Marinex
USER MANUAL

Version 2.2x firmware

CONTENTS

Chapter 1 - Introduction

1.1 General Description

The Marinex telephone exchange is designed to meet the special requirements of all internal and external telephone calls made on-board ship. Up to 120 extensions and/or 12 external lines can be supported by the exchange, enabling connection to Shore lines, Satcoms, Public address lines and Pagers. Facilities are available to enable a maximum of 8 connection circuits (to be increased to 16 at a later date) to be made at any time.

The exchange is pre-programmed to provide specific facilities for Officer Class and Crew Class extensions. These facilities are held within the exchange memory and can be changed to suit individual requirements by using an IBM PC (or compatible) with VT100 terminal emulator software. The memory is provided with its own battery support and any changes made to the set-up will therefore be maintained if the exchange is disconnected from the power supplies.

When connected to the shore lines, incoming calls are directed to a pre-specified extension. Outgoing calls are enabled for Officer Class phones and can be directly dialled by pre-fixing the required number with a specific code.

Call-logging facilities are provided by the exchange to enable all outgoing and incoming calls to be logged. The information logged includes the source extension, the number dialled and the duration of the call and is output through a RS232 serial interface. Either a printer or a magnetic recording device can be directly connected to the interface for subsequent analysis.

The Marinex telephone exchange is completely modular in construction and is housed in a standard 19 inch 3U high case. A switch mode power supply enables the exchange to be used with both DC and 50/60 Hz mains supplies. Connections to the exchange are made through screw terminal plugs that mount directly onto the back-plane at the rear of the unit, so eliminating the need for internal cable looms.

Future expansion and servicing of the exchange is easily facilitated by simply adding or replacing plug-in modules. To assist with maintenance and fault finding, a number of indicators are provided on the modules to show the status of the exchange and the extension lines.

1.2   Specifications

1.2.1   Basic Specifications

Capacity (maximum)	120 internal extensions (in blocks of 8). 12 external lines (in blocks of 4). Maximum of 8 circuits can be made at any time
External Connections	Shore lines, Satcoms, P.A. lines, Pagers
External Signalling	Pushbutton dual tone multi-frequency preferred. Loop disconnect can be used, but with reduced internal facilities
Battery life – programme memory	5 years minimum
Frequency Range	300Hz to 5Khz at 3dB points
Cabling	2 wire throughout
Input Voltages	120 or 240V, 50/60Hz +/-10%, 120VA max and/or 24V D.C. +/-10%, 6A max. Uninterrupted changeover on mains failure. Indicators provided for both A.C. and D.C. supply to show which supply is in use
Fuses	AC - 2A anti surge 20mm
	DC - 10A anti surge 20mm.
MTBF	10,000 hours (fully loaded system)
MTTR	30 minutes
Dimensions	212mm (H) x 600mm (W) x 505mm (D)
Weight	Approx 30.9Kg (Basic unit)
	305g (Subscriber card)
	274g (Exchange card)
	35.4Kg (fully loaded).

1.2.2   Environmental Specifications

Protective coatings are applied to the Marinex during manufacture in order to prevent corrosion of metal parts and to provide protection against salt spray.

The Marinex exchange has been designed to comply with the requirements of Lloyds Register ENV2.

Temperature
       Operating   0 to +55 deg C
       Storage   0 to +70 deg C

Humidity   5 to 95% relative humidity

Altitude   0 to 9000m above mean sea level

Vibration   1.0mm amplitude at 2 to 13.2Hz
                                               1g at 13.2 to 100Hz

Chapter 2 - User Facilities

2.1   General

The Marinex extensions are grouped into two categories. Category 'A' extensions are Officer Class extensions and category 'B' are Standard Crew Class extensions. The Marinaid utility can be used with an IBM PC (or compatible) to provide different facilities to those programmed at the time of delivery for any of the extensions. All changes will be stored in a memory provided with its own battery support and will therefore be maintained if the power is disconnected from the exchange.

2.2   Crew Class Extensions

Crew Class extensions are factory configured to have the following facilities:

- Extension in service
- Call transfer of incoming calls
- Call back on busy or no reply
- Place incoming calls on hold
- Call pickup
- Call forward

2.3   Officer Class Extensions

Officer Class extensions are factory configured to have the following facilities:

- Extension in service
- Call transfer
- Call back on busy or no reply
- Interrupt priority
- Direct dial out
- Place incoming calls on hold
- Call pickup
- Call forward
- Date and time set
- Engineering check print outs

2.4   Additional Services

The following group facilities are also available :

- Multiple call forward (10 telephones max)
- Hunt group (12 telephones max)
- Group pickup

2.5   User Facilities

2.5.1   Extension In Service

Extension in service simply means that an extension is available for making internal calls and for receiving both internal and external calls. If an extension is not available (for example, extension card not fitted), the number unobtainable sound will be given.

2.5.2   Call Transfer

This facility enables the user to redirect the call to another extension. For all calls, depress the 'hook' switch momentarily and listen for the intermittent dial tone, then dial the required extension number. When the extension answers, the call will be automatically transferred by replacing the handset. However, if the extension to which the call is being transferred is engaged, does not answer, or is unobtainable, then by dialling *7 the call will revert to the original extension. Alternatively, dial *4, wait for the intermittent dial tone, then dial a different extension.

2.5.3   Call Back On Busy

If an extension is busy, the caller can select a code to make the phone ring when the extension becomes free. On hearing the engaged tone, dial *6 and replace the receiver. As soon as the extension becomes free the caller's phone will ring and the exchange will call the extension. Note that only one 'call back' can be enabled at any time.

2.5.4   Call Back On No Reply

If no reply is obtained when an extension is dialled, the caller can select a code to make the phone ring immediately after the extension is next used. When no reply is received, dial *6 then replace the receiver. When the dialled extension is next used, immediately the receiver is replaced the caller's phone will ring and the exchange will call the extension. Note that only one 'call back' can be enabled at any time.

2.5.5   Cancel Call Back

The current 'call back' can be cancelled by dialling **6.

2.5.6   Calls on Hold

Incoming calls can be placed on hold by momentarily pressing the 'hook' switch and listening for the intermittent dial tone, then dialling a 'hold' number. The person who receives the call can then use the P.A. to announce the call and request that the person for whom the call is intended should dial the 'hold' number. The factory configured numbers for this facility are

500 to 515. The call will return to the extension that initially answered it after approximately 1 minute if it is not picked up by another extension. If the call is not answered after another minute, it will be lost.

2.5.7   Interrupt Priority

This facility enables the caller to interrupt a call currently taking place on another extension. To select interrupt priority dial the extension then, if it is engaged, dial'*1'. A background 'pip' will be heard on the extension and the caller will be free to interrupt the conversation.

2.5.8   Rapid Ring

When making an internal call to another extension, the telephone will make a rapid ringing tone if the caller has this option enabled.

2.5.9   Direct Dial Out

External calls can be directly dialled by prefixing calls with a preset digit. This digit is set to '9' for shore lines and '61' for Satcomms. Public address lines can be dialled direct, using the numbers 62 to 65 (possibly only one, or two of these will be available) and pagers can be dialled direct using the numbers 66 and 67. These facilities are pre-programmed on delivery but can be changed if required.

2.5.10   Direct Dial In

This is configurable using Marsetup on Satcomm or Shore Lines. This facility is not factory enabled, but can be configured through the Marsetup Tie Line Configuration, the 'I' key will add the direct dial in. To clear re-enter Marsetup Tie Line Configuration and select either 'S', 'L' or 'M'.

When an incoming call is received, the exchange answers after 4 seconds of ringing tones and presents a dial tone. The caller, **using a tone type telephone**, can now dial the required telephone extension on-board the vessel. If no extension is dialled within 5 seconds, the normal designated telephone will ring for 10 seconds. If no answer is received the call will then transfer to the second designated telephone, such as a night bell if available and ring for 10 seconds. In either case, after the 10 second ringing period, if the telephone has not been answered, the connection through the shore line or SATCOMM will be disconnected. If the required extension is engaged, 5 seconds of the busy tone will be heard, then the line will be disconnected.

2.5.11   Designated Incoming Extension

One or more extensions can be designated to receive incoming calls. These can then be transferred to the required extension. The exchange is factory configured with extension 103 to receive incoming calls. This number can be changed using the MARINAID utility program.

2.5.12   Emergency Phone

Emergency telephones can be accessed simultaneously by several users, so enabling anyone on the ship to interrupt in an emergency. The emergency phone can be configured with dialling disabled (intermittent dial tone) using the MARINAID utility program.

2.5.13   Call Pickup

A ringing extension can be picked up from another extension by dialling *8 followed by the number of the ringing extension.

2.5.14   Group Pickup

Any ringing extension within a pre-selected group can be picked up by dialling *9. To set up the extensions for this facility it will be necessary to use the MARINAID utility program.

2.5.15   Call Forward

A user can re-direct all his calls to another extension by dialling *3 followed by the new extension number. When calls have been redirected, an intermittent dial tone will be heard on the original extension.

2.5.16   Reset Call Forward

A 'call forward' can be reset to the original extension by dialling **3.

2.5.17   Remote Call Forward

A user can re-direct all his calls from another extension (follow me), by dialling *2 followed by the original extension number. When calls have been called forward, an intermittent dial tone will be heard on the original extension.

2.5.18   Reset Remote Call Forward

A 'remote call forward' can be reset to the original extension by dialling **2 plus the original extension number.

2.5.19   Multiple Call Forward

A group can be allocated up to 10 extensions maximum for multiple call forward. If the number that is dialled is not answered within approximately 15 seconds, the call will be available to all extensions in the group and these will all ring rapidly in short succession until the call is picked up. The extensions will then revert to normal operation. This facility is particularly useful for extensions that are often not manned. To set up the extensions for this facility it will be necessary to use the MARINAID utility program.

2.5.20   Hunt Groups

A hunt group number can be created for up to 12 extensions. When the hunt group is dialled, the first free phone in the group will ring. This facility is particularly useful for very busy phones where alternative people could answer the calls. To set up the extensions for this facility it will be necessary to use the MARINAID utility program.

2.5.21   Night Bell

Any extension can be allocated to be a night bell. Incoming calls are normally directed to a designated extension. If that extension is engaged, or is not answered within 15 seconds, the incoming call will ring the night bell. The call can then be picked up by any extension dialling '8'. The night bell phone will have no dial tone. This facility can be added using the MARINAID utility program.

2.5.22   Broker

This facility enables a user to switch alternately between two calls. Whilst communicating with one line, or extension, the user may momentarily depress the 'hook' switch and, on hearing the dial tone, dial another extension. To switch back to the original call, press *0. The user may then switch between the two calls by just pressing *0.

2.5.23   Three Party Conversation

This facility allows three parties to be connected to a conversation. Dial the first extension, put that extension on hold, then dial the second extension. To connect the three parties together press *5 when connected to the second extension.

2.5.24   Alarm Set

This facility allows the user to set the extension to ring at a chosen time. To activate the alarm dial *5 plus the time required HH MM (using the 24 hour clock).

2.5.25   Cancel Alarm

The 'alarm' facility can be cancelled by dialling **5.

2.5.26   Date and Time Set

The date and time used for call logging can be set from officer class extensions as follows :

        #84 hhmmss   will set the time

        #85 ddmmyy   will set the date

2.5.27   Phone Reset Facility

It is possible to reboot from an officer class extensions as follows :

> #87   will cause the exchange to reboot
>
> #88   will restore the factory configuration (provided the write protect link is not in protect mode), then cause the exchange to reboot

2.6 Factory Configurations

The exchange will be factory configured to the following. It is recommended that no change should be made to this configuration until the correct operation of the complete system has been fully established, as described in the Engineering Checks given in Chapter 3. For details of how to re-configure the Marinex exchange, refer to Chapter 4.

Extension Number	Equipment Line	Class of Service	Description
100	00	A	Captain's telephone (dedicated speech channel)
101	01	A	Officer class A
102	02	A	Officer class B
103	03	A	Radio officer, designated for all incoming calls, both shore line and Satcomms.
104-195	04-95	B	Crew class
500-515			Calls on hold

Tie Lines

Extension Number	Description
956	Shore line (loop disconnect signalling)
957	Shore line (MF out signalling)
958	PA
959	Satcomm (MF out signalling)
952-954	PA
955	Pager
948 & 949	Shore line (loop disconnect signalling)
950 & 951	Shore line (MF out signalling)

Note that the tie line numbers are for reference only and are not the dialled number.

The call logging facility will be factory configured for logging of all external calls only.

2.7   Call Logging

Details of all internal, incoming and outgoing calls can be logged by a printer or magnetic recording device connected to the RS232 serial interface. This facility will record the source extension number, the destination dialled and the duration of the call. No speech or data communicated over the telephone line will be recorded. For connection details to the RS232 serial interface refer to Chapter 3. The format of the recorded information will be as follows:

Internal calls
```
25/11/88 at 10:21:08 extn 112 rang 100 for 00:01:14
```

Outgoing Calls
```
25/11/88 at 10:25:34 extn 101 used 951 for 00:02:26 D'ld 42356
```

Incoming Calls
```
25/11/88 at 10:27:16 line 956 rang 104 for 00:03:29
```

In all the above examples, the start time will be printed in the following format:
```
        DD/MM/YY HH:MM:SS
```

Where DD/MM/YY is the date/month/year

        HH:MM:SS is the time in hours:minutes:seconds

The duration will be printed in the format:
```
        HH:MM:SS
```

The date and time used by the call logging port can be set from an officer class phone as follows :

        #84 hhmmss   sets the time

        #85 ddmmyy   sets the date

Note that changing the date and time whilst calls are in progress may result in false times being printed out for those calls. A total of six digits must always be entered for the date and the time settings, e.g. 9.30 a.m. should be entered as 093000.

The Marinex is factory configured to log external calls only. To log both internal and external calls, enter #71 from an officer class phone. To revert to external calls only, enter #72.

2.8   PIN Number

A 4 digit PIN (Personal Identification Number), can be entered from officer class extensions, so that a user can access outside lines (9 or 61 through to 68), on phones that do not normally have access. Only one PIN number can be set up.

2.8.1   Setting a PIN Number

When a new exchange is delivered or the system has been rebooted to the factory configuration, a PIN number will not exist. The PIN number can be set from any officer class extension as follows:

>   enter   #6 yyyy

where yyyy represents the new 4 digit PIN number

2.8.2   Changing the PIN Number

It is possible to change the existing PIN number from any officer class extension as follows :

>   enter   #6 xxxx yyyy

where xxxx represents the old pin number, and yyyy represents the new PIN number.

If the old PIN number is entered incorrectly then an unobtainable tone will be heard. If the correct PIN number is entered then the dial tone will be heard.

2.8.3   Using the PIN Number

The PIN number allows the user to access outside lines from crew class extensions, which do not normally have access to outside lines. To obtain an outside line dial as follows :

>   enter *0 yyyy 9 nnnn nnnnnn

Where yyyy is the PIN number and nnnn nnnnnn is the outside call number.

If the PIN number is entered incorrectly then an unobtainable tone will be heard. If the correct PIN number is entered then the dial tone will be heard.

Access will be valid for the current call only.

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Chapter 3 - Installation

3.1   Pre-Installation Checks

Before unpacking the Marinex exchange, check the packing carton for signs of damage. Any damage to the carton should be reported to the supplier before proceeding.

Open the carton, carefully remove the contents and check for any signs of mechanical damage.

The Marinex is supplied with terminal connectors and a User Manual as standard.

Front View

Side View

Mounting Position

All dimensions in mm
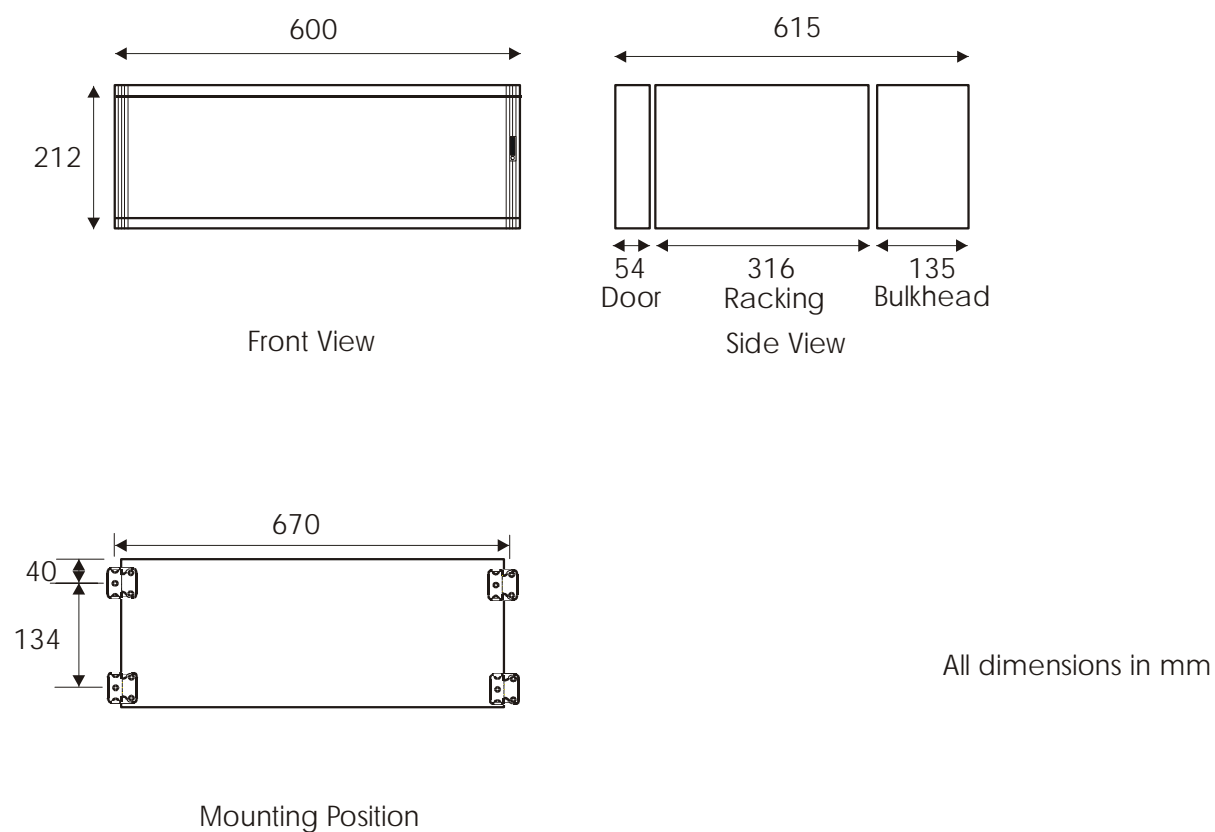
Figure 3-1 Case and Mounting Dimensions

3.2   Physical Installation

Installation of the Marinex should be in a location away from electrical noise and excess vibration. Where possible the equipment should be installed in a well ventilated area where it will not be adversely affected by salt water and extremes of heat.

During installation care should be taken to allow at least 900mm of clearance at sides of the exchange for access to the exchange modules and cable connectors. Refer to Fig. 3.1 for dimensional details of the Marinex exchange.

Ensure that the exchange is rigidly fixed and that all cables to the exchange are fixed such that they cannot pull the connectors out of the exchange.

If additional holes are used in the top or bottom panels for the routing of cables protect any cut-outs with grommet edging.
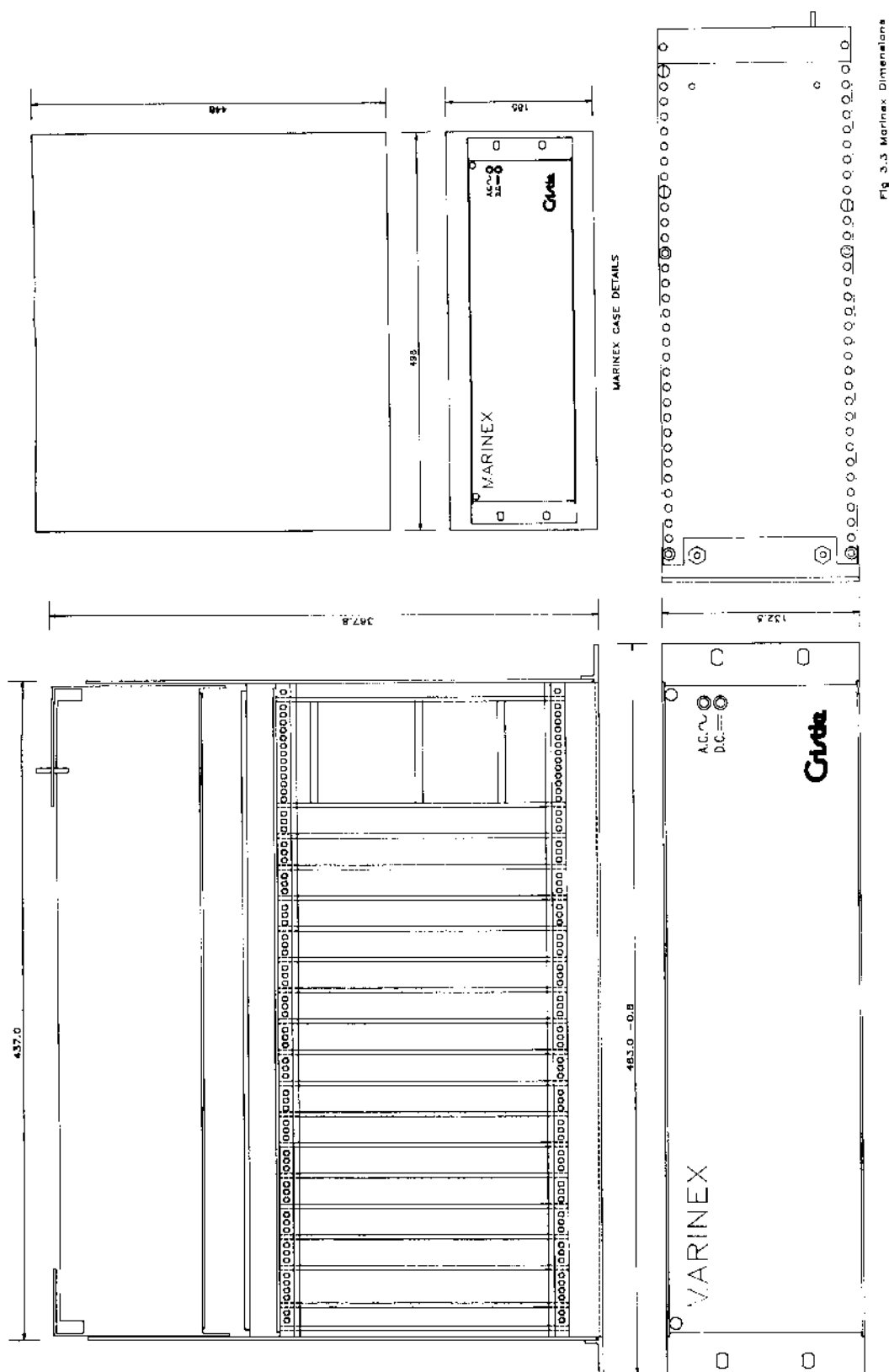
Fig 3.2 Internal layout

3.3   Module Location

Access to the modules is gained by unscrewing the eight screws on the front panel. Location of the modules inside the exchange should be in accordance with that shown in Fig.3.3 and all modules should be checked to ensure that they are fully plugged into the chassis and correctly located in their card guides before applying power for the first time.
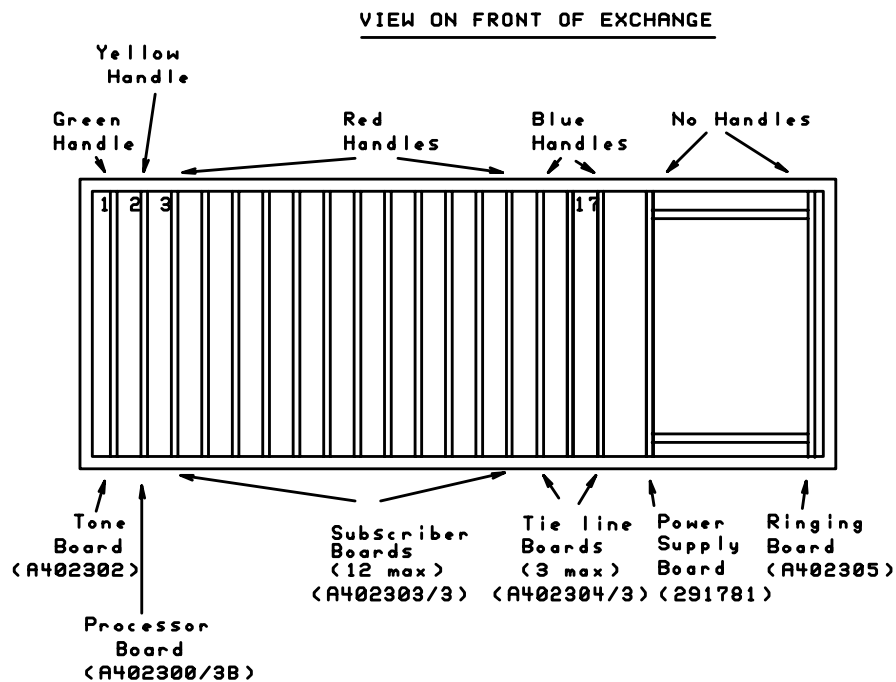
Figure 3-3 Module Location

3.4   Power Connections

Power connections are to two separate terminal blocks mounted at the rear of the exchange (refer to Fig.3.4). When viewed from the rear, the Mains input connects to the left hand terminal block and the D.C. connects to the right hand terminal block. A voltage selector is provided in the top corner of the left hand panel to select 120V or 240V operation. When connecting to the terminal blocks, the wires should be pushed in from the top of the blocks and clamped by the top screw in each position.
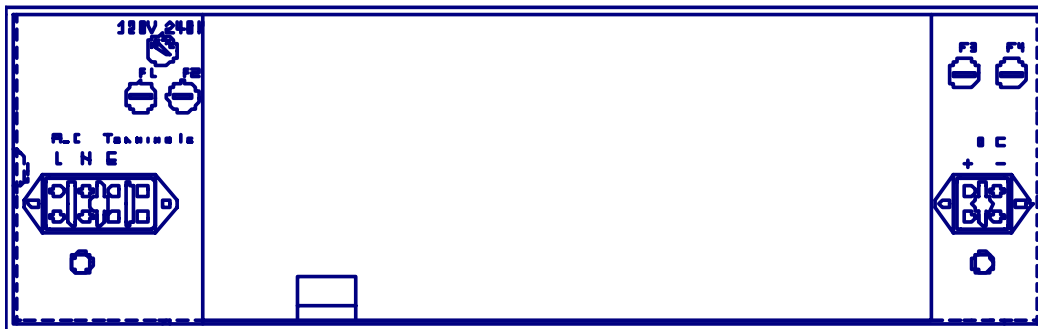
Figure 3-4 Power Connection

3.5   Exchange Connections

Connections between the exchange and the external equipment are through two part screw type connectors mounted on a printed circuit board located at the rear of the exchange (refer to Fig.3.5). All connections associated with a particular board are to a connector mounted directly behind that board.

PL01

PRINTER/RS232C   NOT USED

| B 107 A | B 106 A | B 105 A | B 104 A | B 103 A | B 102 A | B 101 A | B 100 A |

| B 115 A | B 114 A | B 113 A | B 112 A | B 111 A | B 110 A | B 109 A | B 108 A |

| B 123 A | B 122 A | B 121 A | B 120 A | B 119 A | B 118 A | B 117 A | B 116 A |

| B 131 A | B 130 A | B 129 A | B 128 A | B 127 A | B 126 A | B 125 A | B 124 A |

| B 139 A | B 138 A | B 137 A | B 136 A | B 135 A | B 134 A | B 133 A | B 132 A |

| B 147 A | B 146 A | B 145 A | B 144 A | B 143 A | B 142 A | B 141 A | B 140 A |

| B 155 A | B 154 A | B 153 A | B 152 A | B 151 A | B 150 A | B 149 A | B 148 A |

| B 163 A | B 162 A | B 161 A | B 160 A | B 159 A | B 158 A | B 157 A | B 156 A |

| B 171 A | B 170 A | B 169 A | B 168 A | B 167 A | B 166 A | B 165 A | B 164 A |

| B 179 A | B 178 A | B 177 A | B 176 A | B 175 A | B 174 A | B 173 A | B 172 A |

| B 187 A | B 186 A | B 185 A | B 184 A | B 183 A | B 182 A | B 181 A | B 180 A |

| B 195 A | B 194 A | B 193 A | B 192 A | B 191 A | B 190 A | B 189 A | B 188 A |

A & B = SPEECH PAIRS

951 | D C B A | D C B A | D C B A | D C B A | 948
951 | MF | MF | LD | LD | 948

955 | D C B A | D C B A | D C B A | D C B A | 952
955 | PAGER | SWB SWA MIC MIC | SWB SWA MIC MIC | SWB SWA MIC | 952

959 | D C B A | D C B A | D C B A | D C B A | 956 PL16
959 | MF | SWB SWA MIC MIC | MF | LD |

SATCOM   PUBLIC ADDRESS   SHORE   SHORE

SWA & SWB = CONTACT CLOSURES

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Fig 3.5 Exchange connections

3.6   RS232 Call Log Serial Interface Connections

These connections are provided by a two part screw terminal strip located behind the processor board at the rear of the exchange. Only pins 1 to 8 are used.

Pin	Signal
1	0V
2	Transmitted data from Marinex
3	Received data to Marinex (for Xon/Xoff control)
4	Ready To Send (RTS) - output from Marinex
5	Clear To Send (CTS) - input to Marinex
6	Data Set Ready (DSR) - input to Marinex (not used at present).
7	0V
8	Data Terminal Ready (DTR) - output from Marinex (always held high).

3.6.1   Printer Data Format

The RS232 call log interface is configured to operate at 9600 baud, no parity, 8-bit data and one stop bit.

3.7   Set-up Terminal Connections

The terminal used for setting up the Marinex is connected to a 25-way 'D' plug on the front of the processor card. To access this connector, it will be necessary to hinge down the front panel. The connections are as follows:

Pin	Signal
1	0V
2	Transmitted data from Marinex
3	Received data to Marinex
4	Ready To Send (RTS) – output from Marinex
5	Clear To Send (CTS) – input to Marinex
7	0V
20	Data Terminal Ready (DTR) - output from Marinex (always held high).

3.7.1   Terminal Data Format

The terminal port is configured to operate at 9600 baud, no parity, 8-bit data and one stop bit.

3.8   Engineering Checks

3.8.1   Installation Checks

Once the equipment has been installed, the Marinex exchange should be powered up and the indicators observed on the front panel to ensure that power is reaching the Marinex exchange. Only one indicator will light at any time as these show whether the exchange is operating from the AC or the DC supply.

A systematic check should now be made of all 'in-service' telephones to ensure that each telephone is capable of dialling another telephone and is capable of being dialled. The speech quality of each telephone should also be checked when each telephone is dialled.

Having checked the basic operation of each telephone, one of the officer class telephones should be used to check the operation of each external line and each facility listed in Chapter 2.

It is recommended that no special programming of the Marinex exchange should be performed until satisfactory operation of the complete system has been established.

In the event of a fault being found during the installation checks, the following engineering checks should prove useful in identifying the cause. Further help can be obtained by referring to the Fault Finding section in Chapter 5.

3.8.2   Bell Check

If you lift the receiver, dial *6, then replace the receiver, the telephone should ring to enable the amplitude and operation of the bell to be checked.

3.8.3   Extension Number Check

If you dial your own extension number a high pitched 'busy' ringing tone should be heard.

3.8.4   Off-Hook (locked out) Extensions

A print out of all off-hook (locked out) extensions can be obtained from the call logging port by dialling #83, provided officer class phones have this facility enabled.

3.8.5   Channels Out of Service

A print out of the channels out of service (either because not fitted, or faulty) can be obtained from the call logging port by dialling #86, provided officer class phones have this facility enabled.

3.9   Maintenance

3.9.1   Routine Maintenance

No routine maintenance is required for the Marinex exchange. Should the operation of any part of the system be in doubt, carry out the Engineering checks described in Section 3.8 above.

3.9.2   Battery Replacement

Any changes made to the facilities within the Marinex exchange will be stored in battery backed non-volatile memory on the Processor card. The battery is an 'in-socket' lithium cell with an expected life of 10 years. To replace the battery proceed as follows :

    ①   Remove power from the Marinex exchange, then unplug the processor card.

    ②   The battery is located in position IC13 on the processor card, with the memory plugged into the top of the battery. Unplug the memory chip and place on static free matting. Unplug the battery, then fit a new one in its place. The larger semi-circular cutout in the memory body should be at the end nearest the small capacitor. Plug the memory back into the new battery ensuring that the semi-circle cutout in the memory body is at the end nearest the small capacitor.

CAUTION: Extreme care must be taken when fitting the new battery and the memory, to ensure that all pins are correctly inserted into their sockets and not bent under. The Processor card contains static sensitive devices and additional care must be taken to ensure full anti-static precautions are taken when handling these devices.

    ③   Plug the Processor card back into the Marinex exchange, then power up the exchange. Any special facilities will need to be re-programmed as described in Chapter 4.

3.10   List Of Features

Callback	*6
Cancel Callback	**6
Call transfer	Momentarily press 'hook' switch, then dial extension.
Return to held call	*7
Return to dial tone	*4
Three Party Conversation	*5
Broker between second and third parties	*0
Call forward all calls	*3 + extension
Cancel call forward	**3
Remote Call forward all calls (follow me)	*2 + extension
Remote Cancel Call Forward	**2 + extension
Pickup ringing phone	*8 + extension
Group pickup	*9
Intrude on busy	*1
Alarm Set	*5 + Time (HHMM) 24 Hour
Cancel Alarm	**5
Self test ring back	*6
Set time	#84 + Time (HHMMSS)
Set date	#85 + Date (DDMMYY)
Reboot Exchange	#87
Restore Factory Configuration and Reboot Exchange	#88

Direct Dial

Direct dial Satcomms	61
Direct dial public address lines	62-65
Direct dial pager	66
Pick up night bell	8
Shore	9

When using an LD type telephone replace '*' with the number '69', and '**' with the number '60'. This only applies from the dial tone and not from the busy tone.

Call Forward Variants

The following variations are available when using the call forward (*3) function.

*3 6X + number	Call forward internal calls only
*3 7X + number	Call forward internal and external calls only
*3 8X + number	Call forward external calls only

Replace the X by the following number for additional functions

1 = All Calls

2 = On busy, not to a busy phone

3 = On busy unconditional

4 = Busy or no reply (busy only if called phone not busy)

5 = Busy or no reply unconditional

6 = No reply

7 = Cancel

8 = All Calls (If called phone not busy)

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Chapter 4 - Configuration Routines

4.1   Marinex Configuration

The Marinex is factory configured to provide the facilities described in Section 2.6. To reconfigure the Marinex to suit your requirements, it will be necessary to use the MARINAID utility program which is available on a floppy diskette and is described in a separate handbook. A terminal emulation utility is also provided as a part of the MARINAID program to enable an IBM PC (or compatible) to be used for programming the Marinex. It is recommended that these procedures are not implemented until satisfactory operation of the complete system has been fully established as described in the Installation checks given in Chapter 3.

4.2   Requirements

An IBM PC (or compatible) with a serial interface and the MARINAID program.

4.3   Marinex Terminal Emulation

This small routine allows an IBM PC or any IBM compatible computer to be configured to emulate a dumb terminal.

The PC must have Serial Port COM1.

The program will automatically configure the PC for baud rate/byte size etc.

F1 may be used at any time to terminate the program.

4.4   MARINAID

MARINAID is a software utility to enable you to re-configure the Marinex and Mini-Marinex. Full details about MARINAID are provided in the Marinaid User Manual which is available from Marine Communications Limited at the address given in the front of this handbook.

If the Marinex is re-configured by the user, it is recommended that a list of the new configuration is printed off from the MARINAID program (by selecting the "Comms Menu", then "Terminal Emulation", then "P-Print"). The new configuration details should then be kept with this manual for future reference.

4.5   MARSETUP

MARSETUP is a program contained in the Marinex memories to enable the user to configure the extensions and external lines. It is completely menu driven for ease of use and is provided with password protection.

To run MARSETUP connect the terminal to the 'D' connector on the front of the processor card (located behind the hinged front panel) and switch on.

The 'Q' key or <Ctrl> and 'C' keys can be used to break or abort from the program at any point.

The initial menu will offer the following options :

```
P - Print setup
C - Change setup
```

4.5.1   Print Setup

Press the 'P' key to print the setup. The menu will then offer the following options:

```
A - Print all
P - Print part
```

Press the 'P' key to print a selected part of the setup. Another menu will then be displayed as follows:

```
I - Installation
T - Tie lines
E - Extensions
S - Scan tables
D - Directories
G - Groups
W - Wiring list
```

Type the letter appropriate to the part required. You will then be offered the option to output the details to a printer (connected to the call logging port), or to output the details to the screen as follows:

```
P - Output to printer
S - Output to screen
```

Type 'P' or 'S' as required.

The information printed for each part offered in the menu will be as follows :

```
I - Installation
```

This will list the boards fitted to each slot as follows :

```
Slot  Board type   Handle colour

1     Tone         Green
2     Processor    Yellow ***Normally installed in this slot***
3     Extension    Red
           |
           |
17    Tie line     Blue
```

T - Tie lines

This will list the directory numbers alongside the designated extensions and state what the tie line has been designated as :

```
Directory   Designated    Comments
number      extensions


 903        104  600       Satcomm, MF outgoing signalling
 902        104  600       Public address
 901        104  600       Shore line, MF outgoing signalling
 907        104  600       Pager
```

E - Extensions

This will list the directory numbers showing the class of service configured.

```
Directory   Class of     Comments
number      service


100         A
101         A
102         B
555         B            *** EMERGENCY PHONE ***
```

S - Scan tables

This will show the directory numbers that will be scanned by each speech channel. It may be, for example, that speech channel 1 will be dedicated to just one directory number, whereas the remaining speech channels scan all directory numbers.

```
Speech      Directory
channel     numbers
───────

1           100

2           100   101   102   103   104   105   555   600
            200   201   202   203   204   205   206   207
            224   225   226   227   228   229   230   231
            900   901   902   903

3           100   101   102   103   104   105   555   600
            200   201   202   203   204   205   206   207
            224   225   226   227   228   229   230   231
            900   901   902   903
```

D - Directories

This will list the directory numbers that will be scanned for availability when the user dials 9 (for an outside line), or 6 (for P.A., Satcomm, etc). It will also list the numbers available for call parking.

```
DIAL 6 DIRECTORY

Dial        Directory
number      numbers
───────

61          903   919   935   951   975   991   879   895
62          902   918   934   950   974   990   878   894

DIAL 9 DIRECTORY

Dial        Directory
number      numbers
───────

9           900   901   908   909   910   911   914   915
9           916   917   924   925   926   927   930   931
```

```
CALL PARK DIRECTORY

Directory
numbers


500  501  502  503  504  505  506  507
508  509  510  511  512  513  514  515
```

G - Groups

This will print out the numbers allocated to the groups (if any).

W - Wiring list

This will list the plug and pin numbers to connect for each directory number and for the serial interface.

```
Plug        Pin         RS232 Serial
number      number      interface

───────     ───────

PL01        1           0V
PL01        2           TxD (Output from Marinex)
            |
            |
PL01        8           DTR (Output from Marinex - always high)


Plug        Pin         Directory
number      number      number

───────     ───────

PL02        1    2      100
PL02        3    4      101
```

4.5.2   Change Setup

If the option to change the setup is selected the user will be asked to enter a password. The factory configured password is 'RING'. Type the password then press the <Enter> key. The following menu will then be displayed :

```
R - Reboot
P - Change Password
F - Restore factory setup
T - Change Tie lines
E - Change Extensions
```

Selecting one of these options will have the following effect :

```
R - Reboot
```

This will reboot the exchange.

```
P - Change Password
```

Type 'P', enter the new password, then press the <Enter> key.

```
F - Restore factory setup
```

Press 'F' to restore the configuration to the factory configuration.

```
T - Change Tie lines
```

Selecting this option will display the details for the highest numbered tie line. Press 'H' to display the next menu as follows:

```
D - Change directory number
L - Shore line, LD signalling
M - Shore line MF signalling
S - Satcom, MF signalling
A - Public address
P - Pager
I - Direct dialling inwards
C - Change designated extension
2 - Change 2nd designated extension
0 - Remove 2nd extension
+ - Next equipment
- - Previous equipment
X - Save setup and exit
Q - Quit
```

Selecting one of these options by typing the appropriate letter will change details for the selected tie line to the description given for the option. To change the details for the other tie lines, use the + and - keys to select the required tie line, then select the appropriate option. When all the tie lines have been changed to suit your requirements, press 'X' to save the setup and exit from this menu. If you wish to exit without saving the new setup press 'Q'.

It should be noted that when performing changes to directory numbers using this program, no checks will be performed to prevent numbers being duplicated. The user is therefore advised to print out the setup on completion in order to check that no mistakes have been made.

E - Change Extensions

Entering 'E' at the previous menu will display the details for the first extension fitted. Press 'H' to display the next menu as follows :

```
D - Change directory number
A - Class of service A
B - Class of service B
E - Emergency phone
N - Night bell
+ - Next equipment
- - Previous equipment
X - Save setup and exit
Q - Quit
```

Selecting one of these options by typing the appropriate letter will change the details for the selected extension to the description given for the option. To change the details for other extensions, use the + and - keys to select the required extension, then select the appropriate option. When all the extensions have been changed to suit your requirements, press 'X' to save the setup and exit from this menu. If you wish to exit without saving the new setup press 'Q'.

Note that if the emergency phone or night bell option is selected, the directory number pre-configured for that facility will automatically be displayed in place of the selected extension number.

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Chapter 5 - Fault Finding

The following information is intended to assist with fault finding to module level only. All Marinex exchanges and modules are fully tested before despatch from the factory. Should problems be experienced when the exchange is first powered up, you are therefore advised to carefully check all wiring and the presence of power supplies before proceeding. **NO MODULE SHOULD BE REMOVED FROM, OR INSERTED INTO THE MARINEX EXCHANGE WHILST THE EXCHANGE IS POWERED UP.** The Marinex exchange contains static sensitive devices and special anti-static precautions should therefore be exercised when handling the Marinex modules.

5.1   All Telephones Dead

If no sound can be heard at the telephone ear piece when you blow into the mouth piece, then the telephone is considered to be dead. If all telephones exhibit this fault :

①   Check that the Marinex exchange is powered up and that the power indicators are lit on the front of the Ringing card. If they are not lit, check the fuses. If the fuses are correct, replace the Ringing card. If the fault persists replace the Power card.

②   If the indicators on the Ringing card are lit, check that the Subscriber cards align with the cable connections to the terminals at the rear of the Marinex exchange. Re-wire as necessary.

5.2   One Telephone Dead

If the symptoms are as described above for one telephone only :

①   Check the wiring to the telephone. Check the operation of the telephone on another extension. Replace as necessary.

②   Check that the appropriate LED on the front of the Subscriber card lights when the telephone is 'off-hook'. If it does not, replace the Subscriber card.

5.3   All Telephones Live, But No Dial Tone

Sound can be heard at the ear piece when you blow into the mouth piece, but no dial tones can be heard when calling another telephone. If all telephones exhibit this fault :

①   Check that the Marinex exchange is powered up and that the power indicators are lit on the front of the Ringing card. If they are not lit, check the fuses. If the fuses are correct, replace the Ringing card. If the fault persists replace the Power card.

②   If the bottom two power indicators are lit, (the third one only comes on when a phone is ringing), then remove all red and blue handled card *(after turning the power off)*. On the red handled cards check along the bottom of the card for IC23 with the number 230003 on it. A faulty board will probably have this IC label burnt.

③   If you cannot find one with a burnt label then insert one board back into the exchange in the left hand slot next to the yellow handled board and see if there is a dial tone on any of the extensions connected to that board (normally 100-107). If there is a dial tone then that board is OK. Continue to check each of the red handled boards, *turning the power off each time*.

④   Repeat this exercise with the blue handled boards where IC34 numbered 230005 may be faulty. The blue board is less likely to have failed than the red board.

⑤   Also check the programming of the scan ranges and the in/out of service telephones. The factory set configurations are listed in Chapter 2. If you have re-programmed the Marinex exchange, refer to Chapter 4 and print out the current configuration.

⑥   If the programming appears correct, replace the Processor card, but note that any special programming for your exchange will need to be repeated.

⑦   If the problem still exists, replace the Tone and DTMF card.

5.4   One Telephone Live, But No Dial Tone

If symptoms as described above for one telephone only :

①   Check the programming of the scan ranges and the in/out of service telephones. Check if extension set to 'night bell'. The factory set configurations are listed in Chapter 2. If you have re-programmed the Marinex exchange, refer to Chapter 4 and print out the current configuration.

②   Check the wiring to the telephone. Check the operation of the telephone on another extension. Replace as necessary.

③   Replace the Subscriber card.

5.5   Wrong Extension Obtained When Dialling

①   Check if 'call forward' set on telephone.

②   Check the directory to the equipment numbers. Re-allocate the number or re-wire the extension.

③   Check all wiring from the backplane through to the telephone.

5.6 Telephone Always Busy When Dialled

①   Check if 'call forward' set on telephone.

②   Check the wiring to the telephone. Check the operation of the telephone on another extension. Replace as necessary.

③   Check that the appropriate LED on the front of the Subscriber card lights when the telephone is 'off-hook'. If it does not, replace the Subscriber card.

5.7 Telephone Always Unobtainable When Dialled

①   Check the programming of the scan ranges and the in/out of service telephones. Check if extension set to 'night bell'. The factory set configurations are listed in Chapter 2. If you have re-programmed the Marinex exchange, refer to Chapter 4 and print out the current configuration.

②   Check the directory to the equipment numbers. Re-allocate the number or re-wire the extension.

③   Check all wiring from the backplane through to the telephone.

④   Check the wiring to the telephone. Check the operation of the telephone on another extension. Replace as necessary.

⑤   Check that the appropriate LED on the front of the Subscriber card lights when the telephone is 'off-hook'. If it does not, replace the Subscriber card.

5.8 All Telephones Fail to Ring, But Ring Tone can be Heard by Caller

①   Check if 'ringing' indicator on front of Ringing card is illuminated. If not, replace Ringing card.

②   If fault still present, replace Processor card.

③   If installing new system, ensure all telephones do not have the bell turned off. Check also, if 'master' boxes required for telephone connection, and check the wiring of the telephones.

5.9 One Telephone Fails to Ring, But Ring Tone can be Heard by Caller

①   Check destination telephone by dialling *6 (self test). If phone rings, check directory to the equipment numbers.

②   Check if the bell is turned off on the telephone. Check the wiring to the telephone. Check the operation of the telephone on another extension. Replace as necessary.

③   Check if a 'master' box is required for the telephone connection.

④   Replace the Subscriber card.

5.10   Intermittent Dial Tone

①   Check if 'call forward' or 'call transfer' has been selected. The dial tone will automatically change to intermittent when these features have been selected, or during self test.

②   Check if dialling has been disabled. This is usually the case with emergency telephones.

5.11   Crosstalk on Conversation

①   Check for intrusion from officer class telephone.

②   Check if telephone set up as an emergency telephone, since this facility allows any other telephone to intrude on a current call.

③   Check the wiring. This is the most probable cause in a new installation.

④   Change the appropriate Subscriber card.

5.12   Unable to Obtain Shore Line.

①   Check that the line is connected correctly right through from the Marinex to the shore based exchange. If there is a break in the line, the Marinex will give an 'unobtainable' tone.

②   Check the programming to verify that the shore line is set and programmed correctly. The factory set configurations are listed in Chapter 2. If you have re-programmed the Marinex exchange, refer to Chapter 4 and print out the current configuration.

③   Change the Exchange card.

5.13   Incoming Call Not Received

①   Check that the designated telephone is connected and operating correctly. If a night bell has been selected, check that this is operating correctly.

②   Check for 'call forward' of external calls.

③   Check the programming of the shore lines and the scan ranges. The factory set configurations are listed in Chapter 2. If you have re-programmed the Marinex exchange, refer to Chapter 4 and print out the current configuration.

④   Change the exchange card.

5.14   Call Logging Not Outputting Data

①   Check that the printer is connected correctly and that the cable is plugged into the serial port and not the parallel port. It is important that transmitted data (pin 2) from the Marinex is connected to the printer receive data line and that the handshaking lines are correctly connected to enable output when the printer is 'ready'.

②   Check that the printer is set up to operate at 9600 baud with no parity, 8-bit data and one stop bit.

③   Check that the printer has paper, a useable ribbon and is 'on-line'.

④   Check that the printer has not output Xoff control characters.

⑤   Change the Processor card.

5.15   Loss or Change of Facilities

①   Refer to Chapter 4 and print out the current configuration to check that the facilities have changed.

②   If they have changed, this is probably due to a failure of the battery support for the non volatile RAM on the Processor card and will only be apparent after the Marinex has been powered down. The expected life of the battery is 10 years, so failure is unlikely during this period. Refer to Chapter 3 for detail of how to change the battery.

③   If the fault persists, replace the Processor card then re-program any special facilities.

5.16   PA Not Operating Correctly

①   Early Marinex telephone exchanges fitted with issue 2 Exchange cards may exhibit a fault when using the PA system. This problem is restricted to PA systems using issue 2 cards only. The fault can be rectified by fitting two small links across the bridge rectifier in the appropriate exchange circuit. The links connect the + to one AC terminal and the - to the other AC terminal on the bridge rectifier. If in doubt please return the card for a free replacement.

5.17   Loss of Facilities

①   Early Marinex exchanges fitted with issue 2 Processor cards may on very rare occasion loose stored programming information when the exchange is completely powered down. The fault is due to a problem with the reset circuit and should not occur during normal operation. If the problem does occur, re-program the Marinex exchange.

5.18   Tone Distortion

①   Early Marinex exchanges fitted with issue 2 Tone and DTMF cards may exhibit minor distortion of the tones under certain conditions. Exchanges fitted with these cards may also have difficulty in recognising the DTMF tones from some types of telephone. Should you experience difficulties, please return the Tone and DTMF card for a free replacement.

Chapter 6 - Technical Details

6.1   System Detail

6.1.1   Description

The Marinex telephone exchange is built within a 3U eurocard rack, fitted into a 19" instrument case. The exchange has a modular construction, consisting of eight electrical components in four groups, these are :

1 - Processor Card   )
2 - Tone And DTMF Card   ) Plug in cards with a 96 way connector
3 - Subscriber Card   )
4 - Exchange Card   )

5 - Ringing Board   ) Plug in cards with a 64 way connector
6 - Power Supply Card   )

7 - Motherboard/Backplane   ) Connectors only – no electronic components

8 - Power Supply Chassis   ) Non PCB assembly

Many of the cards used within the Marinex exchange are multilayer PCB, and should not be repaired by inexperienced personnel. They contain static sensitive components, which must be handled in accordance with proper procedures for such devices.

In any case of doubt, the whole card should be returned in a static protective bag.

The Ringing board, and Power supply card are bolted together to form a module, which is fitted in all units, along with the Tone & DTMF board, and the Processor card. The Tie Line boards, Subscriber cards, Tone & DTMF boards, and Processor cards can be easily identified by the varying coloured handles. These boards can be fitted into the exchange in any formation, although it is advisable to fit any additional cards in the locations as shown in Chapter 3, figure 3.3.

6.1.2   Operation

A block diagram of the complete Marinex Exchange system is shown in figure 5.1

Operation of the Marinex exchange is controlled by the Processor card which contains a microprocessor together with its associated memories and buffering. The microprocessor is controlled by instruction codes held in the read only memories and by user set-up sequences held in volatile random access memory. Control signals and addresses are generated by the microprocessor to select the subscriber and exchange lines and enable generation of the dialling and tone sequences. Two RS232 interfaces are also provided on the Processor card for the programming port and for the call logging/printer output. Control of these ports is maintained by the microprocessor.

All telephones are connected through terminal strips on the motherboard to a number of Subscriber cards, each of which can accept upto eight 2-wire telephone connections. The Subscriber cards provide the 'phone off-hook' detection and address decoding circuits for the telephones, switch the ringing voltages onto the lines and route the audio speech signals.

Connections to the shore exchanges, satcomm equipment and ship PA systems are made through terminal strips on the motherboard to Exchange cards. These cards accept upto four 4-wire lines and provide isolation for the speech signals through miniature on-board transformers. The Exchange cards also provide DTMF signal generation, address decoding and routing for the audio speech signals.

A total of eight or sixteen speech paths are available within the Marinex exchange and all audio speech signals are routed between the Subscriber and Exchange cards through connections on the motherboard.

The audio dialling and signalling tones are generated on the Tone and DTMF card in response to control signals from the Processor card and are routed via the motherboard to the speech paths. The Tone and DTMF card also decodes DTMF dialling tones received from modern telephones.

The ringing and bias voltages for the telephones are generated on the Ringing card which forms part of the Power Supply module. A 24V DC bias voltage is provided for detection of 'phone off-hook' and a 75V AC voltage is provided for telephone ringing. These voltages are switched to the telephones by optically isolated relays on the Subscriber cards.

The Power Supply module enables operation from either a 110-130V/ 220-260V 50-60 Hz AC supply or a 21.6-26.4V DC supply. With both AC and DC supplies present, the Marinex will automatically switch to operation from the DC supply in the event of the AC supply failing.

All DC voltages required to operate the Marinex exchange are generated by a switch mode card within the Power Supply module.

6.1.3   System Modules

It is recommended that repair and service of the Marinex exchange should be on a module replacement basis only. When ordering replacement modules please quote the Marine Communications Limited part code listed here.

mcl Part No	Description
A402300	Processor card (Version 02.0x firmware)
A402300/3B	Processor card (Version 02.1x firmware)
A402302	Tone and DTMF card
A402303/3	Subscriber card
A402304/3	Exchange card
A402305	Ringing card
291781	Power supply card
A500112	Power supply chassis
A402301	Motherboard
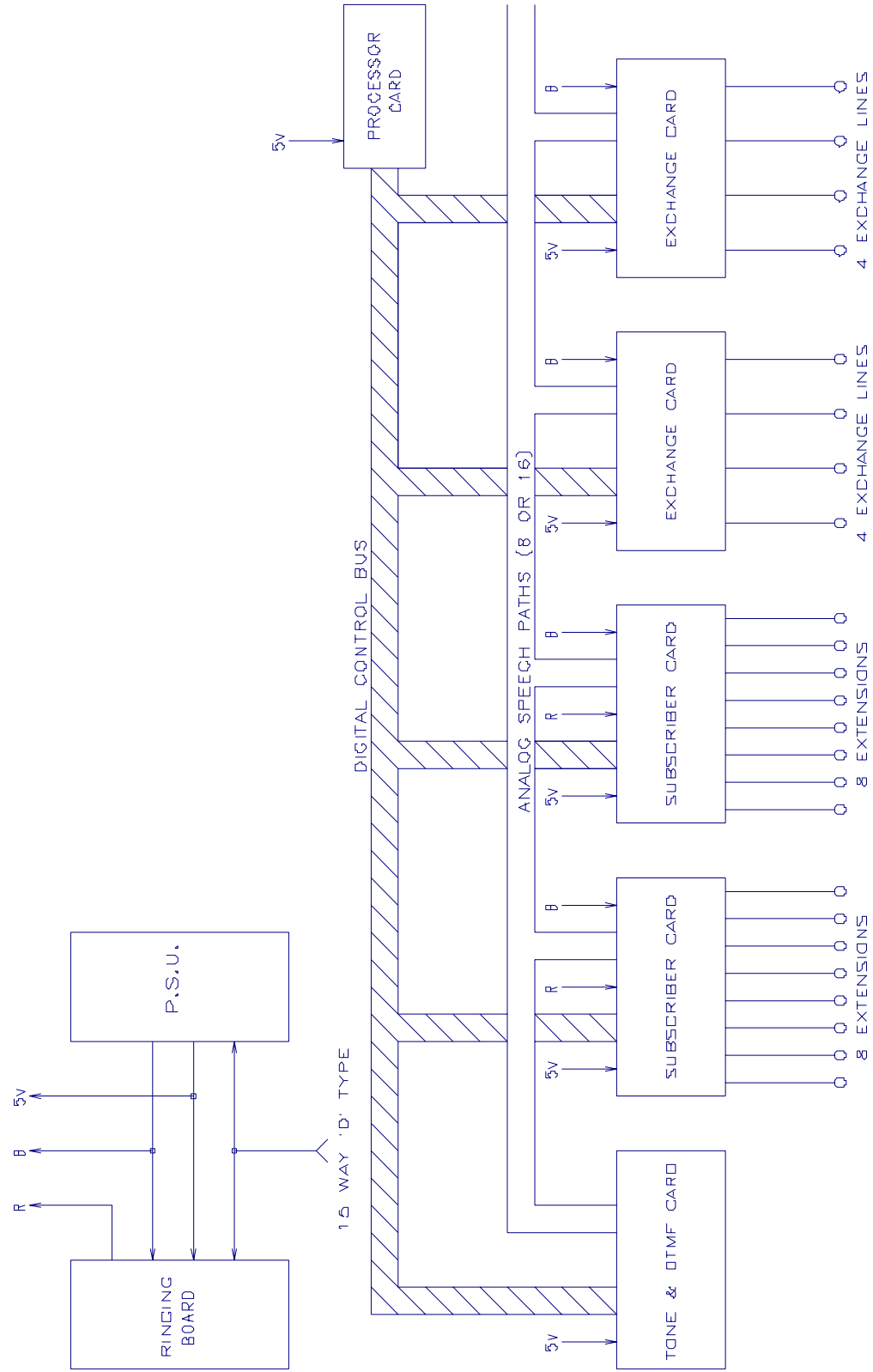
Fig. 5.1 MARINEX SYSTEM BLOCK DIAGRAM

6.2   Processor Card

6.2.1   Description

A block diagram of the Processor card is shown in figure 5.2, followed by a schematic diagram.

The processor card is based on the Hitachi HD64180 microprocessor chip. It controls all the functions of the exchange. There are three memory devices on the card. These are:

1 -   The EPROM containing the functional instruction code for the processor and the default or factory set Marinex Configuration or set-up.
2 -   The RAM used by the processor as workspace during operation and containing a working copy of the configuration (loaded after reset).
3 -   The Non Volatile RAM containing the configuration once modified from the factory settings. This copy is maintained during power down periods by a lithium battery located in the base of the socket under the integrated circuit. This socket also keeps the time and date information.

The address and data signals between the processor and the other cards are buffered on this card.

The RS232 interfaces are both generated on this card - one going out to the motherboard to provide the printer interface, and the other on the front of the card for configuring the exchange.

There are two LED on the edge of the card which should be extinguished during normal operation. If they flash alternatively on power up this indicates a failure during the RAM test.

The Processor card has the Marine Communications part number of A402300, and can be identified in the unit as being fitted with a yellow handle.

Fig. 5.2 MARINEX PROCESSOR CARD BLOCK DIAGRAM

6.2.2   Processor Card Components

Part No	Description	Reference
250932	Capacitor Multilayer Ceramic 100nF 50V	C1, C5-C16
250404	Capacitor Tantalum 22mF 15V	C2, C17
250913	Capacitor Single Layer Ceramic 33pF 63V	C3, C4
291526	LED High Intensity Standard Green HLMP1502	D1
291525	LED High Intensity Standard Red HLMP1302	D2
277692	IC Interface MAX235	IC1
275134	IC Microprocessor HD64180-4B	IC2
274950	IC CMOS Micro Monitor Dallas DS1232	IC3
274932	IC CMOS 74HC244	IC4, IC5, IC8, IC11
230001	IC PAL 18CV8 Marinex PROC V1.0	IC6
231001	IC EPROM 27C256 Marinex PROC V2.2	IC7
274935	IC CMOS 74HC374	IC9
275497	IC Memory RAM V62C256P15L	IC10
274947	IC CMOS 74HC138	IC12
274938	IC Real Time Clock 1216	IC13
274944	IC Static RAM 8KX8 6264	IC13
291051	Tinned Copper Wire 22SWG	J2 Pins 2 & 3, 4 & 5, 6 & 7 J3 Pins 1 & 2, 3 & 4, 6 & 7 J5 Pins 1 & 2
240384	Connector Header Single Row Unshrouded Straight 3 Way	J4
240364	Connector Plug DIN41612 96/96	PL1
240146	Connector 'D' Socket Right Angle 25 Way	PL2
255474	Resistor Metal Film .4W 5% 470K	R1
255472	Resistor Metal Film .4W 5% 4K7	R2
255331	Resistor Metal Film .4W 5% 330R	R3, R6
255102	Resistor Metal Film .4W 5% 1K	R4, R5
258059	Resistor Network SIL 8W9P 100K	RN1,RN2,RN4-RN6,RN12
258197	Resistor Network SIL 4W8P 56R	RN3, RN7-RN11
268325	Crystal HC18U 12.288MHz	X1
296070	Flexible Card Handle Yellow	

The circuit diagrams can be found at the back of the manual.

6.3   Tone And DTMF Card

6.3.1   Description

A block diagram of the Tone and DTMF card is shown in fig 5.3, followed by a schematic diagram.

The Tone and DTMF card has been designed to support eight speech channels with a sixteen speech channel card to follow based on the design of the eight channel card. It is the only 96 way card to have no external connections. The card performs two functions. Firstly it generates call progress tones such as ring, dial, busy and unobtainable and secondly it decodes the DTMF dialling tones received from modern phones.

IC22 is used for board position decoding and IC21 is used to decode the remaining addresses, read and write signals. IC31 is a latch and latches incoming data from the processor whilst IC27 is a buffer for sending data to the processor. IC30 controls DTMF receiver output enables DE0 - DE14 and IC28 & IC29 select 1 of 8 of the DTMF valid data strobes DS0 - DS14. IC34 latches data into the call progress tone generators. IC32 & IC33 control the analog switches that switch tones on and off to the speech channel.

The remaining part of the system (Circuit Diagram Sht.2) can be divided into eight similar speech circuits, of which one is examined here. For speech channel 0, IC5 is the call progress tone generator which is AC coupled by C5. RN17 is needed as IC5 has an open emitter output. IC10 is a buffer amplifier whose gain is set by RN5 and RN7 with C18 filtering out high frequencies. RN6 is used to give unity gain from the second part of IC10. RN9 and RN10 provide 600 ohm matching with IC6 acting as an on/off switch. The DTMF receiver is less complicated with RN1 and RN2 controlling the gain and C1 and RN11 controlling the response characteristic of IC1 the DTMF receiver.

The board has the Marine Communications Limited part number of A402302, and can be identified in the unit as being fitted with a green handle.
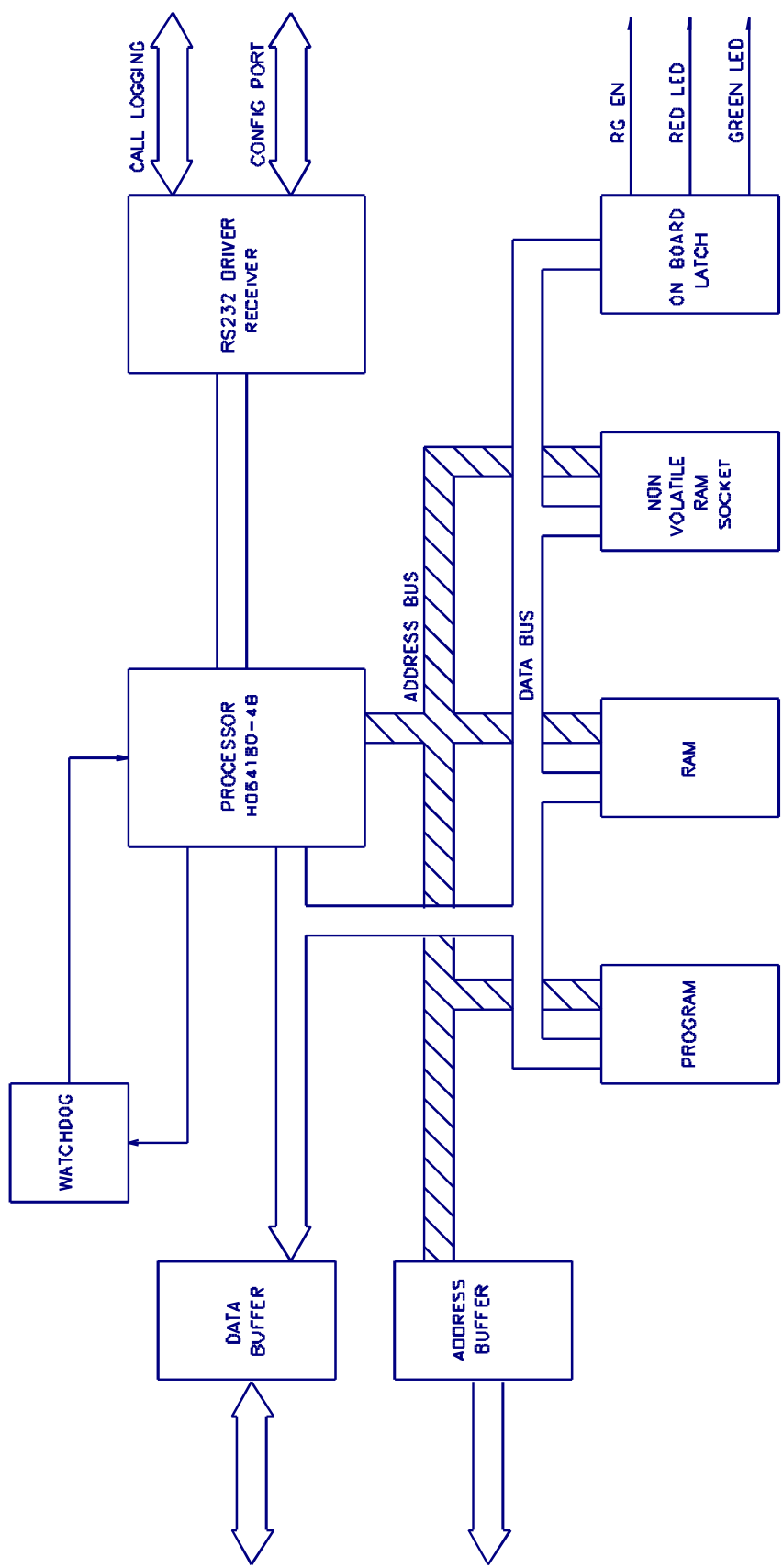
48
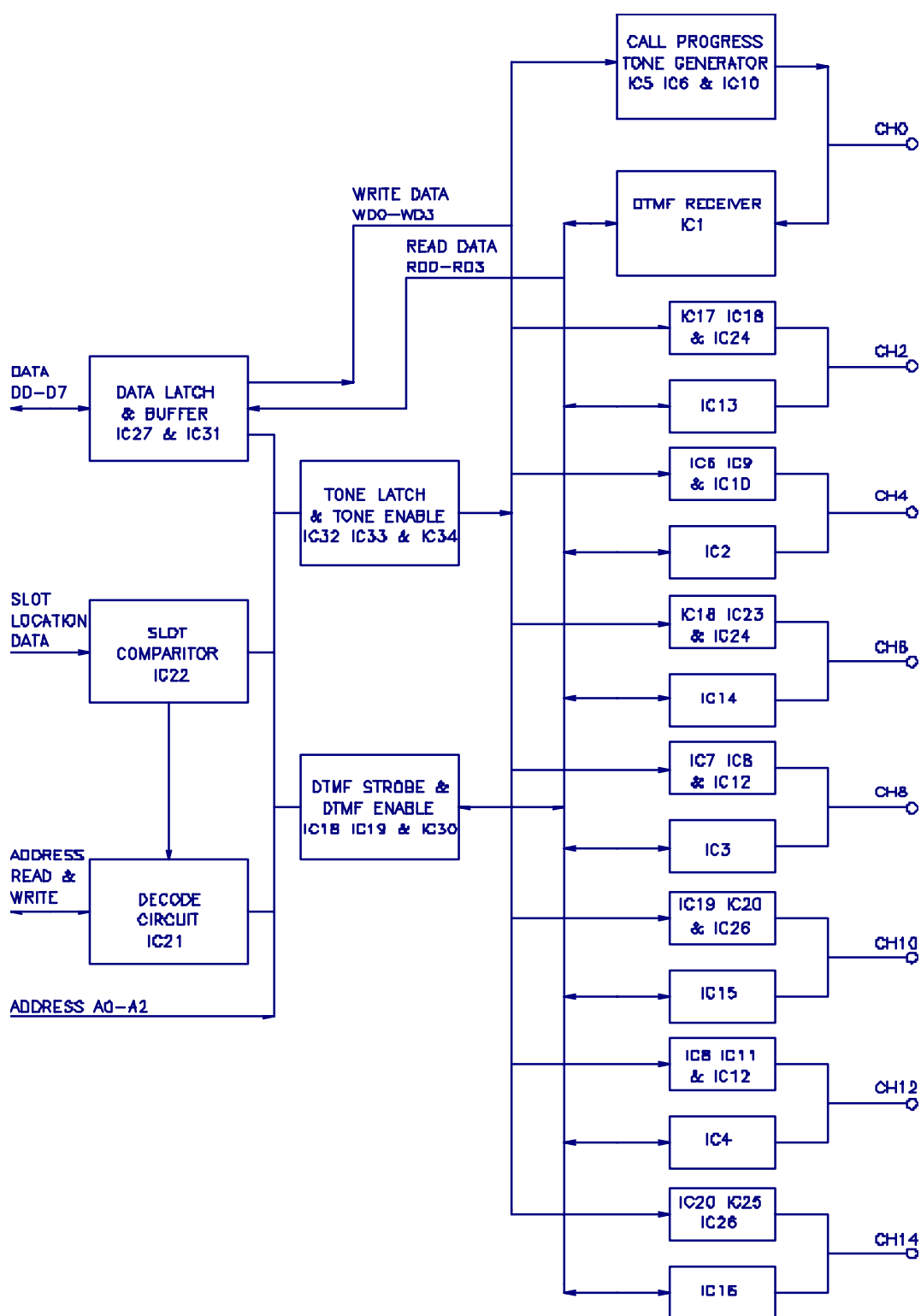
Fig. 5.3 MARINEX TONE & DTMF CARD BLOCK DIAGRAM

6.3.2   Tone And DTMF Card Components

Part No	Description	Reference
250948	Capacitor Multilayer Ceramic 100nF 50V	C1-C4, C7-C14, C24-C27, C33-C40, C47-C50, C52, C53, C60-C66, C69, C72-C75
250958	Capacitor Multilayer Ceramic 220nF 50V	C5, C6, C22, C23, C45, C46, C58, C59
250913	Capacitor Single Layer Ceramic 33pF 63V	C15-C17, C20, C21, C30, C31, C41-C44, C56, C57, C70
250961	Capacitor Multilayer Ceramic 2200pF 50V	C18, C19, C28, C29, C54, C55, C67, C68
250404	Capacitor Tantalum 22mF 16V	C32, C51, C71
274940	IC DTMF Receiver MT8870	IC1-IC4, IC13-IC16
274942	IC DTMF Generator M991	IC5, IC7, IC9, IC11, IC17, IC19, IC23, IC25
274936	IC CMOS 4066	IC6, IC8, IC18, IC20,
268112	IC CMOS Op Amp LM324	IC10, IC12, IC24, IC26
230002	IC PAL 18CV8 Marinex TONE V2.0	IC21
274931	IC CMOS 74HC85	IC22
274932	IC CMOS 74HC244	IC27
274933	IC CMOS 74HC251	IC28, IC29
274937	IC CMOS 74HC4514	IC30, IC34
274948	IC CMOS 74HC373	IC31
274934	IC CMOS 74HC259	IC32, IC33
240364	Connector Plug DIN41612 96/96	PL1
258044	Resistor Network SIL 4W8P 100K	RN1-RN4, RN13, RN14-RN16
258091	Resistor Network SIL 4W8P 10K	RN5, RN6, RN8, RN20, RN21, RN23
258212	Resistor Network SIL 4W8P 27K	RN7, RN22
258211	Resistor Network SIL 4W8P 270R	RN9, RN10, RN18, RN19
258199	Resistor Network SIL 4W8P 330K	RN11, RN12
258198	Resistor Network SIL 8W9P 2K2	RN17
258059	Resistor Network SIL 8W9P 100K	RN24, RN26RN27, RN29
258204	Resistor Network SIL 8W9P 4K7	RN25
258197	Resistor Network SIL 8W9P 56R	RN28, RN30
268324	Crystal HC18U 3.579MHz	X1, X2
296069	Flexible Card Handle Green	

The circuit diagrams can be found at the back of the manual.

6.4   Subscriber Card

6.4.1   Description - Issue 1 PCB

A block diagram of the Subscriber (extension) card is shown in figure 5.4, followed by a schematic diagram.

The Subscriber card provides the interface to eight 2-wire telephone connections made via the motherboard. This card provides the necessary D.C. bias to the phone and detects the on/off hook status of the phone via the mean D.C. level detection circuit. It detects the pulse dialling information from the older loop disconnect telephones (using the D.C. current detection circuit), and it switches ringing voltage onto the telephone lines to ring the bell or buzzer of the phone. Lastly is routes the audio speech signal onto the speech channels of the backplane via the speech channel matrix IC1-IC4.

IC19 is used to decode the board position and IC18 (a PAL) decodes the remaining addresses, read and write signals. IC23 buffers data and low order addresses onto the card from the processor whilst IC22 buffers data out of the card to the processor.

The two detection circuits are opto isolated as are the relay drive circuits. The relay drive data is latched into IC15. The detection data is selected via IC24 for loop current and via IC20 for mean D.C. level.

Since the eight subscriber interfaces are similar, only subscriber 0 is described here. From the speech channel matrix, the audio signal is high frequency filtered by C32 and C33. It is voltage limited by D29, D30, D39 and D40 and biased to mid rail voltage (2.5 volt) by RN13 and RN15. C1 and C4 provide A.C. coupling (D.C. isolation) to the basic phone interface. BR1 protects against external voltage surges. RN4 and C52 provide the mean D.C. level detection and are compared using IC25 to a preset voltage (set by R33 and R34 for all eight circuits). This averaging prevents false tripping during ringing when only A.C. current is flowing through the phone. Bias to the telephone is via R19 on the B line and via RN2, RN1, D10 and IC6 on the A line. The latter forming the D.C. current detect circuit. R1 and R2 act as a current limit. During ring, RL1 is switched on and the ringing voltage and bias is supplied through R17 instead of R19.

There are eight indicators on the front of the card that light when a telephone is 'off-hook'. The top indicator corresponds to the telephone connected to the top terminals, through to the bottom indicator which corresponds to the telephone connected to the bottom terminals.

The board has the Marine Communications part number of A402303, and can be identified in the unit as being fitted with a red handle.
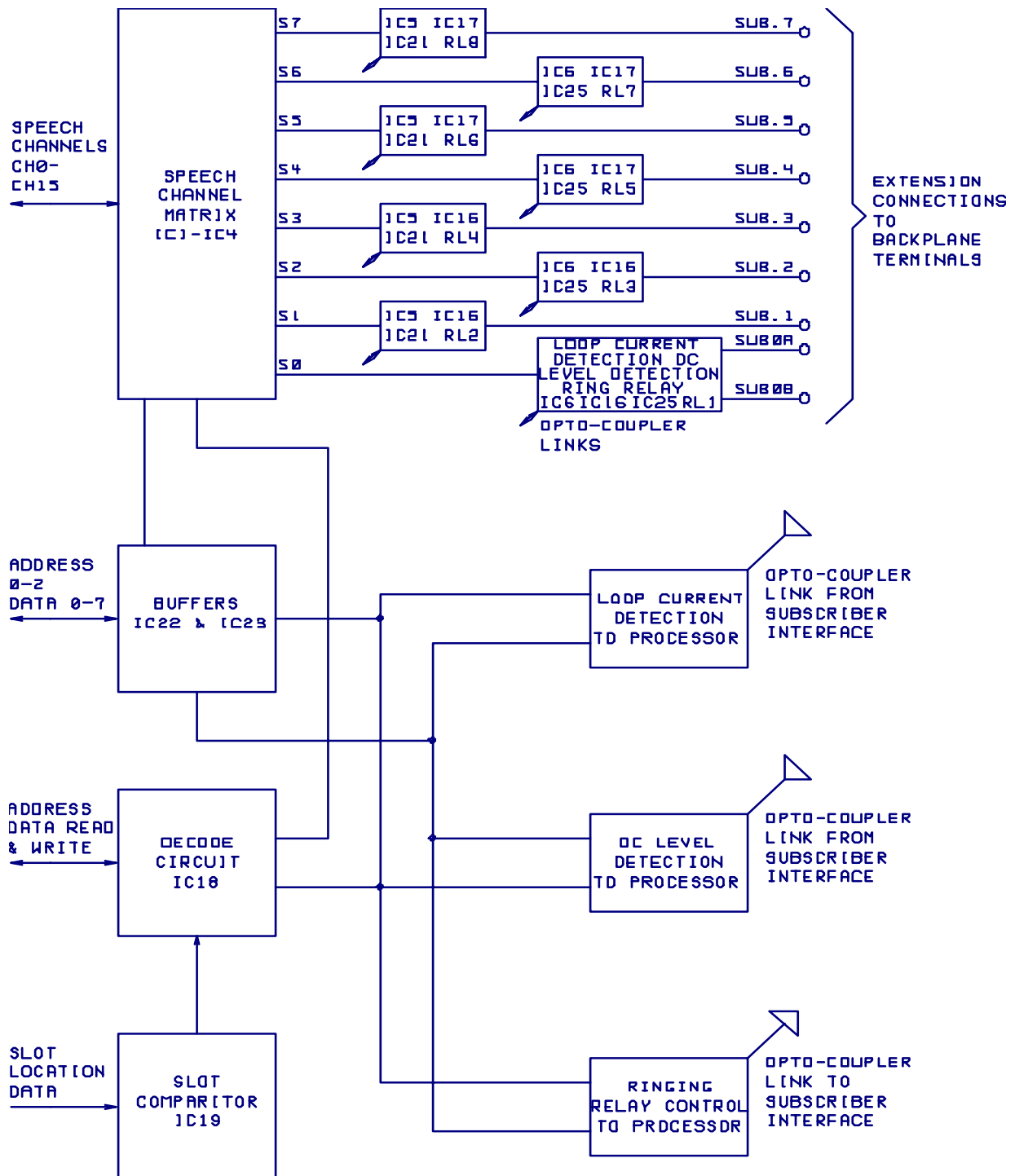
Fig. 5.4 MARINEX SUBSCRIBER CARD BLOCK DIAGRAM

6.4.2   Description - Issue 2 and 3 PCB

The Subscriber card provides the interface to eight 2-wire telephone connections made via the motherboard. This card provides the necessary D.C. bias to the phone and detects the on/off hook status of the phone via the mean D.C. level detection circuit. It detects the pulse dialling information from the older loop disconnect telephones (using the D.C. current detection circuit), and it switches ringing voltage onto the telephone lines to ring the bell or buzzer of the phone. Lastly is routes the audio speech signal onto the speech channels of the backplane via the speech channel matrix IC9-IC12.

IC21 is used to decode the board position and IC23 (a PAL) decodes the remaining addresses, read and write signals. IC24 buffers data and low order addresses onto the card from the processor whilst IC26 buffers data out of the card to the processor.

The two detection circuits are opto isolated as are the relay drive circuits. The relay drive data is latched into IC22. The detection data is selected via IC27 for loop current and via IC28 for mean D.C. level.

Since the eight subscriber interfaces are similar, only subscriber 0 is described here. From the speech channel matrix, the audio signal is high frequency filtered by C18. It is voltage limited by D25 and D27 and biased to mid rail voltage (2.5 volt) by RN3 and RN4. T1 and C2 provide A.C. coupling (D.C. isolation) to the basic phone interface. RN7 and C24 provide the mean D.C. level detection and are compared using IC14 to a preset voltage (set by R35 and R36 for all eight circuits). This averaging prevents false tripping during ringing when only A.C. current is flowing through the phone. Bias to the telephone is via R3 and TR2 on the B line and via R2 and TR1 on the A line. During ring, RL1 is switched on and the ringing voltage and bias is supplied through R1 and R4.

There are eight indicators on the front of the card that light when a telephone is 'off-hook'. The top indicator corresponds to the telephone connected to the top terminals, through to the bottom indicator which corresponds to the telephone connected to the bottom terminals.

The board has the Marine Communications part number of A402303, and can be identified in the unit as being fitted with a red handle.

6.4.3   Subscriber Card Components Issue 1

Part No	Description	Reference
259004	Bridge Rectifier 40V 1.2A 1KAB10E	BR1-BR8
250960	Capacitor Multilayer Ceramic 1mF 50V	C1-C16, C48-C55
250618	Capacitor Radial Electrolytic 100mF 35V	C17
250932	Capacitor Multilayer Ceramic 100nF 50V	C18-C26, C44-C47
250404	Capacitor Tantalum 22mF 15V	C27
250911	Capacitor Single Layer Ceramic 10nF 63V	C28-C43
259224	Diode Signal 75V 100mA BAW62	D1-D16
291525	LED High Intensity Standard Red HLMP1302	D17-D24
259202	Diode Zener BZY88C 4V7	D25-D56
274939	IC Analog Switch MT8812	IC1-IC4
268612	IC Quad Opto Isolator ISQ74	IC5, IC6, IC16, IC17
268616	IC Opto Isolator 4N33	IC7-IC14
274934	IC CMOS 74HC259	IC15
275495	IC Memory PAL 18CV8	IC18
274931	IC CMOS 74HC85	IC19
274933	IC CMOS 74HC251	IC20, IC24
268117	IC Op Amp LM348	IC21, IC25
274932	IC CMOS 74HC244	IC22, IC23
240364	Connector Plug DIN41612 96/96	PL1
255100	Resistor Metal Film .4W 5% 10R	R1-R16
255391	Resistor Metal Film .4W 5% 390R	R17-R32
252222	Resistor Metal Film .6W 1% 2K2	R33
252273	Resistor Metal Film .6W 1% 27K	R34
251031	Relay DIL Changeover 24V D.C.	RL1-RL8
258202	Resistor Network SIL 8W9P 560R	RN1
258203	Resistor Network SIL 8W9P 1K2	RN2
258200	Resistor Network SIL 4W8P 220K	RN3, RN4
258140	Resistor Network SIL 8W9P 680R	RN5
258197	Resistor Network SIL 4W8P 56R	RN6, RN17
258059	Resistor Network SIL 8W9P 100K	RN7, RN10-RN12
258092	Resistor Network SIL 8W9P 10K	RN8, RN18
258204	Resistor Network SIL 8W9P 4K7	RN9
258144	Resistor Network SIL 8W9P 22K	RN13-RN16
296068	Flexible Card Handle Red	

The circuit diagrams for issue 1 PCBs are available on request

6.4.4   Subscriber Card Components Issue 2

Part No	Description	Reference
250412	Capacitor Tantalum 10mF 35V	C1
250368	Capacitor Radial Electrolytic 22mF 63V	C2-C9
250964	Capacitor Radial Electrolytic 100mF 25V	C10
250932	Capacitor Multilayer Ceramic 100nF 50V	C11-C14, C31-C34, C36-C42
250911	Capacitor Single Layer Ceramic 10nF 63V	C15-C22
250968	Capacitor Multilayer Ceramic 470nF 50V	C23-C30
250404	Capacitor Tantalum 22mF 15V	C35
259224	Diode Signal 75V 100mA BAW62	D1-D8
259226	Diode Reference T092 2.5V REF25Z	D9-D24
259202	Diode Zener BZY88C 4V7	D25-D40
291525	LED High Intensity Standard Red HLMP1302	D41-D48
268616	IC Opto Isolator 4N33	IC1-IC8
274939	IC Analog Switch MT8812	IC9-IC12
268612	IC Quad Opto Isolator ISQ74	IC13, IC16, IC17, IC20
268117	IC Op Amp LM348	IC14, IC15, IC18, IC19
274931	IC CMOS 74HC85	IC21
275934	IC CMOS 74HC259	IC22
230003	IC PAL 18CV8 Marinex SUBS V1.0	IC23
274932	IC CMOS 74HC244	IC24, IC26
277694	IC MAX633B	IC25
274933	IC CMOS 74HC251	IC27, IC28
296245	Inductor Ferrite Fixed 470mH	L1
240364	Connector Plug DIN41612 96/96	PL1
255391	Resistor Metal Film .4W 5% 390R	R1, R4, R5, R8, R9, R12, R13, R16, R17, R20, R21, R24, R25, R28, R29, R32
255680	Resistor Metal Film .4W 5% 68R	R2, R3, R6, R7, R10, R11, R14, R15, R18, R19, R22, R23, R26, R27, R30, R31
255103	Resistor Metal Film .4W 5% 10K	R33
255331	Resistor Metal Film .4W 5% 330R	R34
252222	Resistor Metal Film .6W 1% 2K2	R35
252273	Resistor Metal Film .6W 1% 27K	R36
251031	Relay DIL Changeover 24V D.C.	RL1-RL8
258091	Resistor Network SIL 4W8P 10K	RN1, RN2
258059	Resistor Network SIL 8W9P 100K	RN3, RN4, RN13-RN15
258204	Resistor Network SIL 8W9P 47K	RN5, RN8, RN11
258214	Resistor Network SIL 4W8P 470K	RN6, RN7, RN9, RN10
258140	Resistor Network SIL 8W9P 680R	RN12
258197	Resistor Network SIL 4W8P 56R	RN16, RN17
258092	Resistor Network SIL 8W9P 10K	RN18,RN19
296265	Transformer Isolating 600R 1:1	T1-T8

Part No	Description	Reference
259551	Transistor T092 MPSA42	TR1, TR3, TR5, TR7, TR9, TR11, TR13, TR15
259547	Transistor T092 MPSA42	TR2, TR4, TR6, TR8, TR10, TR12, TR14, TR16
296068	Flexible Card Handle Red	

The circuit diagrams for issue 2 PCBs are available on request

6.4.5 Subscriber Card Components Issue 3

Part No	Description	Reference
250412	Capacitor Tantalum 10mF 35V	C1
250948	Capacitor Ceramic 100nF 50V 0.1"	C2, C4, C6, C7-C9, C11, C12, C14, C16, C18, C19-C21, C23, C24
250368	*Capacitor Radial Electrolytic 22mF 63V*	*C3, C5, C10, C13, C15, C17, C22, C25*
250964	Capacitor Radial Electrolytic 100mF 25V	C26
250932	Capacitor Ceramic 100nF 50V 0.2"	C27-C30, C47-C50, C52-C58
250911	*Capacitor Single Layer Ceramic 10nF 63V*	*C31-C38*
250968	Capacitor Ceramic Multilayer 470nF 50V	C39-C46
250404	Capacitor Tantalum 22mF 15V	C51
259224	Diode Signal 75V 100mA BAW62	D1-D8
259226	Diode Reference T092 2.5V REF25Z	D9-D24
259202	Diode Zener BZY88C 4V7	D25-D40
291525	LED High Intensity Standard Red HLMP1302	D41-D48
268616	IC Opto Isolator 4N33	IC1-IC8
274939	IC Analog Switch MT8812	IC9-IC12
268612	IC Quad Opto Isolator ISQ74	IC13, IC16, IC17, IC20
268117	IC Op Amp LM348	IC14, IC15, IC18, IC19
274931	IC CMOS 74HC85	IC21
275934	IC CMOS 74HC259	IC22
230003	IC PAL 18CV8 Marinex SUBS V1.0	IC23
274932	IC CMOS 74HC244	IC24, IC26
277694	IC MAX633B	IC25
274933	IC CMOS 74HC251	IC27, IC28
296245	Inductor Ferrite Fixed 470mH	L1
240364	Connector Plug DIN41612 96/96	PL1
255391	Resistor Metal Film .4W 5% 390R	R1, R4, R5, R8, R9, R12, R13, R16, R17, R20, R21, R24, R25, R28, R29, R32
255680	Resistor Metal Film .4W 5% 68R	R2, R3, R6, R7, R10, R11, R14, R15, R18, R19, R22, R23, R26, R27, R30, R31
255103	Resistor Metal Film .4W 5% 10K	R33
255331	Resistor Metal Film .4W 5% 330R	R34
252222	Resistor Metal Film .6W 1% 2K2	R35
252273	Resistor Metal Film .6W 1% 27K	R36
251031	Relay DIL Changeover 24V D.C.	RL1-RL8
258091	Resistor Network SIL 4W8P 10K	RN1, RN2
258059	Resistor Network SIL 8W9P 100K	RN3, RN4, RN13-RN15
258204	Resistor Network SIL 8W9P 47K	RN5, RN8, RN11
258214	Resistor Network SIL 4W8P 470K	RN6, RN7, RN9, RN10

Part No	Description	Reference
258140	Resistor Network SIL 8W9P 680R	RN12
258197	Resistor Network SIL 4W8P 56R	RN16, RN17
258092	Resistor Network SIL 8W9P 10K	RN18,RN19
296265	Transformer Isolating 600R 1:1	T1-T8
259551	Transistor T092 MPSA42	TR1, TR3, TR5, TR7, TR9, TR11, TR13, TR15
259547	Transistor T092 MPSA42	TR2, TR4, TR6, TR8, TR10, TR12, TR14, TR16
296068	Flexible Card Handle Red	

The following component changes apply to the PCB Subscriber Card A402303 Issue 3 with Mod 02 label

Part 250368 replaced by 250624

Part 250911 replaced by 250981

Part No	Description	Reference
250368	Capacitor Radial Electrolytic 22mF 63V	C3, C5, C10, C13, C15, C17, C22, C25
250911	Capacitor Single Layer Ceramic 10nF 63V	C31-C38

The circuit diagrams for Issue 3 PCB can be found at the back of the manual.

6.5   Exchange Card

6.5.1   Description - Issue 2 PCB

A block diagram of the Exchange (tie line) card is shown in figure 5.5, followed by a schematic diagram.

The exchange card is the interface card between the Marinex and shore exchanges, satcomm equipment and ship P.A. systems. For connection to shore lines and satcomm systems only, two wires are needed. For use with a P.A. system four wires are used with two providing voltage free contacts to operate the mike switch.

The card has a speech path matrix similar to the subscriber card using IC1-IC4. The control signals are decoded by IC25, IC26, IC32, IC35.

Each exchange line has a designated DTMF transceiver which is used to transmit DTMF dial tones on an MF line when the originator only has a Loop Disconnect phone. A twin transistor circuit is used to loop the line (D.C. loop) and because of the bridge rectifier it is not polarity sensitive to the line connections. The circuit can detect A.C. ring current when it is being rung from by shore line or satcomm. It can also detect D.C. loop current when it is using the line for outgoing calls, and the system will not use the line if D.C. loop current is missing.

The transformer with each exchange line provides isolation for the speech path from the shore line or satcomm.

There are four indicators on the front of the card that light when the DC loop for the line is on. The top indicator corresponds to the line connected to the top terminals, through to the bottom indicator which corresponds to the line connected to the bottom terminals.

The board has the Marine Communications part number A402304, and can be identified in the unit as being fitted with a blue handle.

Fig. 5.5 MARINEX EXCHANGE CARD BLOCK DIAGRAM

6.5.2   Description - Issue 3 PCB

A block diagram of the Exchange (tie line) card is shown in figure 5.5, followed by a schematic diagram.

The exchange card is the interface card between the Marinex and shore exchanges, satcomm equipment and ship P.A. systems. For connection to shore lines and satcomm systems only, two wires are needed. For use with a P.A. system four wires are used with two providing voltage free contacts to operate the mike switch.

The card has a speech path matrix similar to the subscriber card using IC1-IC4. The control signals are decoded by IC29, IC30, IC34 and IC5.

Each exchange line has a designated DTMF transceiver which is used to transmit DTMF dial tones on an MF line when the originator only has a Loop Disconnect phone. A twin transistor circuit is used to loop the line (D.C. loop) and because of the bridge rectifier it is not polarity sensitive to the line connections. The circuit can detect A.C. ring current when it is being rung from by shore line or satcomm. It can also detect D.C. loop current when it is using the line for outgoing calls, and the system will not use the line if D.C. loop current is missing.

The transformer with each exchange line provides isolation for the speech path from the shore line or satcomm.

There are four indicators on the front of the card that light when the DC loop for the line is on. The top indicator corresponds to the line connected to the top terminals, through to the bottom indicator which corresponds to the line connected to the bottom terminals.

The board has the Marine Communications part number A402304, and can be identified in the unit as being fitted with a blue handle.
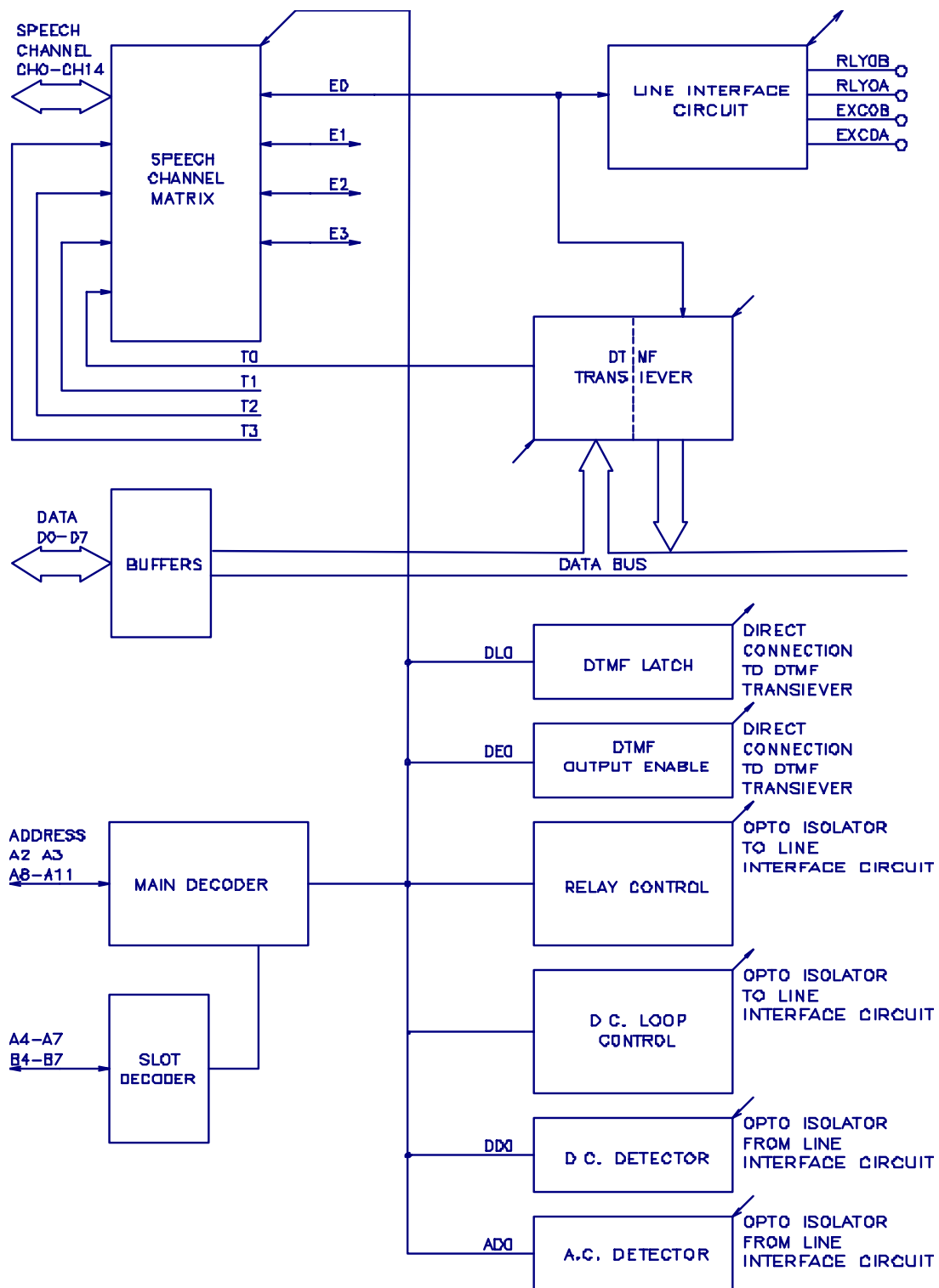
6.5.3   Exchange Card Components Issue 2

Part No	Description	Reference
259009	Bridge Rectifier 200V 1.2A 1KAB20E	BR1-BR4
250412	Capacitor Tantalum 10mF 35V	C1
250128	Capacitor Polyester 100nF 250V	C2, C3, C12, C13
250946	Capacitor Radial Electrolytic 47mF 63V	C4, C8, C9, C14
250400	Capacitor Tantalum 10mF 16V	C5, C7, C10, C15
250932	Capacitor Multilayer Ceramic 100nF 50V	C6, C11, C20-C30, C32, C38-C41 C44-C53
250911	Capacitor Single Layer Ceramic 10nF 63V	C16-C19
250930	Capacitor Multilayer Ceramic 220nF 100V	C31, C35, C42, C43
250961	Capacitor Multilayer Ceramic 2200pF 100V	C33, C34, C36, C37
250404	Capacitor Tantalum 22mF 16V	C54
259125	Diode Reference 5V T092 REF 50Z	D1, D5, D17, D20
259126	Diode Zener BZY88C 3V9	D2, D3, D6, D7, D13, D14, D22, D23
259224	Diode Signal 75V 100mA BAW62	D4, D8, D9, D11, D15, D16, D18, D24
274939	IC Analog Switch MT8812	IC1-IC4
268616	IC Opto Isolator 4N33	IC5-IC8
268614	IC Opto Isolator 4N38	IC9-IC12
274934	IC CMOS 74HC259	IC13
274933	IC CMOS 74HC251	IC14, IC22
268612	IC Quad Opto Isolator ISQ74	IC15, IC16
274941	IC DTMF Detector M984	IC17, IC18, IC23, IC24
268112	IC CMOS Quad Op Amp LM324	IC19-IC21
274931	IC CMOS 74HC85	IC25, IC32
275495	IC Memory PAL 18CV8	IC26, IC35
274932	IC CMOS 74HC244	IC27, IC33
275137	IC CMOS 74HC240	IC28
274947	IC CMOS 74HC138	IC29, IC36
274943	IC DTMF Transceiver 20C89	IC30, IC31, IC37, IC38
274948	IC CMOS 74HC373	IC34
240364	Connector Plug DIN41612 96/96	PL1
255101	Resistor Metal Film .4W 5% 100R	R1-R4
255105	Resistor Metal Film .25W 5% 1M	R5
251031	Relay DIL Changeover 24V D.C.	RL1-RL4
258199	Resistor Network SIL 4W8P 330K	RN1
258042	Resistor Network SIL 4W8P 47K	RN2
258209	Resistor Network SIL 4W8P 33K	RN3
258140	Resistor Network SIL 8W9P 680R	RN4
258091	Resistor Network SIL 4W8P 10K	RN5, RN10 RN11, RN17
258092	Resistor Network SIL 8W9P 10K	RN6
258044	Resistor Network SIL 4W8P 100K	RN7, RN8, RN9, RN12

Part No	Description	Reference
258144	Resistor Network SIL 8W9P 22K	RN13, RN18
258210	Resistor Network SIL 4W8P 2K2	RN14
258059	Resistor Network SIL 8W9P 100K	RN15, RN19, RN20, RN22, RN23
258197	Resistor Network SIL 4W8P 56R	RN16, RN21
296265	Transformer Isolating 600R 1:1	T1-T8
259547	Transistor T092 MPSA42	TR1-TR8
268320	Crystal HC18U 3.579MHz	X1
296067	Flexible Card Handle Blue	

The circuit diagrams for issue 2 PCBs are available on request

6.5.4   Exchange Card Components Issue 3

Part No	Description	Reference
259009	Bridge Rectifier 200V 1.2A 1KAB20E	BR1-BR4
250932	Capacitor Multilayer Ceramic 100nF 50V	C2-C6, C15, C17, C34-C41, C46,C47, C51-C57
250961	Capacitor Multilayer Ceramic 2200pF 100V	C42-C45
250930	Capacitor Multilayer Ceramic 220nF 100V	C30-C33
250128	Capacitor Polyester 100nF 250V	C18-C21
250946	*Capacitor Radial Electrolytic 47mF 63V*	*C11-C14*
250911	*Capacitor Single Layer Ceramic 10nF 63V*	*C7-C10, C26 - C29*
250913	Capacitor Single Layer Ceramic 33pF 63V	C48-C50
250412	Capacitor Tantalum 10mF 35V	C1
250400	Capacitor Tantalum 10nF 16V	C22-C25
250404	Capacitor Tantalum 22mF 16V	C58
240364	Connector Plug DIN41612 96/96	PL1
259125	Diode Reference 5V T092 REF 50Z	D21-D24
259224	Diode Signal 75V 100mA BAW62	D9-D20
259126	Diode Zener BZY88C 3V9	D1-D8
274939	IC Analog Switch MT8812AE	IC1-IC4
274932	IC CMOS 74HC244	IC31-IC33
274933	IC CMOS 74HC251	IC19
274934	IC CMOS 74HC259	IC18, IC20
274931	IC CMOS 74HC85	IC29, IC30
268112	IC CMOS Quad Op Amp LM324	IC25, IC26
274952	IC DTMF Transceiver MT8880AE	IC23, IC24, IC27, IC28
268616	IC Opto Isolator 4N33	IC6-IC13
268614	IC Opto Isolator 4N38	IC14-IC17
230004	IC PAL 18CV8 Marinex EXCH V2.0 IC05 ?	IC5
230005	IC PAL 18CV8 Marinex EXCH V2.0 IC34	IC34
230006	IC PAL 18CV8 Marinex EXCH V2.0 IC35	IC35
268612	IC Quad Opto Isolator ISQ74	IC21, IC22
291525	LED High Intensity Standard RED HLMP1302	D25-D28
251031	Relay DIL Changeover 24V D.C.	RL1-RL8
255101	Resistor Metal Film .4W 5% 100R	R1-R4
255334	Resistor Metal Film .4W 5% 330K	R5-R8
258044	Resistor Network SIL 4W8P 100K	RN1, RN3, RN13, RN15
258042	Resistor Network SIL 4W8P 47K	RN2, RN4
258091	Resistor Network SIL 4W8P 10K	RN5, RN8, RN9, RN11
258140	Resistor Network SIL 8W9P 680R	RN6, RN12
258092	Resistor Network SIL 8W9P 10K	RN7
258209	Resistor Network SIL 8W9P 33K	RN10
258199	Resistor Network SIL 4W8P 330K	RN14
258059	Resistor Network SIL 8W9P 100K	RN16, RN17, RN21, RN22
258197	Resistor Network SIL 4W8P 56R	RN18, RN20
258204	Resistor Network SIL 8W9P 4K7	RN19, RN23

Part No	Description	Reference
296265	Transformer Isolating 600R 1:1	T1-T4
259547	Transistor T092 MPSA42	TR1-TR8
268324	Crystal HC18U 3.579MHz	X1
296067	Flexible Card Handle Blue	

The following component changes apply to the PCB Exchange Card A402304 Issue 3 with Mod 01 label

Part 250946 replaced by 250624

Part 250911 quantity reduced from 8 to 4 (C26 - C29)

Part 250911 replaced by 250981 at C7 - C10

Part No	Description	Reference
250911	Capacitor Single Layer Ceramic 10nF 63V	C26 - C29
250981	Capacitor Multilayer 47nF 63V	C7 – C10
250624	Capacitor Radial Electrolytic 3300nF 63V	C11-C14

The circuit diagrams for Issue 3 PCB can be found at the back of the manual.

6.6   Ringing Card

6.6.1   Description

A block diagram of the Ringing board is shown in figure 5.6, followed by a schematic diagram.

The Ringing card is physically bolted to the power supply card with long spacers to form the ringing module. To inspect this card it will be necessary to remove the six screws.

This card provides the 75 volt 25 Hz supply needed to ring telephones. The output is only generated when the RG_EN signal from the processor is active.

The 25 Hz sine wave is generated by IC4. This is then buffered by IC3 a transconductance amplifier. When the drive input to IC3 is disabled there is no output. This enable is RG_EN from the processor via IC2 and IC5. IC2 ensures that the output is off during the first few seconds of power on. It is then opto-isolated via IC5. The final stages are a power amplifier (IC1, IC6) and a transformer which steps up the output voltage from 15 volts to 75 volts. The output of the transformer has the DC Bias of -24V on it so that the supply is actually -24V D.C. + 75V A.C.

There are five LED's on the card. The two at the top are to show which external supply the Marinex is operating from, i.e. the A.C. or the D.C. Note that this does not show whether or not the supply is present. The three at the bottom show the supplies generated in the exchange. D15 is only illuminated when the ringing voltage is generated. D16 is illuminated when the Bias (-24V) supply is present. D17 is illuminated when the +5V supply is present. A 20mm 500mA anti surge fuse is provided on this card to protect the ringing supply in the case of over load.

The ringing card is the only place where the 0V supply rail and the GND supply rail are connected together. Further it is also the only place where the EARTH is connected to these rails (via 100K resistor and 0.01uF capacitor). This connection is to stop the exchange rails floating.

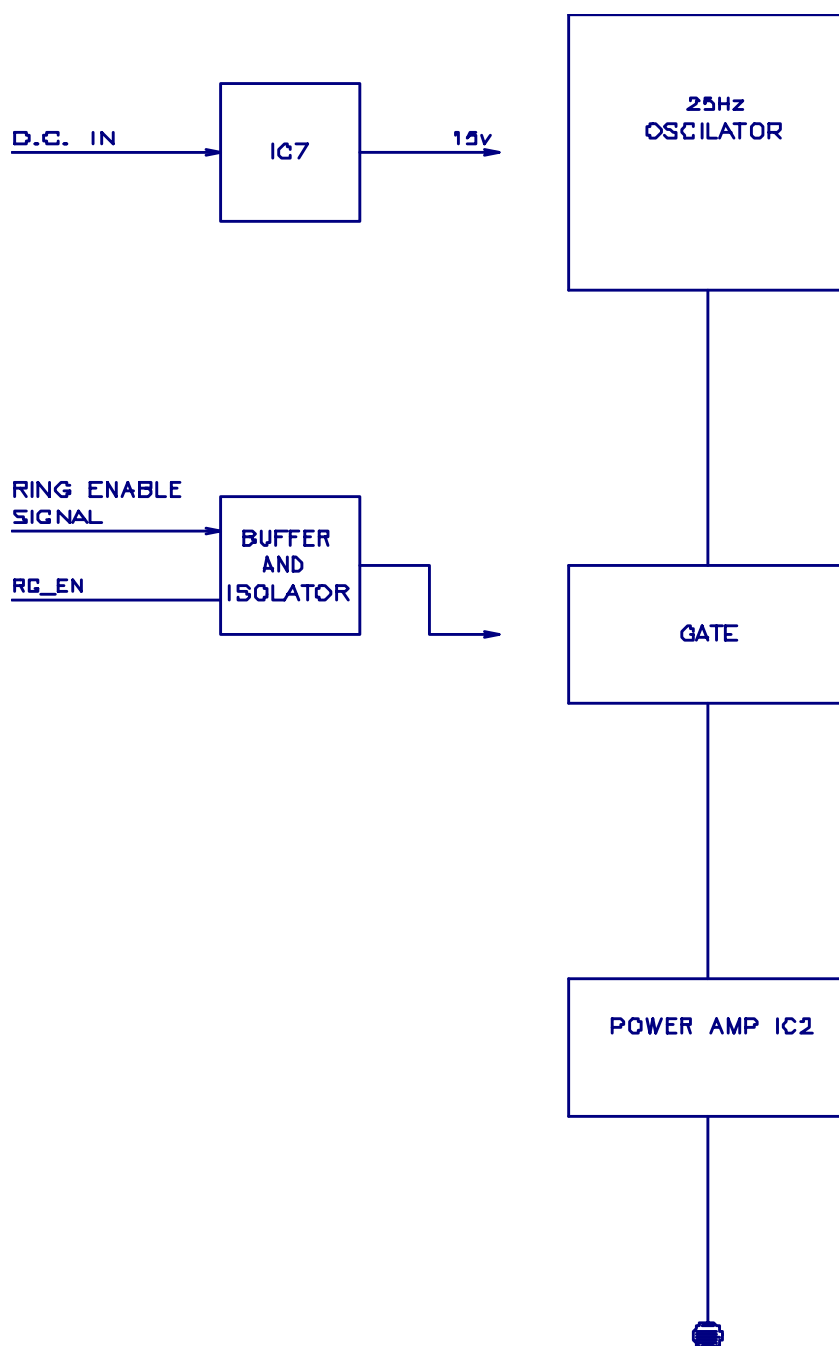The board has the Marine Communications part number A402305.

D.C. IN → IC7 → 15v

25Hz
OSCILATOR

RING ENABLE
SIGNAL →

RG_EN →

BUFFER
AND
ISOLATOR

GATE

POWER AMP IC2

Fig 5.6 MARINEX RINGING CARD BLOCK DIAGRAM

6.6.2   Ringing Card Components

Part No	Description	Reference
250667	Capacitor Radial Electrolytic 47mF 50V	C1, C2
250910	Capacitor Ceramic Disc 10nF 750V	C3
250681	Capacitor Radial Electrolytic 470mF 63V	C4, C5
250404	Capacitor Tantalum 22mF 16V	C6, C17
250412	Capacitor Tantalum 10mF 35V	C7, C9
250932	Capacitor Multilayer Ceramic 100nF 50V	C8, C10, C14, C18, C20, C21
250931	Capacitor Multilayer Ceramic 220nF 50V	C11
250930	Capacitor Multilayer Ceramic 220nF 100V	C12, C13, C15
250618	Capacitor Radial Electrolytic 100mF 35V	C16
250680	Capacitor Tantalum 2200nF 50V	C19
250109	Capacitor Polyester 220nF 100V	C22
250682	Capacitor Radial Electrolytic 220mF 63V	C23, C24
259124	Diode 400V 3A IN5404	D1
259101	Diode 100V 1A IN4002	D2-D5
259224	Diode Signal 75V 100mA BAW62	D6-D8, D14
291562	LED High Intensity Standard Right Angle Red HLMP5030	D9, D10
259117	Diode Zener BZX61 30V	D11, D12
259225	Diode Zener BZY88C 18V	D13
291525	LED High Intensity Standard Red HLMP1302	D15-D17
291431	Fuse 20mm Anti-Surge 500mA	F1
268215	IC Power Amplifier LM1875T	IC1, IC6
274946	IC CMOS 74HC00	IC2
268119	IC Transconductance CA3080E	IC3,
274945	IC Waveform Generator ICL8038CC	IC4
268614	IC Opto Isolator 4N38	IC5
259304	IC Semiconductor Regulator LM7815CT	IC7
240363	Connector Plug DIN41612 64/64	PL1
255561	Resistor Metal Film .4W 5% 560R	R1, R27
255562	Resistor Metal Film .4W 5% 5K6	R2
255392	Resistor Metal Film .4W 5% 3K9	R3
258206	Resistor Metal Oxide 1W 2% 100K	R4
255471	Resistor Metal Film .4W 5% 470R	R5
255474	Resistor Metal Film .4W 5% 470K	R6
291051	Tinned Copper Wire 22SWG	R7
255472	Resistor Metal Film .4W 5% 4K7	R8-R12, R22, R25
255563	Resistor Metal Film .4W 5% 56K	R13,
255391	Resistor Metal Film .4W 5% 390R	R14
255103	Resistor Metal Film .4W 5% 10K	R15, R20, R23
258207	Resistor Metal Glaze .25W 2% 1R	R16, R18
252753	Resistor Metal Film .6W 1% 75K	R17
255154	Resistor Metal Film .4W 5% 150K	R19

Part No	Description	Reference
255223	Resistor Metal Film .4W 5% 22K	R21
255223	Resistor Metal Film .4W 5% 22K	R24, R26
255823	Resistor Metal Film .4W 5% 82K	R28
252623	Resistor Metal Film .6W 1% 62K	R29, R30
258208	Resistor Metal Film .5W 1% 22R	R31
296263	Toroid 240-240V/25V-25V 60VA	T1

The circuit diagrams can be found at the back of the manual.

6.7   Power Supply Card

6.7.1   Description

This is the second card that forms the Power Supply Module. The design is a switched mode power supply capable of 2A at 5V and 3A at -24V. The outputs are isolated from each other and from the input supply. The outputs are short circuit protected and the input is protected by a 20mm 5A quick blow fuse. Should this fuse blow the board must be unbolted from the ringing card to gain access to the fuse.

The Power Supply Card has a Marine Communications part number of 291781.

A circuit diagram of the Power supply Card is shown in figure 5.7. This card is manufactured, set-up and tested as a complete item and no component listing is therefore provided.

The circuit diagrams can be found at the back of the manual.

6.8   Motherboard

6.8.1   Description

The motherboard, or backplane, contains no electronic components and is very unlikely to fail once installed. There is a 15 way 'D' type socket which is provided for connection of ancillary equipment and a 15-way 'D' plug which accepts the main D.C. input from the chassis power supply. The motherboard has seventeen 96-way DIN 41612 connectors which are connected in parallel, apart from 16 pins on each which connect to adjacent klippon connectors and 5 pins that form a 5 bit code for slot identification.

Inserting any of the 96 way cards into any slot will not cause any damage to the exchange but due to physical differences the cards should normally be located as described in Chapter 3.

The board has a Marine Communications part number of A402301.

The connection details for the 15-way ancillary equipment connector are as follows :-

1	Earth	9	0VDC (PSU)
2	28-34V DC nom	10	+24V DC (PSU)
3	-ve return (28V DC)	11	Bias
4	Bias	12	Ground
5	Ground	13	+5V DC
6	+5V DC	14	+5V DC
7	0V	15	0V
8	0V		

6.8.2   Motherboard Components

Part No	Description	Reference
245089	Connector Terminal Plug SL8-V 8 Way	PL1-PL17
240136	Connector Plug 'D' 15 Way	PL17
240068	Connector Socket DIN41612 96/96	SK1-SK17
240067	Connector Socket DIN41612 64/64	SK18, SK19
240174	Connector Socket 'D' 15 Way	SK20

6.9   Power Supply Chassis

6.9.1   Description

The Marinex exchange can be powered by either 110-130V/220-260V AC or 21-28V DC. If both supplies are present, the Marinex exchange will automatically switch to operation from the DC supply in the event of the AC supply failing.

The AC circuitry is protected by two 20mm 2A anti-surge fuses, fitted one in each line. The voltage selector must be set to the correct supply before the unit is switched on.

The DC circuitry is protected by two 20mm 10A anti-surge fuses, fitted one in each line. The Marinex exchange can be run from a 21.6-26.4V DC supply. The DC line is not polarity sensitive.

The Power Supply Chassis has a Marine Communications part number of A500112.

A wiring diagram of the Power supply chassis is shown in figure 5-8.

6.9.2   Power Supply Chassis Components

Part No	Description	Reference
250659	Capacitor Radial Electrolytic 4700mF 63V	C1
291412	Fuse Anti-Surge 20mm 2A	F1, F2
291434	Fuse Anti-Surge 20mm 10A	F3, F4
259015	Bridge Rectifier 400V 25A 26MB40A	REC1, REC2
245135	D.C. Input Terminal Block KS2 2 Way	
245136	A.C. Input Terminal Block KS4 4 Way	
291021	A.C. Voltage Selector Switch 120V/240V	
291467	Fuse holder 20mm screwdriver release	F1-F4
296264	Toroid 120/240V 25/25V sec 160VA	T1

6.10   Engineering Changes

E900064   To eliminate pulse noise.

On the subscriber card, A402303/3, the following resistors were changed from 68R (**mcl** part 255680) to 62R, 1% (**mcl** part 252620):

R3, R7, R11, R15, R19, R23, R27, R31.

E900106   Amplitude adjustment.

On the ringing card, A402305, R21 was changed from 33K (**mcl** part 252333) to 27K (**mcl** part 252273).

E900107   To eliminate occasional RFI interference on exchange cards.

On the exchange card, A402304/3, a polycarbonate capacitor 470pf, 100V (**mcl** part 250009) was fitted between IC9/2 and IC4/3.

E900116   Mechanical interference.

On the subscriber card, A402303/3, capacitor C1 was **mcl** part code 250618, now 250633.

E900129   To improve reliability of ringing circuit at high temperature for all telephone types.

On the subscriber card, A402303/3, C39-C46 were **mcl** part 250 968, now **mcl** part 250972, 470NF 50V X7R dielectric.

E900164   On the ringing card, A402305, R21 value changed to 22K (**mcl** part 255223).

E910125   On the backplane, A402301, polarising keys are now fitted to SK19 positions 5A/5B/28A/28B. The corresponding pins also removed from the ringing card, A402305. This change introduced to prevent accidental incorrect insertion of the ringing module.

E910190   On the ringing board, A402305, an M3 fibre washer is fitted to the 'A' side when securing IC7 heat-sink in order to ensure clearance from the power track.

E930029   Modifications to the DEL217 DC-DC Converter to prevent possible overheating.

E930055   Vertical mounting of LM7815 Regulators due to non availability of long legged Horizontal version.

E930088   Upgrade of firmware to version V02.20

E010503   Lloyds Approved Rittal case detail added. Anti-vibration mounts removed.