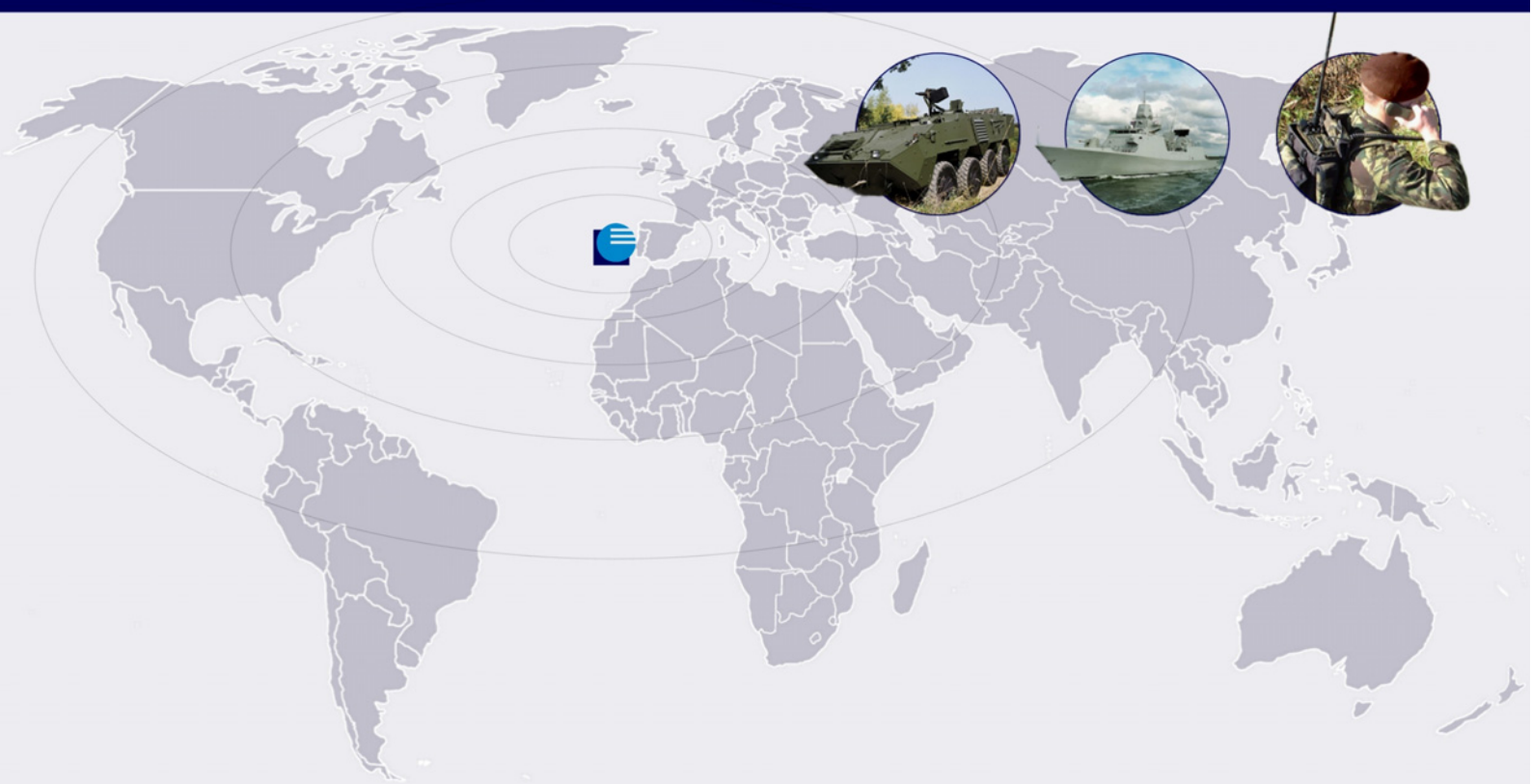
MOST4 Ships

message handling system

SHAPING THE FUTURE



... in defence communications

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1 SYSTEM DESCRIPTION

1.1 General

MOST4 Ships is an automatic Message Handling System, featuring a comprehensive set of facilities aimed at reducing the overheads of traditional on-board radioteletype message management tasks. Providing a substantial degree of automation, the system reduces the operator's workload, thus minimising the likelihood of occurrence of operational and administrative mistakes. The reduction of the ship's complement, as far as skilled communication operators are concerned, is also a significant benefit.

MOST4 Ships has been designed to support the simultaneous operation of several telegraphic circuits (ship-shore, inter-ship, local and area broadcasts) in accordance with ACP127 message formats and procedures.

Simply stated, MOST4 Ships consists of one or more operator workstations, whose number basically depends on the size and operational role of the ship. Industry standard hardware platforms have been adopted, in order to reach cost effective solution. A local area network enables the information exchange among the various workstations, as well as resource sharing.

The interface to the ship's radioteletype and data channels, whose number also depends on the specific type of ship, is provided through front-end processors, built into one 19" sub-rack.

A graphical, enhanced man-machine interface has been developed, providing a straightforward and intuitive operation, which is of utmost relevance under stressful conditions, as frequently found during missions at sea. A user-friendly interface also leads to significant savings, as far as the training effort is concerned.

MOST4 Ships is therefore a flexible system, with indigenous advantages:

- on-site re-configuration, according to the prevailing operational requirements
- easily up-gradable, in terms of processing power and number of operator terminals
- standard interface to other systems/networks
- compatibility with a wide range of hardware platforms, either commercial, ruggedised or mil-spec personal computers/workstations

1.2 Functional Aspects

MOST4 Ships processes the radioteletype messages received and transmitted through the ship's RTTY channels, supporting the simultaneous operation of the following *logical* circuits:

- Area Primary Broadcasts
- TF/TG Broadcast (Transmission and reception)
- Inter-ship circuits
- Ship-Shore circuit (HF or Satcom)
- Shore-Shore circuit, used when the ship is moored
- Custom circuit, user customised circuit in the sense that the system operator can define the start and the end of message sequences.

Message acquisition and transmission is performed automatically, in accordance with ACP127 formats and Supplement 1 and Supplement 3 procedures. The RTTY circuits management and operation is assigned to one or more workstations, thus providing the operator(s) with the ability to control and monitor message transmission and reception.

Features provided as well as the facilities available to MOST4 operators are outlined in the paragraphs below.

1.2.1 MESSAGE TRANSMISSION

The first step of the transmission process is the message drafting or preparation (header and text). This task is quite effortless, due to a set of facilities provided to the operator, namely:

- assisted fill-in of the message header. The operator is prompted to introduce the relevant parameters, with the help of on-screen options
- automatic formatting of the message header, according to the specific circuit through which the message is to be transmitted
- word processing capabilities

A message to be transmitted may be prepared either from scratch or on the basis of existing messages. Once prepared, the system analyses the message in order to detect eventual syntactic errors and also to extract the message parameters.

If any errors are found, the operator is asked to correct the message, hints on the errors detected being provided to him.

When the message is ready for transmission it is delivered to the appropriate queue (there is a queue for each of the logical circuits referred to above). The place in the queue is determined by the message precedence. When it reaches the top of the queue the message is delivered to the front-end communications processor that handles the physical channel assigned to the logical circuit.

The front-end software also takes care of the control and monitoring of cipher equipment, if any, and the PTT of the transmitting equipment, whenever automatic keying is not provided (e.g. by associated FSK/PSK modems).

The transmission procedure is made in accordance with the discipline of the specific circuit.

Further features include facilities for message retransmission and re-addressing as well as for cancellation and breaking of transmission.

The transmitted message is then stored on disk, its relevant parameters being stored into the system log. The final step is the internal distribution of the transmitted message.

1.2.2 MESSAGE RECEPTION

Every incoming message is scrutinised (automatic detection of the start and end of the message, for each and every circuit and according to the prevailing operational context) by the workstation responsible for the management of the circuit. In case of abbreviate service messages, they are rushed to the operator, for immediate action. Otherwise, the message will be analysed in order to detect its parameters.

As for transmitted messages, there is an analysis-correction cycle.

Messages according to ACP127 use address designators to refer both originator and destination units. MOST4 Ships supports single and collective addresses, from ships to tasks, AIG's and Naval Forces.

A full operational context can then be set up into system memory, through a subset of facilities called Operational Organisation. Whenever required, the context above may be easily changed. It should be emphasised that the message scrutiny referred to above takes into consideration the current operational context.

After incoming message analysis and according to the Operational Organisation data, decision is automatically taken on the actions to be performed over the messages. Should the message destination be out of the ship's responsibility, it will be automatically segregated. If that is not the case, messages are routed to the appropriate workstation.

Messages received and not segregated are delivered to the operator in charge of the circuit. The message is then appended to the message database.

Special attention is paid to messages received via broadcast circuits. In this type of circuits, MOST4 Ships automatically detects missing messages and control message duplication.

Manual reconstruction of garbled messages is also possible. There is a garbage collector per circuit that operators can manipulate for message reconstruction, using word processing tools.

1.2.3 MESSAGE RELAYING

An additional distinguished feature of the system is the capability to perform as a relay station. The following situations are covered:

- area broadcast to local (TF/TG) broadcast
- inter-ship to ship-shore
- inter-ship to local (TF/TG) broadcast

The relay operation can be automatic or semi-automatic.

1.2.4 OPERATIONAL ORGANISATION

As mentioned earlier, full operational contexts can be defined in order to enable the system to:

- determine the ship's responsibility scope, as far as incoming messages are concerned (in other words, to filter out messages that are not of interest to the ship herself or dependent entity)
- define the address designators that constitute start of message sequences
- assist the operator in selecting addressees when preparing messages
- include automatically routing indicators or call signs according to the circuit through which the message is to be forwarded (also applicable when transmitting messages to be further relayed)

The system makes available to operators a set of tools to create in advance various scenarios and then activate the proper one as a function of the current operational demands. Only one of these scenarios can be active at a time. Facilities to modify the active scenario on-line are also provided. Printouts can also be made whenever convenient as well as back-up and restore operations.

MOST4 Ships supports single and collective addresses, AIG's and Naval Forces, as well as the semantic and programmed relationships between them.

1.2.5 TEST AND SERVICE MESSAGES

Test and abbreviated service messages do not follow the normal flow within the system and are submitted to a specific treatment. MOST4 Ships includes special provision for editing, transmission and reception of such messages.

1.2.6 MESSAGE PARAMETERS

Besides transmitting and receiving messages, MOST4 Ships enables other operations over messages to be performed, as discussed below. Before proceeding, a reference to message parameters shall be given.

When analysing a message, the system automatically detects the message parameters and associates to each message the following data:

- journal number (or record number)
- type (transmitted, received or service messages)
- circuit through which the message was transmitted or received
- transmit/receive DTG

The operator can optionally associate a comment to the message for further reference. Both NATO and national security, precedence levels and Special Handling Designators are supported.

1.2.7 DISTRIBUTION

The distribution of received and transmitted messages can be made in accordance with any of the following criteria:

- **SIC** - the system identifies the Subject Information Code, checks the configuration table and determines the recipients (printers and/or terminals) of the message copies.
- **Distribution lists** - Different distribution lists may be created each one with an arbitrary number of consignees. When a message is to be distributed, the operator may choose any of the existing lists.
- **By request** - the operator picks, from the full set of on-board addressees, each and every entity to which the message is to be distributed.

1.2.8 MESSAGE DRAFTING

As mentioned before, messages can be created from scratch or on the basis of existing ones. In addition, provisions are made to import messages stored in external media and also insert messages via paper tape punch/readers. Whatever the case may be, edition facilities are required to prepare new messages or modify existing ones.

Facilities for selection of blocks of text to copy and paste (within a message or between messages) as well as find and replace tools are available, just as in any other Windows application. Experienced operators may find this editor quite easy to deal with, but the job become friendlier when using templates that will assist the operator to fill-in the message header. With this editor, all entries are validated and warnings are issued whenever a parameter is missing or inconsistencies are found.

The system makes it possible to switch from free text to ACP127 messages and vice-versa. When the message is converted to ACP127 format or transmitted, its parameters will be up-dated according to the prevailing operational context.

There is also a special editor for service and test messages. Circuit-specific test messages are available in the system, so that the operator does not have to edit such messages whenever he wants to check an established circuit.

When errors are found in a message (either received or to be transmitted), the system activates the correction editor, which includes a list of detected errors.

As a final reference, the system provides facilities to retransmit and re-address messages, as well as to insert pilots in the message header. Specific editors are available for both re-addressing and pilot insertion.

1.2.9 IMPORTING AND EXPORTING MESSAGES

It is always possible to insert in the system messages prepared, received or transmitted by other ways than the system itself. For instance, a message prepared elsewhere and stored in a external media can be downloaded into the system for further action. When inserted, the message is automatically analysed to detect possible errors, as for all other types of messages. Messages can also be imported via paper tape punch/readers, which is especially useful for off-line encrypted messages.

Conversely, messages can be exported out of the system either via flash drive or paper tape punch/reader.

1.2.10 ARCHIVE, BACK-UP AND RESTORE

Every message flowing through the system is automatically stored on disk (i.e., appended to the messages databases) so that it can be used later, for whatever purpose may be.

Nonetheless, the system provides back-up mechanisms, enabling messages to be stored on external media. Long-term message archives can therefore be created.

Messages previously backed-up can be restored into the on-line archive again, whenever necessary. Restore operations can be made message by message or embody groups of messages complying with operator-defined criteria.

Note the system handles messages stored on external media the same way as it does with messages on-line (for instance, it is possible to make copies of a message previously backed-up without having to load it in the system).

1.2.11 RETRIEVAL

Messages previously archived can be retrieved using any of the following criteria (or combination thereof):

- journal number
- type of message
- date-time group range
- precedence
- channel number/Transmit Identification (broadcast and shore circuits)
- security
- circuit
- specified words or blocks of text

The operator has means to create, delete or change filters for message retrieval.

1.2.12 AGENDA

MOST4 Ships provides an *Agenda* facility, whereby operators can program in advance several types of actions, such as generic warnings the operator will use for his own purposes; the system will then take care of making them happen at the right time. It is also possible to define which actions are to occur only once or if they should be activated daily, weekly, monthly or last day of the month.

1.2.13 CONTROL AND SUPERVISION

MOST4 Ships is, irrespective of operator proficiency, a user-friendly system, due to the type of man-machine interface used. In fact, the underlying graphical user interface (*Windows*) provides the following characteristics:

- ✓ the application behaviour is similar to all others. In general, the way a particular operation is initiated is identical in every application
- ✓ the information is organised in blocks having functional affinity (windows)
- ✓ wide use of menus and virtual buttons for initiating processing activities, instead of laborious and cumbersome command line interfaces
- ✓ extensive use of context sensitive help menus, thus assisting the operators in case of doubt

Through the system workstations, the following facilities are available to system operators:

- ❒ message generation and retrieval
- ❒ message correction and supervision
- ❒ circuits operation, monitoring and management
- ❒ queue management and view
- ❒ alarms monitoring and handling

The system supervisor, besides the above mentioned facilities, is also able to:

- dynamically allocate, for each of the RTTY logical circuits, the supervision, correction and operation functions, in order to distribute the workload by the operators, according to the prevailing traffic conditions
- dynamically assign the logical circuits to the physical channels; this means that switching of encryption devices is not required. In fact, if a certain channel, either plain or secure, is not working properly, their functions can be easily and quickly assigned to another one.
- control the functional scope of printers
- create and modify the routing indicator, address and SIC tables
- set-up or modify the Operational Organisation
- endorse security control, including password management and definition of user profiles (security level and access rights)
- resource management, including data storage devices. The system provides information about their status and contents, generating alarms and early warnings when the maximum capacity is being reached
- serial interfaces configuration (baud rates, protocols, character length, parity, start/stop sequences, etc.)

Upon power-up, the system recovers the configuration that existed before the interruption of the supply. However, the supervisor can create configuration files and store them on disk or external media. This enables an efficient set-up of the system whenever configuration changes are required.

1.2.14 SECURITY

MOST4 Ships software, running in the workstations main processor, starts automatically as soon as the system is switched on and keeps running as long as the system is on. Because of security matters, the system does not allow any other program to run.

MOST4 Ships on its own is protected against unauthorised use by keeping track of its operators, associated passwords and security levels. If the correct name and password are not given during the start-up process, the system will not accept further commands.

MOST4 Ships supports several levels of access, typically: supervisor, operator and user. The supervision functions can be carried out in any of the workstations. Supervisor privileges are password protected.

All relevant events are recorded in the system **Log** that can be read or printed but not changed. Each record in the Log database includes a descriptive text of the occurrence, the date/time at which the event took place and logged operator, if applicable.

1.3 Ship's LAN Distribution (Message Distribution application)

In addition, the MOST4 Ships can be configured to offer message services to the Ship's Network Users enabling the distribution of ship's received and transmitted messages as well as delivery of user's messages to be transmitted by MOST4 Ships. For this purpose, a Message Distribution Application, running under Windows Operating Systems, shall be installed on the required Ship's LAN personal computers.

After successful login, the Message Distribution application Users can do the following:

- Receive ACP127 messages.
- Message drafting, using a structured editor.
- Message preparation, allowing intervention of several users.
- Send messages to MOST4 Ships, to be transmitted. This operation is reserved to users with especial privileges (Senders).

1.4 System Architecture

As already emphasised, the MOST4 Ships configuration that best suits a particular class of ships strongly depends on their operational role, survivability requirements and budget constraints. For a typical ship no more than two workstations would be required, as illustrated in the Figure 1.

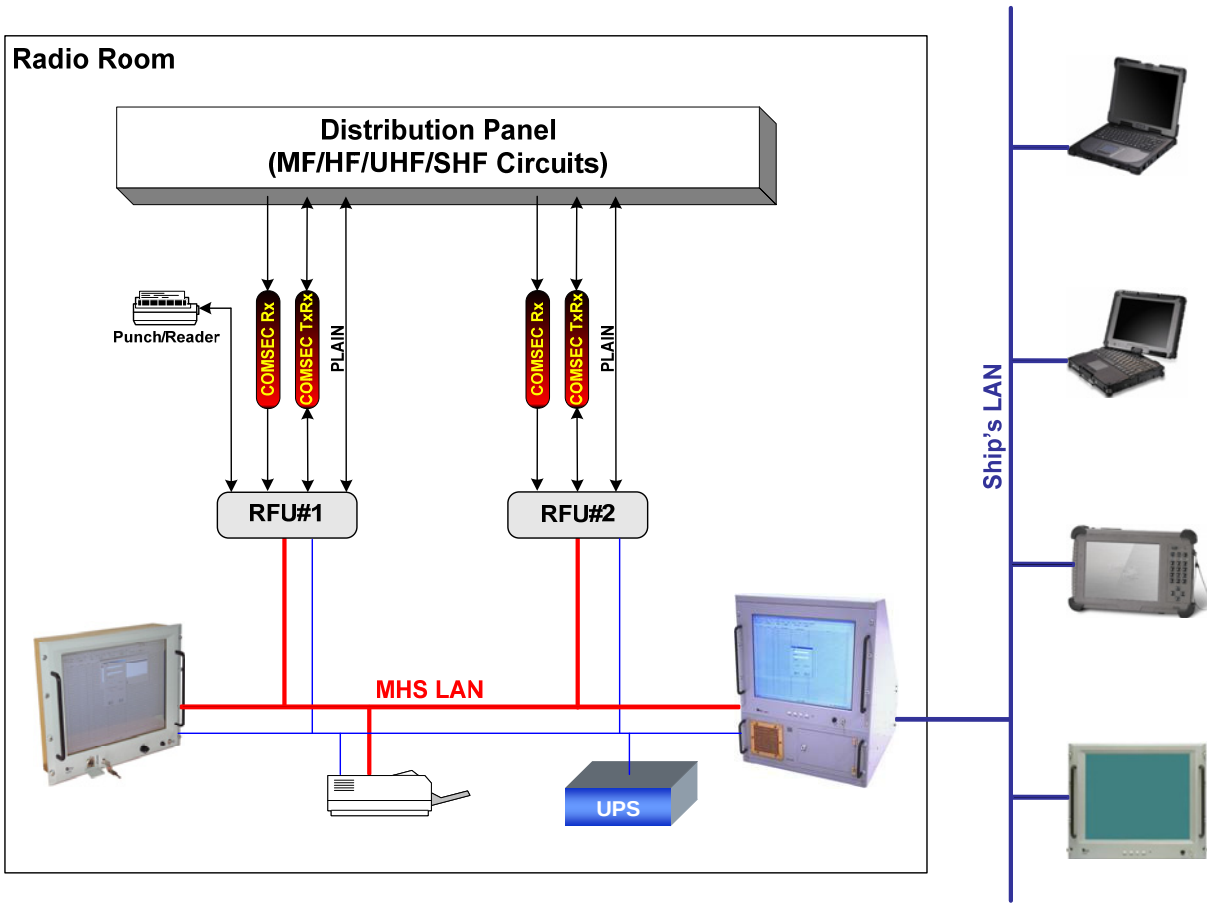

Figure 1 - MOST4 Ships typical configuration

The RFU(C) provides the interface to the ship's telegraphic channels, either plain or secure. Provision is made for the connection of secure and plain channels. Expansions are easily made through additional RFUs.

The system should also include an Uninterrupted Power Supply to avoid data corruption in case of a ship's mains failure.

1.5 Hardware Structure

This section provides a description of the system hardware. Given the multiple solutions that may be adopted, several alternatives can be considered, enabling the Customer to choose the one that best fits its requirements and budget.

Being specific, either commercial-off-the-shelf, yet reliable, hardware platforms or ruggedised computer chassis can be used.

It shall be emphasised that hybrid solutions, with different workstation types may always be selected.

1.5.1 REMOTE FRONT-END UNIT - RFU(C)

The **RFU(c)** is a front-end communications unit, providing the interface to the communications/ /COMSEC equipment and is responsible for the **MOST4 Message Handling System** signal transmission and reception.

A typical **RFU(c)** unit includes, see Figure 2:

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

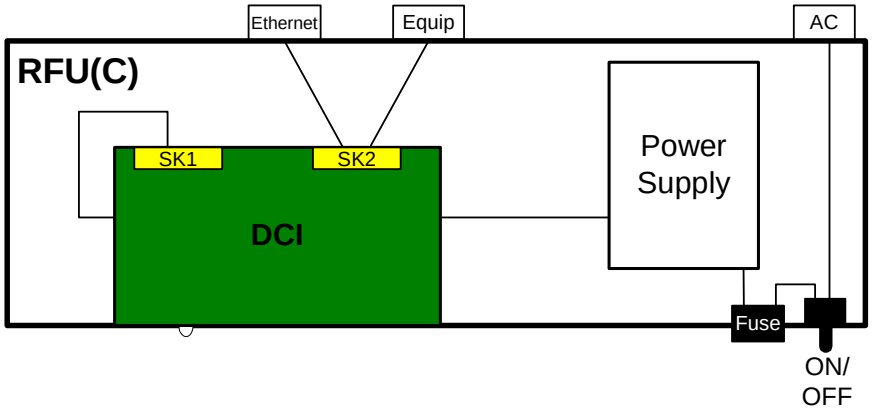

Figure 2 – RFU(c) Block diagram

The ***D**ata and **C**ontrol **I**nterface* (**DCI**) enables the interface to the serial ports of communications/COMSEC equipment. Besides serial and parallel ports, this module also includes a 10BaseT Ethernet Interface. Digital I/O lines are also available for special purposes.

Given the diversity of interface requirements, resulting from the wide range of communications equipment that are integrated, **DCI** are designed to ensure interface compatibility with existing equipment (either new or existing) thus avoiding new designs whenever changes occur in the communications outfit. On-going and future equipment developments are also taken into account, as far as possible.

The AC/DC converter supply power to the unit from the main's network (115/230 Vac). Each **DCI** module includes a DC/DC converter that transforms the external dc supply into the voltages required internally.

The **RFU(c)** consists of 1U height unit adequate for 19″ rack/console installation. Connections to the RFU(c) are made through receptacles mounted in the rear panel of the unit.

Figure 3 – RFU(c) Front view

Figure 4 – RFU(c) Rear view (connectors panel)

The specifications of the **RFU(c)** are as follows:

Interfaces

Serial Interfaces	RS232/RS422/RS423/MIL-STD-188C/V28/V10/V11, synchronous or asynchronous
	RS232/RS423/V28/V10 Protocol signals (RTS / CTS / CD / DSR / DTR / RI)
	RS232/RS423/V28/V10 Clock signals
	Baud rate: configurable from 75 to 57600
	Nº of stop bits: 1, 1.5, 2
	Parity: none, odd, even
Ethernet Interface	10 BaseT according to IEEE 802.3
Digital inputs	optically isolated, voltage detection between 5V and 12V, 500Vrms isolation
Digital outputs	Solid state relay; 500Vrms isolation
Power Supply	115/230Vac ± 10%, single phase, 47 to 63Hz
Operating temperature range	0 to 50º C
Humidity	up to 95% non-condensing

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