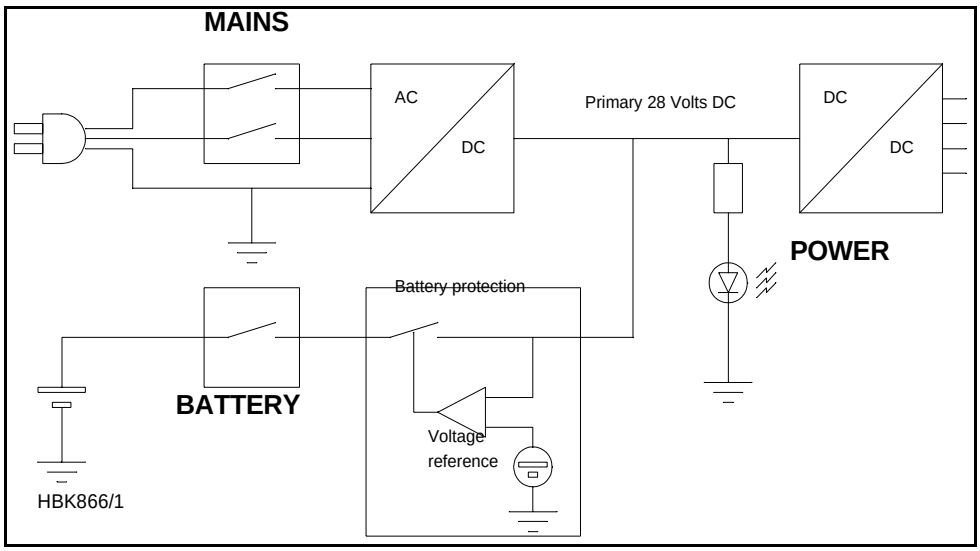


Figure 8-2 Simplified power diagram

If the BATTERY switch is *OFF* in normal mains power operation, the battery will not be charged.

If the battery voltage drops below 22V, the internal battery protection circuitry will disconnect the battery. The battery will not be reconnected until the mains power returns to normal.

8.2 Local Control Operation

The **Local Control** is the lower half of the control section on the cabinet front. This section is used to control the transmitters and the operational modes of the **Marker Beacon** (MB) besides showing the system status via Light Emitting Diodes (LED's).

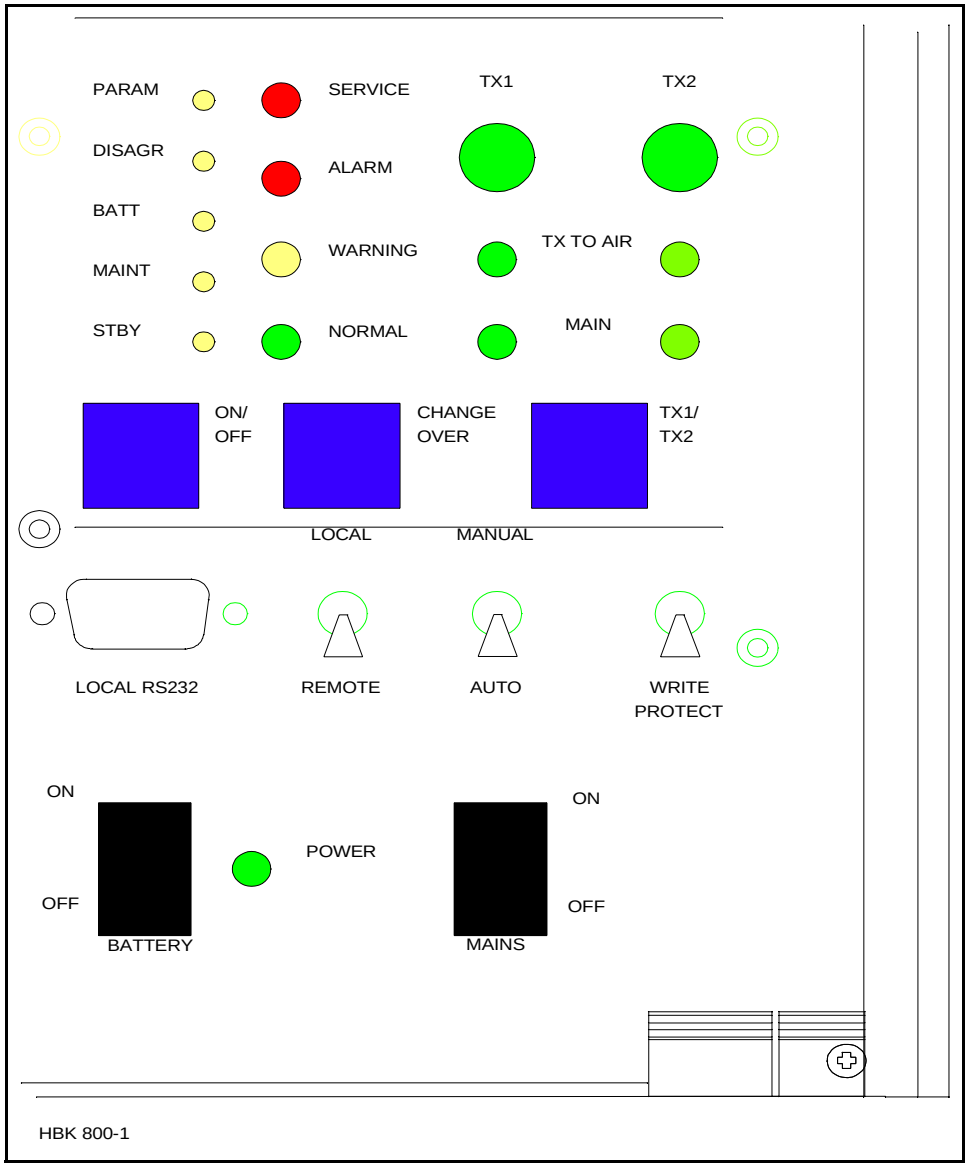
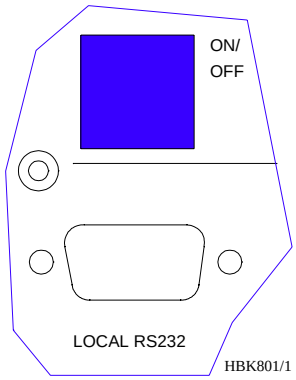


Figure 8-3 LC1377 on front panel

8.2.1 Glossary

AUTOMATIC	When the MB is in automatic mode of operation, any detected alarm(s) will lead to either CHANGEOVER or SHUTDOWN.
MANUAL	When MB is in manual operation, the MB state will not change if alarm(s) is detected.
INTERLOCK	When an MB is in active interlock mode, the MB will turn off active transmitter and not allow them to be turned on before the interlock condition is removed. This signal overrides manual mode of operation.



8.2.2 Pushbuttons

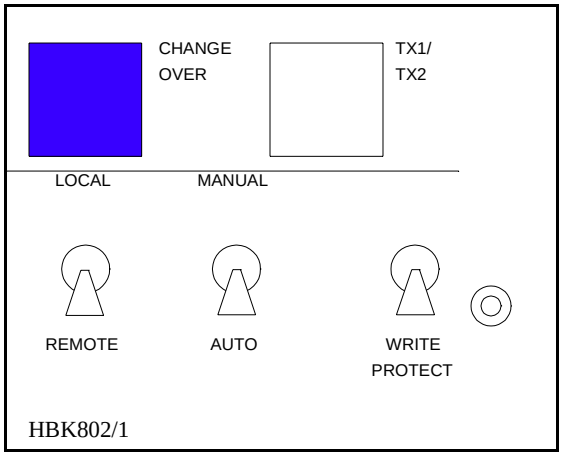
ON/OFF

Used to:

- Toggle the **MB** on/off.

Valid when:

- The LOCAL/REMOTE switch must be in *LOCAL* position.
- The INTERLOCK signal is *NOT ACTIVE* if the MB is configured for Interlock.



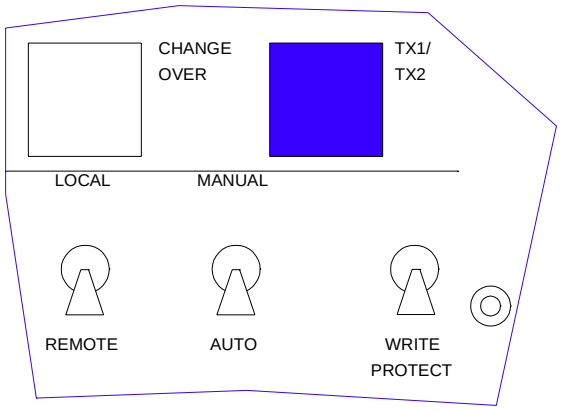
CHANGEOVER

Used to:

- Toggle the transmitters between TX1/TX2 as the active transmitter(s).

Valid when:

- The LOCAL/REMOTE switch is in *LOCAL* position.
- The **MB** is *ON* when the MANUAL/AUTO switch is in *AUTO* position



HBK803/1

MAIN SELECT

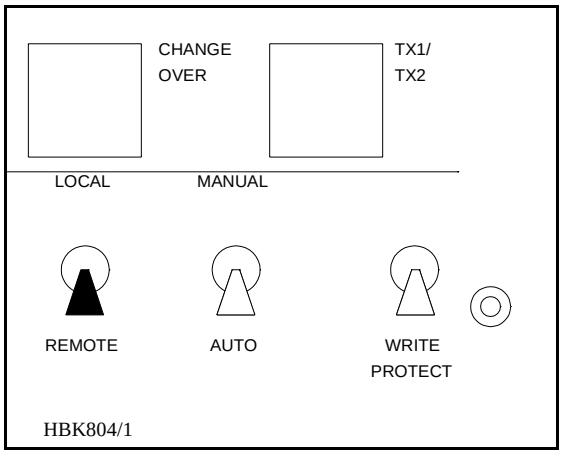
Used to:

- Toggle between TX1/TX2 as the main transmitter and standby transmitter.

Valid when:

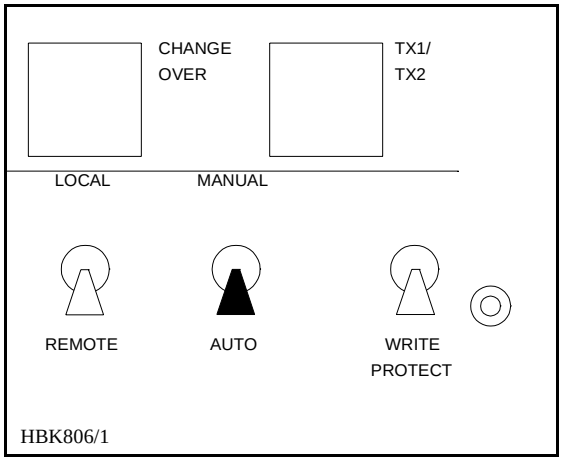
- The LOCAL/REMOTE switch is in *LOCAL* position.

8.2.3 Switches/Switchlocks



LOCAL/REMOTE

Used to:



- Select between *LOCAL* and *REMOTE* mode of operation. *REMOTE* mode of operation will inhibit use of the local push buttons and the local serial communication port for entering *RMS ACCESS LEVEL 2* and *3*. *LOCAL* mode of operation will inhibit use of the remote control push buttons (ON/OFF, CHANGEOVER) and the use of the remote serial communication port.

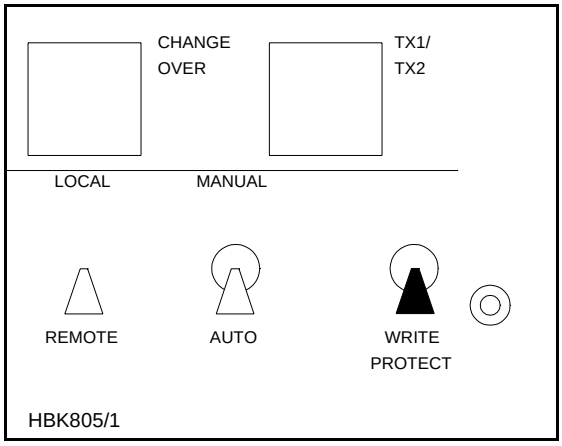
MANUAL/AUTO

Used to:

- Select between *AUTOMATIC* and *MANUAL* mode of operation.

Valid when:

- The LOCAL/REMOTE switch is in *LOCAL* position.



WRITE PROTECT

Used to:

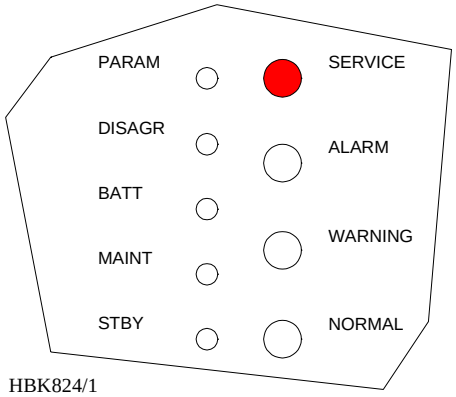
- Prevent changing of alarm limits and other parameter adjustments. Setting this switchlock will prevent entering of access level 3.

Valid when:

- Always.

If the LOCAL/REMOTE switch is in *REMOTE* position, an RMM operator may alter the MANUAL/AUTO mode without this being reflected on the physical switch.

8.2.4 System Status Indications



HBK824/1

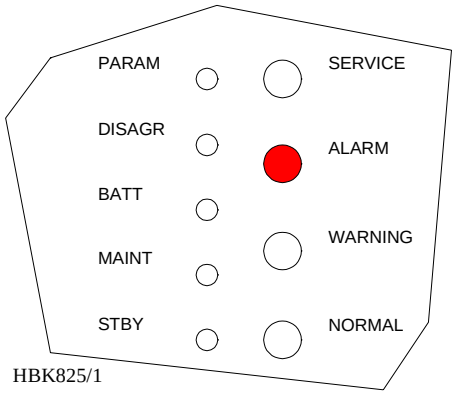
SERVICE

Used to :

- Indicate that the **MB** is currently in *SERVICE* mode of operation. This will also set the remote control to alarm state.

Activated by :

- **RMS** in *ACCESS LEVEL 2* or *3*, or
- The LOCAL/REMOTE switch is in *LOCAL* position, or
- The MANUAL/AUTO switch is in *MANUAL* position, or
- *MANUAL* mode entered from **RMS**, or
- Mismatch between the WRITE PROTECT switch and configuration strap setting on U6 (strap position 6-15).



HBK825/1

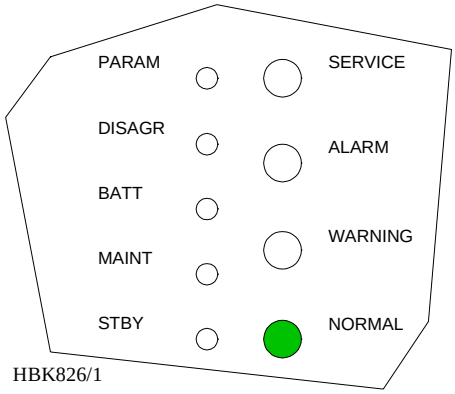
ALARM

Used to:

- Indicate that the **MB** has detected an alarm condition.

Activated by:

- One or more alarms present



HBK826/1

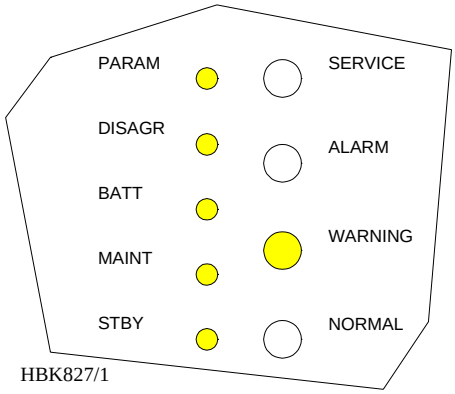
NORMAL

Used to :

- Indicate that no alarm conditions are detected by the **MB**.

Activated by :

- No alarms present.



HBK827/1

WARNING

Used to :

- Indicate that the **MB** has detected one or more warning conditions.

Activated by :

- Warning condition(s) detected by **RMS**.

PARAMETER WARNING

Used to :

- Indicate that there are one or more monitor parameter warnings present. The warnings from the **Monitor 1/Monitor 2** are voted before displayed.

Activated by :

- One or more monitor parameters outside the warning limits.

MONITOR DISAGREE (MODEL 7050 C AND D ONLY)

Used to :
- Indicate that **Monitor 1** and **Monitor 2** disagree on which parameters that are in alarm state.

Activated by :
- Difference in monitor 1/monitor 2 alarm detection.

BATTERY WARNING

Used to :
- Indicate that the **MB** is running using the 24V battery.

Activated by :
- Loss of mains for charging the 24V battery.

MAINTENANCE WARNING

Used to :
- Indicate that one or more of the maintenance parameters warnings detected.

Activated by :
- One or more maintenance parameters faulty or outside limits.

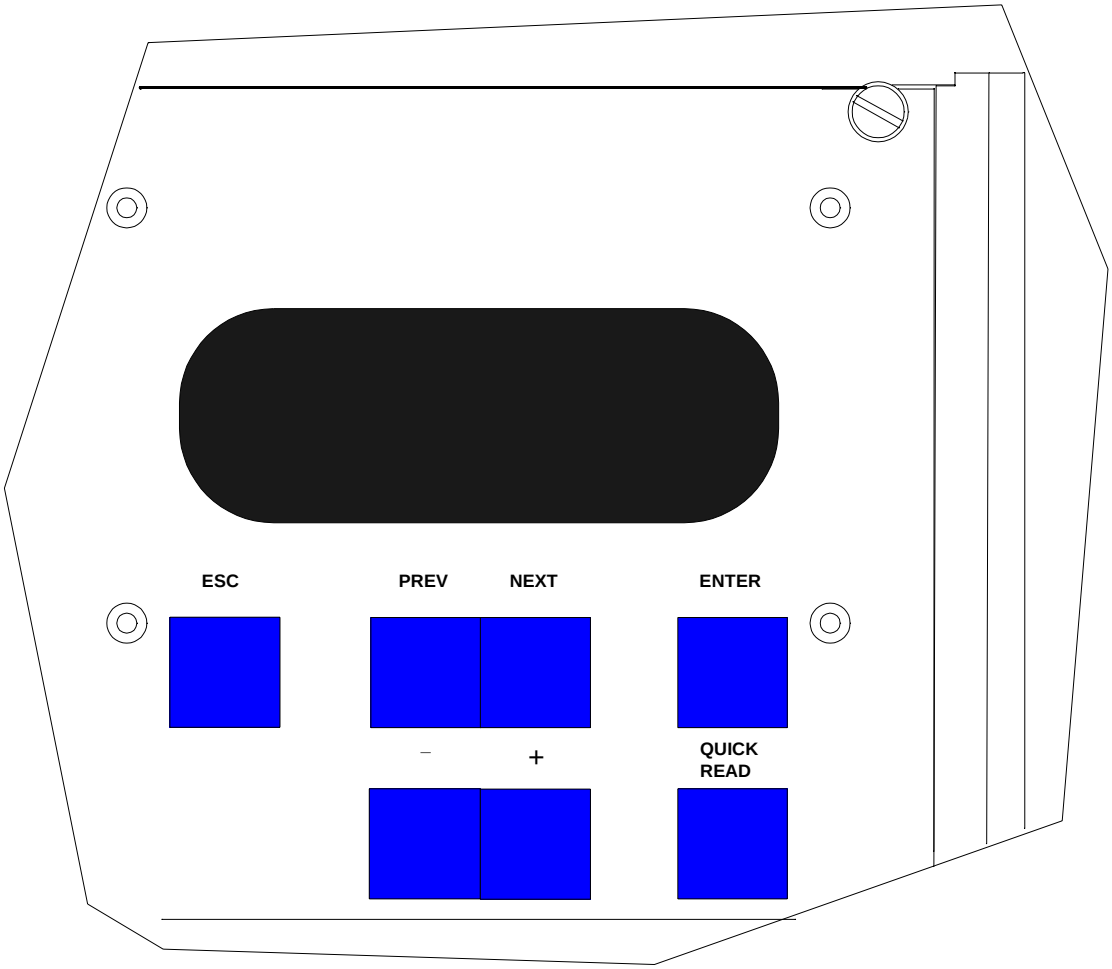
STANDBY TRANSMITTER ON AIR

Used to :
- Indicate that the RF relay directs the standby transmitters to the antenna and the main transmitters to the dummy load.

Activated by :
- TX to air position differs from transmitter main select.

8.3 Local Keyboard/display Operation

The **Local Keyboard and Display** is a simple interface to the RMM system. This means you have access to most of the RMM functionality without the need of a PC.



HBK807/1

Figure 8-4 Local keyboard and Display

8.3.1 The menu structure

The front panel menu system includes a 20x4 character LCD with 7 dedicated push-button keys. The system is organised as a top-down menu tree-structure where the main menu is the default entering point.

The main menu screen has three menu-options. The options are divided into the three ACCESS LEVELS; *LEVEL 1* with basic readout functions, ***LEVEL 2*** with test and control functions and *LEVEL 3* with permanent system parameter settings and configuration changes.

>Read syst para	L1
Local settings	L2
Syst settings	L3

Figure 8-5 The top level main menu screen.

8.3.2 Handling the different menu screens.

The menu system consists of five basic screen types; menu screens, readout screens, toggle

screens, input/storing screens, and the quick read screens.

8.3.2.1 The menu screen

The menu screen is controlled by the key-buttons : PREV , NEXT , ENTER and ESC.

The menu options are formatted as a long list where each option holds one character line. If a menu screen includes more than four options, a small arrow-indicator will be displayed in the lower right corner. This informs the user that more than four menu options are available. The blinking arrow cursor left to the menu text is controlled by the NEXT and PREV keys. The ENTER key activates the menu options left to the arrow-cursor.

The ESC key brings the user one menu-level upwards or back in the menu-tree-structure.

The menu scrolls down if the user pushes the NEXT key when the arrow-cursor is at the lower line and the arrow indicator is displayed in the lower right corner. The menu will in the same way scroll upwards by pushing the PREV-key in a corresponding situation.

8.3.2.2 The readout screen

The readout screens display the various monitor and maintenance parameter readings. The screens are entered by stepping through the menu options. The ESC key brings the user back to the previous menu screen again. The parameter readings are continuously updated..

```
 readout  M1 Rf Mod.
Mod.  :                 95.2%
Al    U   99.0%     L  91.0%
Wa    U   98.0%     L  93.0%
```

Figure 8-6 A typical readout screen: Monitor Depth of Modulation.

8.3.2.3 The toggle screens

The toggle screens offer the user to choose between two or more options. The options text is enclosed by two blinking square-brackets. The plus «+» and minus «-» keys step through the various options. The ENTER key activates the chosen toggle option. The ESC keys leaves the screen without activating any of the options.

```
Set bitrate Local

        [     9600     ]
```

Figure 8-7 ***A typical toggle screen: Local RS232 baudrate***

8.3.2.4 Input/Store screen

The user can change the various parameter alarm and warning settings in the input/storing-screens. A virtual cursor is controlled by the PREV and NEXT keys. An input field number will blink if the cursor is moved to the correct position. The blinking limit values can now be changed by pushing the plus «+» and minus «-» keys. If the input field is digital, the valid options will be *FALSE* and *TRUE* when the plus «+» and minus «-» keys are pushed.

When all the input numbers in the screen are changed to the preferred new values, the cursor must be moved to the STORE-field in the upper left corner. When the cursor is placed at this

STORE-field, the brackets will start blinking. The ENTER key will now store the new values on the screen in the MB. The ESC key leaves the screen unchanged.

```
<store>  M1 Rf Mod.
Mod.  :              94.8%
Al     U: 99.0%    L  91.0%
Wa     U: 98.0%    L  93.0%
```

Figure 8-8 ***A typical input/store screen: Monitor Depth of Modulation***

8.3.2.5 The quick read screen

The quick read screens are accessed by pushing the QUICK READ key. The key toggles between the original menu tree and the quick read screens. The QUICK READ button can be pushed at all times, not changing the original menu screens. The quick read screens include only the basic monitor readings and a few system voltages. The PREV and NEXT keys step through the quick read screens.

```
-QR-   Monitor 1
Rf  :                3.0v
Mod.:               94.9%
Keying:              On
```

Figure 8-9 ***The quick read screen for monitor 1.***

8.3.3 The access levels

The level 3 menu options must be entered by typing a 4 character password. The level 2 menu can be entered as an ordinary menu option.

8.3.3.1 Level 2

To enter the level 2 menu option, the front panel switches must be in the *LOCAL* and *MANUAL* positions. The remote panel access switch must also be in *ACCESS* position. The user is denied access if the switches are not correctly set.

```
Local switch on
Front panel in
REMOTE position
    Push <ESC>
```

Figure 8-10 ***An access denial screen: Switch in REMOTE position.***

8.3.3.2 Level 3

To enter the level 3 menu option, the front panel switches must be as for level 2 access. In addition the WRITE PROTECT switch must be in *ACCESS* position. The user must key a 4 character password to enter level 3 access. The access-screen is operated similarly to an input/store-screen. The blinking cursor is moved by the PREV and NEXT keys. A blinking input field is changed by the plus «+» and minus «-» keys.

When the correct password is entered, the cursor must be moved to the <LEVEL 3 ACCESS>-field. The brackets will then start blinking. The ENTER key will now bring the user to the level

3 options. The ESC key leaves the screen back to the main menu..

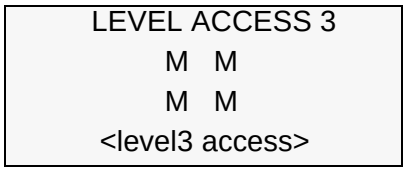


Figure 8-11 ***Level 3 access screen***

8.3.3.3 Leaving the access levels

If the user enters *LEVEL 2* or *3*, an extra menu line is added in the main menu screen. This is a leave current access level option. The user must enter this menu option to quit the current access level - typically when leaving the **MB**.

The access levels are also left when the front panel switches are changed to an illegal position. (e.g. switch in *REMOTE* position).

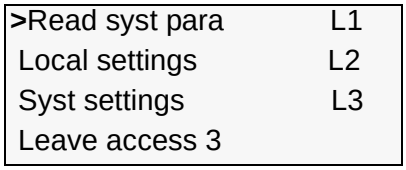


Figure 8-12 ***The top level main menu screen: User in level 3 access.***

8.3.4 Function listing

The menu system includes the following functionality.

8.3.4.1 Level 1

- Readout of all the monitor values, warning and alarm limits.
- Readout of all the maintenance values and warning limits.
- Readout of all the delays.
- Readout of all the TX1 and TX2 configurations.

8.3.4.2 Level 2

- TX1 and TX2 : Using pre-programmed test settings.
- Communications.

8.3.4.3 Level 3

- Settings of all the monitor warning and alarm limits.
- Settings of all the maintenance warning limits.
- Settings of all the delays.
- Settings of all the TX1 and TX2 configurations.
- Communications.

8.3.5 The menu tree

The top levels of the menu tree is shown in Figure 8-13.

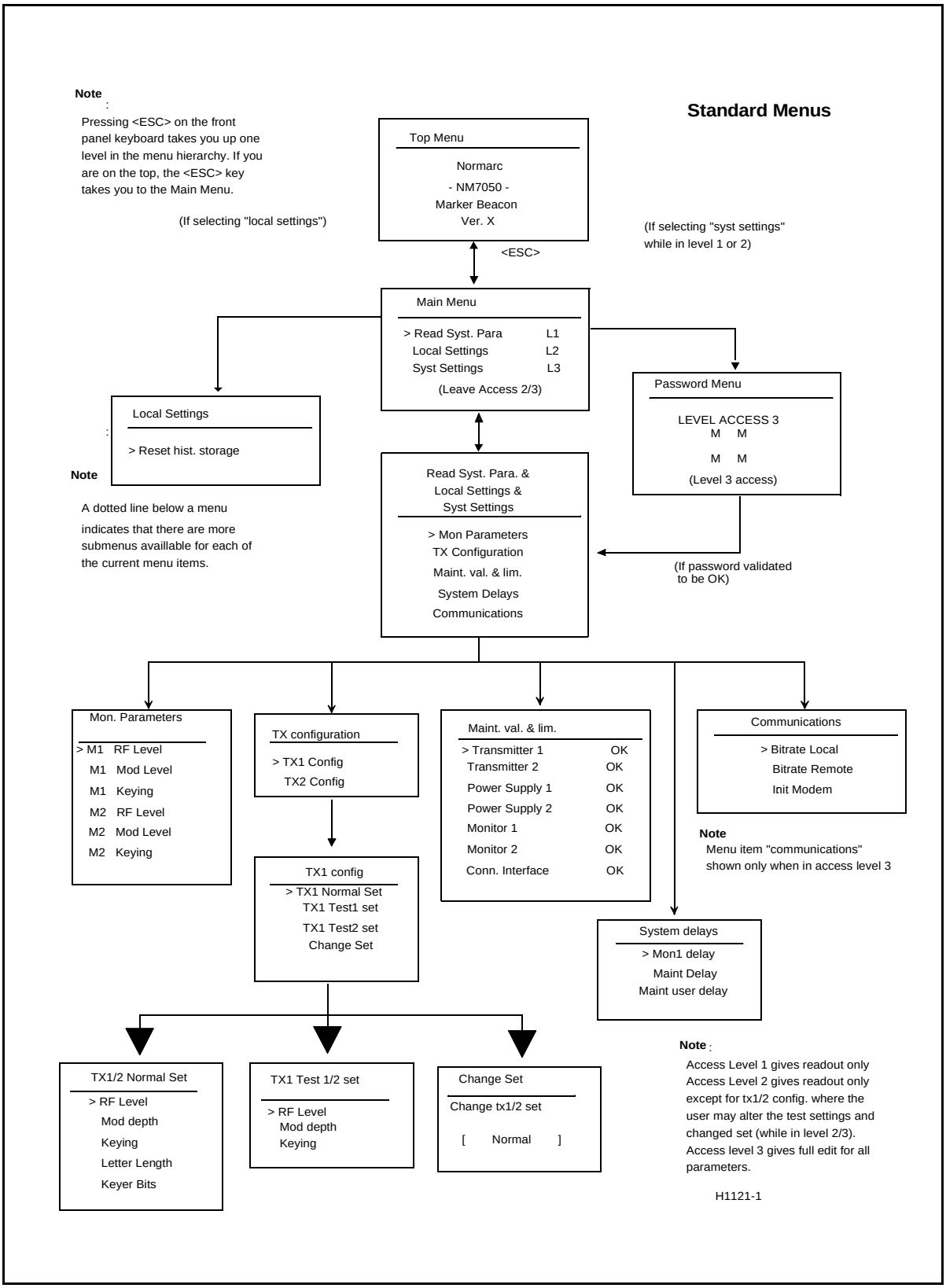


Figure 8-13 Menu system, Standard Menu

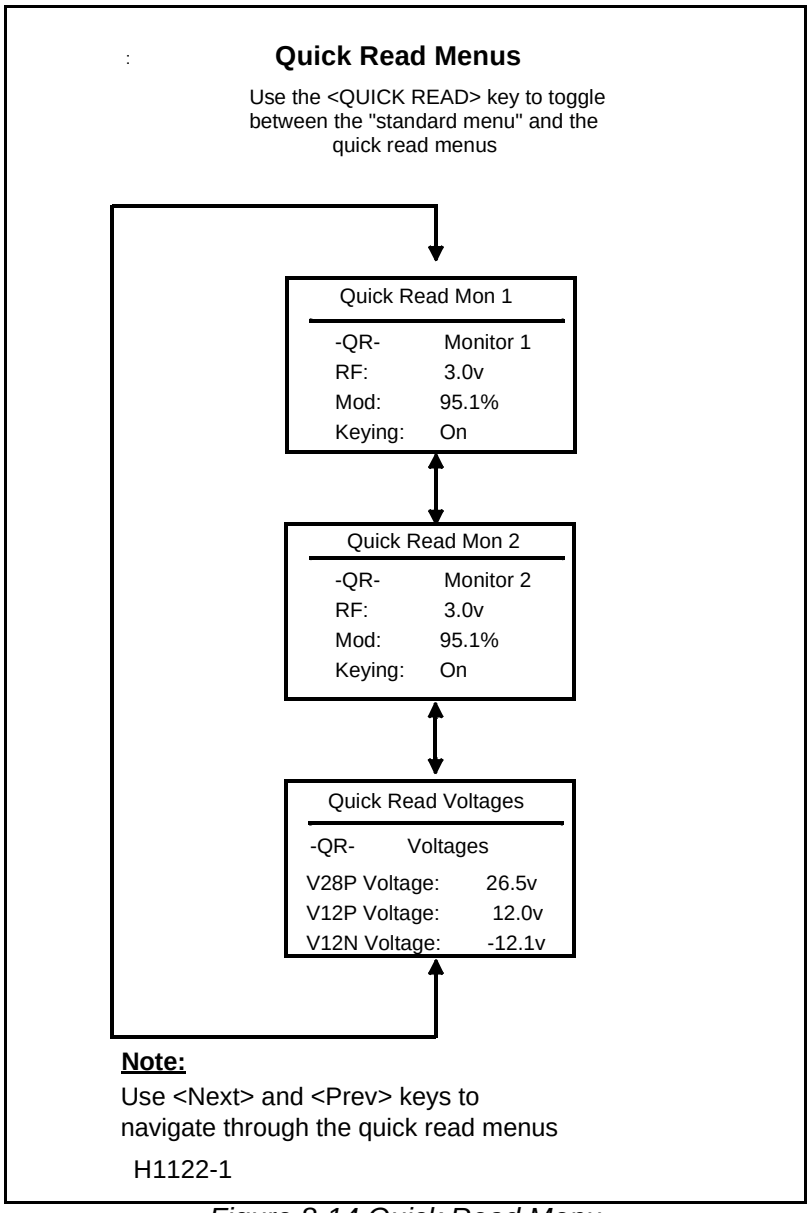


Figure 8-14 Quick Read Menu

9 Remote Control And Slave Operation

9.1 Remote Control Operation

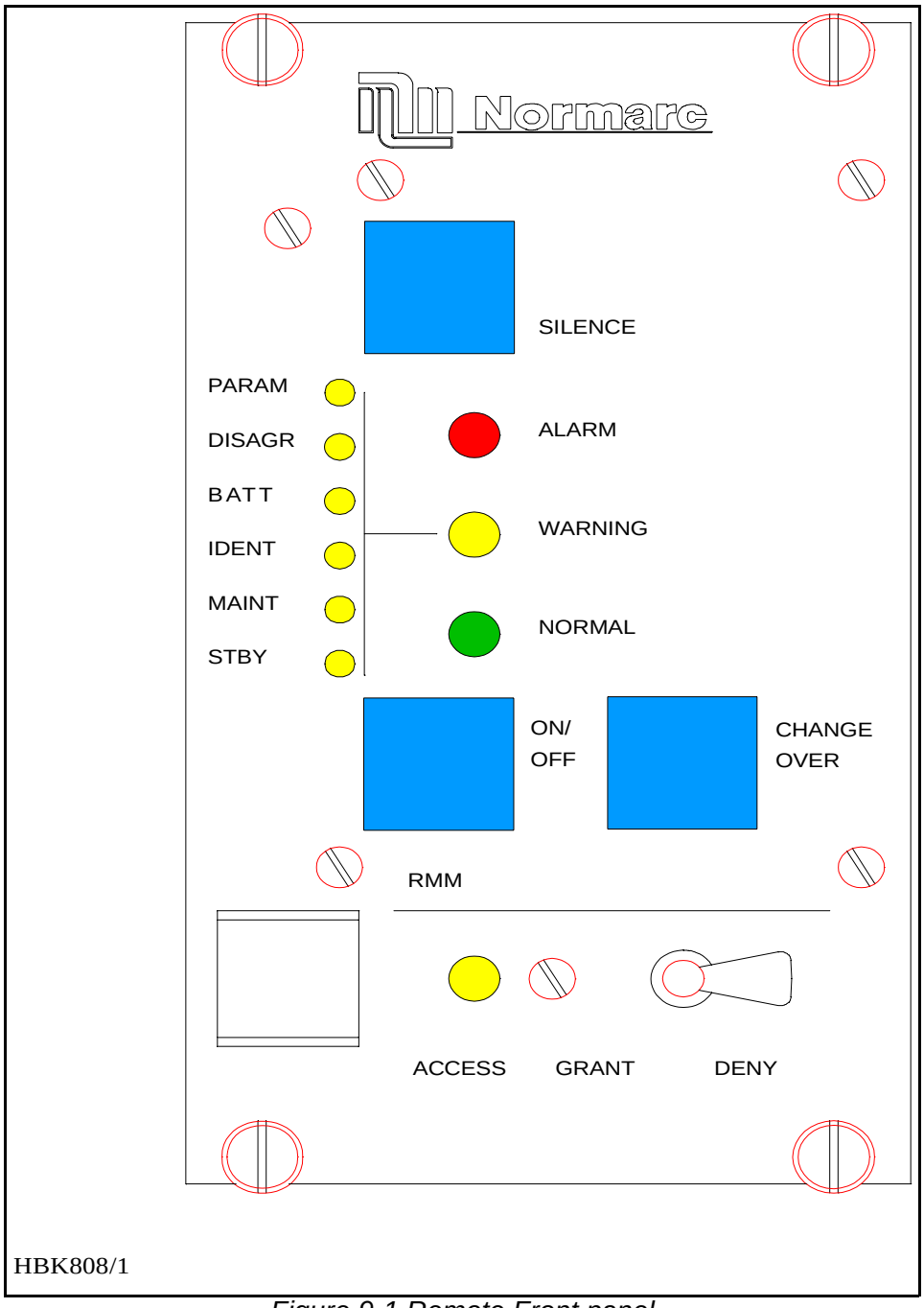


Figure 9-1 Remote Front panel

9.1.1 Glossary

INTERLOCK When an ILS is in active interlock mode (the interlock signal is an input to the remote control), the ILS will turn off all active transmitters and not allow them to be turned on before the interlok condition is removed. This signal overrides

manual mode of operation.

9.1.2 Pushbuttons

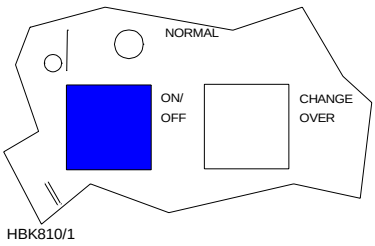
ON/OFF

Used to:

- Toggle the MB on/off.

Valid when:

- The LOCAL/REMOTE switch must be in REMOTE position, and
- The interlock signal is not active if the MB is configured for interlock.



HBK810/1

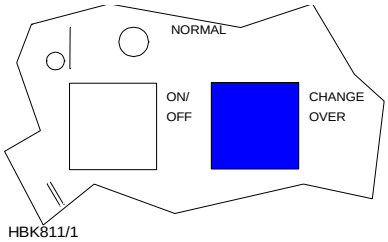
CHANGEOVER

Used to:

- Toggle the coax relay and transmitters between TX1/TX2 as the active transmitter(s).

Valid when :

- The LOCAL/REMOTE switch on the ILS is in REMOTE position, and
- The MB is «on» when he MANUAL/AUTO switch is in AUTO position.



HBK811/1

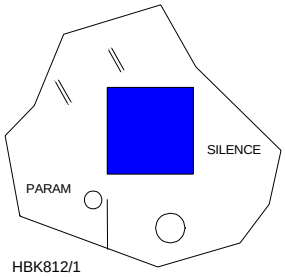
SILENCE

Used to:

- Turn off the audio alarm on the remote control (caused by remote status change from NORMAL to ALARM). Also used for lamp test (all lamps are illuminated when this push-button is held down).

Valid when:

- Always.



HBK812/1

Switches

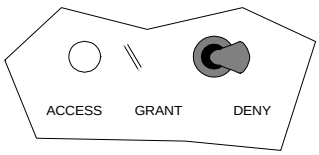
GRANT/DENY

Used to:

- Give access grant (access level 2/3) for RMS control of the MB when the switch is in GRANT position.

Valid when:

- Dependent on strap S2 on the configuration platform, see chapter 7.



HBK813/1

9.1.3 System Status Indications

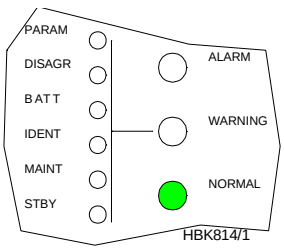
NORMAL

Used to :

- Indicate that no alarm conditions are detected by the MB.

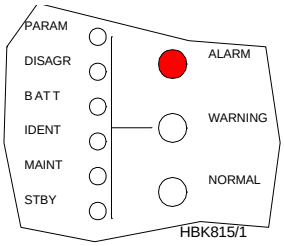
Activated by:

- No alarms present, and
- Communication with MB is OK.



HBK814/1

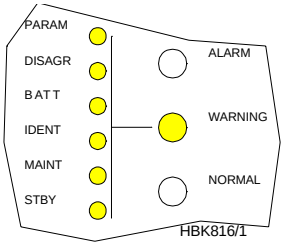
ALARM



Used to:
- Indicate that the MB has detected an alarm condition.

Activated by:
- One or more alarms present on the MB, or
- Communication failure with MB.

WARNING



Used to :
- Indicate that the MB has detected one or more warning conditions.

Activated by:
- Warning condition(s) detected by RMS.

PARAMETER WARNING

Used to :
- Indicate that there are one or more monitor parameters warnings present.

Activated by :
- One or more monitor parameters outside the warning limits.

MONITOR DISAGREE (MODEL 7050 C AND D ONLY)

Used to :
- Indicate that there are one or more monitor parameters warnings present. The warnings from the monitor 1/monitor 2 are voted before displayed.

Activated by :
- Difference in monitor 1/monitor 2 alarm detection.

BATTERY WARNING

Used to :
- Indicate that the MB is running using the backup battery.

Activated by :
- Loss of mains for charging the backup battery.

MAINTENANCE WARNING

Used to :
- Indicate that one or more of the maintenance parameters warnings detected.

Activated by :
- One or more maintenance parameters faulty or outside limits.

STANDBY TRANSMITTER ON AIR

Used to :
- Indicate that coax position directs the standby transmitters to the antenna and the main transmitters to the dummy load.

Activated by :
- Coax position differs from transmitter main select.

ALARM BUZZER

Used to :
- Indicate that a transition from NORMAL to ALARM has occurred. Reset by pressing SILENCE push button.

Activated by :

- Remote control state transition from NORMAL to ALARM

The IDENT warning lamp is not in use on Marker Beacon stations. This lamp is for Localizers and Glide path stations only.

9.2 Slave Panel Operation

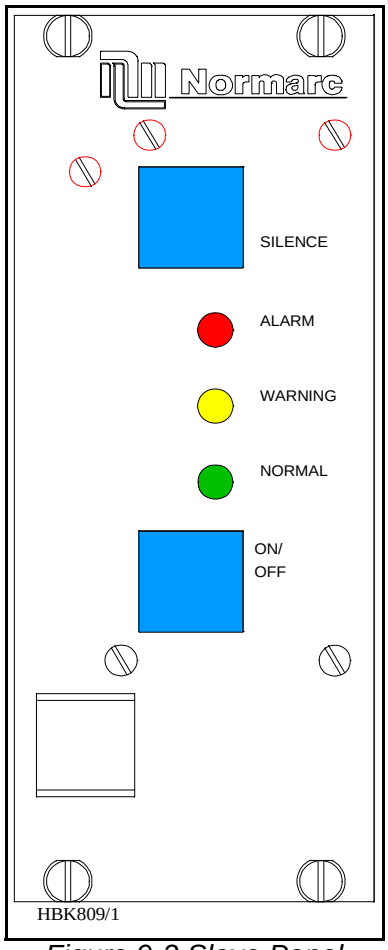


Figure 9-2 Slave Panel

9.2.1 Glossary

INTERLOCK When an ILS is in active interlock mode (the interlock signal is an input to the remote control), the ILS will turn off all active transmitters and not allow them to be turned on before the interlock condition is removed. This signal overrides manual mode of operation.

9.2.2 Push buttons

ON/OFF

Used to:

- Toggle the MB on/off.

Valid when:

- The LOCAL/REMOTE switch must be in REMOTE position, and
- The interlock signal is not active if the MB is configured for interlock.

SILENCE

Used to:

- Turn off the audio alarm on the slave panel (generated by remote control). Also used for lamp test (all lamps are illuminated when this push button is held down).

Valid when:

- Always.

9.2.3 System Status Indications

ALARM

Used to:

- Indicate that the MB has detected an alarm condition.

Activated by:

- One or more alarms present on the MB, or
- Communication failure with MB.

NORMAL

Used to:

- Indicate that no alarm conditions are detected by the MB.

Activated by:

- No alarms present, and
- Communication with MB is OK.

WARNING

Used to:

- Indicate that the MB has detected one or more warning conditions.

Activated by:

- Warning condition(s) detected by RMS.

10 Operation of RMM

This chapter is the user manuasl of the **Remote Maintenance Monitoring** (RMM) program of the NM 7050 series **Marker Beacon**.

10.1 Introduction

The remote monitoring software consists of software running in the MB rack (the **RMS**) and on software running on IBM/PC's or compatibles (the **RMM**). The purpose of the system is to retrieve status and measurements from the MB rack and to change the MB operation and parameters. The retrieved data can be displayed and further processed by programs on the PC. This includes displaying data on screen, saving data and exporting data to other programs, i.e. for trending analysis.

10.1.1 System Requirements

As mentioned above you need a **PC** to run the RMM software. The operating system has to be either Windows 95 (or newer) or Windows NT 4.0 (or newer). The table below shows the hardware requirements to make the software play well.

Operating System	Windows 95		Windows NT	
Hardware	Minimum	Recommended	Minimum	Recommended
Processor	486DX66	Pentium 75	Pentium75	Pentium 100
Hard disk	200 MB		300 MB	
RAM	8 MB	16 MB	20 MB	32 MB
Communication	a RS-232 serial port connected to a Hayes compatible 14400 baud, or better, modem.			

Table 10-1 PC hardware requirements

10.1.2 How to use this manual

The RMM is a windows based software, and uses standard windows interface. If you are familiar with windows you can skip Chapter 10.2.

If you are not the type that reads manuals in bed at night (engineers are usually not), the chapter 10.4 Getting started will give you a quick guidance into the system.

The chapters 10.4.2 and 10.5.16 are for the **System Administrator**, normal users may skip these chapters.

10.2 The desktop area

The purpose of this chapter is to give the inexperienced Windows user some quick instructions on the environment. If you need more details, please refer to the Windows User's Guide.

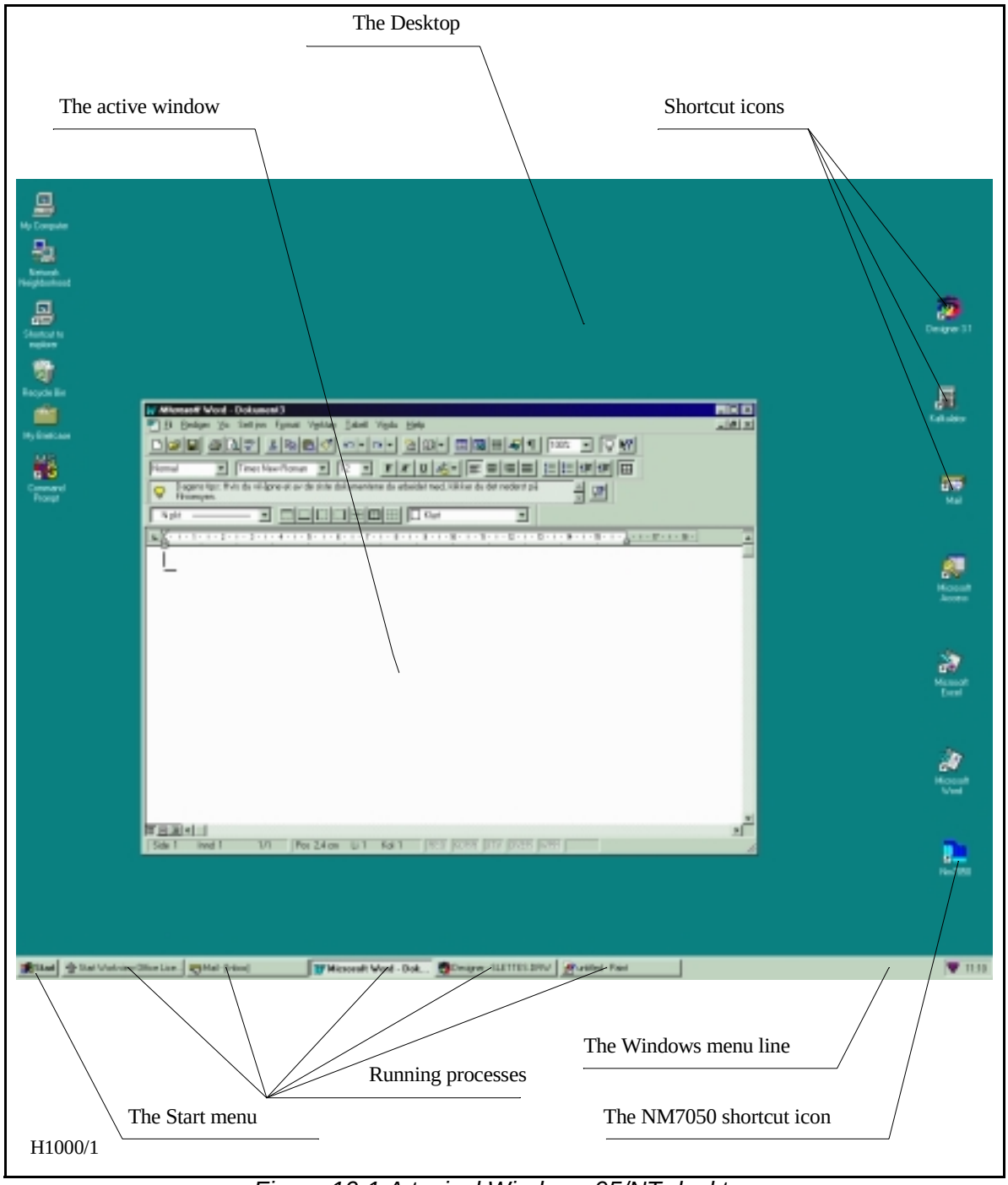


Figure 10-1 A typical Windows 95/NT desktop

The screen background is called a desktop. From this desktop you start and run your programs and you are quite free to lay out your desktop area as you find practical. All programs are reachable from the Start menu in the lower left corner. Several programs may run at the same time and you may hide them by clicking the programs iconize button or bring them to front by clicking the programs icon in the Windows menu.

To get quick access to the most frequently used programs you may put a shortcut icon on your desktop. To start the program, position the mouse pointer over the icon and double click the left mouse button. See 10.3 on how to create a shortcut icon.

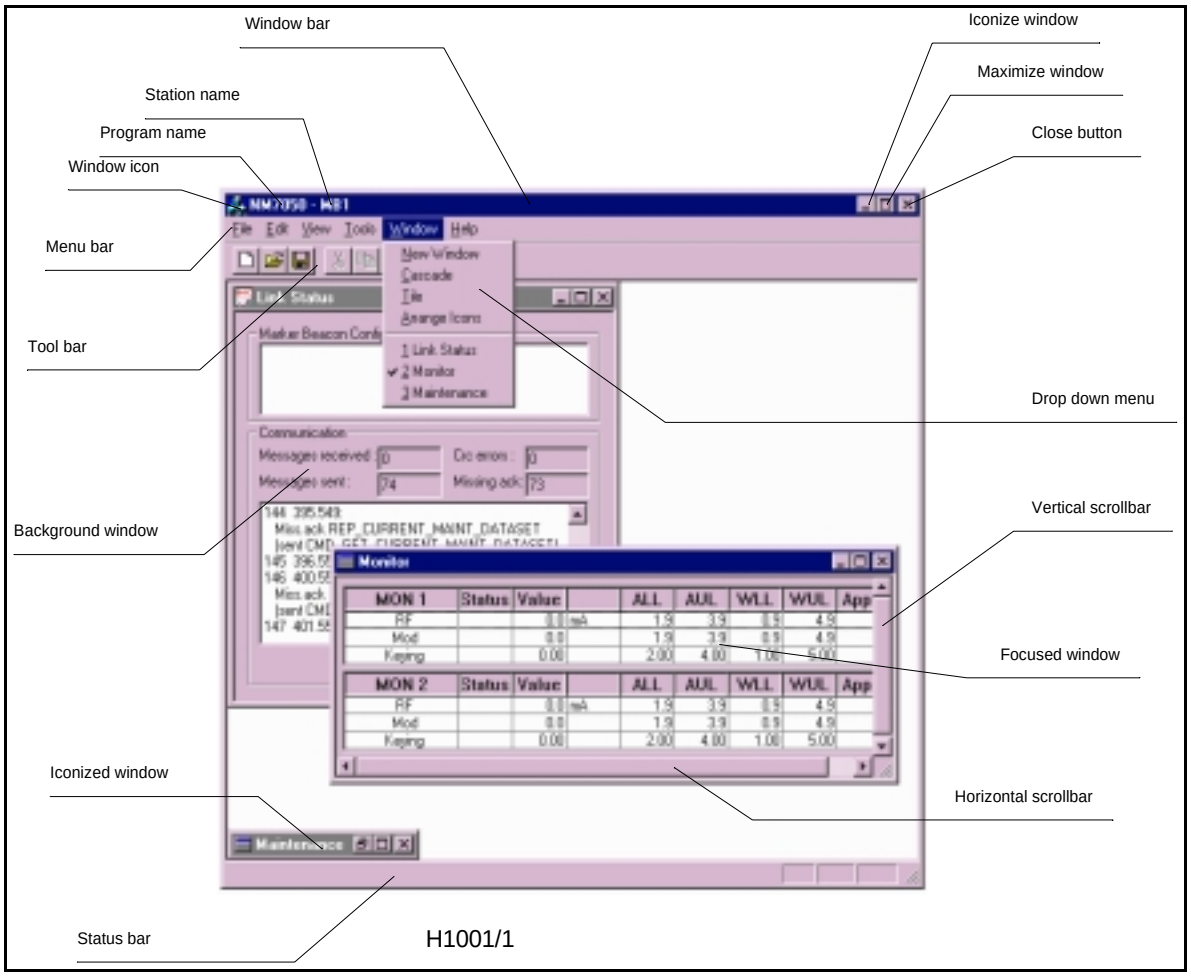


Figure 10-2 The elements of a typical Windows program environment

Inside a single program you may have several windows open at the same time, too. You open windows and apply various commands from the menus or by clicking buttons. The commands you apply takes effect in the currently focused window only.

If you want to...	Do this...
Open a window	Select it from the **View** menu
Close a window	Click on the CLOSE WINDOW button or double click on the WINDOW Icon
Maximise a window	Click on the MAXIMISE WINDOW button or Double click on the WINDOW BAR
Minimise a window	Click on the ICONIZE WINDOW button

Move a window	Position the cursor over the WINDOW BAR, hold left mouse button down and move.
Resize a window	Position the cursor over one of the edges or corners. When a double arrow appears, hold left mouse button down and drag.
Focus on a window	Click on the window or Select it from the **Window** menu
Move sideways inside a window	Click the left or right arrow on the horizontal scroll bar
Move up or down inside a window	Click the up or down arrow on the vertical scroll bar

Table 10-2 Frequently used Windows commands

- A greyed out menu or toolbar item is not a legal option.
- The status bar show various messages from the program
- A focused window (the window you are currently working in) has a dark window bar.
- A background (unfocused) window has a grey window bar.

10.3 Installation

To install the NM7050 RMM program on a hard disk drive:
- Put the first floppy disk in the floppy disk drive or the CD-ROM in the CD-ROM drive
- From the Windows Start Bar, select Start | Run.
- Type a:\SETUP.
- Follow the instructions in the Installation Wizard

You will now have a program group named NAVIA AVIATION in the START|PROGRAMS menu. In this group the program NM7050 MARKER BEACON appears. Select this to start the program.

If you want to create a shortcut on your desktop area do this:
- Position your mouse pointer over the program icon in your program group (you might want to use **Windows/NT Explorer** for this).
- Click and hold the right mouse button down
- Drag the icon into the desktop area and release the mouse button
- Select the *CREATE SHORTCUT(S) HERE* option.
- You will now have a shortcut icon with a little arrow on it

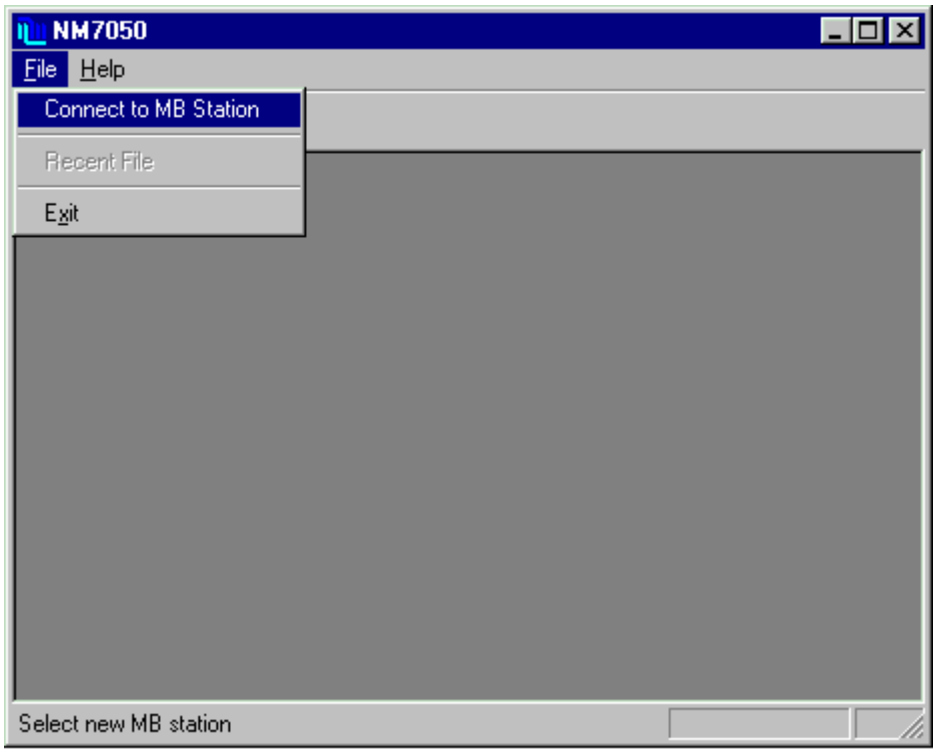
10.4 Getting started

You start the program by selecting START|PROGRAMS|NAVIA AVIATION|NM7050 MARKER BEACON in the desktop menu or, if you have created a shortcut, simply by double-clicking the program icon on your desktop. The program will now appear as an empty shell.

10.4.1 The normal procedure

You now want to connect to a specific Marker Beacon station. To do this select the *FILE*|*CON-*

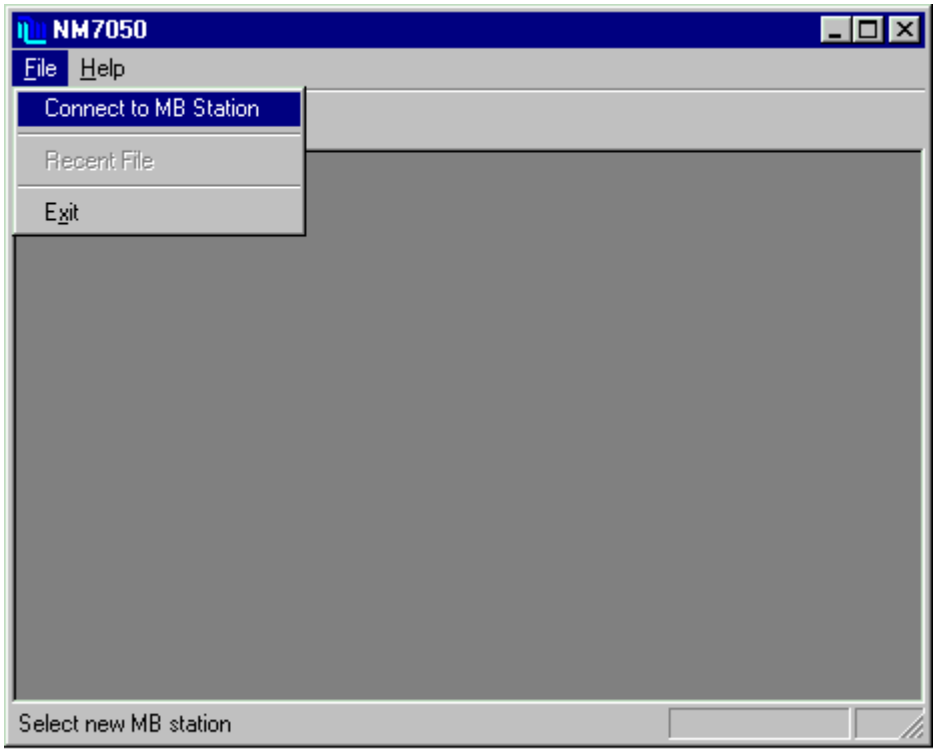
NECT TO MB STATION from the menu.



H1004/2

Figure 10-3 The first view

A list of available Marker Beacon stations will now appear, the so called **Station List**.



H1004/2

Figure 10-4 Station List

The NM7050 program can only connect to one station at a time. To connect to several stations you have to start the program once for each station. But be aware that you need one communication (COM-) port on your PC for each station.

To select a station, click on the line and it will be highlighted. Now click on the CONNECT button and the **Log On** window will appear. Alternatively you can double-click on a station.

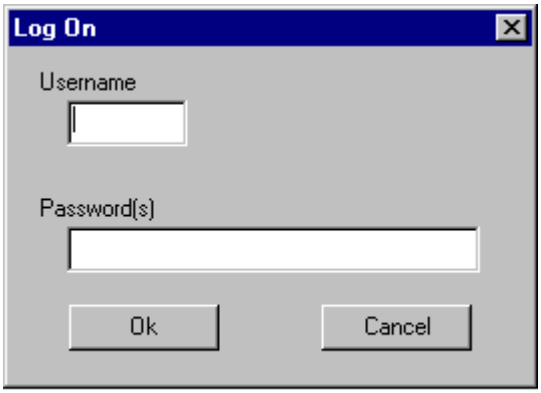


Figure 10-5 Logging on

Due to the strict security demands for the landing systems, the system is protected from unwanted access with *USERNAMES* and three levels of *PASSWORDS*. Now enter your user name and password(s) (separated with space) according to your access level. If you don't have a user name, please contact the **System Administrator**. For explanations on access levels, see chapter 10.5.3 (Logging in and out and access levels).

The desktop will now show the **Link Status** window. This window shows the station's configuration and the communication status. But you are probably more interested in the station's overall status, the value of the measured parameters and maybe the system settings. To do this you have to open one or more of the **Monitor**, **Maintenance** and **TX settings** windows from the VIEW menu.

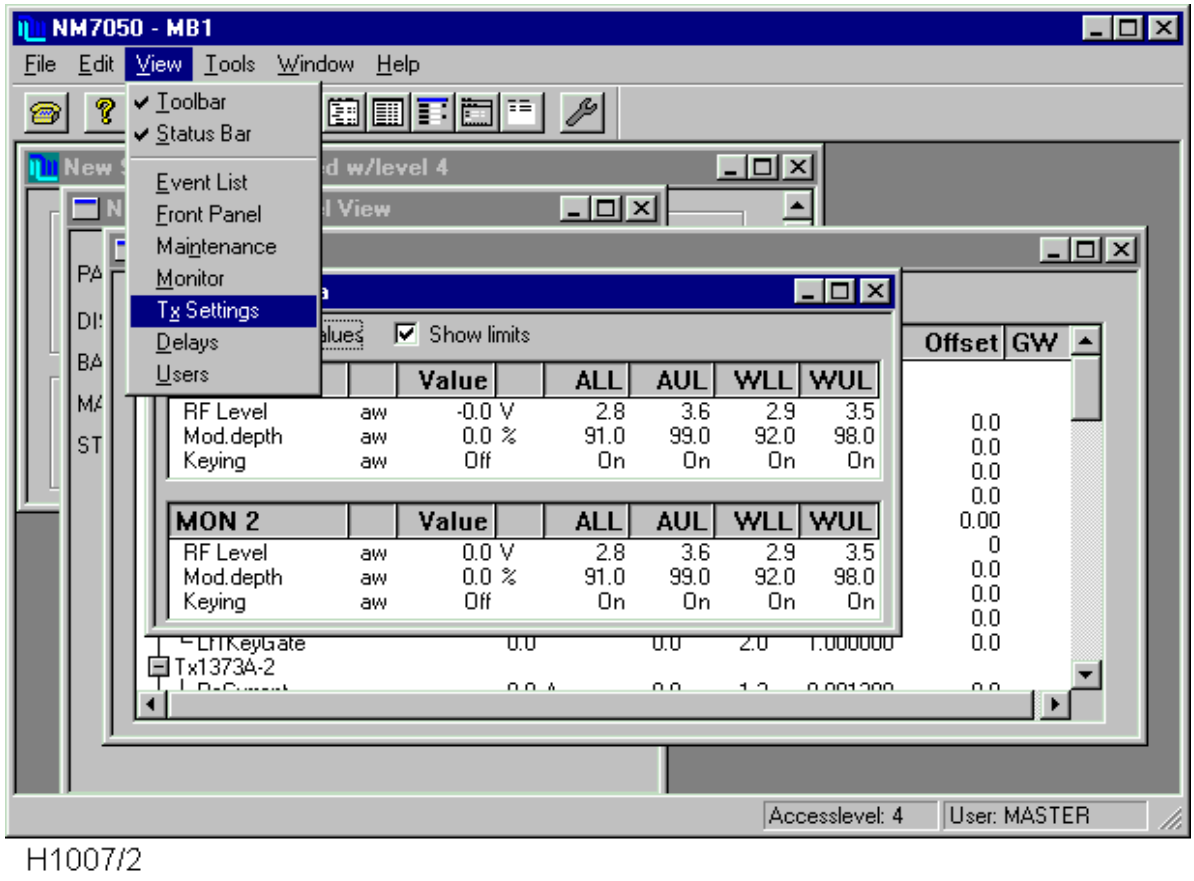


Figure 10-6 Opening more windows

The windows will now appear on top of each other. Use a couple of minutes to organise your desktop by moving and resizing the windows. The program will remember your current settings the next time the program starts. The windows that were shown when you last disconnected from the station will be reopened at next log on.

The final result of your desktop organisation may look something like this:

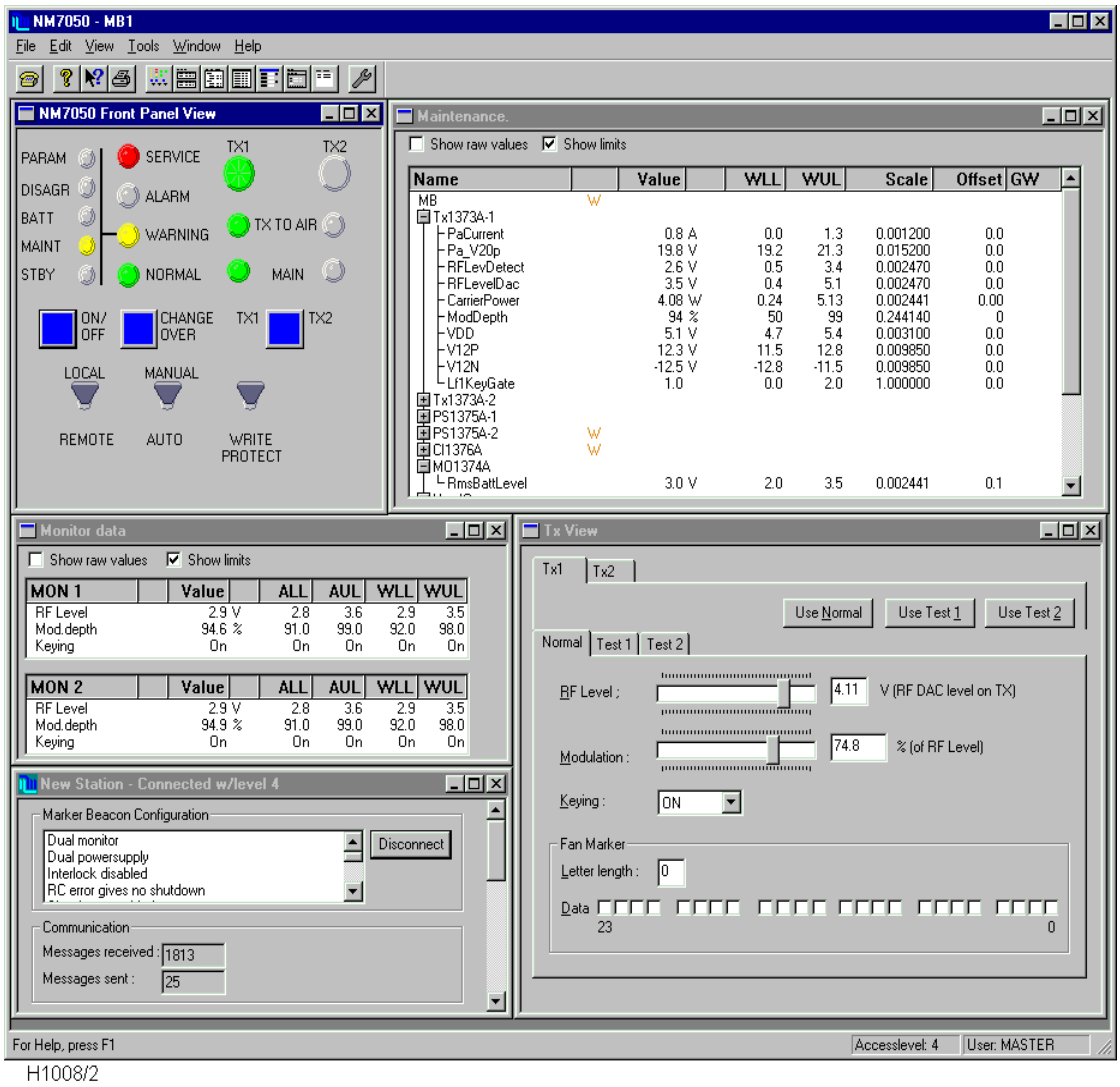


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Figure 10-7 An organised desktop

You are now up and running. For further explanations on windows and commands see paragraph 10.5.

Logging off is done by selecting the *DISCONNECT* button in the same window, or by closing the **Link Status** window.

10.4.2 The very first time

The very first time you log on to a Marker Beacon Station there are some differences from the normal procedure:

- You have no physical connection to the station
- The **Station List** is empty
- There is only one valid *USERNAME/PASSWORD* combination

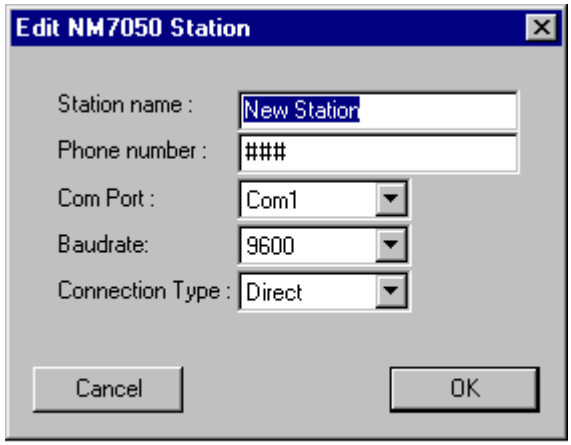
10.4.2.1 Establishing the physical connection

Use the delivered PC-cable with 9 pins D-SUB contact in both ends. Plug one end in either the **Local port** on the Marker Beacon front panel, or in the **Remote Port** on the motherboard inside the cabinet. The other end of the cable must be put in one of your PC's COM-ports (i.e.

COM1). The **Write Protect** switch must be in *OFF* position (upwards) for access level 3 or higher.

10.4.2.2 Editing the station list

After applying FILE|CONNECT TO MB STATION from the menu, an empty **Station List** window appears on the screen. Now click the *NEW* button, and the **Edit Station** window will pop up:



H1009/2

Figure 10-8 Creating a new station

- **Station Name**: You may call the station *AUNT MARY* or *SMOKED SALMON WITH SCRAMBLED EGGS*, but it is probably more convenient to call it something like *FBRWY09MM*.
- **Phone number:** You don't need to enter this now as you are directly connected to the equipment. For further details see chapter 10.5.4 *Station list*.
- **Com Port:** Here you enter the communication port you put your PC cable in, i.e. *COM1*.
- **BAUDRATE:** Select among the baudrate options available. Normally *9600* works well.
- **Connection Type:** Enter *DIRECT* as you use no modem.

Click *OK* and you will return to the **Station List**. Now highlight the station by clicking the left mouse button over it, and then click *CONNECT*.

10.4.2.3 Logging on

For establishing the connection to the station you have to enter a USERNAME and three PASSWORDS. There is only one key to the lock, the so called **Master account**. Enter :

USERNAME*:*	Master
PASSWORDS:	Master1 Master2 Master3

NOTE! The passwords are space separated.

The Master account has unrestricted access to the system. In order to keep your system safe, change the passwords immediately and REMEMBER them. If you have to write the passwords down, keep them in a safe place far away from the station. This applies for the Menu Password as well.

For changing the PASSWORDS see chapter 10.5.16 *Administration*.

10.5 Users guide

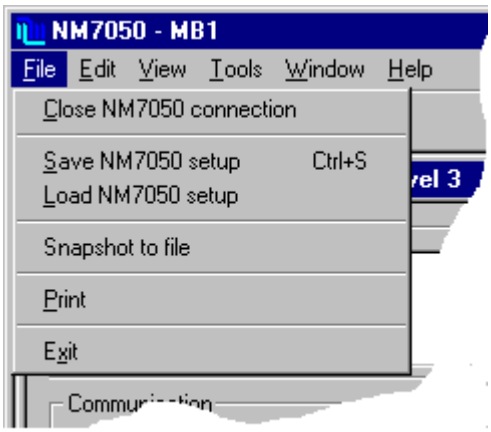
In this chapter we will go through the windows, menus, tools and buttons in greater detail.

10.5.1 The menus

There are six menus:
- **File** - Log on, exit, print, etc.
- **Edit** - Edit user privileges
- **View** - Opening windows, toolbar and status bar
- **Tools** - Options, logging and secondary parameters
- **Window** - Arranging the opened windows
- **Help** - Opening help, program information

Entry	Function	Shortcut
Close MB connection	Close this MB session	Alt-F-C
Save NM7050 setup	Save NM7050 limits/ delays to file	Alt-F-S
Load NM7050 setup	Set NM7050 limits/ delays from file	Alt-F-L
Snapshot to file	Snapshot of mon/ maint data to textfile	
Print	Print a report	Alt-F-P
Exit	Exit the program	Alt-F-X

Table 10-3 The FILE menu



H1010/3

Entry	Function	Shortcut
Users	Create, delete or change users. Change menu password.	Alt-E-U

Table 10-4 The EDIT menu

H1011/2

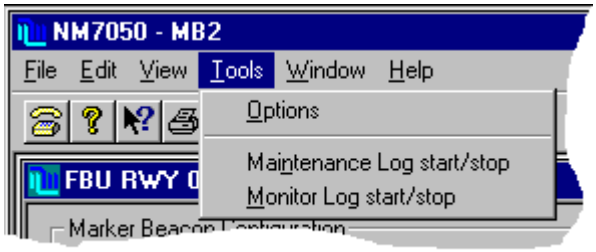
Entry	Function	Shortcut
Toolbar	Show or hide toolbar	Alt-V-T
Status Bar	Show or hide status bar	Alt-V-S
Event List	Open event list	Alt-V-E
Front Panel	Open front panel	Alt-V-F
Maintenance	Open maintenance window	Alt-V-N
Monitor	Open monitor window	Alt-V-M
TX settings	Open TX settings window	Alt-V-X
Delays	Open delays window	Alt-V-D
User List	Open the list of users	Alt-V-U

Table 10-5 The VIEW menu

H1012/2

Entry	Function	Shortcut
Options	Secondary settings	Alt-T-O
Maintenance Log start/ stop	Start or stop logging of maintenance parameters to file.	Alt-T-N
Monitor Log start/stop	Start or stop logging of monitor parameters to file.	Alt-T-M

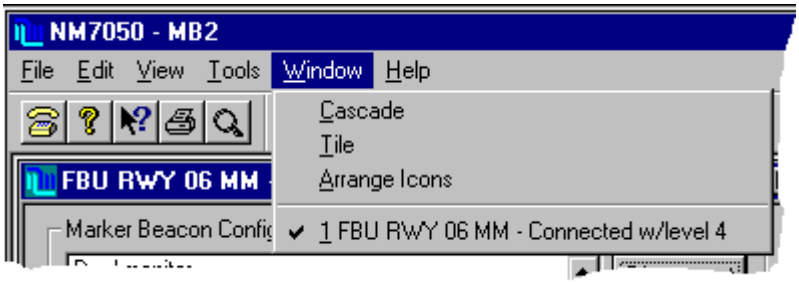
Table 10-6 The TOOLS menu



H1013/2

Entry	Function	Shortcut
Cascade	Put opened windows on top of each other	Alt-W-C
Tile	Arrange opened windows all visible	Alt-W-T
Arrange Icons	Arrange iconized windows in the lower part of the program window	Alt-W-A
Window list	Quick selection of opened windows	Alt-W-<number>

Table 10-7 The WINDOW menu



H1014/2

Entry	Function	Shortcut
Help Topics	Open help window	Alt-H-H
About	Information about program	Alt-H-A

Table 10-8 The HELP menu

10.5.2 The toolbar

Figure 10-9 The toolbar

The toolbar is a selection of shortcuts to menu commands. To activate the command simply click the button.

Entry	Menu command	Function
	File | Connect to MB station	Connect to a NM7050 MB station
	Help | About NM 7050	Shows the software versions in use etc.
	Help on command	Click the command you want help on.
	File - Print	Print standard maintenance report.
	View | Front panel	Open the front panel view
	View | Monitor	Open the monitor data view
	View | Maintenance	Open the maintenance data view
	View | Events	Open the events view

	View | Delays	Open the delays view
	View | TX settings	Open the TX setting view
	View | Users	Open the user list view
	Tools | Options	Open the options dialogue
	File | Snapshot to file	Saves current monitor and maintenance data in tex-tfile

Table 10-9 The toolbar entries

10.5.3 Logging in and out and access levels

In order to keep your landing system safe and reliable, the opening of the RMM communication is secured with a USERNAME and one to three PASSWORDS. The number of passwords corresponds to the ACCESS LEVEL, which again give different permissions to the system as The access levels shows.

The system administrator will supply you with a user name and passwords according to your access level.

Access level	Permissions
1	• Readout of all the monitor values, warning and alarm limits. • Readout of all the maintenance values and warning limits. • Readout of all the delays. • Readout of all the TX1 and TX2 configurations. • Readout of users (only id's and last logout time)
2	• Level 1 + • Turning on and off transmitters (same as using the front panel buttons) • TX1 and TX2 : Using pre-programmed test settings.
3	• Level 2 + • Settings of all the monitor warning and alarm limits. • Settings of all the maintenance warning limits. • Settings of all the delays. • Settings of all the TX1 and TX2 configurations. • Modulation tone settings to *NORMAL*, *CONTINUOUS* or *OFF* on TX1/TX2. • Start initialisation of modem.
Master	• Level 3 + • User administration • Communications set-up • Setting system date and time

Table 10-10 The access levels

After you have selected the MB station the **Log On** dialogue appears. Enter your USERNAME, use the tabulator on the keyboard or the mouse pointer to move to the PASSWORD field and

enter your password(s). To finish the operation, click the *OK* button or press *ENTER* on the keyboard.

- A user name may be written in either upper or lower case letters
- A password is not case sensitive.
- Multiple passwords are separated with a single space.

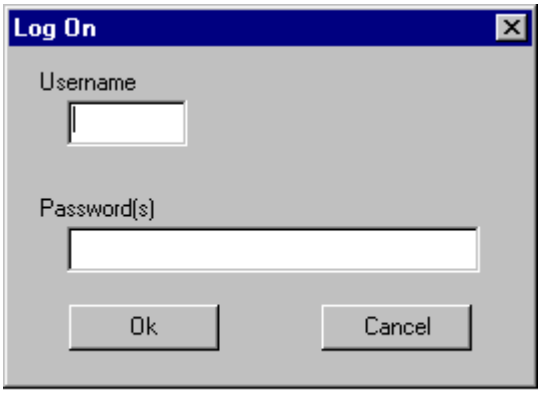


Figure 10-10 The Log On dialogue

You may restrict your system from remote access level 2 or 3 connections on the remote RS232 comm. port. The access level 2 or 3 user then have to connect directly to the Local port at the Marker Beacon site. To achieve this, the hardware straps 6 (access level 2 inhibit) or 7 (access level 3 inhibit) on the configuration platform must be removed inside the Marker Beacon cabinet.

The **Link status** window shows the configuration of the NM7050, that is:

- Inner, middle, outer marker or fan marker (set on each of the transmitters)
- One or two power supplies (set on configuration platform inside the cabinet)
- One or two monitors (set on configuration platform inside the cabinet)
- Shutdown at standby failure (set on configuration platform inside the cabinet)
- Shutdown at remote control failure (set on configuration platform inside the cabinet)
- In addition the communication status is shown.

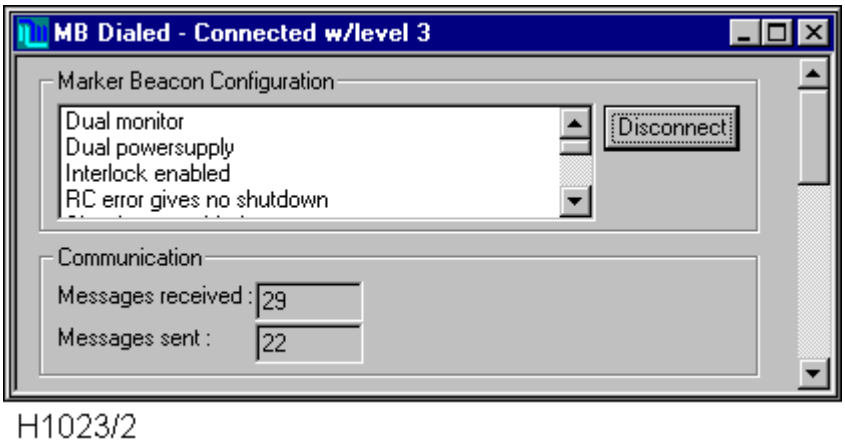


Figure 10-11 The Link Status window

Logging off is done by clicking the DISCONNECT button or by simply closing the **Link Status** window.

10.5.4 Station list

The **Station List** is a list of the currently available Marker Beacon stations. You may connect to, add, edit or remove entries on the list. This is also the place to set up the modem connections.

You may have different types of connections to the same station, i.e. one direct line, one leased line and one dialled line connection. This can be particularly useful on portable PC's that are used both on site, in the control room and more distant places.

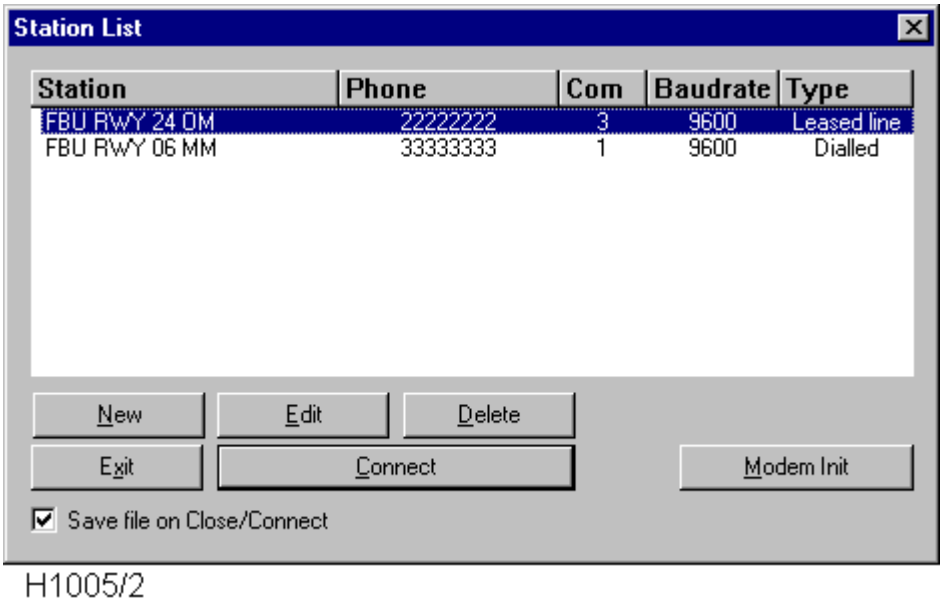


Figure 10-12 The Station List view

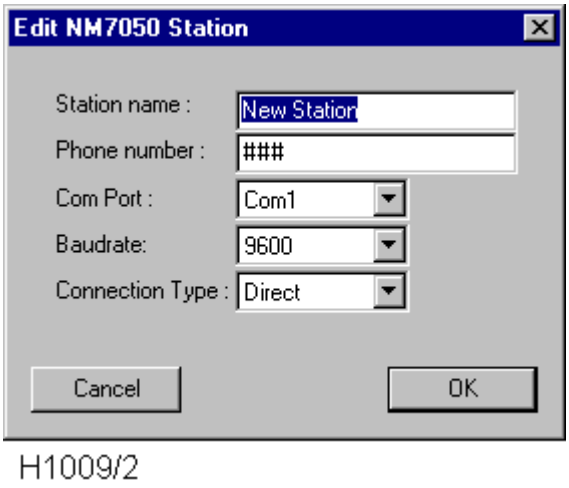


Figure 10-13 The Edit Station view

The STATION NAME may be chosen freely. The maximum number of characters is unlimited for all practical purposes. Be aware that this name will also be the name of the home directory for this station, where for example the log files will be put as default. We recommend meaningful names like *MIDDLE MARKER 01*, *OUTER MARKER 19 LEFT* to tell the marker type and runway end. You may also include the site name if you handle NM7050s on more than one airport.

The PHONE NUMBER is only necessary when using modems on the public telephone net (CONNECTION TYPE = *DIALLED*). Simply enter the telephone number in the same way that you would dial on your phone.

If your modem connection have to go through a local telephone switchboard, you have to enter the code to get the public dial tone, to commas to make a pause and finally the phone number. Ex.: 0,,11223344

10.5.5 Modem set-up

To change set up for connected modems, select the MODEM INIT button in the **Station List View**. You will now enter the modem set-up dialogue.

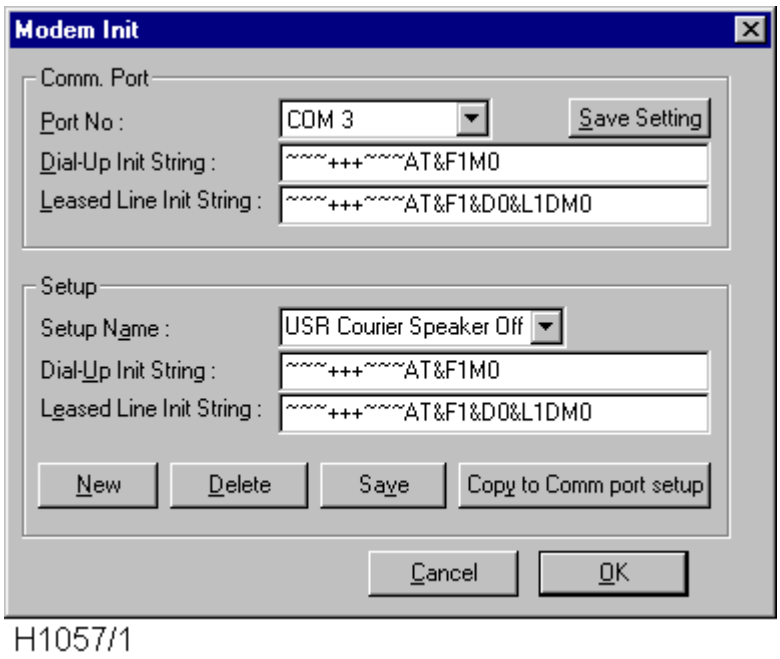


Figure 10-14 The Modem Init window

The **Comm. Port** part of the dialogue shows the set-ups for the modems connected. Note that these set-ups are based on what kind of modems that are connected to each of the COM ports connected to the PC. There are set-ups for both normal DIAL-UP INIT STRING and LEASED LINE INIT STRING. Theses strings are sent to the modems at the start of a station connection, but only if DIAL-UP or LEASED LINE is selected in the **Station List View**. When changing the settings, remember to select the SAVE SETTING button before exiting the dialogue (pressing the OK button). These settings are saved for the next time you start up the program.

The Set-up part of the dialogue is just a collection of fixed set-ups that can be selected (by using the SETUP NAME combo box), and then copied to the set-up for the selected COM port (by selecting the COPY TO COMM PORT SETUP button). The set-ups can be edited and saved much in the same way as the stations in the **Station List View**.

10.5.6 Setting up connections

The **Com Port** is a physical plug on your PC that transfers serial data communication. They are normally tagged *COM1*, *COM2*,.... on the rear of your PC. A standard PC configuration has two COM-ports where the mouse might occupy one of them. Use a free COM port to connect your modem or NM7050 directly and select the same port from the list. If you have a modem installed the list will say for instance *MODEM ON COM2.*

There are three CONNECTION TYPES:
- Direct Line
- Leased Line
- Dialled Line

DIRECT LINE is typically a serial link cable with a nine pins D-SUB contact in each end. You may use either the **Local** or the **Remote port** on NM7050 and one of the **COM ports** on your PC. The direct line is limited to approximately 15 m cable length.

LEASED LINE is a dedicated telephone line where you are the only user. There will be no need of a telephone number, but you need a leased-line type modem in each end to be able to drive the line. There is no length restrictions on a leased line if the telephone line standards are followed.

DIALLED LINE is a normal public telephone line where the signal passes a number of telephone switches on its travel. You need a dial up modem to dial the number and drive the telephone line. As with normal telephones, you may phone all over the world.

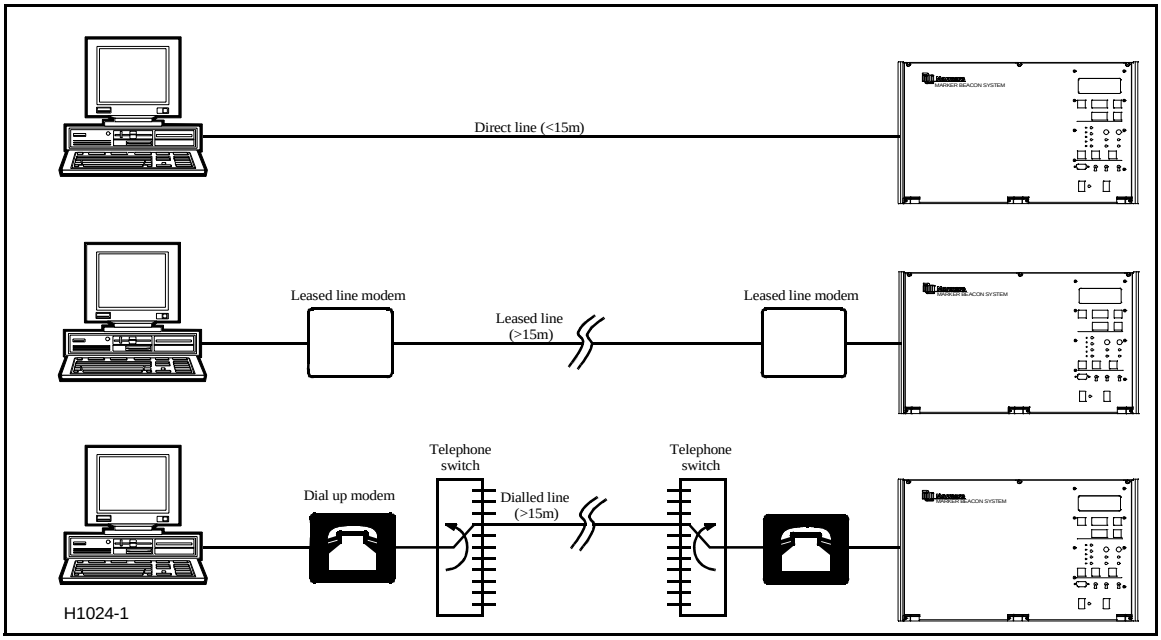


Figure 10-15 The connection types

If you use Leased Line the two modems have to be identical, or else they might not communicate well.

A leased line modem may be a standard commercial modem used in leased line mode.

10.5.6.1 Setting up a Dial-up connection with an US Robotics Courier V34 modem

This section describes how to set up communication for dialled operation using the US Robotics Courier V34 modem on the REMOTE port on the NM7050. See also the description of connection types .

10.5.6.1.1 What to do on the NM 7050 side:

1. Connect a PC directly to the Local RS232 port on the front of the NM7050 and log on as MASTER with three passwords.
2. After connection has been established, go to the Tool|Options menu and select the NM7050 Communications tab.
3. Connect the modem to the remote RS232 connector inside the NM7050 cabinet and make sure that the modem power is turned off.
4. Set the DIP switches at the bottom of the modem in the following positions :
   ON OFF ON OFF OFF OFF OFF ON OFF ON
5. Turn the power on and wait a few seconds before turning the power off again.
6. Turn DIP switch 10 to OFF and turn on the modem power again.
7. Uncheck the Use modem default init checkbox.
8. Write ~~~+++~~~ in the User modem init string field.
9. Select the Apply button that popped up above the User modem init string field.
10. Select the Init modem button.
11. After approximately 10 seconds after the Init modem button was pressed the Last modem result field shall read an OK message.
12. Write AT&F1&L0S0=1&W in the User modem init string field and repeat 8-11.
13. The modem shall now turn on the AA led (if not already on). The AA led indicates that this modem is ready to answer calls from other modems.
14. Log off the local RS232 port.

10.5.6.1.2What to do on the RMM side:

1. Connect the RMM PC to the other modem (the modem that shall be used to call up the modem connected to NM7050).
2. Turn the power on the modem off.
3. Set the DIP switches at the bottom of the modem in the following positions :
   OFF OFF ON OFF ON OFF OFF ON OFF ON
4. Turn the power on and wait a few seconds before turning the power off again.
5. Turn DIP switch 10 to OFF and turn on the modem power again.
6. Enter the station list dialog (menu File | Connect to MB station).
7. Edit or create a new station to match the comm. port the modem is connected to, and with the same baudrate as set for the remote port on the NM7050 (usually 9600).
8. Set the Connection Type to Dialed.
9. Select the modem init button for entering the Modem Init dialog .
10. Fill the Dial-Up Init String field with the string ~~~+++~~~AT&F1&L0&W .
11. If you have changed the setting, select the Save Setting button to actually store the new dialed setup for the comm. port.

12.Select OK to get back to the station list.
13.If necessary modify the telephone number to the number that the NM7050 modem is connected to.
14.Select the dialed station in the list and select the Connect button.
15.The modem shall now take off the hook (OH Led illuminated) and start to call the phone number for the modem connected to NM7050.
16.After some time (up to 30-40 seconds), the two modems should connect, if everything is OK. This will be indicated by an illuminated CD Led on both modems.

After this set-up, all you have to do to reconnect another time is to select the correct station in the station list and select the Connect button.

10.5.6.2 Setting up a Dial-Up connection with a Westermo modem

This section describes how to set up communication for dialled operation using the Westermo TD-32AC / TD-32DC modem on the REMOTE port on the NM7050. See also the description of connection types .

10.5.6.2.1What to do on the NM7050 side

1. Connect a PC directly to the Local RS232 port on the front of the NM7050 and log on as MASTER with three passwords.
2. After connection has been established, go to the Tool|Options menu and select the NM7050 Communications tab.
3. Connect the modem to the remote RS232 connector inside the NM7050 cabinet and make sure that the modem power is turned off.
4. Set the DIP switches inside the modem in the following positions :
   SW1 : All OFF
   SW2 : 1 and 4 ON, all other OFF
   SW3 : 1 ON, all other OFF
   SW4 : 2, 3, 5 and 6 ON, all other OFF for baudrate 9600, 3, 5 and 6 ON, all other OFF for badurate 4800, 5 and 6 ON, all other OFF for badurate 2400
   SW5 : 1, 2, 3 and 4 ON, all other OFF
   Note that SW4 must be set equal on both modems!
5. Turn the power on and wait a few seconds.
6. Uncheck the Use modem default init checkbox.
7. Write ATE0&C1&D2&W in the User modem init string field.
8. Select the Apply button that popped up above the User modem init string field.
9. Select the Init modem button.
10. After approximately 10 seconds after the Init modem button was pressed the Last modem result field shall read an OK message.
11. The modem shall now enter the Auto Answer mode, though the ANS led will not immediately be illuminated. The ANS led will blink when a ring signal is detected on the line. After this the ANS led will be on continuously when waiting for incoming calls.
12. Log off the local RS232 port.

10.5.6.2.2What to do on the RMM side:

1. Connect the RMM PC to the other modem (the modem that shall be used to call up the modem connected to NM7050).
2. Turn the power on the modem off.
3. Set the DIP switches inside the modem in the following positions :
   SW1 : 1 ON, all other OFF
   SW2 : 1 ON, all other OFF

SW3 : 1 ON, all other OFF
SW4: 2, 3, 5 and 6 ON, all other OFF for baudrate 9600, 3, 5 and 6 ON, all other OFF for badurate 4800, 5 and 6 ON, all other OFF for badurate 2400
SW5 : 1, 2, 3 and 4 ON, all other OFF
Note that SW4 must be set equal on both modems!

4. Turn the power on and wait a few seconds before turning the power off again.
5. Enter the station list dialog (menu File | Connect to MB station).
6. Edit or create a new station to match the comm. port the modem is connected to, and with the same baudrate as set for the remote port on the NM7050 (usually 9600).
7. Set the Connection Type to Dialed.
8. Select the modem init button for entering the Modem Init dialog .
9. Fill the Dial-Up Init String field with the string ATX3&C1&D2\N5&W .
10. If you have changed the setting, select the Save Setting button to actually store the new dialed setup for the comm. port.
11. Select OK to get back to the station list.
12. If necessary modify the telephone number to the number that the NM7050 modem is connected to.
13. Select the dialed station in the list and select the Connect button.
14. The modem shall now start to call the phone number for the modem connected to NM7050.
15. After some time (up to 30-40 seconds), the two modems should connect, if everything is OK. This will be indicated by illuminated LINE Led on both modems.

After this setup, all you have to do to reconnect another time is to select the correct station in the station list and select the Connect button.

10.5.6.3 Setting up a leased-line connection with a US Robotics Courier V34 modem

This section describes how to set up communication for leased line operation using the US Robotics Courier V34 modem on the Remote port on the NM7050. See also the description of connection types .

10.5.6.3.1What to do on the NM 7050 side:

1. Connect a PC directly to the Local RS232 port on the front of the NM7050 and log on as MASTER with three passwords.
2. After connection has been established, go to the Tool|Options menu and select the NM7050 Communications tab.
3. Connect the modem to the remote RS232 connector inside the NM7050 cabinet and make sure that the modem power is turned off.
4. Set the DIP switches at the bottom of the modem in the following positions :
   ON OFF ON OFF OFF OFF OFF ON OFF ON
5. Turn the power on and wait a few seconds before turning the power off again.
6. Turn DIP switch 10 to OFF and turn on the modem power again.
7. Uncheck the Use modem default init checkbox.
8. Write ~~~+++~~~ in the User modem init string field.
9. Select the Apply button that popped up above the User modem init string field.
10. Select the Init modem button.
11. After approximately 10 seconds after the Init modem button was pressed the Last modem result field shall read an OK message.
12. Write AT&F1&L1S0=1&W in the User modem init string field and repeat 8-11.
13. Turn the power on the modem off, wait a few seconds, and turn it on again.

14.The modem shall now turn on the AA led (if not already on) and the OH led. The OH led may be turned off for short periods of time when not connected, but it shall be turned on again within approximately 30 seconds.
15.Log off the local RS232 port.

10.5.6.3.2What to do on the RMM side:

1. Connect the RMM PC to the other modem (the modem who's line is connected to the modem you just initialized on the NM7050 side).
2. Turn the power on the modem off.
3. Set the DIP switches at the bottom of the modem in the following positions :
   OFF OFF ON OFF ON OFF OFF ON OFF ON
4. Turn the power on and wait a few seconds before turning the power off again.
5. Turn DIP switch 10 to OFF and turn on the modem power again.
6. Enter the station list dialog (menu File | Connect to MB station).
7. Edit or create a new station to match the comm. port the modem is connected to, and with the same baudrate as set for the remote port on the NM7050 (usually 9600).
8. Set the Connection Type to Leased Line.
9. Select the modem init button for entering the Modem Init dialog .
10.Fill the Leased Line Init String field with the string ~~~+++~~~AT&F1&L1D&W.
11.If you have changed the setting, select the Save Setting button to actually store the new leased line setup for the comm. port.
12.Select OK to get back to the station list.
13.Select the leased line station in the list and select the Connect button.
14.The modem shall now take off the hook (OH Led illuminated) and the two modems shall now start to try to connect to each other.
15.After some time (up to 30-40 seconds), the two modem should connect. This will be indicated by and illuminated CD Led on both modems.

10.5.6.3.3Troubleshooting the leased line connetion

1. If the OH lamp on one or both of the two modems don't illuminate at all within a time period of longer than 30 seconds, try to turn the modem power off and on again for that modem.
2. Check that the line cord between the two modems are not broken or short-circuited.
3. Check that the AA lamp on the modem connected to the NM7050 is illuminated.

10.5.6.4 Setting up a leased-line connection with a Westermo modem

This section describes how to set up communication for leased line operation using the Westermo TD-32AC / TD-32DC modem on the Remote port on the NM7050. See also the description of connection types .

10.5.6.4.1What to do on the NM7050 side:

1. Connect a PC directly to the Local RS232 port on the front of the NM7050 and log on as MASTER with three passwords.
2. After connection has been established, go to the Tool|Options menu and select the NM7050 Communications tab.
3. Connect the modem to the remote RS232 connector inside the NM7050 cabinet and make sure that the modem power is turned off.
4. Set the DIP switches inside the modem in the following positions :
   SW1: 2 and 4 ON, all other OFF
   SW2: 1 and 4 ON, all other OFF
   SW3: 1 ON, all other OFF

SW4: 2, 3, 5 and 6 ON, all other OFF for baudrate 9600, 3, 5 and 6 ON, all other OFF for badurate 4800, 5 and 6 ON, all other OFF for badurate 2400
SW5: 4 ON, all other OFF
Note that SW4 must be set equal on both modems!

5. Turn the power on and wait a few seconds.
6. Check the Use modem default init checkbox.
7. Select the Init modem button. Ignore the Last modem result message.
8. Log off the local RS232 port.

10.5.6.4.2What to do on the RMM side:

1. Connect the RMM PC to the other modem (the modem who's line is connected to the modem you just initialized on the NM7050 side).
2. Turn the power on the modem off.
3. Set the DIP switches inside the modem in the following positions :
   SW1 : 1 ON, all other OFF
   SW2 : 1 ON, all other OFF
   SW3 : 1 ON, all other OFF
   SW4 : 2, 3, 5 and 6 ON, all other OFF for baudrate 9600, 3, 5 and 6 ON, all other OFF for badurate 4800, 5 and 6 ON, all other OFF for badurate 2400
   SW5 : 1, 2, 3 and 4 ON, all other OFF
   Note that SW4 must be set equal on both modems!
4. Turn the power on and wait a few seconds.
5. Enter the station list dialog (menu File | Connect to MB station).
6. Edit or create a new station to match the comm. port the modem is connected to, and with the same baudrate as set for the remote port on the NM7050 (usually 9600).
7. Set the Connection Type to Leased Line.
8. Select the modem init button for entering the Modem Init dialog .
9. Fill the Leased Line Init String field with the string AT\N5&D0&C1&L1&WD . If you experience trouble with connecting using this init string, there might have been a restart of the NM7050 since last connection. In this case you might have to use the following init string: ATH0\N5&D0&C1&L1&WD .
10. If you have changed the setting, select the Save Setting button to actually store the new leased line setup for the comm. port.
11. Select OK to get back to the station list.
12. Select the leased line station in the list and select the Connect button.
13. The modem shall now start connect with the other modems shall now start to try to connect to each other.
14. After some time (up to 30-40 seconds), the two modem should connect. This will be indicated by illuminated LINE Leds on both modems.

10.5.7 Front panel

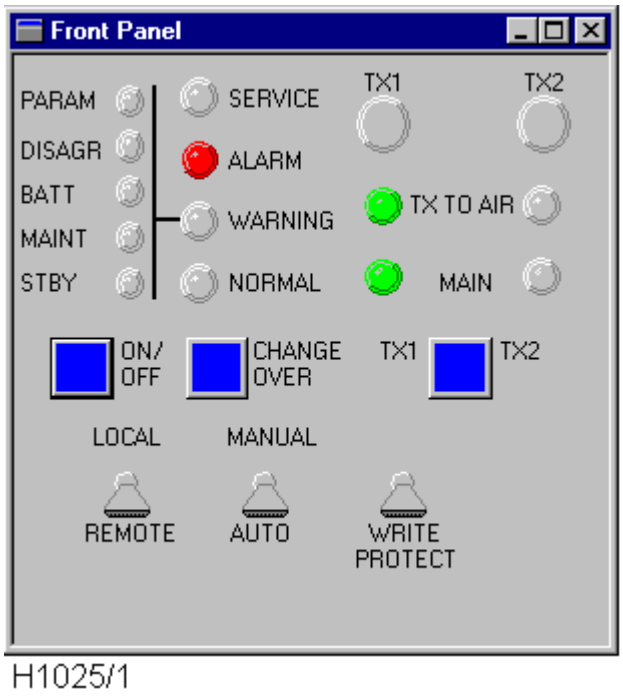


Figure 10-16 The front panel

The **Front Panel** has the mostly the same functionality as the physical front panel. For details on the front panel functionality, see chapter 8.

Front panel switch operation is restricted to certain access levels as shown in Tabelle 10-12. The LOCAL/REMOTE and WRITE PROTECT switches are only status indicators, while the MANUAL/AUTO switch is controllable too.

Button	Function	Valid in access level
TX1	Turn on transmitter 1 in manual mode	2/3
TX2	Turn on transmitter 2 in manual mode	2/3
MAIN SELECT (TX1 - TX2)	Select main transmitter (the other one is standby)	2/3
ON/OFF	Toggle main transmitter on/off	2/3
CHANGE OVER	Change active transmitter (reflected in TX TO AIR)	2/3
LOCAL/REMOTE	Show local or remote mode	Not controllable in RMM
MANUAL/AUTO	Set manual or automatic mode	2/3
WRITE PROTECT	Show if permanent changes of settings are enabled	Not controllable in RMM

Table 10-11 Front panel buttons

Since the MANUAL/AUTO switch on the RMM front panel is controllable it will NOT necessarily reflect the position of the physical MANUAL/AUTO switch.

10.5.8 Monitor windows

The Monitor view shows the primary parameters, RF LEVEL, MODULATION DEPTH and KEYING, that is the parameters that may cause alarm and make the system change transmitter or shut down. An alarm or a warning will be generated if the parameters value falls outside the ALARM LIMITS or WARNING LIMITS respectively.

Attribute	Function	Possible values
Name	The name of the attribute	Letters, numbers and spaces
Status	Alarm/Warning status	Blank = OK w/W = raw/delayed warning a/A = raw/delayed alarm
Value	Calculated value (ax+b)	A floating point number
Unit	The unit of Value	%, V
ALL	Alarm Lower Limit	A floating point number
AUL	Alarm Upper Limit	A floating point number
WLL	Warning Lower Limit	A floating point number
WUL	Warning Upper Limit	A floating point number

Table 10-12 Monitor parameter attributes

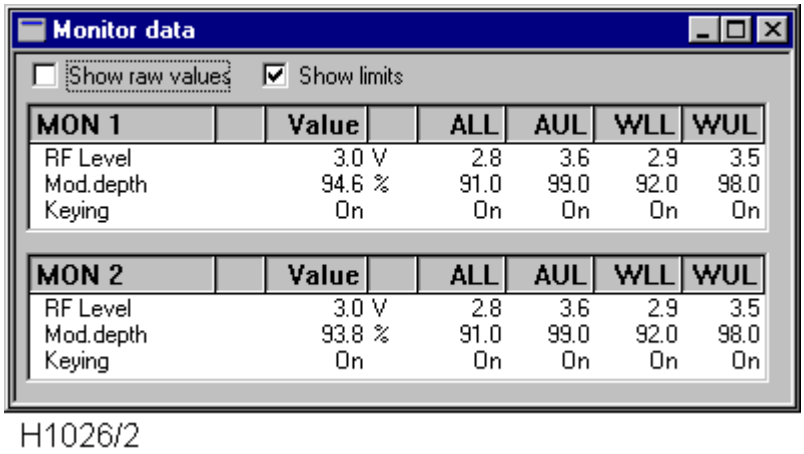


Figure 10-17 The Monitor view

You may edit the alarm and warning limits in access level three by selecting a parameter, and click on the EDIT button that has popped up in the top right corner of the window. A double-click on the parameter will do the same. You will now enter a edit dialogue for changing alarm/warning limits.

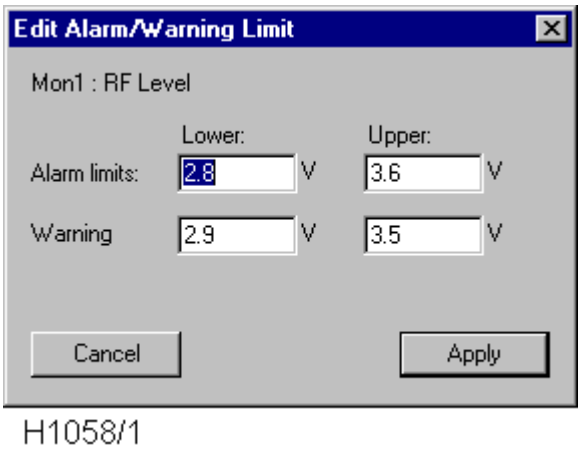


Figure 10-18 The Monitor Edit window

Just type in the new values and press the APPLY button. The new limit values will now be transferred to the marker beacon station.

See also the section for saving and loading limits and delays to/from file.

10.5.9 Maintenance

The maintenance parameters, which show the internal health of the NM7050, are organised in a tree structure in three levels:

Station
- Module 1.
  - Parameter1
  - Parameter2
- Module 2.
  - Parameter 1
  - Parameter2

The tree may be expanded by clicking the ⊞ button and collapsed with the ⊟ button. Each parameter has several ATTRIBUTES, which are shown in a table structure in the **Maintenance** view. The attributes are:

Attribute	Function	Possible values
Name	The name of the attribute	Letters, numbers and spaces
Status	Warning status	Blank = OK w/W = raw/delayed warning
Value	Calculated value (ax+b)	A floating point number
Unit	The unit of Value	%, V, W, A
WLL/WUL	Warning Lower/Upper Limit	Floating point numbers
Scale	Scaling factor (a in ax+b)	A floating point number
Offset	Constant offset (b in ax+b)	A floating point number
GW	Generate Warning	Yes, No (checked, unchecked)

Table 10-13 Maintenance parameter attributes

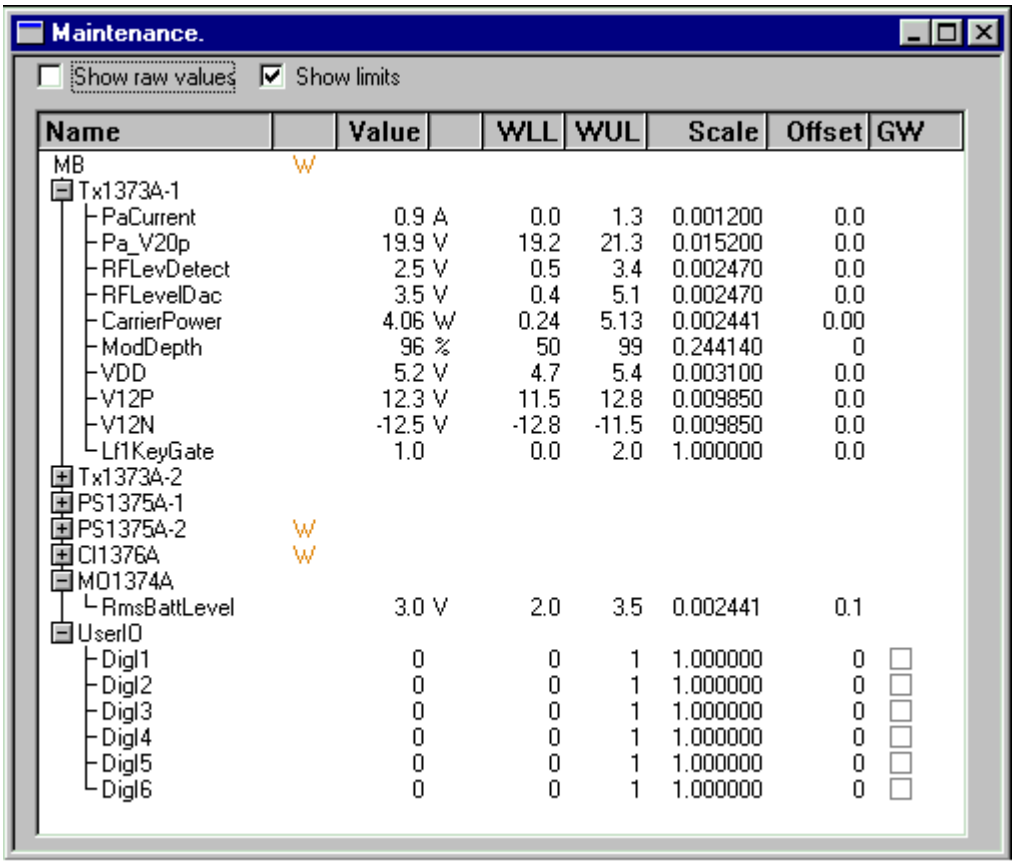


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Figure 10-19 The Maintenance view

You may edit the and warning limits in access level three by selecting a parameter, and click on the EDIT button that will pop up in the top right corner of the window. A double-click on the parameter will do the same. You will now enter a edit dialogue for changing warning limits, which for the normal maintenance parameters may look like this:

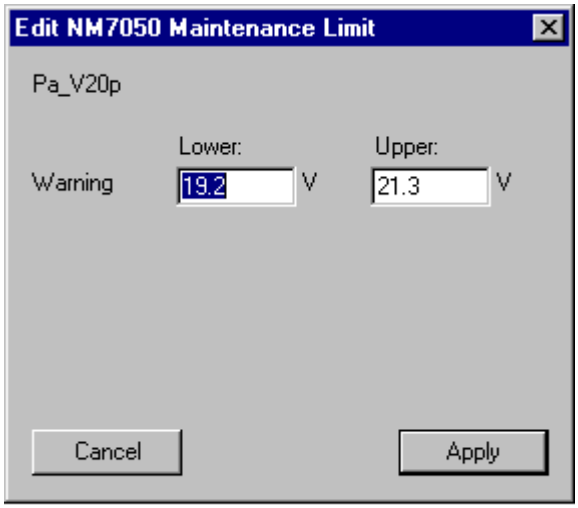

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Figure 10-20 The Monitor Edit window

Or like this for user maintenance parameters:

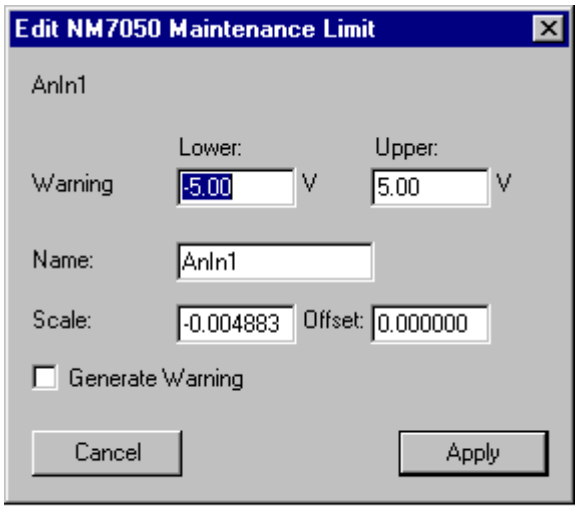

Figure 10-21 The Monitor Edit window

The NAME field is a user selectable name consisting of up to 10 characters. The SCALE field is the factor the analogue input (range +/-10V) converted to a digital value (+2047 to -2048) will be multiplied against. To convert to plain voltage level, the factor 10/-2048 = -0.004883 will do. The GENERATE WARNING checkbox determines if the parameter shall generated maintenance warning if the value exceeds the lower/upper warning limits.

When you have finished typing in the new values, press the APPLY button. The new limit values will now be transferred to the marker beacon station for update.

See also the section for saving and loading limits and delays to/from file.

10.5.9.1 Description of maintenance parameters

The maintenance parameters are located on various boards. The boards and the parameters belonging to the specific board are listed here:

TX1373A-1

PaCurrent	This is the current that is drawn from V20P in the RF Power Amplifier.
Pa_V20p	This is the measured voltage for the +20V input.
RFLevDetect	This is the analog RF-level value from the on-board detector on the transmitter.
RFLevelDac	This is the DC-voltage controlling the carrier power.
CarrierPower	This is the calculated carrier power output based on RFLevDetect.
ModDepth	This is the calculated modulation depth from the on-board detector.
VDD	This is the measured value for the +5V input power.
V12P	This is the measured value for the +12V input power.
V12N	This is the measured value for the -12V input power.
Lf1KeyGate	This is the signal controlling the keying (modulation on/off) for the transmitter. The signal will be toggling between '0' and '1' when keying is ON, '0' when keying if OFF and '1' when keying is CONT (continuous).

TX1373A-2

Same parameters as for TX1373A-1

PS1375A-1

V28P This is the +28V power generated by the mains input. This will be low when the NM7050 is running on battery power.

V20P This is the +20V power from this power supply.

VDD This is the +5V power from this power supply.

V12P This is the +12V power from this power supply.

V12N This is the -12V power from this power supply.

I28Vcurrent This is the current measurement for the current that is generated by the mains power.

IBattCurrent This is the current that is going in/out of the power supply. Normally this value will be positive when the mains power is charging the battery, and neg ative when the system is operating on battery. However, when there are two power supplies in the NM7050, the power supply with the highest +28V output will actually charge the power converters on the other power supply. This will be indicated by a negative value for this parameters on the other power sup ply. To calculate the actual current that is charging the battery, the IBattCur rent parameters for both power must be added together. For example if the IBattCurrent for the two power supplies shows 1.4A and -0.5A, the actual charge current to the battery is 0.9A.

PS1375A-2

Same parameters as for PS1375A-1

CI1376A

V28P The system +28V power, measured on the power line connected with the bat tery.

V20P The system +20V power.

V12P The system +12V power.

VDD The system +5V power.

V12N The system -12V power.

TInDoor The temperature measured on the TEMP INDOOR connector inside the NM7050 cabinet. At shipping the scale/offset is set for a 10mV/C^{o} tempera ture sensor, but the user may scale and offset this if wanted.

TOutDoor This is the temperature measured on the TEMP OUTDOOR connector inside the NM7050 cabinet. At shipping the scale/offset is set for a 10mV/C^{o} tem perature sensor, but the user may scale and offset this if wanted.

Vac This is an input from a transformer that can be mounted in the NM7050 cab inet for measuring the AC voltage. At shipping there is no transformer mounted. When a transformer is implemented, the scale and offset must be adjusted to suit the characteristics of the transformer. Keep in mind the this input shall be a DC-voltage.

AnIn1 The analog user input from the analog channel marked ANA CH1 on the CI1376A. The range is +/- 10V.

AnIn2 The analog user input from the analog channel marked ANA CH2 on the

	CI1376A. The range is +/- 10V.
AnIn3	The analog user input from the analog channel marked ANA CH3 on the CI1376A. The range is +/- 10V.

MO1374A

RmsBattLevel	The measured voltage of the backup battery on MO1374A.

UserIO

DigI0	The digital input from DIG PORT A pin 3 on CI1376A.
DigI1	The digital input from DIG PORT A pin 1 on CI1376A.
DigI2	The digital input from DIG PORT B pin 3 on CI1376A.
DigI3	The digital input from DIG PORT B pin 1 on CI1376A.
DigI4	The digital input from DIG PORT C pin 3 on CI1376A.
DigI5	The digital input from DIG PORT C pin 1 on CI1376A.

10.5.10 TX settings

This view is used to tune the transmitters RF OUTPUT LEVEL, MODULATION DEPTH and KEYING. There are also two test set-ups which are pre-set values used to provoke alarms in maintenance situations.

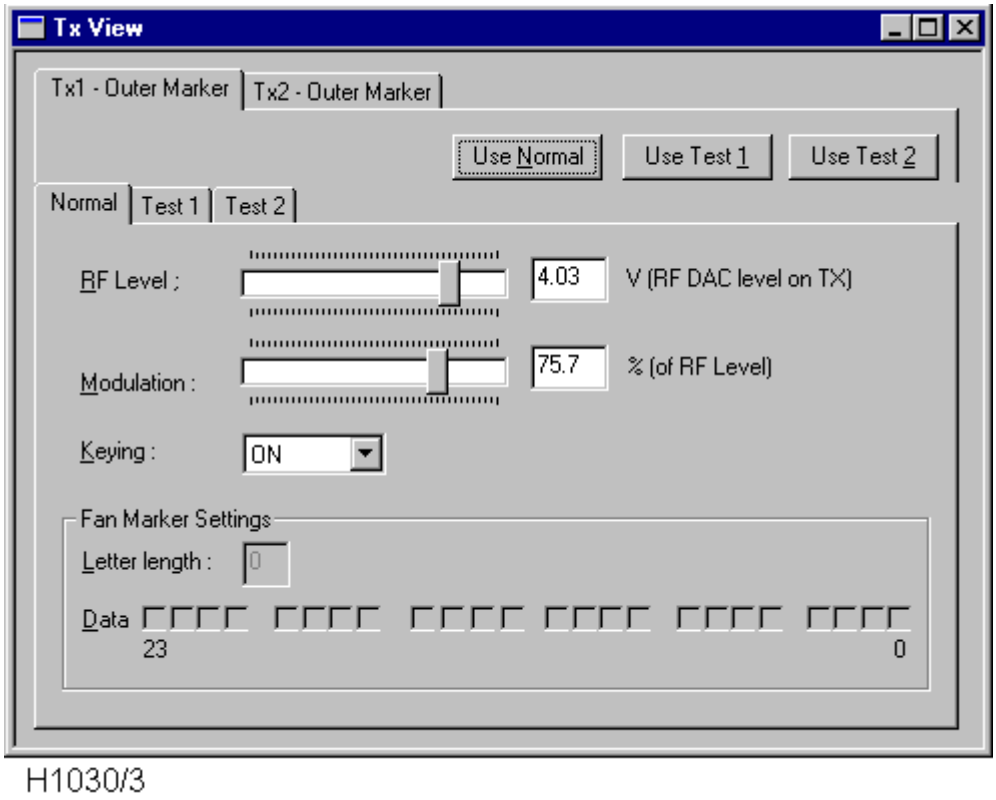

Figure 10-22 The TX settings view

ALTERING VIEWS

- You may select between TX1 and TX2 by clicking the TX1 or TX2 tabs.
- You may select transmitter set-up by clicking the NORMAL, TEST1 or TEST2 tabs.

Figure 10-23 Selecting test settings

You may choose between three pre-set transmitter settings by clicking the USE NORMAL, USE TEST 1 or USE TEST 2 buttons.

Note that when leaving access level 2/3, the Normal set-up will be loaded into the transmitters. This is also the case when turning the transmitter from off to on.

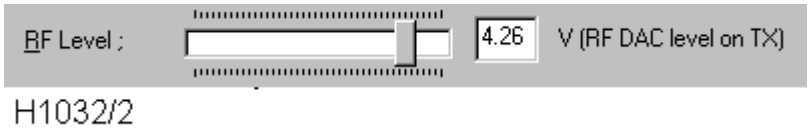

Figure 10-24 Adjusting the RF level

The RF LEVEL (output power) is adjusted by dragging the RF LEVEL knob. The value in volts in the window to the right shows the control voltage to the power amplifier. If you want a power indication in Watts, open the maintenance window and watch the CarrierPower parameter for the selected TX1373.

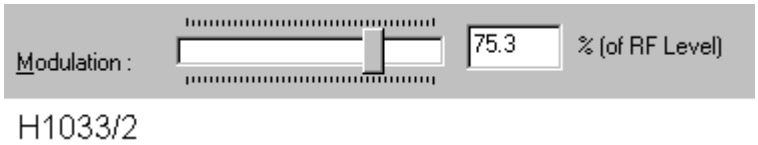

Figure 10-25 Adjusting the modulation depth

Similar to above, the MODULATION DEPTH is adjusted by dragging the MODULATION knob. The value is given in percent. This percentage is not the same as the modulation depth in the monitor, but the percent of the RF Level DAC that is used to feed the modulation circuitry in the transmitter.

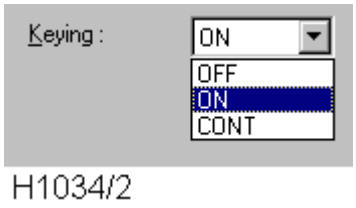

Figure 10-26 Setting keying type

There are three possible keying alternatives: *NORMAL*, *CONTINUOS* and *OFF*, the two latter used for test or maintenance purposes.

FAN MARKER

If the station is configured as a *FAN MARKER*, the keying may be set quite freely. Each of the 24 Data boxes corresponds to one tick which endures for approximately 150ms. An X indicates sound while an empty box indicates silence. LETTER LENGTH is how many ticks are used in a sequence. The table below shows the expected lengths for keying elements:

Keying element	#ticks
Dot	1
Dash	3
Space	1
Letter space	2

Table 10-14 Fan Marker keying elements

Let's say you want to transmit an *X*. Then you should program *DASH-SPACE-DOT-SPACE-DOT-SPACE-DASH-LETTER SPACE*. This gives a LETTER LENGTH of 3+1+1+1+1+1+3+2=*13* as shown in Abbildung 10-27

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Figure 10-27 Fan marker keying programming.

Note that the Fan Marker settings are available only when the transmitter are configured as Fan Marker.

10.5.11 Event list

The Event List shows the last 50 events for a specific Marker Beacon station. An event is for example *CHANGE OVER, SHUTDOWN, MAINTENANCE* or *WARNING*. These events are stored in the stations internal memory in order to diagnose errors.

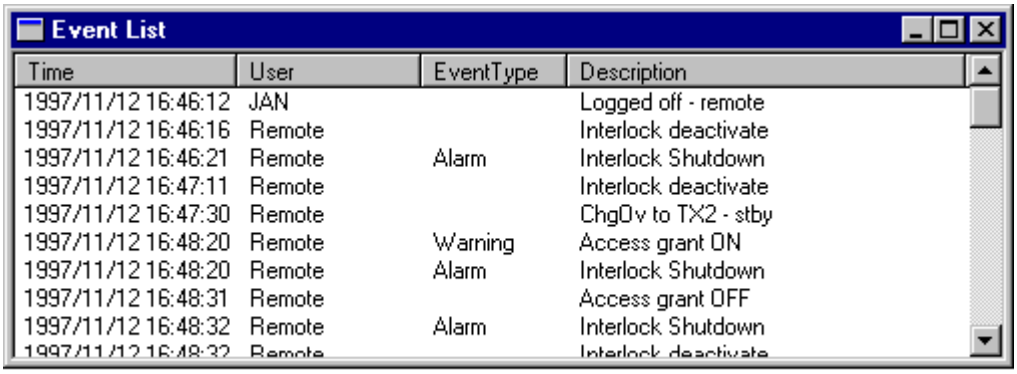

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Figure 10-28 The Event List

When you have the **Event List** window up, new events will appear in the window as soon as they are detected on the NM7050 and sent over to the PC program.

10.5.12 Delays

There are four individual alarm/warning delays in the NM7050:
- Monitor 1 alarm/warning delay
- Monitor 2 alarm/warning delay
- Maintenance parameter delay
- User input/output parameter delay

You specify the delay in *seconds* and activate the new settings with APPLY, which pops up whenever a delay is changed.

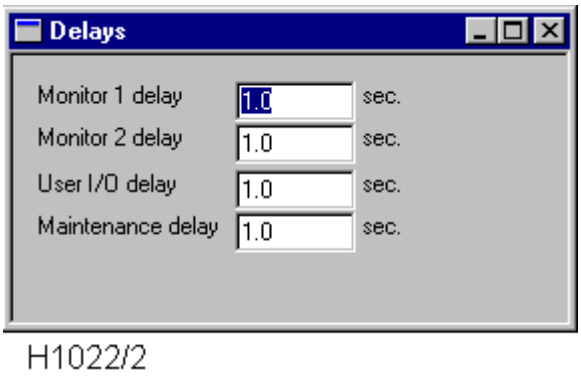

Figure 10-29 The Delay view

A delay in this context is the time an alarm or warning must be present before the Transmitter Control performs a Changeover or Shutdown.

USER IOS are the analogue and digital input and output ports located on the connection interface board (CI 1376) inside NM7050.

10.5.13 Printing Reports

Printing the reports is done simply by clicking the printer button. You will then enter the dia-

logue for report selection.

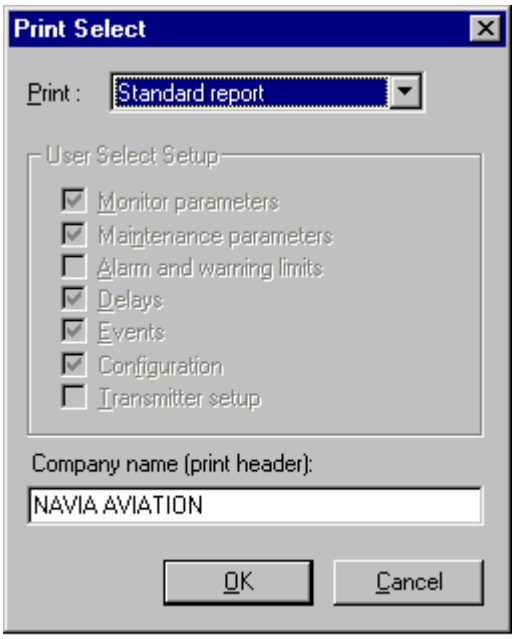

Figure 10-30 The Print Select dialogue

Here you can select a the report type you want. Either a standard report, a full report or a report containing the elements you specify. You may also choose the name that will be printed on the top of the report in the *COMPANY NAME* field.

Press OK when you are finished, and the standard windows print dialogue appears. When you have done you choices, select the OK button for generating a report on the printer that is specified in the NAME field.

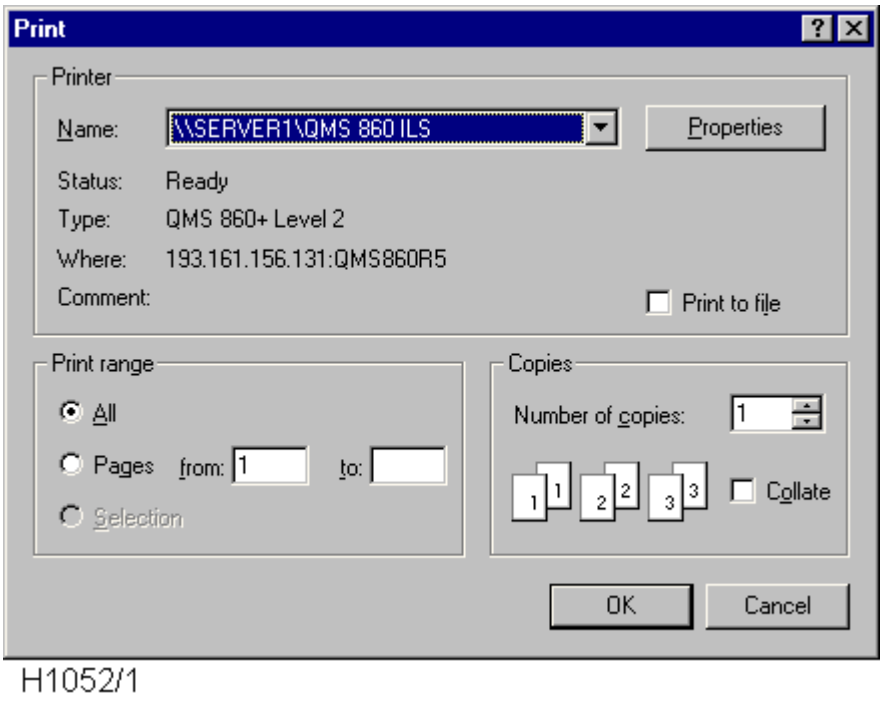

Figure 10-31 The Standard Print dialogue

10.5.14 Loading and saving alarm/warning limits and delays

To ease setting of alarm limits, warning limits and delay settings, the user is provided with the **Save NM7050 Setup** and **Load NM7050 Setup** commands in the **File** menu.

To save the settings on a NM7050 to a file, choose **File|Save NM7050 Setup**. The following dialog appears.

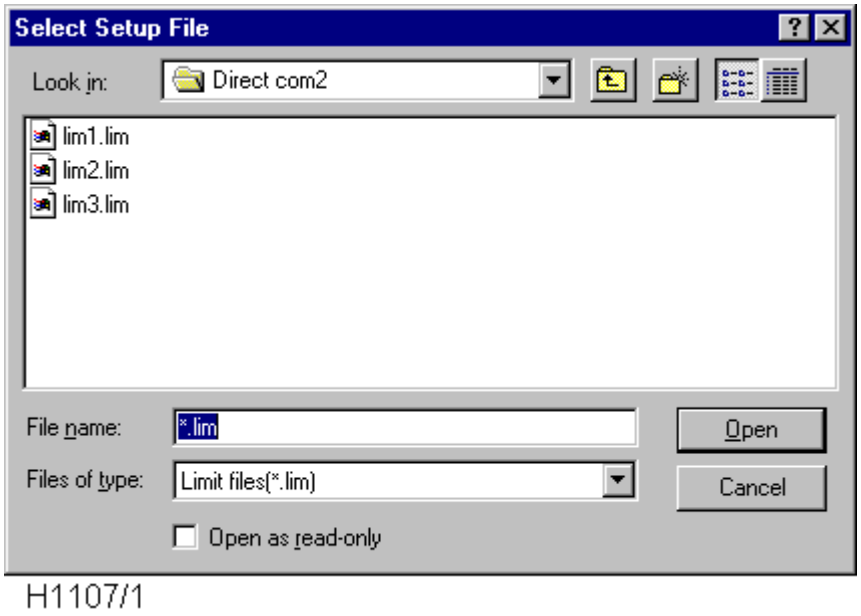

Figure 10-32 The Select Setup File Dialog

Type in a new filename if you want to create a new one, or select a file to replace it. Press **Open** to proceed or Cancel to escape.

If Open was selected, the setup for the currently opened station will now be saved as a text file (<name>.lim), and the following information should appear, with the filename you have selected

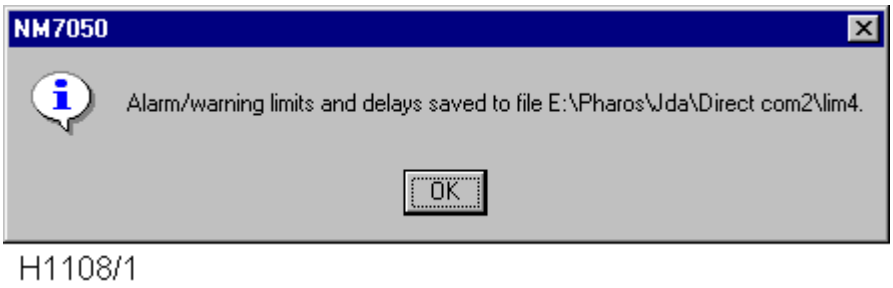

Figure 10-33 The Setup Save OK messagebox

To load settings from a file and apply them to the currently opened NM7050, choose menu item **File|Load NM7050 Setup**. The same dialog as for the Save NM7050 Setup should now appear. Select the file that contains the setup you want, and press the **Open** button. The following view should now appear:

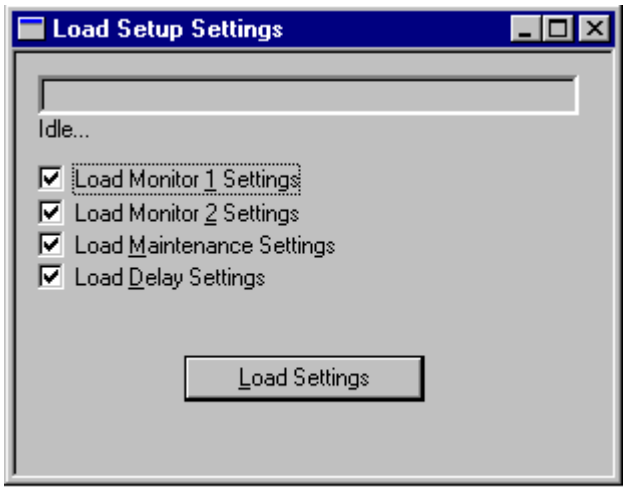

Figure 10-34 The Setup Select View

Select which parts of the setup you actually want to load. By default everything is selected. When selection is satisfactory, press the **Load Settings** button. The progress bar in the top of the view will now increase until all parameters/delays are properly set. This may take some time, especially for the maintenance settings, so be patient.

You must have access level 3 or higher to be able to load settings from file.

10.5.15 Tool options

From Tool Options the secondary parameters and facilities are configured. The options are organised in different pages that are accessed through selecting the different tabs in the dialogue. Note that the settings you specify are directly executed when selecting an APPLY button in one of the option pages. The CANCEL button will not redo these changes.

10.5.15.1The Data Logging Page

From the **Data Logging** page you may specify regular logging of data to hard disk files. Logging of *Maintenance* and *Monitor* data is done to separate files.

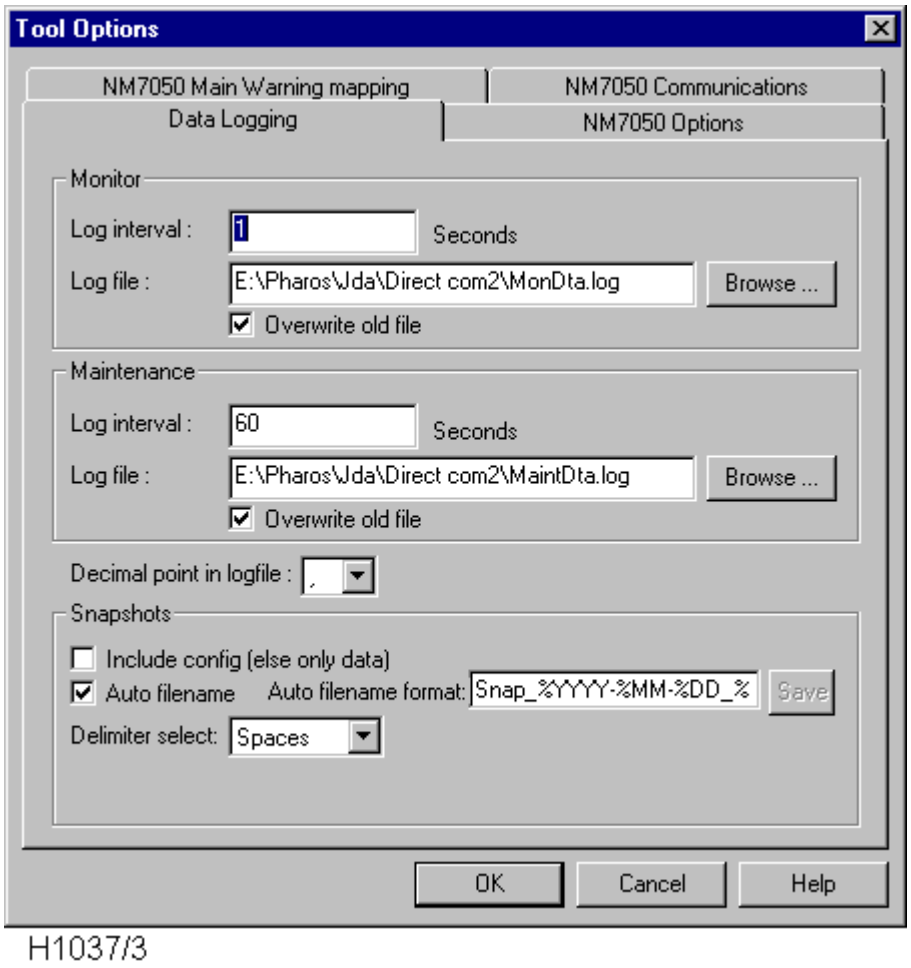

Figure 10-35 The Tool Options Data Logging page.

- The time between two samples, the LOG INTERVAL, must be given in seconds.
- The LOG FILE name may be written directly, The standard directory is a directory with the same name as the station you logged on to (the directory is created automatically when you log on if it don't exist), or you may BROWSE for the file/directory you want your log file in.
- If you activate OVERWRITE, you will erase the data in an existing file. When OVERWRITE is deactivated (blank field) you *append* the data to an existing file.
- The Decimal point in log file field is used to select between a dot or a comma as the decimal point in the log values (this is done for exporting compatibility to other programs).

Tip: Name your files with date info, i.e. *log199707* for July 1997 for easy locating of files later on.

The files are stored in a format which makes it easy to import in for example Excel. Just drag and drop a log file over the Excel icon on your desktop.

You may also alter the snapshot function. A snapshot in this context is a text file containing a snapshot of the current monitor and maintenance data. The snapshot is taken whenever of the menu selection File|Snapshot or Snapshot toolbar button is selected. Both of the Monitor and Maintenance views must be activated before a snapshot may be taken (to ensure fresh monitor and maintenance data).

If the Include config (else only data) checkbox is checked, the snapshot will also include con-

figuration (alarm and warning limits).

If the Auto filename is checked, the text in the Auto filename format field will be used to generate the filename where the snapshot is placed. If not checked, the user may select a file by a standard file browser. The filename format may contain directly text or codes that will insert the current date/time value according to the following rules:

- %YY[YY] The current year is inserted
- %M[M] The current month (1-12)
- %D[D] The current day (1-31, depending on month and year)
- %H[H] The current hour (0-23)
- %m[m] The current minute (0-59)
- %S[S] The current second (0-59)
- %T The current tenth of a second (0-9)

For example the string

SNAP_%YYYY-%MM-%DD_%HH.%mm.%SS.txt

will give a filename such as

SNAP_1998-10-30_14.39.16.txt

You may also select how to separate the elements of the snapshot by selecting in the droplist Delimiter select. This may be useful if special formatting is wanted for exporting to certain programs. You may select between

- Spaces Text is formatted for best reading using a standard text editor.
- Tabs Tab character is inserted between data elements.
- :(Colon) The colon character is inserted between data elements.
- ;(Semicolon) The semicolon character is inserted between data elements.

10.5.15.2The NM7050 Options page

From this page you can change the real time clock in the NM7050. In addition you may configure your NM7050 to not set the station in SERVICE condition if the Write Protect switch is turned off. From this dialogue you can also override the interlock if the Local/Remote and Auto/Manual switches are in Local/Manual. This option is only valid when the interlock is active (meaning that the NM7050 is forced off by the interlock switch in the tower). You may also specify the periodic interval for logging of history storage (not implemented in the first version of the program).

- If you press PC CLOCK, DATE and TIME field are filled with the date and time on your PC. The value is loaded into NM7050 when you press the APPLY button. The APPLY button will only be shown when there are changes in the DATE and TIME fields.

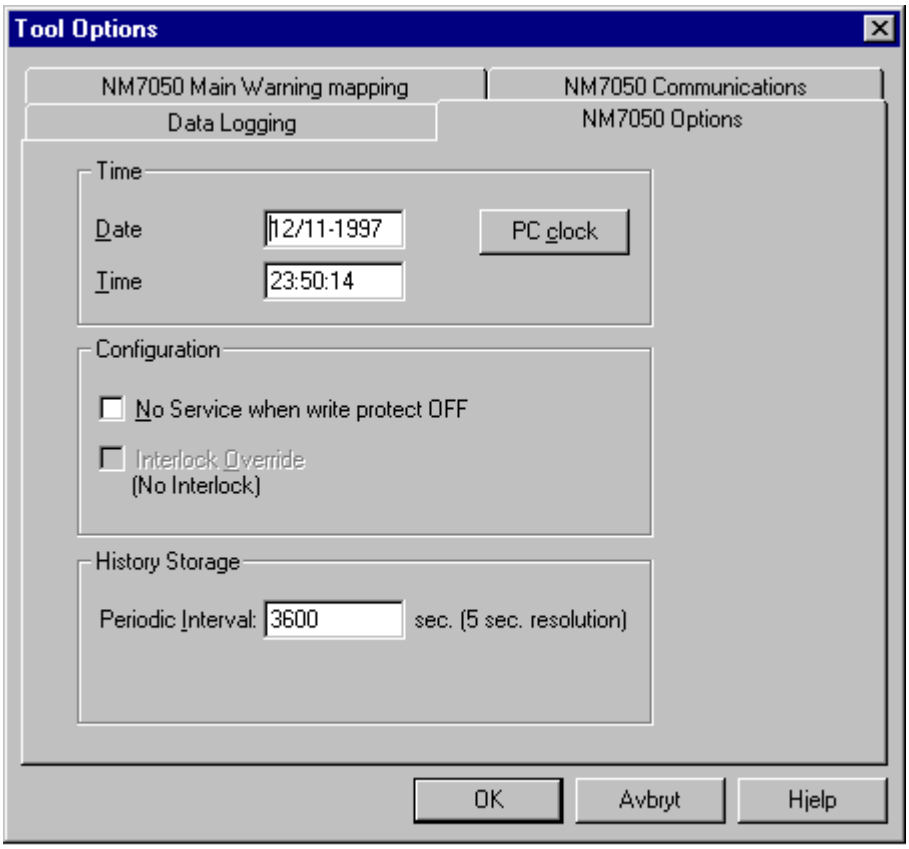

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Figure 10-36 The Tool Options NM7050 Options page.

10.5.15.3The NM7050 Main Warning mapping page

The sub-warning to main warning mapping can be programmed individually for the local front panel and the remote control panel. This means that the user can select which sub-warnings that will generate a system warning for the station both locally and remotely. Checking all selections (factory default) will make any sub-warning generate a system warning on the NM7050.

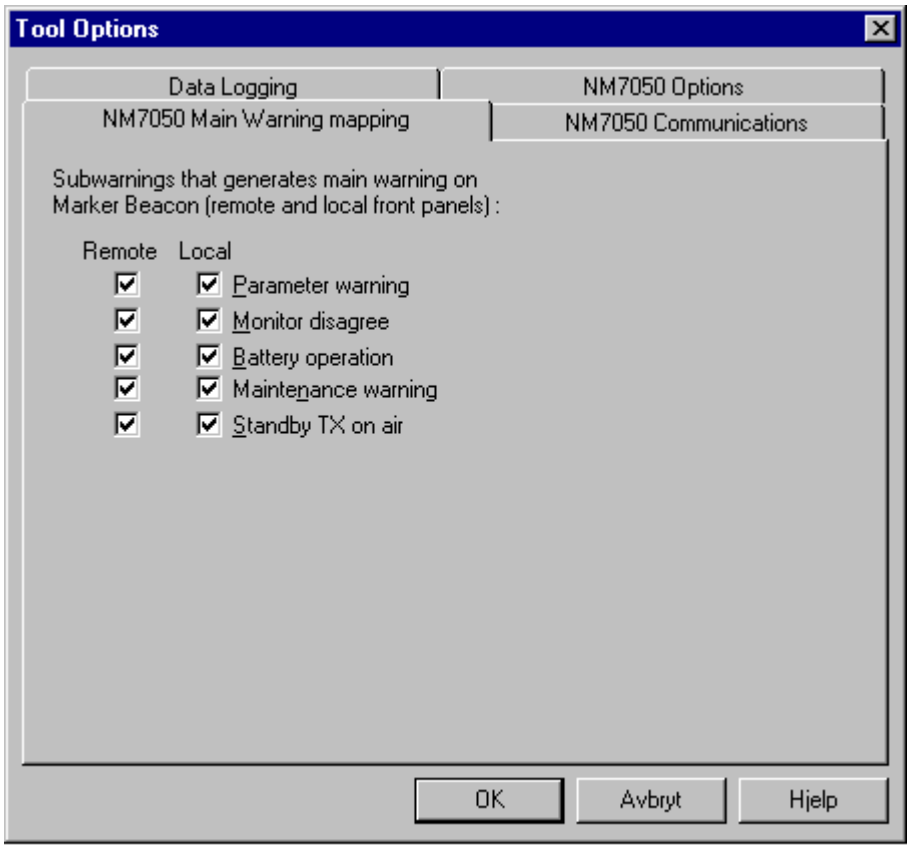

Figure 10-37 The Tool Options NM7050 Main Warning mapping page.

These settings are available only with access level 3 or higher.

10.5.15.4The NM7050 Communications page

This page is used for setting up communication for the remote RS232 connection. Typically the user has logged on directly using the local RS232 port for setting up a modem connected to the remote RS232 port. From this options page you can set up both local and remote communication settings.

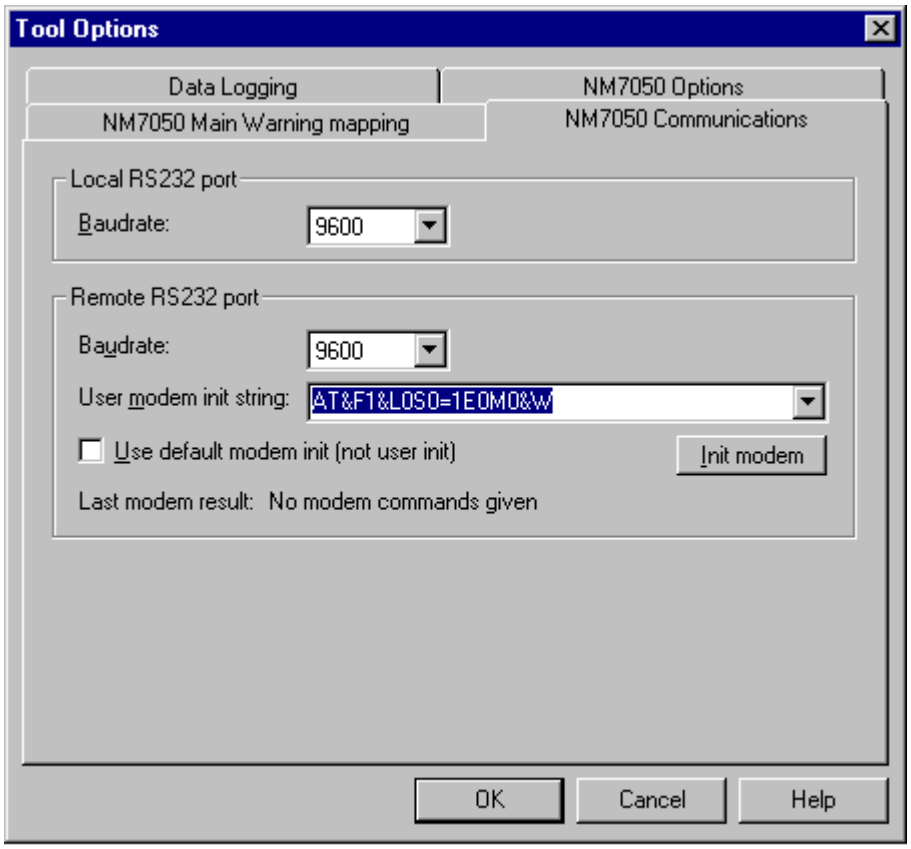

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Figure 10-38 The Tool Options NM7050 Communications page.

10.5.15.4.1Local RS232 port settings

Here you can specify the baudrate you want to use when communicating with the NM7050 through the local RS232 port.

10.5.15.4.2Remote RS232 port settings

Here you can specify the baudrate and modem initialisation for the remote RS232 port. The BAUDRATE field let you select the baudrate the NM7050 will use when communicating using the remote RS232 port. The USER MODEM INIT string lets you specify the init string that will be sent to the modem at restart of the NM7050 program. If you want to use this string at start-up, you must uncheck the USE DEFAULT MODEM INIT checkbox. Unless this is done, the default modem init string within the NM7050 is used.

10.5.16 Administration

The System Administrator , who has access to the Master-account has several rights that other users do not have. These are:

- Create new users
- Delete users
- Changing the users access rights
- Tell a preoccupied engineer his/her forgotten password.

In order for the system administrator to do this, he/she must first log on as master with three

valid passwords on the local RS232 port. The Local/Remote and Manual/Auto switches must be in Local/Manual position, and the Write Protect switch must be up. After having logged on and having connected to the system, the system administrator has access level 3 on the system in addition to the master user privileges (sometimes called access level 4). You may now select the Edit | Users menu.

Figure 10-39 The Edit | User menu choice.

The Edit Users window will now appear, and you may do you changes.

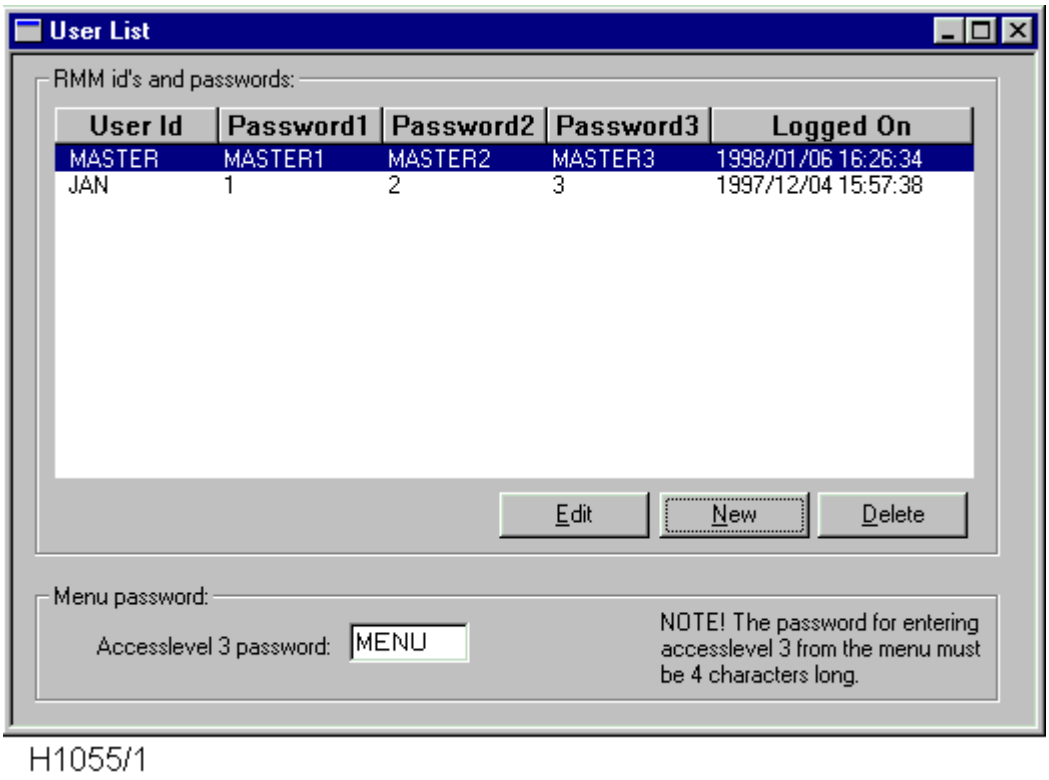

Figure 10-40 The Edit Users window.

RMM USER ID AND PASSWORD

To delete a user simply click on the user to delete, and then select the Delete button.

To create a new user, just select the New button.

To edit a current user, click on the user and then select the Edit button.

For creating new and edit current users, the following dialogue pops up (the user id and passwords will not necessarily be the same as in the figure below) :

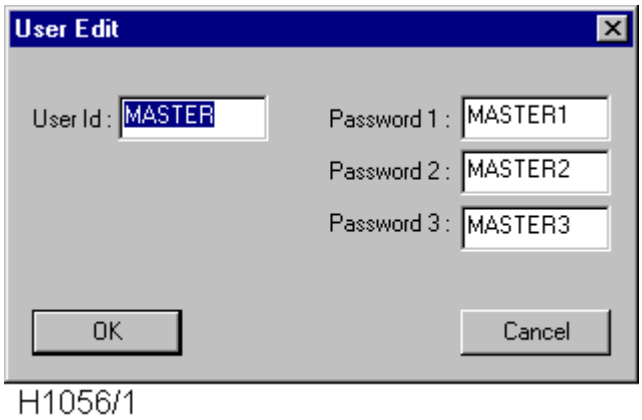

Figure 10-41 The Edit User dialogue.

The following rules applies for the Edit User dialogue:

- The user id and password must at least contain 1 characters, but no more than 8 characters.
- The number of filled in passwords define the maximum access level for that user. For example if passwords 1 and 2 are filled with strings, that user can log in with either access level 2 or access level 3.
- A user must have at least Password 1 defined.
- User Id and passwords can be selected freely.
- All letters are converted to uppercase.
- There is a maximum of 15 users in the system.

When you are satisfied with the id and passwords, select the OK button, and the NM7050 will be instructed to insert a new user/change an existing user. When the NM7050 responds, the User View will be updated with the new values.

MENU USER ACCESS LEVEL 3 PASSWORD

To enter access level 3 through the local keyboard, the user must first enter a correct four letters password (besides setting the LOCAL/REMOTE and WRITE PROTECT switches in LOCAL and OFF positions). The password is set by changing the Access level 3 password field to a new four letters password, and then select the Apply button. The Apply button pops up only when the password has changed, and there are four letters in the Access level 3 password field.

11 Periodic maintenance

The NM7050 Marker Beacon has an extensive **Remote Monitor and Maintenance** (RMM) system. This remote facility, which makes the user able to perform most of the maintenance from the airport, is particurlarly useful for marker beacons since their location is up to 7 km away.

The periodic maintenance is splitted in two parts, monthly remote maintenance and annual on site maintenance..

Even though the on site maintenance is once a year, a more frequent visual inspection is recommended. The Markers are often located in non trafficated areas where unwanted guests or mother nature may work in peace.

11.1 Reference Report

Print out a standard report after commisioning. This will serve as a reference for later inspections. This **Reference Report** should be kept updated if changes are made to alarm or warning limits.

11.2 Monthly inspection

The monthly inspection is most practically performed from the control tower. Dump the current state of the Marker Beacon parameters to either printer or file from the RMM program.

To printer:

Select *FILE-PRINT REPORT* from the menus or click the PRINT button.

To file:

Select *FILE-SAVE REPORT* from the menus or click the SAVE button.

11.2.1 Parameter check

Check that the parameters are well within their alarm and warning limits. Also check that the alarm and warning limits corresponds with the **Reference Report**.

11.2.2 Monitor check

Provoke alarm situations with the test settings and check that the monitor generate the corresponding alarm and performs a transmitter change over. The easiest way is to make sure the preprogrammed test settings sets RF LEVEL, MODULATION DEPTH and KEYING outside the alarm limits.

- Set *ACCESS GRANT* on the **Remote Control**
- Set *REMOTE* mode on the **Front Panel** in the RMM program
- Set *AUTOMATIC* mode on the **Front Panel** in the RMM program
- Log in on *ACCESS LEVEL 2*
- Set an alarm generating test setting on the main transmitter in **TX settings**
- Check that RF LEVEL, MODULATION DEPTH and KEYING are in *ALARM* state
- Check that a *CHANGE OVER* is performed
- Set an alarm generating test setting on the standby transmitter in **TX settings**
- Check that RF LEVEL, MODULATION DEPTH and KEYING are in *ALARM* state
- Check that a *SHUTDOWN* is performed

.

If the configuration of the NM 7050 disables *STANDBY FAILURE SHUTDOWN*, the *SHUTDOWN* will NOT be performed. The configuration is reported in the Link Status window.

11.2.3 Remote Control check

Check the Remote Control connection by performing remote control actions and watch the response on the virtual Front Panel in the RMM program.

- Open the RMM Front Panel
- Perform a change over from the Remote Control
- Check that the action is reflected on the RMM Front Panel
- Disconnect the Remote Control
- Check that an alarm is generated and a shutdown performed

If the configuration of the NM 7050 disables *REMOTE CONTROL FAILURE SHUTDOWN*, the *SHUTDOWN* will NOT be performed. The configuration is reported in the Link Status window.

11.2.4 Main select

In order to keep the reliability of the two transmitters equally high, it is recommended to perform a *MAIN SELECT* every month.

11.3 Annual inspection

- Perform the monthly inspection
- Check that the carrier frequency is *75 MHz +/- 0.005%*
- Check that the modulation frequency is:

Outer Marker	400 Hz	±*10 Hz*
Middle Marker	1300 Hz	±*32 Hz*
Inner Marker	3000 Hz	±*75 Hz*

- With continous keying, check that the harmonic contents of the modulation tone is less than 8% of the tone..

If you want more detailed statistics, you may dump the Periodic Storage to a file. The file may be imported to spreadsheets or other programs that do statistic analysis and/or graphical presentations. The sample period of the Periodic Storage is programmable.

PART IV DESCRIPTION

12 Detailed Description

This chapter describes the modules in detail.

12.1 Main Cabinet

12.1.1 TX 1373A Transmitter

12.1.1.1 General Description

TX 1373A is a module designed to transmit Marker Beacon signals. An on board oscillator working at 75 MHz provides an output of app.0 dBm that is used as input to the Power Amplifier (PA). The level of this input signal is adjusted to an output of app. +20 dBm. The Power Amplifier is capable of delivering up to 4W carrier power at the cabinet output.

Unwanted frequencies are removed by a lowpass filter after the PA. Part of the signal out of the PA is tapped off to be demodulated and used for feedback and self test purposes. Demodulation is done by a mixer with a linear detector.

The audio signals are generated in the LF circuitry mainly by a Field Programmable Gate Array (FPGA). Inner, Middle or Outer Marker is selected by straps.

12.1.1.2 Block diagram

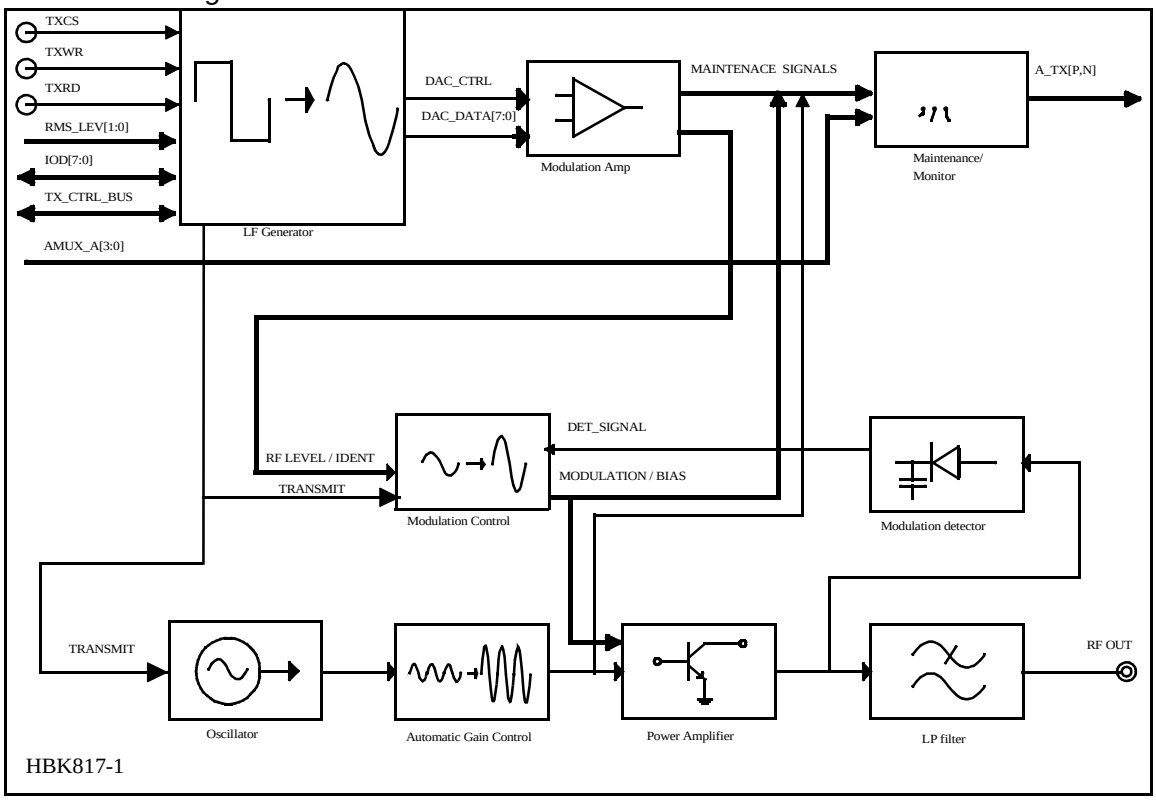

Figure 12-1 TX1373 Block diagram

12.1.1.3 Signals

(See block diagram Figure12-1)

In	From	Description
IOD[7:0]	MO 1374	Parellel data bus for communication between TX 1/2, CI and MO1
~TXCS	MO 1374	Transmitter card select
~TXWR	MO 1374	Write strobe for IO bus
~TXRD	MO 1374	Read strobe for IO bus
TX_ADR	CI 1376	Transmitter select
TX_ON	MO 1374	Transmitter on/off
AMUX_A[3:0]	MO 1374	Used to select measurement
~RMS_LEV[1:0]	MO 1374	Signals access level for RMS

Out	In	Description
RF_OUT	Antenna	Radio signal
~TX_FB	MO 1374	Signal tells monitor that transmitter is active
A_TX[P,N]	RMS	RMS analogue test signals
~TXCSB	MO 1374	Transmitter card select back

Bidirectional	To/From	Description
TX_CTRL_BUS	MO 1374	Changeover Control (TX_ADR), transmitter on/ off (TX_ON), card select back (TXCSB), feed back (TX1/2_FB)

Power in	From	Description
V20P	PS 1375	+20 VDC to PA
V12P	PS 1375	+12 VDC
VDD	PS 1375	+5 VDC
GND	PS 1375	Analogue ground
V12N	PS 1375	-12 VDC

12.1.1.4 Building blocks

(See block diagram Figure12-1)

OSCILLATOR

The oscillator is controlled by the Transmit signal from the LF generator. When Transmit is low, a controllable voltage generator turns the internal oscillator 12V voltage on. +12 VDC is then applied to the collector of a bipolar transistor, which is the active device of the oscillator. A 75 MHz crystal is connected in the feedback path together with a resonance circuit.

The output signal is amplified to approximately 0 dBm through a RF gain block.
Signals in: ON/OFF to switch oscillator on.
Signals out: RF to AGC

AUTOMATIC GAIN CONTROL

The AGC circuitry is designed to adjust the signal level from the oscillator to the PA. The signal from the oscillator is fed to one of the ports of a dual gate MOSFET. The signal enters the

PA after being amplified, while part of it is fed back to the other port of the MOSFET. The transistor detects the difference between these two signals and increases or decreases the signal out to the PA, depending on the signal levels from the oscillator.

Signals in:7 5 MHz RF from oscillator.
Signals out: RF to PA, app. +20 dBm
DRV_AGC: control voltage to monitor.

POWER AMPLIFIER

The Power Amplifier stage is implemented by three cascaded stages, with the two first

being bipolar MRF 553 transistors that are collector modulated. The modulation voltage is 0-12VDC both at stage one and stage two. With an input signal from oscillator / AGC of +20 dBm, the first stage will deliver +30 dBm peak power with a dynamic range of 25 dB. A 10 dB resistive π-attenuator is inserted before stage two. The input to the second stage will then be +20 dBm. After amplification and modulation, the peak power will be +30 dB, but the dynamic range is increased to 50 dB. The last stage is a MRF 171 MOSFET transistor designed to deliver high power output. It is biased by 1mA and +20VDC drain voltage. After amplification, the peak power will be +43 dBm with a dynamic range of 75-80 dB.

The TX is capable of delivering 4W carrier power.

Signals in: 75 MHz RF from oscillator / AGC.
Modulation voltages, up to +12VDC.
Power Supply, +20 VDC.
Bias, 0-5 V, to power stage.
Signals out: RF to detector / LP Filter.

LOW PASS FILTER

The output signal from the PA is filtered to remove harmonic frequencies. The filter is a seven pole passive lowpass filter.

Signals in: 75 MHz RF PA.
Signals out: RF to CI 1376.

MODULATION DETECTOR

Part of the output signal is demodulated for feedback and self test purposes. The signal is tapped out via a hybrid coupler to avoid destructive coupling from the detector to the output signal and make sure the detected signal is good. The detection is achieved by a mixer and linear detector. The output is used both as feedback to the modulation control circuitry, and sent to the monitoring circuit where RF level and keying envelope are detected.

Signals in: RF_In from PA.
Signals out: DET_SIGN to modulation control circuitry.
LO_LEVEL to monitor.

LF-GENERATOR

A Field Programmable Gate Array (FPGA) clocked by a 4.9152 MHz oscillator, EEPROM and other digital circuits generate the LF signals. The generated LF frequency is a square wave that is converted to a sinusoidal signal by filtering off the higher order harmonics. The main

inputs to the FPGA are the strapped signals used to select outer, middle, inner or FAN marker frequency, as well as status signals regarding oscillator, RF- and LF-level output. Communication with the FPGA is done by the IOD[7:0], ~TXRD and ~TXWR signals. Multiplying DAC's are used to adjust RF level and modulation depth. The keyed LF signal and the RF level is applied to the Modulation Control Circuits. The modulation voltages to the PA is generated by the use of these signals as well as the ON/OFF signal from the AGC and the detected signal from the PA.

MAINTENANCE / MONITOR CIRCUITRY

The purpose of the onboard monitor circuitry is to give the Monitor card MO 1374 information about the status of the transmitter. The AMUX_ADR[3:0] from the MO 1374 is applied to the analogue multiplexer. These four lines select one of sixteen possible signals to be measured.

The signals measured are:
- PA 20 VDC supply voltage
- PA current drain @ 20 VDC
- Detected RF level from demodulator
- Keying envelope from demodulator
- Positive/negative modulation peaks
- LF AGC voltage
- Driver AGC voltage
- RF level DC voltage from LF generator
- Supply voltage status

The signal information is sent to the MO 1374 monitor unit as a differential analogue test signal from the MUX.

12.1.2 MO1374 Monitor

12.1.2.1 General description

The MO1374 monitor is a microprocessor based module. It contains the MB software and forms the basis of the monitor, transmitter control, system maintenance handling and RMS user interface.

The MO1374 consists of two submodules:

The CPU section includes; CPU, memory, communication ports and an AD converter system.

The RF frontend receives a recombined 75MHz AM monitor signal with modulation frequency of 400, 1300 or 3000 Hz, from one or two antennas. This signal is conditioned, mixed and demodulated to produce the output parameters; RF level, modulation level and keying envelope. These parameters are monitored by the CPU section.

12.1.2.2 Block diagram

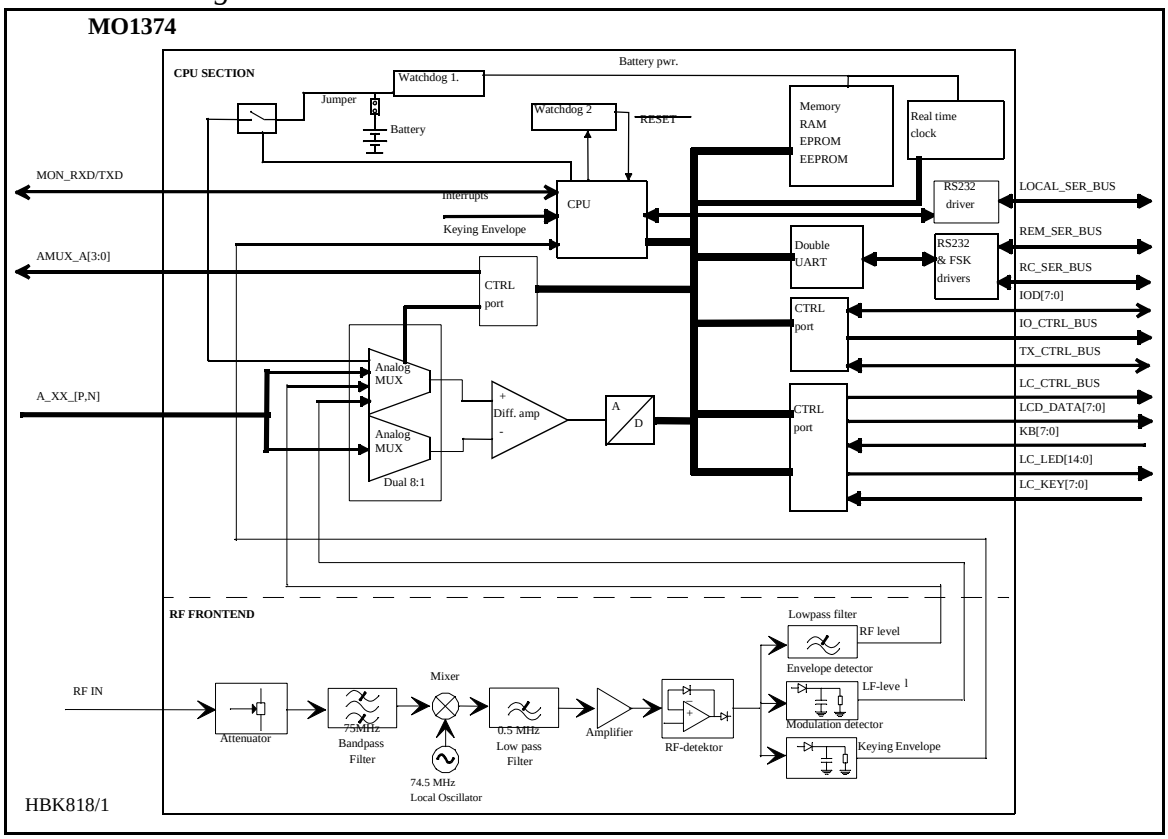

Figure 12-2 MO 1374 block diagram

12.1.2.3 Signals

(See block diagram Figure12-2)

TO BACKPLANE::

In	From	Description
RF_IN	Antenna	RF from antenna
A_TX1/2[P,N]	TX 1373	Analogue input from transmitters
A_PS1/2[P,N]	PS 1375	Analogue input from power supplies
A_CI[P,N]	CI 1376	Analogue input from Connection Interface
TX1/2_FB	TX 1373	Feedback from transmitters

Out	To	Description
~RMS_LEV[1:0]		RMS Access level
AMUX_A[3:0]	TX 1373 PS 1375	Address signals for differential analogue signal bus
IO_CTRL_BUS	TX 1373, CI 1376	Control signals for IOD[7:0]

Bidirectional	To/From	Description
IOD[7:0]	TX 1373, CI 1376	Parallel data bus for communication between TX ½, CI and MO1
RC SER BUS	Remote Control	FSK and RS232 lines to remote control
REM SER BUS	Remote PC	RS232 line to remote PC
MON_RXD/TXD	Other monitor	Serial data channel

TO FRONTPLANE:

In	From	Description
LC_KEY[7:0]	LC 1377	Local control panel pushbuttons/switches
KB[7:0]	LC 1377	Local keyboard inputs

Out	To	Description
LCD_DATA[7:0]	LC 1377	data bus to LCD
LCD_*	LC 1377	Control strobes for LCD_DATA[7:0]
LC_LED[14:0]	LC 1377	Led indicators

Bidirectional	To/From	Description
TX_CTRL_BUS	TX 1373	Changeover Control (TX_ADR), transmitter on/ off (TX_ON), card select back (TXCSB), feed back (TX1/2_FB)

LOCAL SER BUS	Local PC	RS232 line to local PC

12.1.2.4 Building blocks

(See block diagram Figure12-2)

CPU SECTION:

CPU

The CPU is an 80C188EB micro controller. Included in the CPU is an address decoding unit and two UARTs. Both of these UARTs are used for serial communication. The operating frequency of the CPU is 20MHz. This requires a 40MHz oscillator because of the internal divide by two circuit.

WATCHDOG AND BATTERY

The watchdogs resets the CPU:

- at power up
- if the CPU does not toggle the watchdog reset bit at less than approx. 1.6 sec. intervals

When the +5V supply voltage goes below the battery voltage, battery voltage is passed through to the RAM and real time clock. The battery voltage is measured through an optocoupler switch in order to keep the battery life time high. The battery lifetime is approximately one month with continuous use (system power turned off).

INTERRUPTS

4 of the CPU's 5 interrupt lines are utilised for serial communication and AD conversion.

DOUBLE UART

Serial data channel for communication between Monitor 1 and Monitor 2.

RS232 DRIVERS

The RS232 drivers are single supply RS232 drivers. They interface the UARTs to external PCs and modems.

REAL TIME CLOCK

The real time clock keeps track of the date and time. Date and time is used to timetag monitor and maintenance data sets. The RTC shall be accurate within 0.5 seconds per 24 hours.

IO BUS

The IO bus is a parallel data bus connecting TX1, TX2 and CI to Monitor 1.

ANALOGUE INTERFACE

Analogue monitor and maintenance parameters are passed to the monitor module via the analog bus. The analogue bus consists of differential signal lines from the modules TX1, TX2, PS1, PS2 and CI, and Monitor 1. The TX, PS and CI cards share a common address bus. The differential signals from the different modules are multiplexed into the monitor module AD system.

MEMORY

The memory block contains RAM for data storage, EPROM for the program and EEPROM for permanent system setup parameters.

RF FRONTEND:

ATTENUATOR

This section consists of three resistive π-attenuators, 6dB, 12dB and 16 dB respectively, all matched to 50 ohms. Attenuators are selected by strap settings. Nominal input level shall be adjusted to app. -21 dBm. The section also contains vernier potensiometers within the 6dB steps. The adjustement range for the potmeters is $\pm$4dB.

BANDPASS FILTER

The section is equipped with a passive bandpass filter to remove input signals outside the MB channel.

Passband:	72-78 MHz
Maximum passband attenuation:	0.2 dB.

MIXER

The 75 MHz RF-signal is mixed down to 500 kHz to simplify the LF-detection. This is done by the use of a Mini Circuits RMS-2 mixer and a 74.5 MHz local oscillator.

The mixer is specified at max. +1 dBm RF in, and the conversion loss is approximately 7 dB.

Nominal signal levels:

RF in:-	21 dBm 75 MHz AM
LO in:	+7 dBm 74.5 MHz sine.
IF out:	-28 dBm 500 kHz AM.

LOWPASS FILTER

A passive lowpass filter is then used to remove unwanted mixer products, mainly 149.5 MHz.

Stopband:	Above 5 MHz
Minimum stopband attenuation:	30 dB.

AMPLIFIER STAGE

The 500 kHz IF signal out of the Mixer section is amplified approximately 20 dB to interface the LF-detector.

Nominal signal levels:

RF in:	- 28 dBm 500 kHz AM.
RF out:	- 8 dBm 500 kHz AM.

RF DETECTOR

The LF Detector is realised by the use of a precision peak rectifier consisting of two operational amplifiers connected in cascade.

Nominal signal levels:

RF in:	- 8 dBm 500 kHz AM.

The detected LF signal is then amplified before being split to the three output generating circuits.

RF LEVEL DETECTOR

The RF level is detected by lowpass filtering the LF signal to remove the ident tone. The lowpass filter is designed as a two pole active filter using one operational amplifier.

Minimum attenuation in the stopband (400 Hz - 3 kHz):40 dB.

MODULATION LEVEL DETECTOR

The modulation level is detected by a peak detector consisting of an operational amplifier feeding a diode and a RC-network. The RF level DC is removed before detection. The time constant of the RC-network is chosen to ensure minimum ripple at the lowest keying frequency. The voltage ripple should be maximum 1% relative to nominal output level.

KEYING ENVELOPE DETECTOR

The keying envelope is detected by the use of an operational amplifier feeding a diode and a RC network. The RF level DC is removed before detection. The time constant of the RC network is chosen to ensure a significant difference between the dash/dot output level and the pause level. The output voltage from the peak detector will resemble a pulse train. This pulse train is then applied to a comparator circuit that converts the output signal to an ideal TTL level pulse train.

12.1.3 PS1375 Power Supply Module Description

12.1.3.1 General description

PS1375 is a 100W power module with 120V or 230V AC input voltage and +28V/3.5A, +20V/2.5A, ±12V/1.25A and 5V/6A DC output voltages. The 28V output is temperature compensated to ensure optimum battery charging. All outputs are short circuit protected. PS1375 may operate in parallel with an equal module to increase reliability and power capacity.

12.1.3.2 Block diagram

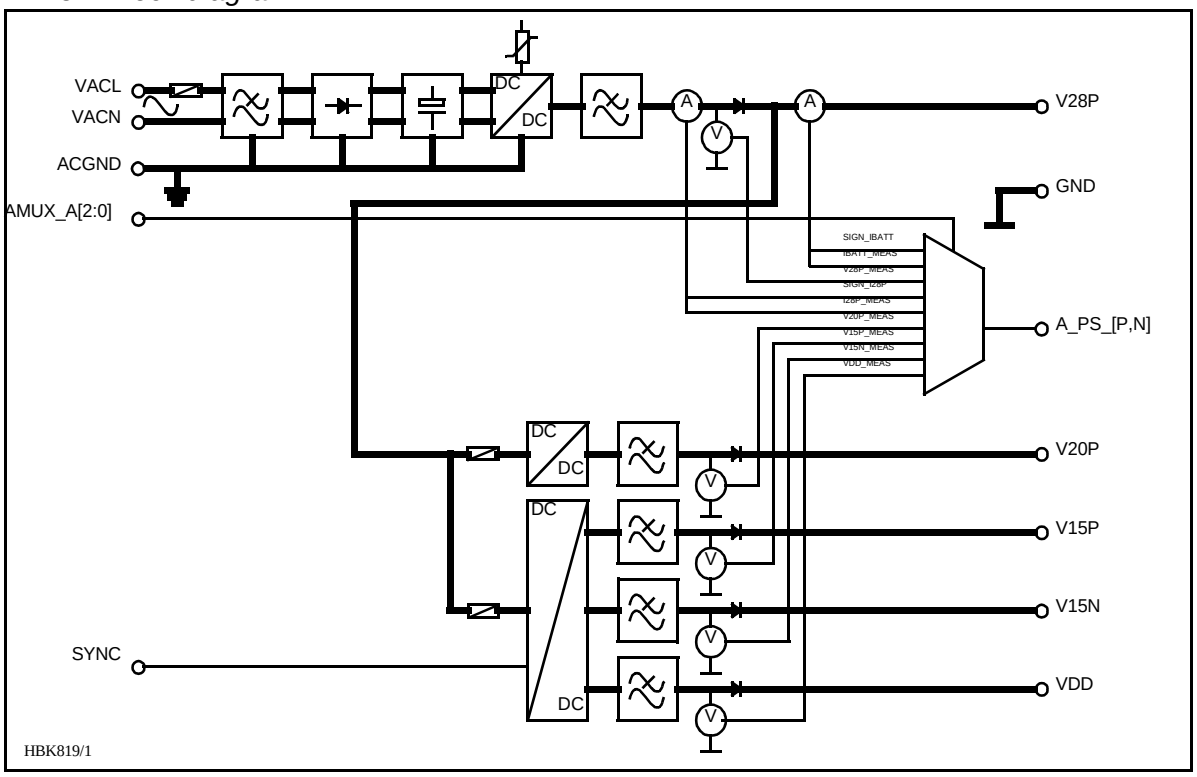

Figure 12-3 PS 1375 block diagram.

12.1.3.3 Signals

(See block diagram Figure12-3)

In	From	Description
VAC[L,N]		Manis AC
AC_GND		Mains Ground
AMUX_A[2:0]	MO 1374	Address signals for differential analogue signal bus

Out	To	Description
V28P		Battery charger voltage and primary DC voltage 28V
V20P	TX 1373	DC voltage to transmitter section 20VDC
V12P		System DC voltage +12V
V12N		System DC voltage -12V
VDD		System voltage to digital parts
A_PS_[P,N]		Multiplexed maintenance signals
SYNC		Frequency syncronisation between power modules

12.1.3.4 Functional description

(See block diagram Figure12-3)

The mains input is fused and filtered before it is rectified and smoothed. The first DC/DC converter generates 28VDC output which is filtered in the next block. The filter output serves as both battery charger and input to the +20V, ±12V and +5V DC/DC converters. V28P is temperature compensated to give 26.4V at 50°C, linearly increasing to 29.6V at -30°C.

The voltage (V28P) from either the AC/DC section or the battery is passed through an on/off switch and separate fuses to the secondary DC/DC converters. Here +20V, ±12V and 5V are created in one single and one triple output DC/DC converter. All outputs are lowpass filtered in LC filters.

The or'ing diodes on the DC outputs makes parallel coupling possible. All RMM voltage measurements are done prior to these diodes to make fault tracking possible. All RMM measurements are multiplexed into A_PS_[P,N] by the AMUX_A[2:0] signals.

The RMM measurements are:

Signal	Measurement
I28P_MEAS	Total current in V28PP
IBATT_MEAS	Battery current in V28P
SIGN_I28P	Charge/discharge info to the
SIGN_IBATT	current measurements above
V*_MEAS	Voltage in corresponding V*

12.1.4 CI1376/PB1378 Connection Interface Module Description

12.1.4.1 General description

CI 1376 is the electrical backplane of NM 7050. The module has four functions:
- External connections interface with over voltage protection.
- Motherboard for all plug-in boards.
- Transmitter change over.
- Battery protection against deep discharge

12.1.4.2 Block diagram

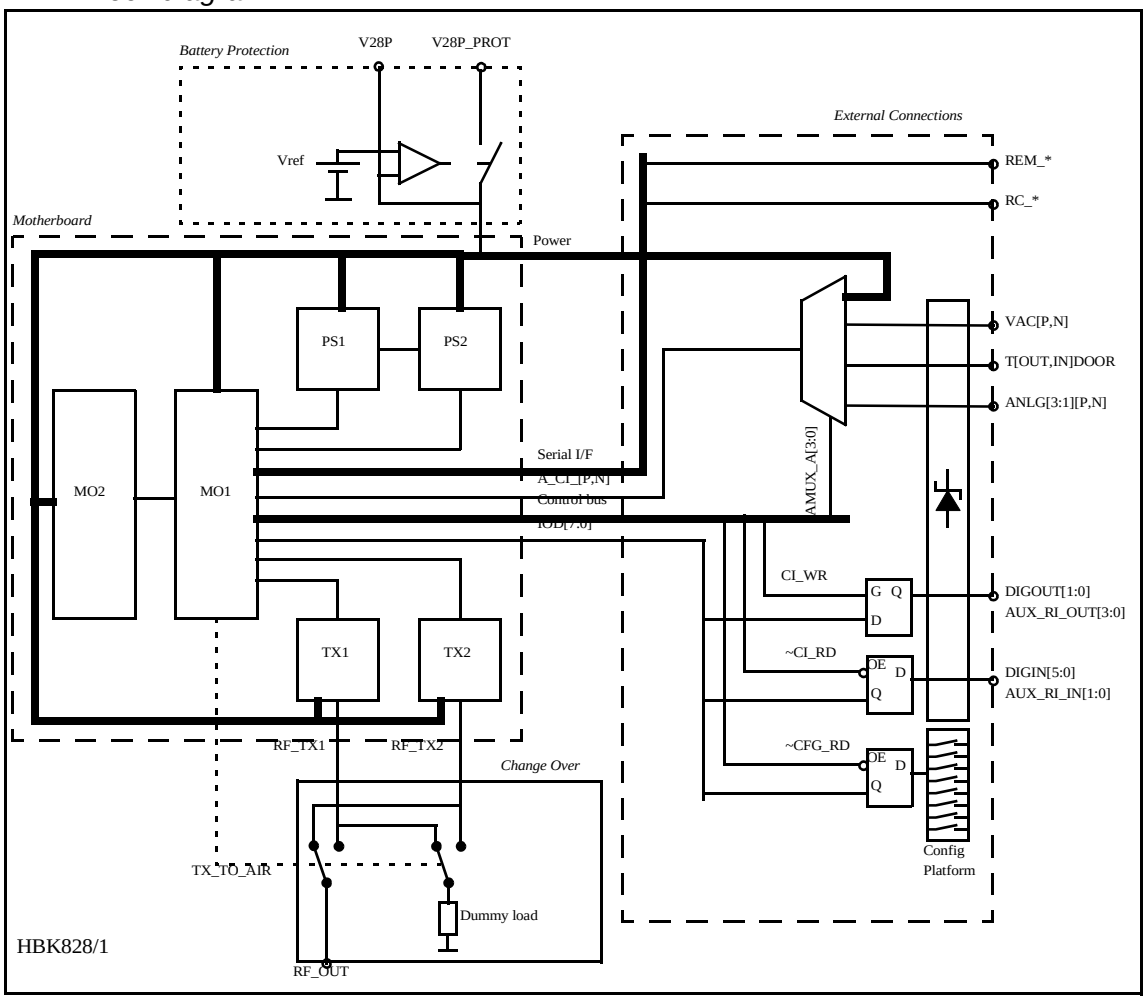

Figure 12-4 Connection Interface block diagram

12.1.4.3 Signals

(See block diagram Figure12-4)

For plug in board signals see the specifications for each board..

External	Description
REM_*	Remote PC RS232 interface
RC_LINE[A,B]	Remote control FSK modem interface (serial I/F bus)
RC_[TXD,RXD]	Remote control RS232 interface (serial I/F bus)
VAC[P,N]	AC voltage input (50-60Hz)
T[OUT,IN]DOOR	Temperature sensor input
ANLG[3:1][P,N]	Differential analogue DC input
DIGIN[5:0]	Digital inputs (TTL level)
DIGOUT[1:0]	Digital outputs (TTL level)
V28P	+28V DC input in case of external battery charger
V28P_PROT	Battery input/output, disconnected if voltage drops below 22V

Transmitter	From	Description
RF_TX[1:2]	TX 1373	50 ohms RF input
RF_OUT	Change over relay	50 ohms RF output

CONTROL SIGNALS:

TX_TO_AIR	MO 1374	Controls which transmitter is connected to antenna (change over)
AMUX_A[3:0]		Controls which analogue maintenance signal that is connected to A_CI_[P,N]
CI_WR		Controls writing from the IOD bus to DIGOUT[1:0] external output and AUX_RI_OUT[3:0] auxiliary remote control outputs.
~CI_RD		Controls reading from DIGIN[5:0] external input to the IOD bus and AUX_RI_IN[1:0] auxiliary remote control inputs.
~CFG_RD		Controls reading from the system configuration platform to the IOD bus

INTERNAL DATA PATHS

IOD[7:0]	RMS databus to and from MO1374
A_CI_[P,N]	Differential analogue maintenance signal to MO1374
V28P, V20P, V12[P,N], VDD"	Power" bus from PS1375

12.1.4.4 Building Blocks

(See block diagram Figure12-4)

EXTERNAL CONNECTIONS

CI 1376 contains overvoltage protected interfaces to the following external connections:
- One marker Beacon antenna
- One backup battery (or external battery charger)
- One PC (RS232 direct or via modem)
- One Remote control (via FSK modem or RS232)
- Two temperature sensors
- Three differential analogue DC channels
- One mains voltage sensor (transformer)
- Six digital inputs
- Two digital outputs

In addition, measurement on all power voltages are multiplexed into the analogue maintenance bus. Two auxiliary inputs and four auxiliary outputs are connected to the RMS parallel bus (IOD). System configuration is transferred from a strap platform to the RMS-system over the IOD bus.

MOTHERBOARD

CI1376 performs interconnections between two TX1373 transmitters (TX1 and TX2), two MO1374 monitors (MO1 and MO2) and two PS1375 power supplies (PS1 and PS2) and the external connectors.

TRANSMITTER CHANGE OVER

The TX_TO_AIR signal (driven by the station control software in MO1374) controls which transmitter is connected to the antenna and which is connected to the dummy load. The change over function is performed by an RF relay and the dummy load is a suitable 50Ω resistor.

BATTERY PROTECTION

A voltage comparator compares the V28P signal (on the PS1375 side) to a reference voltage. If V28P drops below 22V, the comparator disconnects the battery (V28P_PROT). The battery is reconnected when V28P exceeds 22V. If external chargers are used (to extend battery backup time) an external battery protection circuit has to be used and the CI1376 protection circuit is bypassed.

12.1.5 LC 1377 Local Control and Display/Keyboard Interface

12.1.5.1 General description

LC1377 is an interface card between MO1374 (monitor/TX control w/CPU) and the man/machine interface (local control pushbuttons/LEDs and LCD/keyboard pushbuttons) of the Marker Beacon.

12.1.5.2 Block Diagram

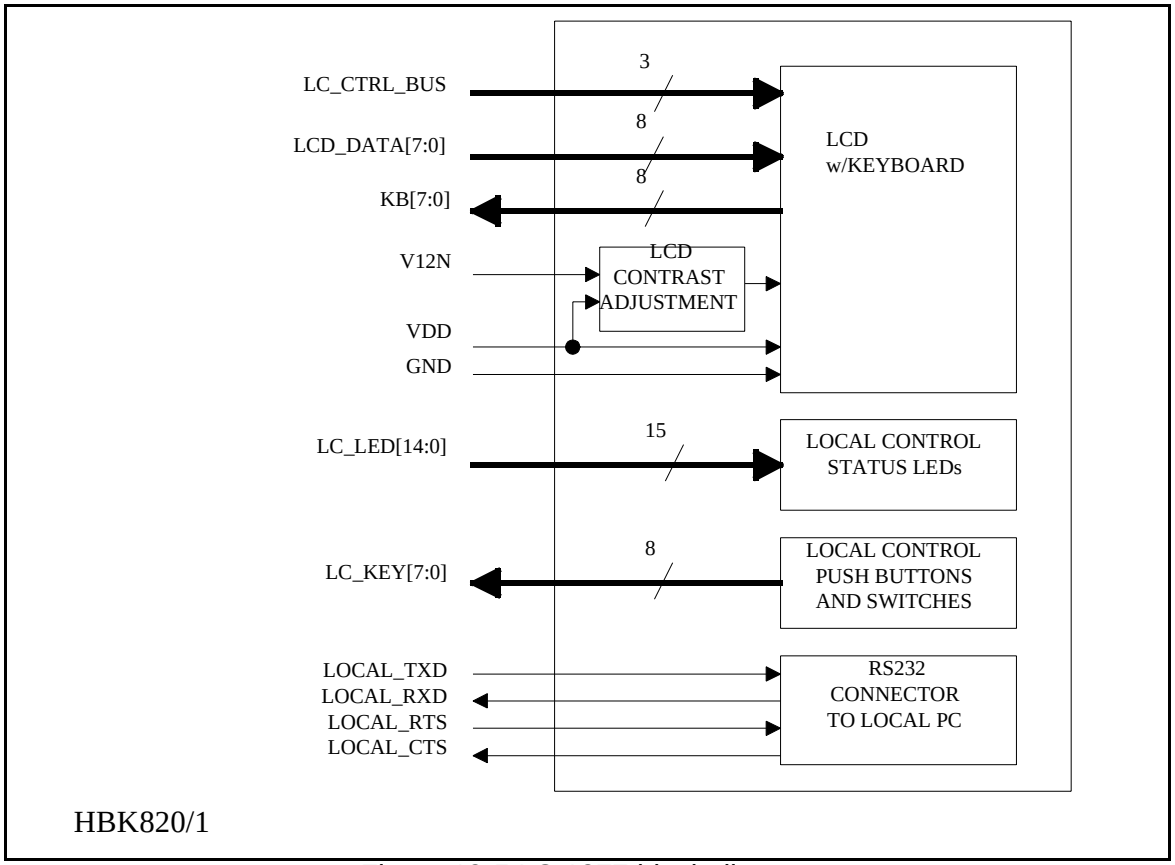

Figure 12-5 LC 1377 block diagram

12.1.5.3 Signals

IN	From	Description
LC_LED[14:0]	MO 1374	LED driver inputs
LCD_DATA[7:0]		Data input to LCD
LCD_RW	LCD	R/W select for LCD interface
LCD_RS		LCD register select trobe
LCD_ENA		LCD enable
V12N		-12VDC system voltage
VDD	PS 1375	+5 VDC system voltage
GND		Ciruit ground

Out	To	Description
LC_KEY[7:0]	MO 1374	Local control push buttons and switches
KB[7:0]	MO 1374	Keyboard push buttons

Bidirectional	To/From	Description
LOCAL_*	Local PC	RS 232 to local PC

12.1.5.4 Building Blocks

(See block diagram Figure12-5)

LEDS

The LEDs on the LC1377 are driven by LED driver input signals. The LED anodes are connected to VDD and the cathodes are connected to LED driver inputs. The LED driver circuits (outside LC1377) contains the resistors for correct LED illumination currents. LED status indications includes :

- System Alarm
- System Warning
- System Service
- System Normal
- Main select = TX1
- Main select = TX2
- TX to air = TX1
- TX to air = TX2
- TX1 on/off status
- TX2 on/off status
- Standby TX on air Warning
- Parameter Warning
- Battery Warning
- Monitor disagree Warning
- Maintenance Warning

LOCAL CONTROL PUSHBUTTONS/SWITCHES

The local control pushbutton/switch outputs are normally open. One side of the pushbutton/switch is connected to ground while the other is connected to the output line. Pushbutton functions include:

- ON/OFF key
- CHANGEOVER key
- MAIN SELECT key

- TX1 ON/OFF key
- TX2 ON/OFF key
- AUTO/MANUAL switch
- REMOTE/LOCAL switch
- WRITE PROTECT switch

LCD KEYBOARD

The LCD keyboard pushbuttons functions in the same way as the local control pushbuttons, except for the functionality :

- ESCAPE
- NEXT
- PREVIOUS
- ENTER
- PLUS
- MINUS
- QUICK READ

LCD

The LCD is controlled by the LCD_DATA[7:0], LCD_RW, LCD_RS and LCD_ENA. These signals are directly connected to the LCD.

LCD contrast can be adjusted by means of a potentiometer. Adjust the potentiometer until the LCD can be read clearly. The adjustable voltage is between -8.5V and +5V.

RS232 TO LOCAL PC

The RS232 interface to the local PC includes TxD, RxD, RTS and CTS. The RS232 lines has over voltage protection.

12.2 Tower Equipment

12.2.1 Remote Control Assembly

12.2.1.1 General Description

The RCA1240A remote control assembly consists of the remote control RC1241A and front panel RF1242A, and provides the user interface to the MB from the control tower, or technical equipment room. The RCA1240A connects to the MB either by using ordinary telephone lines, or by an optional transmission medium using the RS232 signals. The selection between these two interfaces are done by means of straps on the RC1241A.

The line interface is using the V.21 standard (300 baud FSK) for use with ordinary 2-wire 600 ohm telephone line. The transmitter level is -10 dBm, and the receivers dynamic range is from -10 dBm to -34 dBm.

12.2.1.2 Block Diagram

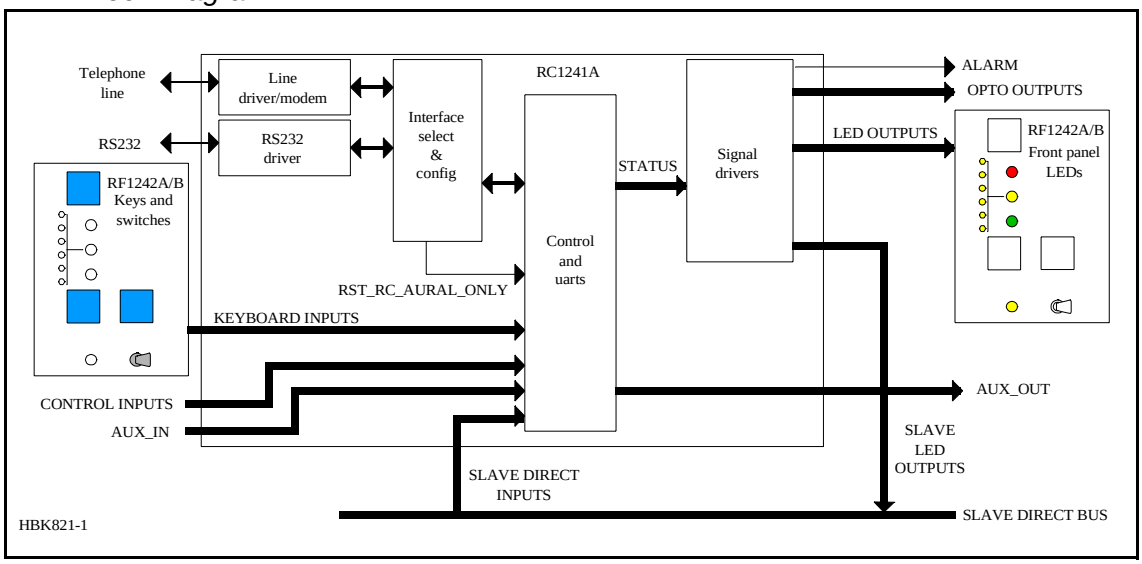

Figure 12-6 RCA1240A block diagram.

12.2.1.3 Signals

CONTROL INPUTS:	MB control signals. Consists of INTER-LOCK and TX_OFF.
OPTO OUTPUTS:	Optocoupler outputs. Collector/emitter for ALARM, NORMAL, WARNING and STB_ALARM.
SLAVE_DIRECT_BUS:	Data interface to optional slave panel. Consists of open collector outputs (ALARM, NORMAL, WARNING, STB_ALARM and SLAVE_BUZZER) and active low inputs (ON_OFF, CHANGEOVER and SILENCE). If this slave interface is used, connection of SLAVE_SERIAL_BUS is unnecessary.

12.2.1.4 Block Description

CONTROL AND UARTS

This unit interprets serial data from the MB and generates status outputs to front panel LEDs, slave panel outputs, opto outputs and buzzers based on the received status. Failure in data from MB results in alarm condition. Remote control front panel operations/slave panel operations are sent together with other control signals to the MB after being converted to serial data. Serial communication with an optional slave panel is continuously updated.

INTERFACE SELECT

This strap field selects between line interface or RS232 interface. The line interface is used for standard connection between MB and remote control using telephone lines, while the RS232 interface should be used when another transmission medium is used (must interface to the RS232 signals). The default is line interface.

LINE DRIVER/MODEM

This unit converts logic level serial signals to and from FSK line signals.

RS232 DRIVER
This unit converts logic level serial signals to and from RS232 signals.

SIGNAL DRIVERS
This unit drives the front panel LEDs, opto outputs and slave panel LEDs.

FRONT PANEL LEDS
This unit contains the front panel LEDs used to indicate the state of the MB.

KEYS AND SWITCHES
This unit contains the keys and switches used to interface to the operator.

NMP114A Remote Control

12.2.1.5 General Description

NMP114A is a FPGA containg the remote control function. The NMP114A sends data from remote control and receives data from the transmitter control TCA1218A/B. NMP114A is based on the Actel ACT1020 FPGA. For electrical specifications see the ACT1020 datasheet.

12.2.1.6 Block Diagram

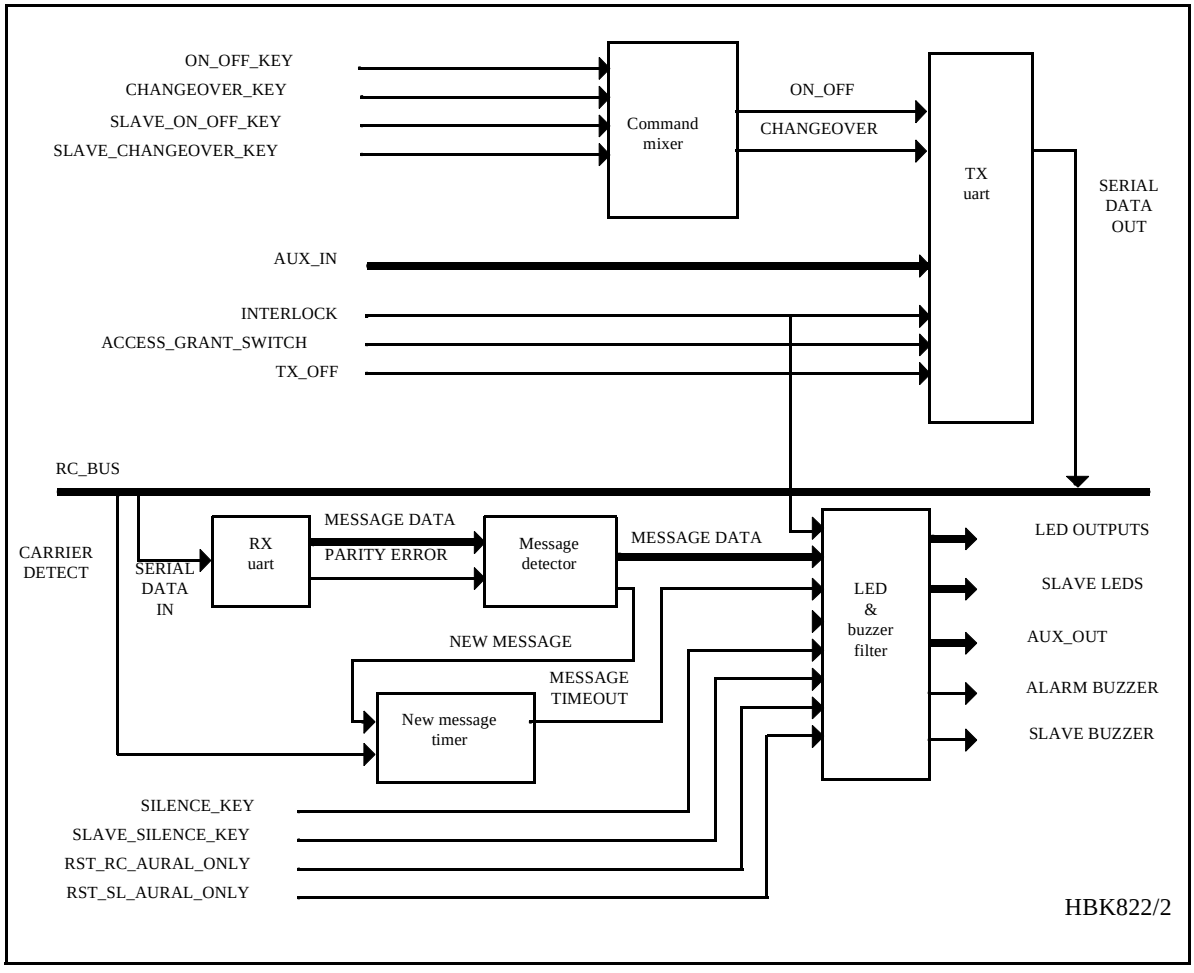

Figure 12-7 NMP114A block diagram.

12.2.1.7 Block Description

COMMAND MIXER
This unit mixes the on/off and changeover commands from the different sources (remote control front panel or slave front panel direct input).

TX UART
Converts parallel data to 2-bytes serial messages. The protocol is start bit, 8 data bits, 1 stop bit, odd parity.

RX UART
Converts serial data from remote control to parallel data (2 bytes).

MESSAGE DETECTOR
Messages are accepted only if two equal messages are received in sequence. If so, the data output is updated and a new-message pulse is asserted.

NEW MESSAGE TIMER
Checks that an OK message and carrier detect is present. Missing message or no carrier detect for 2 seconds or more gives timeout.

LED & BUZZER FILTER
Data from the MB is filtered according to the following descriptions:
- Missing data from MB sets an alarm condition.
- Activating SILENCE-key turns on all LED's (lamptest).
- Interlock turns off all LEDs.

Buzzers are activated at transitions from normal to alarm. Lamptest always activates buzzers. Pressing SILENCE-key deactivates the local buzzer. The remote control SILCENCE-key may deactivate the slave panel buzzer (configurable).

12.2.2 Remote Frame Assembly - RFA1353

GENERAL DESCRIPTION

The RFA1353 remote frame assembly is a subrack which can fit a maximum of five RCA1240A remote control assemblies. The remote frame assembly is 19'' wide and three units high. It contains a power supply PS635B, a motherboard MB1347A and one motherboard MB1346A for each RCA1240A.

Power to the remote frame assembly is supplied via connector P2 on MB1347 (GND on pin1, 24V on pin3). Power to each remote control is supplied from connector P3 on MB1347A.

The power supply PS635B is connected to MB1347A. PS 635B is built around a switch-mode DC/DC converter module (Eripower PKA 2212). The unit features shutdown for low input voltage, and current limiting on outputs (short circuit proof). Inputs are protected by fuses.

MB 1346A is a motherboard for RCA 1240A/B. It has the following connectors:

J1	Backplane connector for RCA1240
J2	RS-232 connector for use with external line modems, radio modems or fibre optic connections (alternative to P9 line connection).

P3	Parallel connection to slave panel or status unit.
P4,P5	Power connectors
P6	Aux in/out signals. May be used for FFM status, intruder alarm or other auxiliary functions
P7	Opto coupler outputs for ALARM, NORMAL, WARNING and STB. ALARM.
P8	Interlock connector (alternative connector on slave panel)
P9	RC telephone line. Alarm output and off input to establish automatic shutdown of GP when LLZ is off.

12.2.3 SF1344 / SP 1394 Remote Slave Panel

12.2.3.1 General Description

The SF1344A / SP 1394A are slave panel user interfaces to the MB from the control tower, or technical equipment room. The units connects to the remote control by directly connecting to the driver circuits on the remote control. SF 1344A and SP 1394A are very similar except for mechanical dimensions.

12.2.3.2 Block Diagram

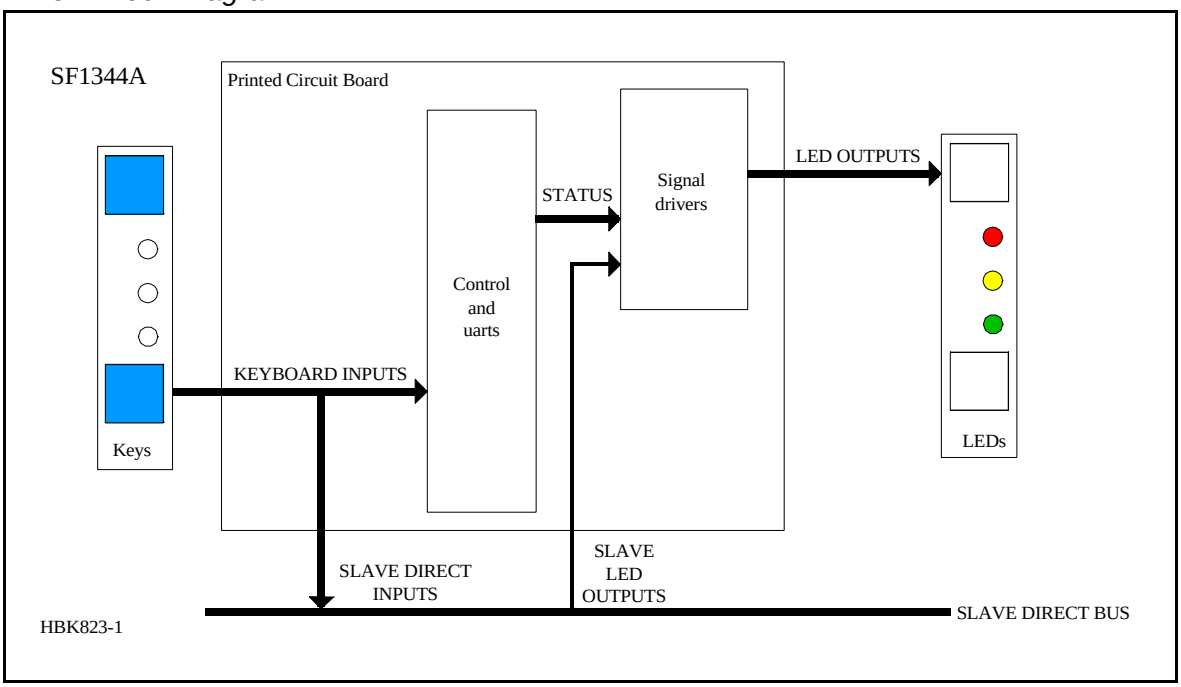

Figure 12-8 SF1344A / SP 1394A block diagram.

12.2.3.3 Signals

SLAVE_DIRECT_BUS:	Data interface from remote control to slave panels. Consists of open collector outputs (ALARM, NORMAL, WARNING, STB_ALARM (for hot standby configurations) and SLAVE_BUZZER) and active

low inputs (ON_OFF and SILENCE).

12.2.3.4 Block Description

SIGNAL DRIVERS
This unit drives the front panel LEDs.

FRONT PANEL LEDS
This unit contains the front panel LEDs used to indicate the state of the MB.

KEYS
This unit contains the keys used to interface to the operator.

12.3 Antenna

Normarc supplies single and dual antennas, NM 3561 and NM 3562 respectively. The single antenna may be used for inner, middle and outer marker, while the dual antenna is specially designed for outer markers. The advantage of the dual antenna is a lower spread in FLYING THROUGH TIME inside the localizer coverage area. In addition to two antenna elements, the monitor and distribution network DI 726 is included in NM 3562.

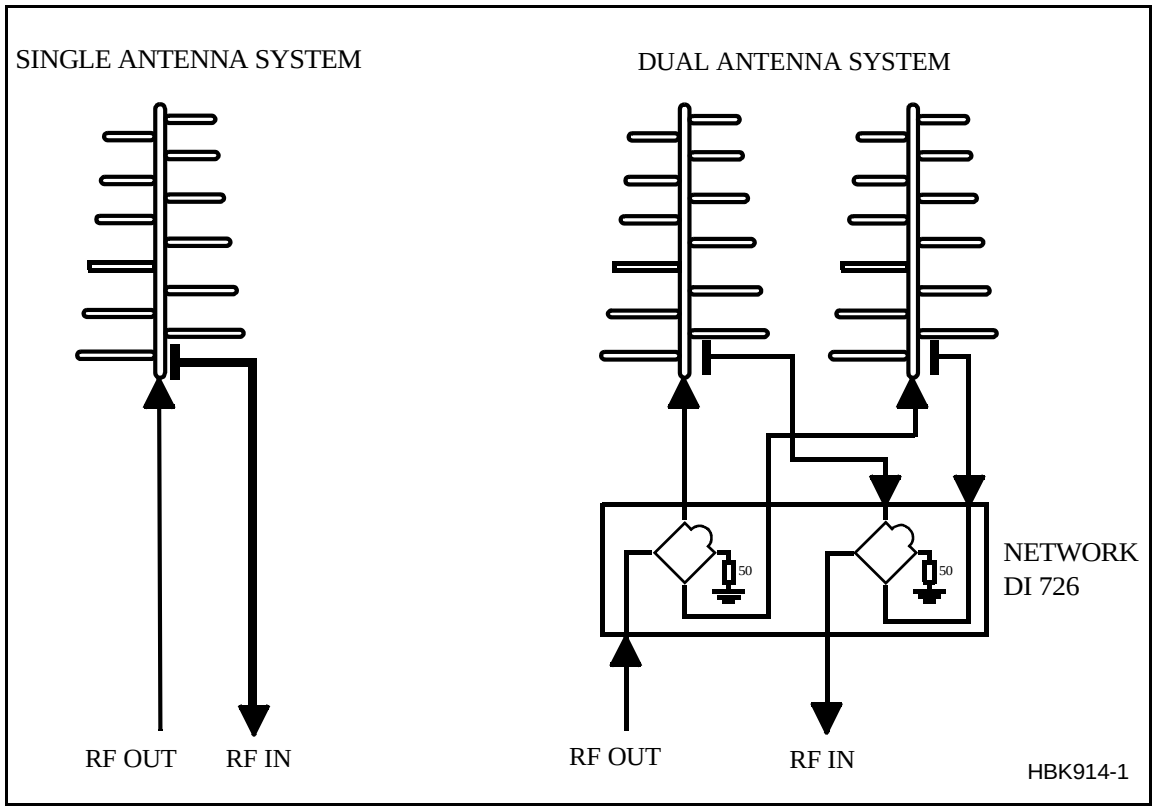

Figure 12-9 Antenna block diagram

Figure12-10 shows the field strength of the radiated signal directly above the middle marker antenna. Figure12-11 and Figure12-12 illustrate the field strength above the outer marker antenna, using single and dual antenna, respectively. The localizer course sector is scetched. Along an elliptical curve, the field strength is constant. If you look at the diagrams as ordinary geographical maps, you will see that the dual antenna "field-strength-mountain" is steaper and more stretched sideways than the single antenna "mountain". This corresponds to a sharper on/off response on the aircraft's marker beacon instruments.

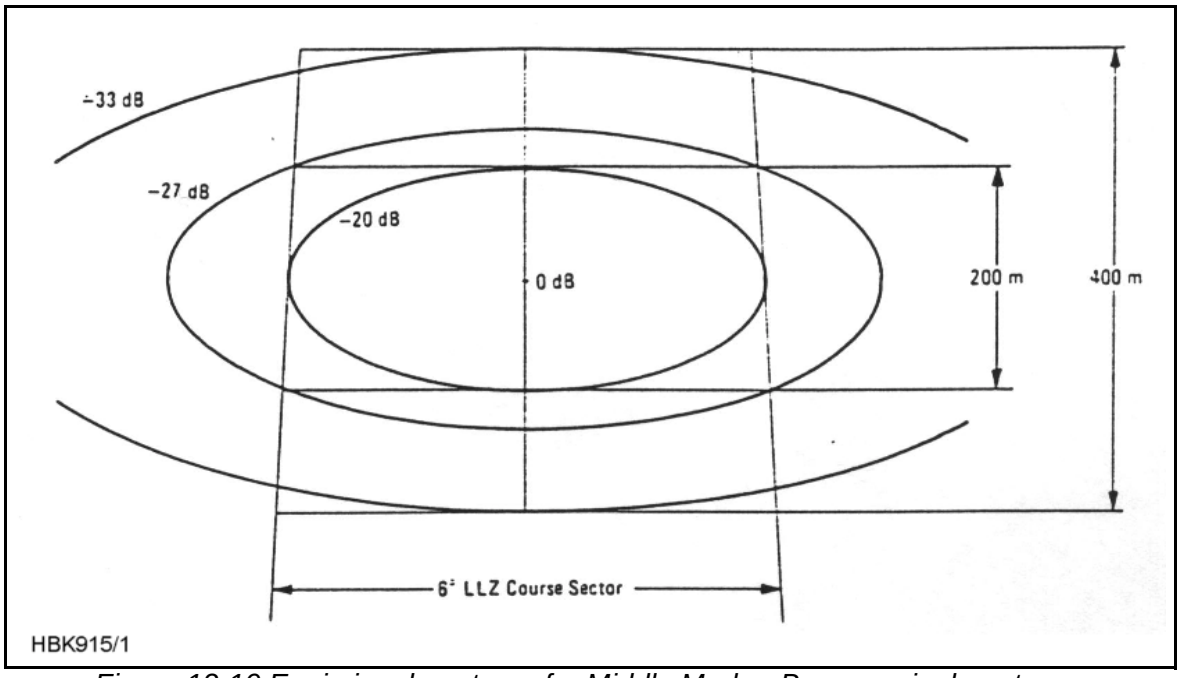

Figure 12-10 Equi-signal-contours for Middle Marker Beacon, single antenna

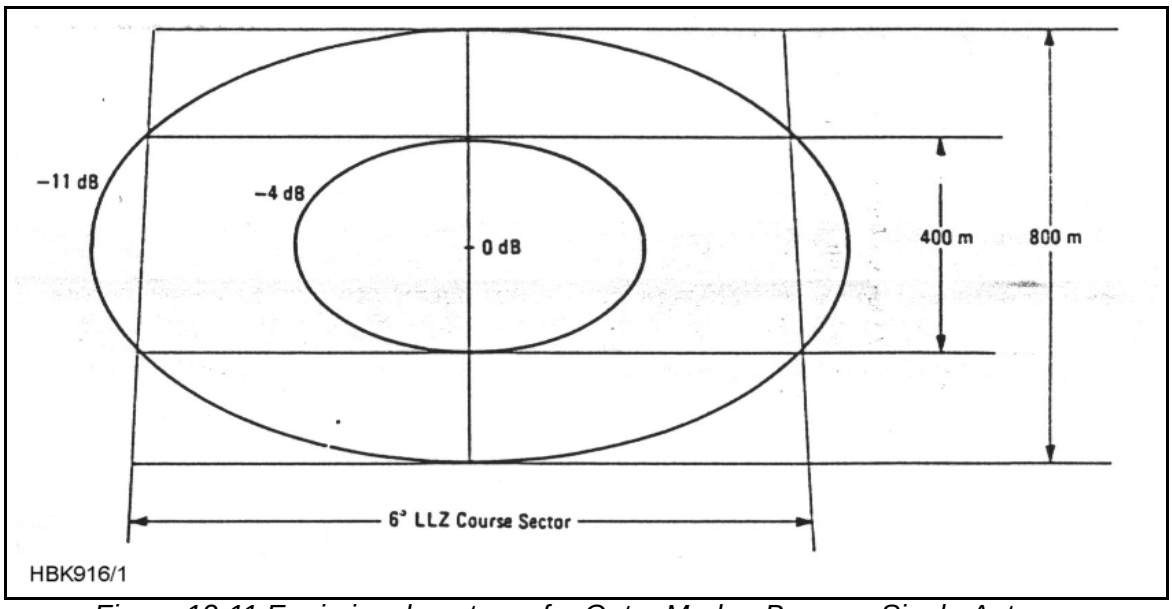

Figure 12-11 Equi-signal-contours for Outer Marker Beacon, Single Antenna

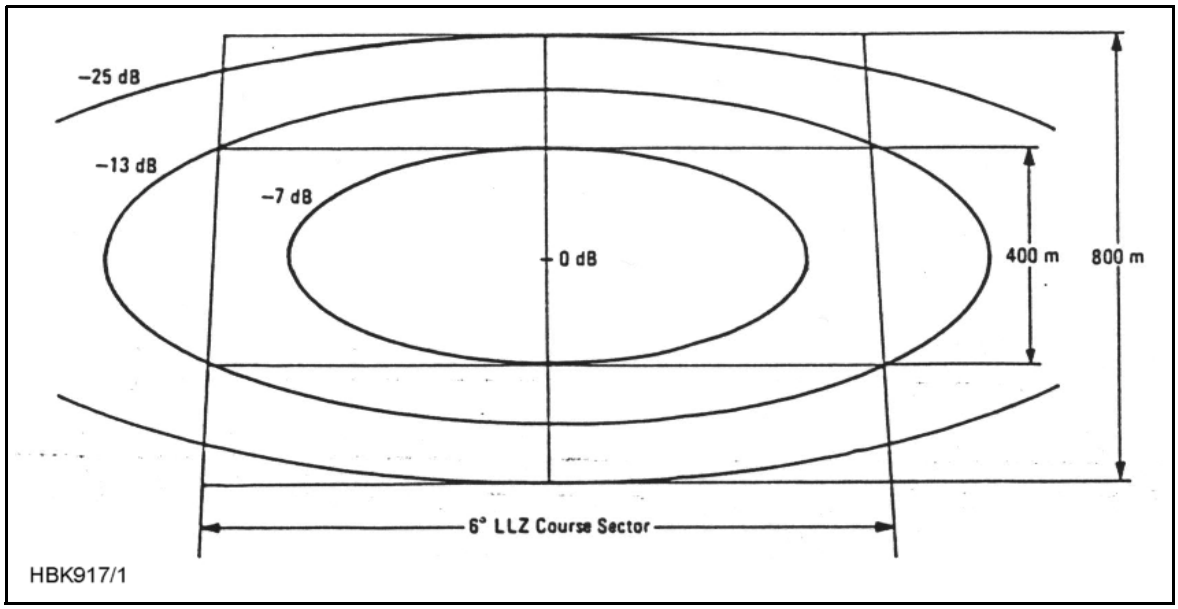

Figure 12-12 Equi-signal-contours for Outer Marker Beacon, Dual Antenna

13 Circuit diagrams

Circuit Diagrams for NM 7050

Main Cabinet
- TX 1373
- MO 1374
- PS 1375
- CI 1376
- LC 1377
- PB 1378

Tower Equipment
- CA 1240:
- RC 1241
- RF 1242
- RFA 1353:
- MB 1346
- MB 1347
- PS 635
- SF 1344
- SP 1394

Extension Board
- EB 1384

14 Parts lists

Electrical Parts List for NM 7050

Main Cabinet
- TX 1373
- MO 1374
- PS 1375
- CI 1376
- LC 1377
- PB 1378

Tower Equipment
- CA 1240:
- RC 1241
- RF 1242
- RFA 1353:
- MB 1346
- MB 1347
- PS 635
- SF 1344
- SP 1394

Extension Board
- EB 1384

15 Component Locations

Component Location for NM 7050

Main Cabinet
- TX 1373
- MO 1374
- PS 1375
- CI 1376
- LC 1377
- PB 1378

Tower Equipment
- CA 1240:
- RC 1241
- RF 1242
- RFA 1353:
- MB 1346
- MB 1347
- PS 635
- SF 1344
- SP 1394

Extension Board
- EB 1384

PART V APPENDIX

A ANTENNA TYPE NM 3561 / NM 3562

A.1 Antenna NM 3561 / NM 3562 For Ils Marker Beacon

The NM 3561/NM 3562 Marker Beacon Antennas are log-periodic dipoles possessing properties of high gain and directivity, and low side lobes. The performances og the antennas conform to ICAO Annex 10 item 3.1.6, and are such that they are largely independent of environment factors such as rain, snow and ice, and they can therefore be located at «difficult» sites. The directivity of the antennas can, if required, be even further increased by adding additional elements to the array.

The radiation patterns for the antennas are almost unaffected by the surrondings, and the antennas are therefore suitable for offset location where tilting of the antennas is necessary in order to obtain the required signal coverage. (Refer to figure A-1)

Figure 12-10, 12-11 and 12-12 shows constant field strenght lines through points in the glide path (GP angle 3º). The marker beacons are located vertically beneath the localizer course line at distance of 1050 m (middle marker) and 3.9 nautical miles (outer marker) from the threshold. The field strengths specified are relative to the maximum level directly above the antenna. The figures show that for an aircraft travelling at a speed of 50 m/s (96 knots) within the maximum allowable course sector of 6º the duration of the visual indication will be within the prescribes limits. The instrument panel lamp should be adjusted so as to switch on or off at the levels indicated in the figures i.e. -27 dB to -33 dB for Figure 12-10, -11 dB to Figure 12-11, and -13 dB to -25 dB for Figure 12-12.

The marker beacon antennas are mounted on poles, with the dipoles parallel to the course line. The rear end of an antenna should be at least 2 metres above the ground.

The NM 3562 antenna comprises two elements, and is fed via a distribution network (DIA 726) which splits the transmitter power into two equal parts. The network is a coaxial cable hybrid housed in silumine box together with the monitor network which is used to combine the signal from the two monitor probes.

Specifications:	**NM 3561:**	**NM 3562:**
Antenna construction	1 LPDA	2 LPDAs
Frequency	75 MHz	75 MHz
Gain	8,2 dB	11 dB
VSWR 50 Ohm	1,2 dB	1,2 dB
Required RF power	0,5W	0,4W
Dimensions	3,3 x 2,2 m	3,3 x 4,7 m
Weight	50 kg	110 kg
Mounting	Both types: 2.2 metres above ground	
Temperature	Both types: -40ºC to +70ºC	
Wind velocity	Both types: up to 180 km/h	

B MAINTENANCE PARAMETERS

BOARD NAME	PARAMETER NAME	FUNCTION
TX1 / TX2 TX1373A	PA CURRENT	Power Amplifier Supply Current (20V)
	VOLTAGE 20V	Power Amplifier Supply Voltage (20V)
	RF LEVEL DETECTED	Detected RF level voltage
	RF LEVEL DAC	RF level control voltage from D/A converter
	CARRIER POWER	Computed carrier Output Power
	MODULATION DEPTH	Modulation Depth
	VOLTAGE 5V	+5V supply voltage
	VOLTAGE 12V	+12V supply voltage
	VOLTAGE -12V	-12V supply voltage
	KEY_GATE	Keying envelope (toggling)
MO1 / MO2 MO1374A	BATTERY	RAM backup battery voltage (3.3V)
PS1 / PS2 PS1375A	VOLTAGE 28V	+28V supply voltage prior to OR diode
	VOLTAGE 20V	+20V supply voltage prior to OR diode
	VOLTAGE 5V	+5V supply voltage prior to OR diode
	VOLTAGE 12V	+12V supply voltage prior to OR diode
	VOLTAGE -12V	-12V supply voltage prior to OR diode
	CURRENT 28V	+28V supply current
	CURRENT BATTERY	Battery current
CI CI1376A	Voltage 28V	+28V supply voltage
	Voltage 20V	+20V supply voltage
	Voltage 12V	+5V supply voltage
	Voltage 5V	+12V supply voltage
	Voltage -12V	-12V supply voltage
	TEMP OUTDOOR	Temperature outdoor
	TEMP INDOOR	Temperature indoor
	VOLTAGE AC	Mains voltage (via transformer)
USER IO CI1376A	ANALOGUE 1	User defined differential Analog input 1-3
	ANALOGUE 2	
	ANALOGUE 3	
	DIGITAL 1	User defined digital input 1-6
	DIGITAL 2	
	DIGITAL 3	
	DIGITAL 4	
	DIGITAL 5	
	DIGITAL 6	

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We take your opinions seriously, and will confirm receipt of your comments and keep you advised of any resulting actions.

Yours Sincerely,

Linda Røssland
Customer Service

Product Report

Please forward to:
Customer Service Dept.

CS - No.:			
Customer / company:	**Name:**	**Received by:**	**Date:**
Address:	**Phone:**	**Fax number:**	**E-mail:**
Site of installation:	**Contract number:**	**Navia order No.:**	**Warranty expires:**
Product:			**Serial No:**
Fault description / symptoms:			**Attachement:**

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Sender's Name:..... Tel: .....

Site: ..... Fax: .....

Return Adress:.....

Consignee:

NAVIA AVIATION AS
P.O. Box 50, Manglerud
N-0612 Oslo Tel: +47 23 18 02 00
NORWAY. Fax: +47 23 18 02 13

Carrier's Name: ..... Date of Shipment: .....

Carrier's Ref No: ..... Number of Packages: .....

The following item(s) will be sent for repair under Maintenance Contract No.

_____

Item Description	Quantity	Part Number	Serial Number
1			
2			
3			
4			
5			

NAVIA AVIATION AS:

Please fax acknowledgement of goods received (including date received) to:

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