

ERCS

Equipment Remote Control System





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1 PREAMBLE

The performance of modern warships, in terms of communications, is unquestionably of critical importance, since the accomplishment of tactical and operational tasks depends more and more on the efficiency and flexibility of information exchange and gathering.

The increasing complexity of naval communications scenarios requires an efficient management of resources, and also the capability to deal with fast, global and unexpected changes on the whole communications environment. A high degree of automation is thus required, together with the necessity, felt by navies all over the world, of minimising the number of skilled personnel.

Equipment Remote Control System (**ERCS**) was designed and developed specifically to provide an effective equipment remote control management and automation tool, therefore coping with the trends above.

Being more specific, **ERCS** provides the centralised remote control of communications equipment, enabling the effective control and monitoring of its working parameters.

The **ERCS** can be tailored and configured to control of any type of communications equipment.

The system is essentially composed of the following building blocks:

- ❑ **RIU Remote Interface Units**, providing the necessary remote control interfaces to the communications equipment.
- ❑ **Control Computers (CC)**, enabling a single operator to take care of the full control and supervision of the system. Through a user-friendly man-machine interface, a comprehensive set of tools is available to the operator, helping him to perform his duties efficiently and with minimum effort. The CC is composed of a rugged computer, high-resolution LCD flat-panel colour display, keyboard and track-ball.

The following sections provide a detailed description of the above mentioned components. Some of the indigenous benefits of the proposed system can already be highlighted:

- ✓ **Unique operational characteristics**, namely *efficient management of resources*, as well as the capability to *react quickly to changes* on the operational scenario.
- ✓ **State-of-the-art** technology
- ✓ **Proven concept**, as demonstrated by the performance of existing systems
- ✓ Potential to incorporate **additional features**, as required by the specific needs or communications policy of the user
- ✓ **User-friendly** operation with context sensitive help, definitely reducing training cycles and costs.
- ✓ Reduced **number of skilled operators** required
- ✓ **Distributed architecture** with indigenous high **survivability** and **reliability**
- ✓ **No single point of failure** at the system level
- ✓ **Modular** design
- ✓ **Flexible** configuration
- ✓ **Open system**, based on widely accepted standards and technology.
- ✓ Simple and **inexpensive maintenance**.
- ✓ **Inherent upgrade** capabilities
- ✓ Excellent **immunity to electromagnetic interference**
- ✓ **Reduced size and weight, minimum cabling**

1.1 System Description

1.1.1 REMOTE INTERFACE UNIT (RIU)

The **RIU** provides the interface to the remote controlled equipment. The unit with a height of 1U rack unit, adequate for 19" installation, houses the hardware modules. The number and type of such modules depends on the specific system configuration.

A typical RIU unit includes, see Figure 1:

- ❑ **DCI** Data and Control Interface module
- ❑ AC/DC Power supply

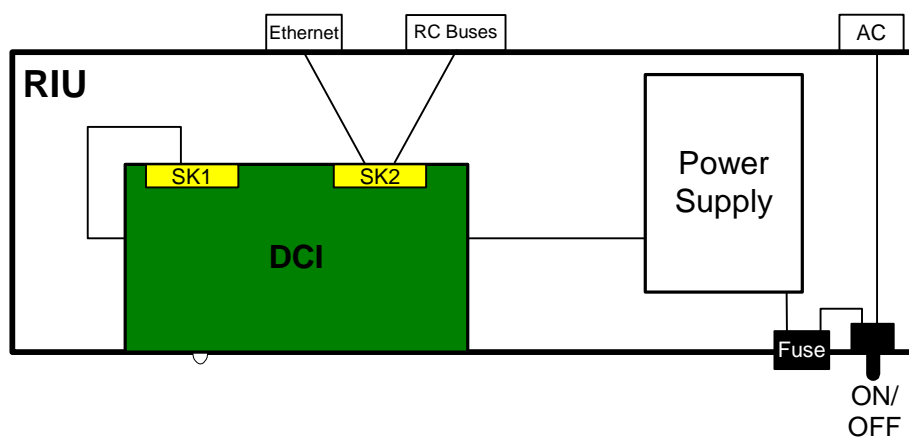


Figure 1 - RIU Block diagram

The Data and Control Interface (**DCI**), performs the remote control of equipment. Control commands issued by operators are routed to the **DCI**. In turn, the **DCI** provides the serial channels or buses that are connected to equipment remote control ports. Conversely, information coming from the remote controlled equipment is received by the **DCI** and from there conveyed to the **Control Computer (CC)**. Besides serial and parallel ports, this module

includes a 10BaseT Ethernet Interface for the CC connection. Digital I/O lines are also available for special purposes.

It should be noted that the application software, specific to each equipment, runs in the DCI. This means that all details regarding the particulars of a given equipment, namely the character string that needs to be sent to it, as well as its response, are hidden from the CC software. This solution is aimed at a maximum efficiency, minimising, at the same time, software configuration and up-grade efforts.

Continuous monitoring of the hardware status is performed within the unit, an alarm or warning being generated whenever a fault is detected. Upon start-up, the various modules run a self-test program for detection of any malfunction. If any fault is detected, an alarm message will be generated on the CC.

The ac/dc converter supply power to the unit from the ship's network (115 Vac). Each DCI module includes a dc/dc converter that transforms the external dc supply into the voltages required internally.

The next Figures show the RIU front and rear views.



Figure 2 – RIU Front view



Figure 3 – RIU Rear view (connectors panel)

The specifications of the **RIU** are as follows:

Remote Control Interfaces	RS232/RS422, synchronous or asynchronous
	Baud rate: configurable from 75 to 57600
	N° of stop bits: 1, 1.5, 2
	Parity: none, odd, even
	10 BaseT Ethernet according to IEEE 802.3
Power Supply	115/230Vac \pm 10%, single phase, 47 to 63Hz
Operating temperature range.....	0 to 50° C
Humidity	up to 95% non-condensing

1.1.2 CONTROL COMPUTER (CC)

The **CC**, responsible for the overall system control and supervision, consists of a rugged computer with a 1280x1024 LCD monitor, keyboard and trackball, suitable for shipboard installation. Alternatively, a PC or Laptop can be used.

1.1.3 ARCHITECTURE

The system control structure is shown in Figure 4. The number of Remote Interface Units (**RIUs**) is defined taking into consideration the quantity and diversity of interfaces required by the system configuration.

The computer(s) is connected to the **RIUs** through an Ethernet link.

In terms of equipment remote control, the **RIUs** include one **DCI** module that generate the serial data channels or buses, which in turn are connected to the equipment control ports.

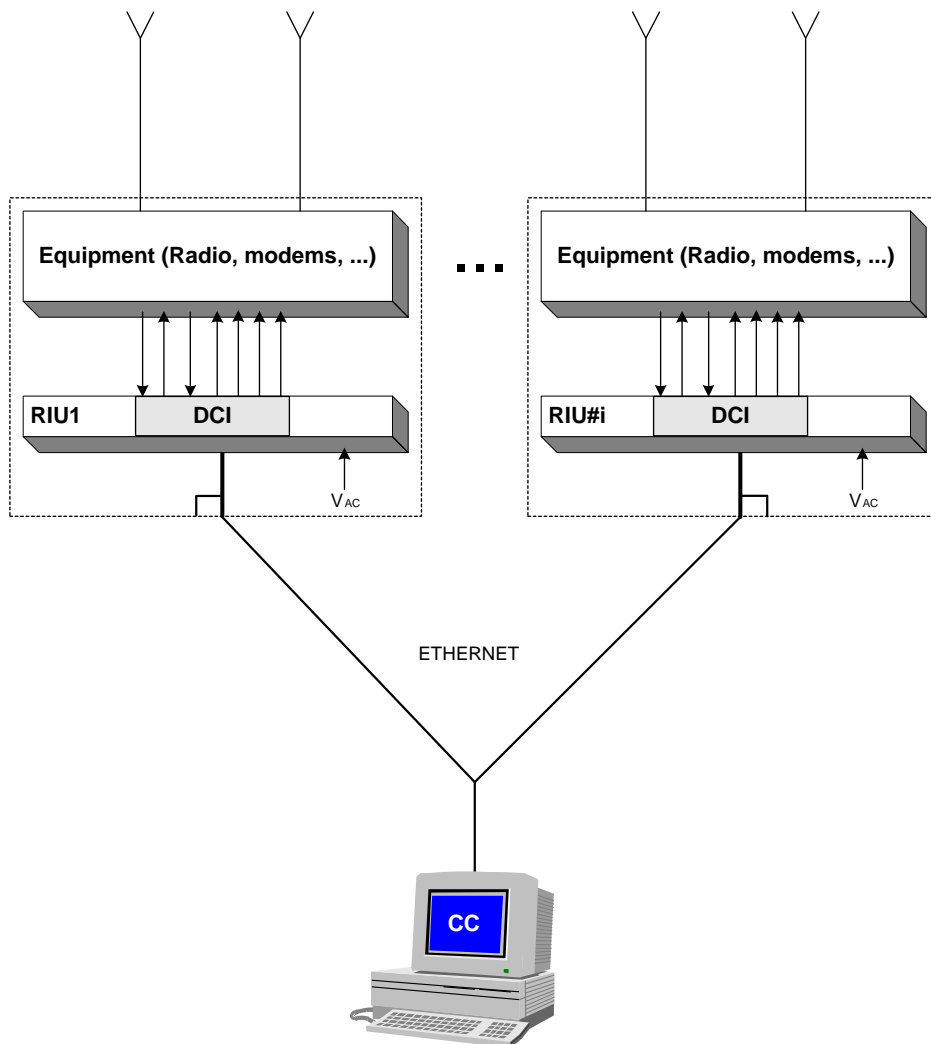


Figure 4 - ERCS Block Diagram

Growth Potential

The proposed **ERCS** configuration is not limited in terms of growth potential. The RIU is able to handle several remote control channels/buses. If the need for a further growth arises, there will be effective solutions to accommodate such expansion. There is also an option for installing additional **RIUs**.

1.2 Functional Aspects

1.2.1 REMOTE CONTROL

The system control scope is only limited by the remote control capabilities of each specific type of equipment. In general, it is possible to remote control quite a diversity of equipment functions. A continuous, real-time monitoring of the equipment status is also automatically performed, enabling fault detection of each and every equipment.

The typical functions under system control for a HF transceiver are listed in Table 1.

As already stressed, the functions associated with remote control are assigned to the Control Computer operator. These functions may however be dynamically entrusted to dedicated remote control units, installed in ship's operational areas such as the operations room. This is particularly useful when, for operational reasons, users need to have direct control of the particular radio that they are using.

Table 1 - HF transceiver remotely controlled parameters

Command	Function	Range/Values	Remarks
FREQUENCY	Sets operating frequency	Rx: 10 kHz - 30 MHz, Tx: 1.5 – 30 MHz	1 Hz step
MODULATION	Sets operation mode and FSK/AFSK parameters, when applicable	AME, USB, LSB, FAX, CW, FSK, AFSK, FM, USB(Rx)/LSB(Tx), LSB(Rx)/USB(Tx), ISB	
	Frequency shift	±42, ±85, ±225, ±425 Hz	FSK/AFSK only
	Baud Rate	50, 75, 100, 150, 300, 600 baud	FSK/AFSK only
	Polarity	Normal/Reverse	FSK/AFSK only
	Frequency offset	-5000 to +5000 Hz	AFSK, 1 Hz step
BANDWIDTH	Sets IF selectivity	150, 300, 600, 1000, 1500, 2100, 2400, 2700, 3100, 6000 and 8000 Hz	FM: 6 or 8 kHz; FSK, AFSK, FAX, SSB and ISB: 3100 Hz
GAIN CONTROL	Selects automatic or manual gain control	AGC: ON, OFF MGC: 0 to 126 dB μ V	1 dB μ V step
DECAY TIME	Sets AGC decay time	25,150,500,1000,3000 ms	
PREAMPLIFIER	Switches preamplifier on and off	ON, OFF	
SQUELCH	Switches squelch function on and off	ON, OFF	AME, FM, SSB and ISB only
POWER LEVEL	Sets output power level	Receive only, Low/Medium/High	
TUNE	Initiates tuning process		
RECALL	Activates a preset channel	Half-duplex: 0 to 99 Simplex: 100 to 400 ITU: 401 to 2240	
STORE	Stores current settings into a channel	Half-duplex: 0 to 99 Simplex: 100 to 400	
BFO	Sets BFO frequency	-5000 to +5000 Hz	10 Hz step; CW, FAX, FSK and AFSK modes only
CHANNEL CONTENTS (VIEW)	Inquiry of channel contents		
CHANNEL PROGRAMMING	Programs contents of half-duplex preset channels (0 to 99)	Rx and tx frequency, modulation, BFO, bandwidth, power level, preamplifier, voice compressor	Ranges as per individual commands
	Programs contents of simplex preset channels (100 to 400)	Frequency, modulation, BFO, bandwidth, power level, preamplifier, voice compressor	Ranges as per individual commands
BIT	Initiates built-in test		
VOX	Switches voice-operated modulation on and off	ON, OFF	AME, SSB and ISB modes only
NOTCH FILTER	Sets notch filter frequency or switches filter off	-5000 to +5000 Hz	10 Hz step
VOICE COMPRESSOR	Switches voice compressor on/ off	ON, OFF	SSB modes only

1.2.2 CONTROL AND SUPERVISION

The **ERCS** control software that runs in the **CC** enables the **COMMUNICATIONS SUPERVISOR** to perform the following:

- Access control and password management
- Define users profile
- Equipment remote control
- Pre-program actions to be executed automatically
- Continuous monitor the system status
- Inspect logged events
- Configuration control (check software and firmware versions)

1.3 Man-Machine Interface

In general terms, the man-machine interface software - supported on a windows-based graphical user interface - will give the Communications operators access to all **ERCS** working parameters, so that appropriate actions can be taken as required. By taking care of all aspects of the system operation that can be automated, and providing helpful suggestions whenever the opportunity arises, the operator's job is greatly simplified.

1.3.1 CONTROL COMPUTER

1.3.1.1 SYSTEM START-UP / ACCESS CONTROL

ERCS is protected against unauthorised use by keeping track of its operators and associated passwords. If the correct name and password are not given during the LOGIN process, the system will not accept further commands.

1.3.1.2 OPERATORS MANAGEMENT

For the purpose of access control, the system includes facilities to view, add and remove operator names and associated passwords. The maximum number of operators is a system configuration.

The system supports several operator access levels. A typical configuration has two access levels, one for communication operators and another for supervisors:

Access level 0 - operators have only access to the basic operations.

Access level 1 - operators (supervisors) have access to each and every system feature.

The main difference between levels 0 and 1 is the capability to add/remove operators to/from the system. When the system is delivered with the default configuration the operators database will have only one operator whose name is COMSUP, the corresponding password being also COMSUP. This operator has access level 1. To avoid dead-locks, the system prevents the deletion of the last operator with access level 1.

Passwords shall be changed at least every 92 days. When the password expires, the operator is asked to change it. If he fails to do so, access is denied.

1.3.1.3 MAIN WINDOW

After the start-up phase, the system opens the Main window and the respective Login access control window, providing an overview of the system status. After successful login the user has access to the complete system functionality.

Figure 5 illustrates a typical HFBB remote control window.

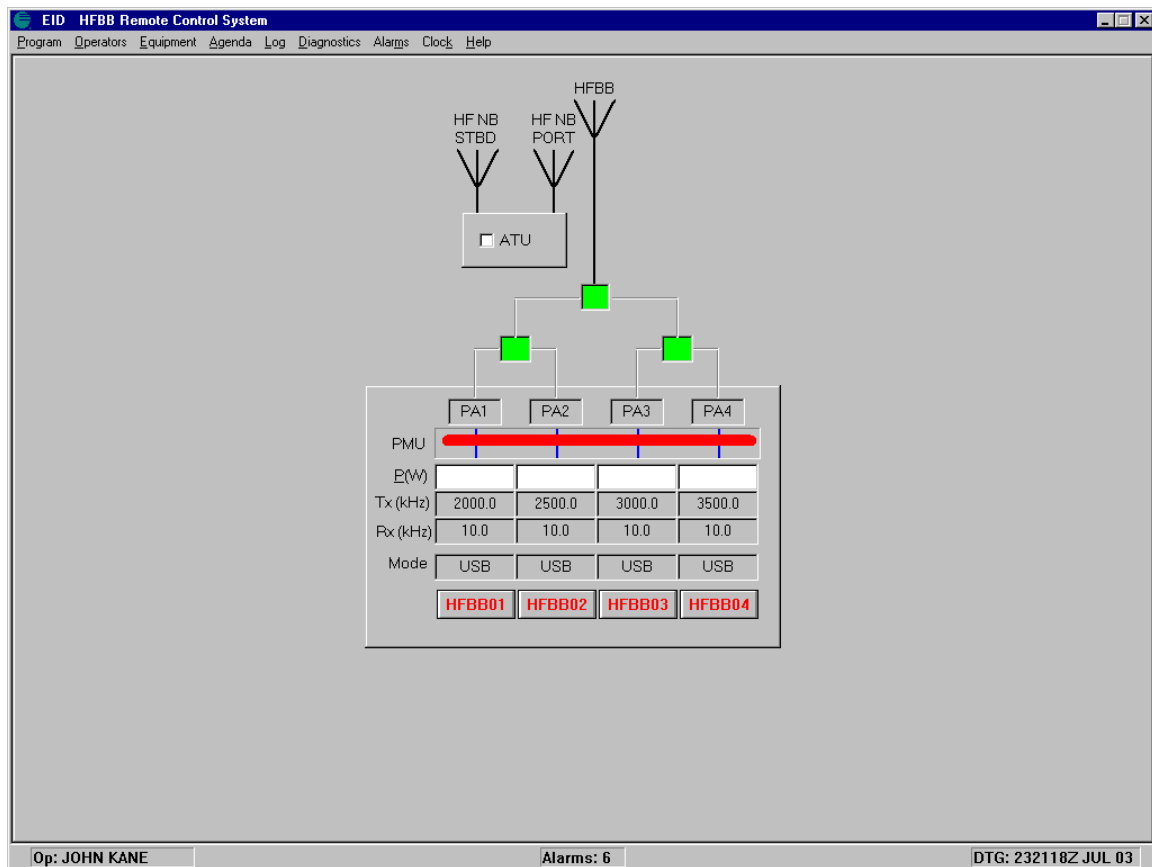


Figure 5 – Main Window

The information elements displayed in the Main window central area are as follows:

- ❑ Full picture and status of the **HFBB** system
- ❑ Name of the current operator.
- ❑ Number of pending alarms.
- ❑ Date-time group.

Besides all this information, this window enables the operator to remote control the pieces of equipment. For instance, if the operator clicks on HFBB03, access to the corresponding remote control window will be given, see Figure 6.

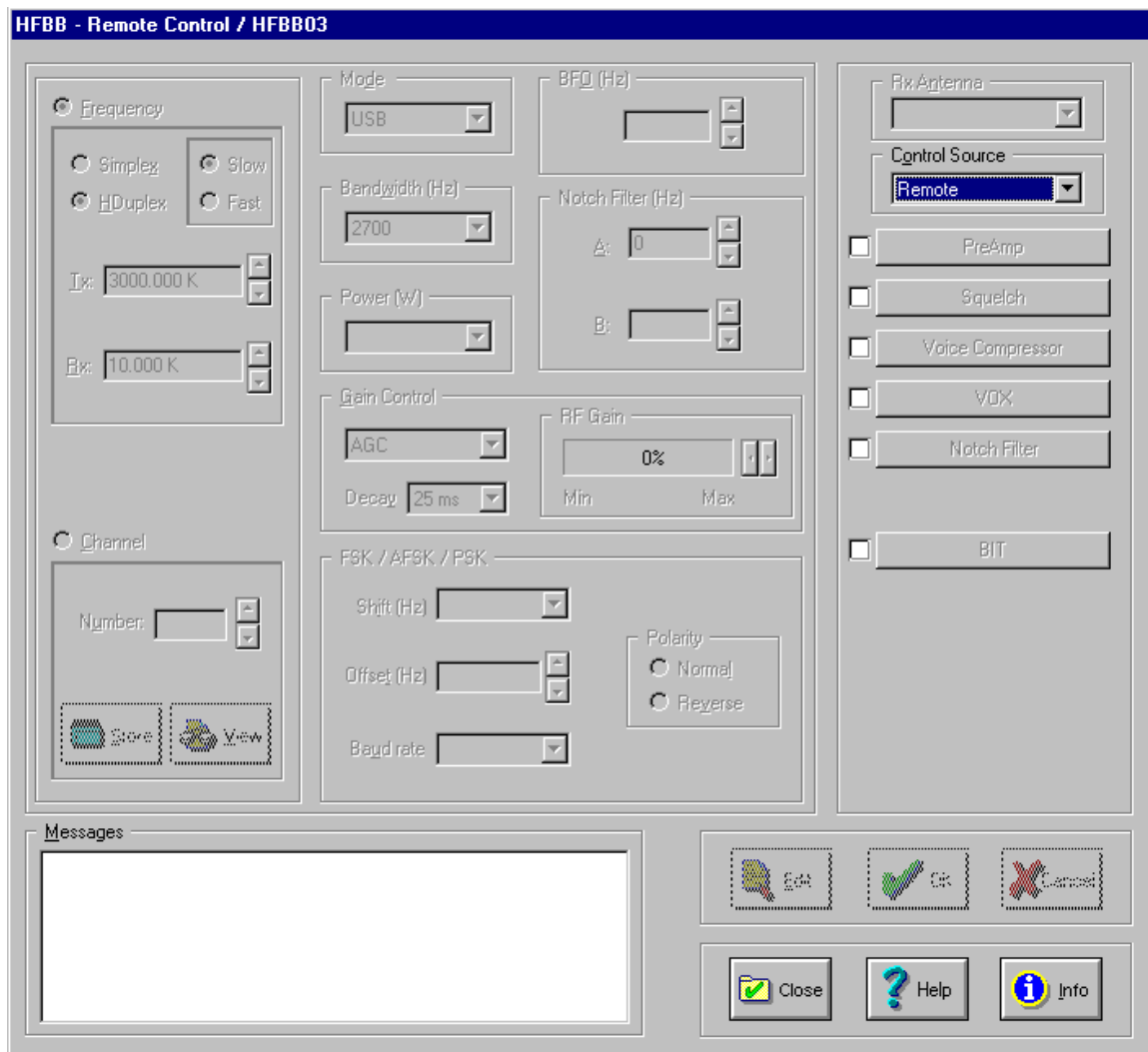


Figure 6 – HFBB03 Control Window

In the upper area of the window a number of buttons is available to activate functions that are also accessible through menu commands. A brief description of the menus is provided below.

The **Program** menu includes the following commands:

Logout - This command makes it possible to change operators without leaving the program.

Exit - You select this option to terminate program execution. This command opens the Exit window, which includes only two buttons: **OK** and **CANCEL**.

About - This will show you the *credits screen*: the program name and release, copyright notice, part and serial numbers.

The **Operators** menu includes the **Change password** and **Set-up** commands. The former will let you change your password by opening the **Operators/Change Password** window. The latter, only enabled if you have level 1 privileges, opens the **Operators/Set-up** window, letting you add and remove operators from the system.

The **Equipment** menu has the following commands:

History - This lets you access the equipment management facilities that will show you the changes that occurred in equipment status.

Radios RControl - By selecting this command you will get to the **Equipment/Radios Remote Control** window, through which you can control radio equipment.

HFBB RControl - By selecting this command you will get to the **Equipment/HFBB Remote Control** window, dedicated to the control of the HF Broadband system.

Rx Mult RControl - By selecting this command you will get to the **Equipment/Rx Mult Remote Control** window, through which you can perform antenna selection for equipment without remote control. Otherwise, you will do it in the corresponding

remote control window. In addition, the window provides an overall picture of receive antennae assignment.

Modems RControl - By selecting this command you will get to the **Equipment/Modems Remote Control** window, through which you can control each and every modem.

UHFSAT RControl - By selecting this command you will get to the **UHF SATCOM Remote Control** window, through which you can control the UHF SATCOM equipment.

SHFSAT RControl - By selecting this command you will get to the **SHF SATCOM Remote Control** window, through which you can control the SHF SATCOM equipment.

CDMA RControl - By selecting this command you will get to the **CDMA Remote Control** window, through which you can control the CDMA modems.

Additional buttons and menu items will be added to cover the remote control of specific equipment, as applicable.

The **RSilence** (EMCON) menu lets you access these commands (when applicable):

All - This command will activate radio silence immediately, for all radio equipment.

HF - This command will activate radio silence immediately, only for radio equipment in the HF frequency range.

VHF - This command will activate radio silence immediately, only for radio equipment in the VHF frequency range.

UHF - This command will activate radio silence immediately, only for radio equipment in the UHF frequency range.

Selective - This command will activate radio silence immediately, only for the radio equipment selected in the Radio Silence/Selective window. This window shows a list box of all transmitting equipment, enabling the operator to select or de-select the ones he wants.

OFF - This option is only enabled when radio silence, either global or partial, is being enforced. This command will terminate the radio silence period.

It shall be noted that radio silence periods can also be programmed in the Agenda/Insert window.

The **Agenda** menu has only the **View** command. If you select this menu command, the system will get you into the **Agenda** window where you have access to the Agenda features.

The **Log** menu includes the **View** command, through which you have access to the Log features, whereby you can view all the recorded events.

The **Diagnostics** menu has the following commands:

Software Versions - Whereby you get information about the software/firmware version installed in each of the system modules.

RControl Firmware Versions - This command gives for all and every remote controlled equipment the following data:

- remote controlled equipment firmware version.
- equipment firmware version(s) supported by the **ERCS** remote control software.



The **Alarms** menu includes the **View** command, which opens the **Alarms** window. It will show you all the pending alarms in the system. If there are no alarms this command is disabled. Additionally the **Notify** command enable/disable the automatic view of the alarm messages, whenever an alarm occurs.

The **Clock** menu, through the **Set-up** command, opens the **Clock/Set-up** window that will enable you to change the system time and date.

The **Help** menu has the following commands:

Index - This command will activate the **Help** program and show you the **ERCS** help index. From this index you can navigate through the help files.

How to use - By choosing this command you will activate the **Help** program, thus getting instructions on how it works.

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