RIU and DIU Multiplexers for ICCS

EID

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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.

The communications system components shall be as small and light as feasible. In fact, real estate is at a premium on board warships. Cabling should be reduced to a minimum, leading to lower weight and installation costs. Immunity to electromagnetic interference phenomena shall be provided, as well as minimum cross talk, to avoid red signals to leak out, resulting in security breaches.

The **ICCS Multiplexers**:

- Radio Interface Units (RIU) and
- Data Interface Units (DIU)

enable a high degree of communications equipment integration reducing the ship's cabling as well as improving immunity to electromagnetic interference and crosstalk.

The Multiplexers cope with the constraints associated with the various equipment and ship systems, providing interface compatibility with:

- the radio equipment available on the market and suitable for shipboard use, including satellite and underwater communications
- tactical data link terminals
- secure voice equipment (narrowband and wideband)
- cryptographic equipment
- FSK, PSK and general purpose data modems
- message handling systems

The following sections provide a detailed description of the multiplexers. Some of the indigenous benefits can already be highlighted:

- ✓ **Minimum cross-talk**
- ✓ Excellent **immunity to electromagnetic interference**
- ✓ **Reduced size and weight**, **minimum cabling**
  - ❒ Significant cabling reduction
  - ❒ Reduction of the Ship's cables assembly and test

  (Advantage for the Shipyard)
- ✓ **Simple integration** on the Equipment racks
  - ❒ 1HU
  - ❒ Easier internal cabling
  - ❒ No need for Rack internal Junction/Distribution box
  - ❒ Reduces the racks' external connectors

  (Advantage for the Communications Integrator)
- ✓ **Simpler** Engineering
  - ❒ Simpler ship´s block diagrams and core lists

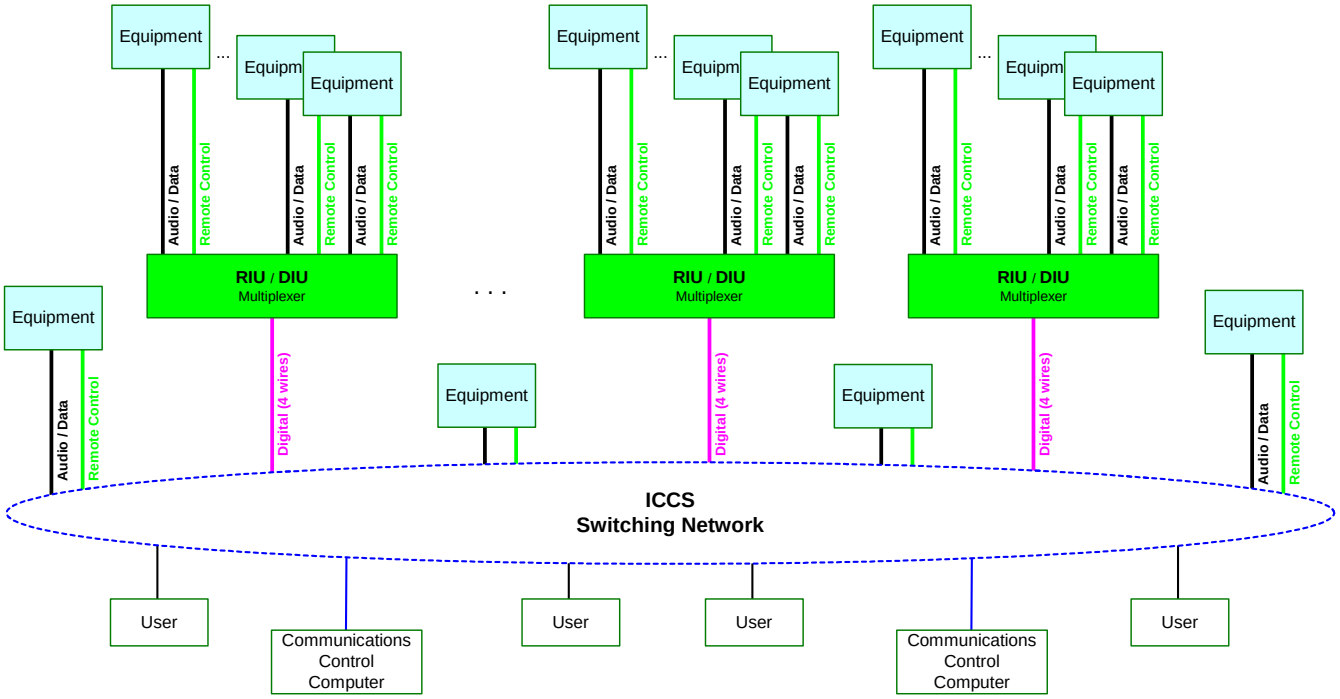
  (Advantage for the Communications Integrator)
- ✓ **Simpler** Integration FAT
  - ❒ Reduces Integration FAT cabling
  - ❒ Reduces Integration FAT setting-to-work

  (Advantage for the Communications Integrator)
- ✓ **Reduce** Setting-to-work (STW) and Maintenance activities
  - ❒ Reduced times
  - ❒ Easier procedures

  (Advantage for the Communications Integrator and the Shipyard; Final Customer during system lifetime)

ICCS Multiplexers

Radio Interface Unit - RIU
Data Interface Unit - DIU



2 MULTIPLEXERS DESCRIPTION

2.1 Radio Interface Unit (RIU)

The Radio Interface Unit (RIU) multiplex up to 8/4 radio equipment (audio, data, Vinson and remote control interfaces) into a 2 Mbps interface.

The following figures compare, in terms of ship's cabling, the standard solution with the RIU solution (HF and UHF / VHF equipment).

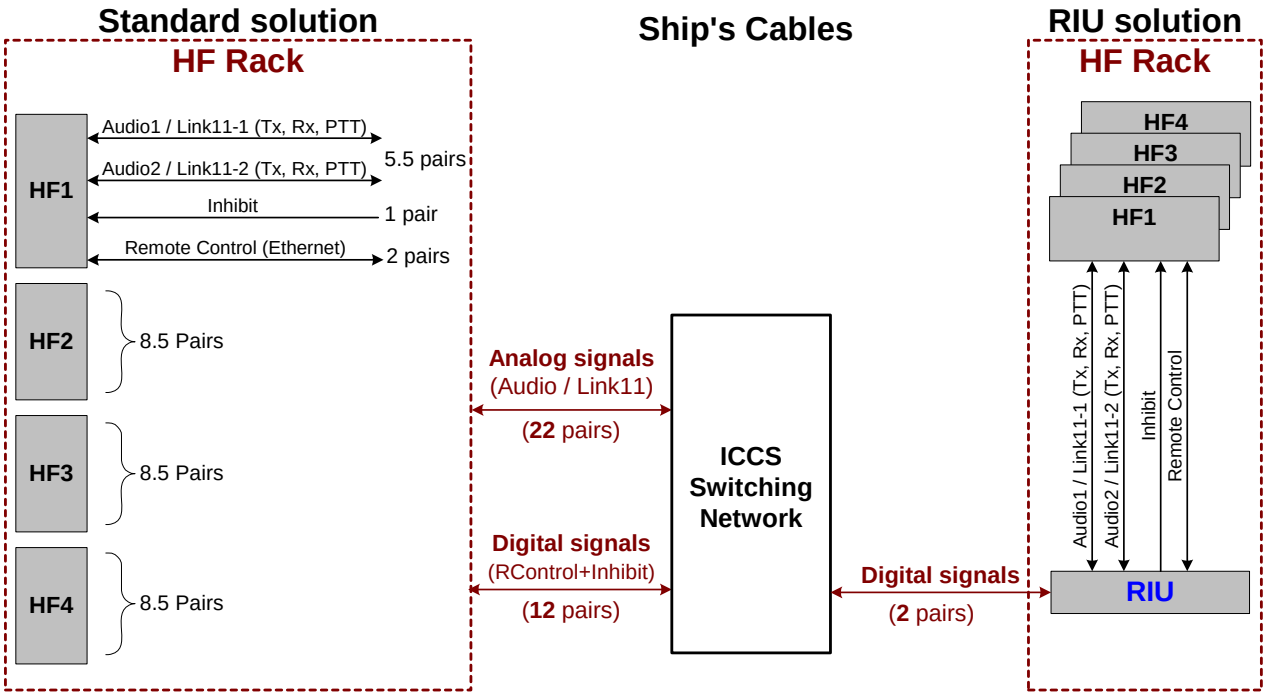


Figure 2-1 – HF Ship's cabling

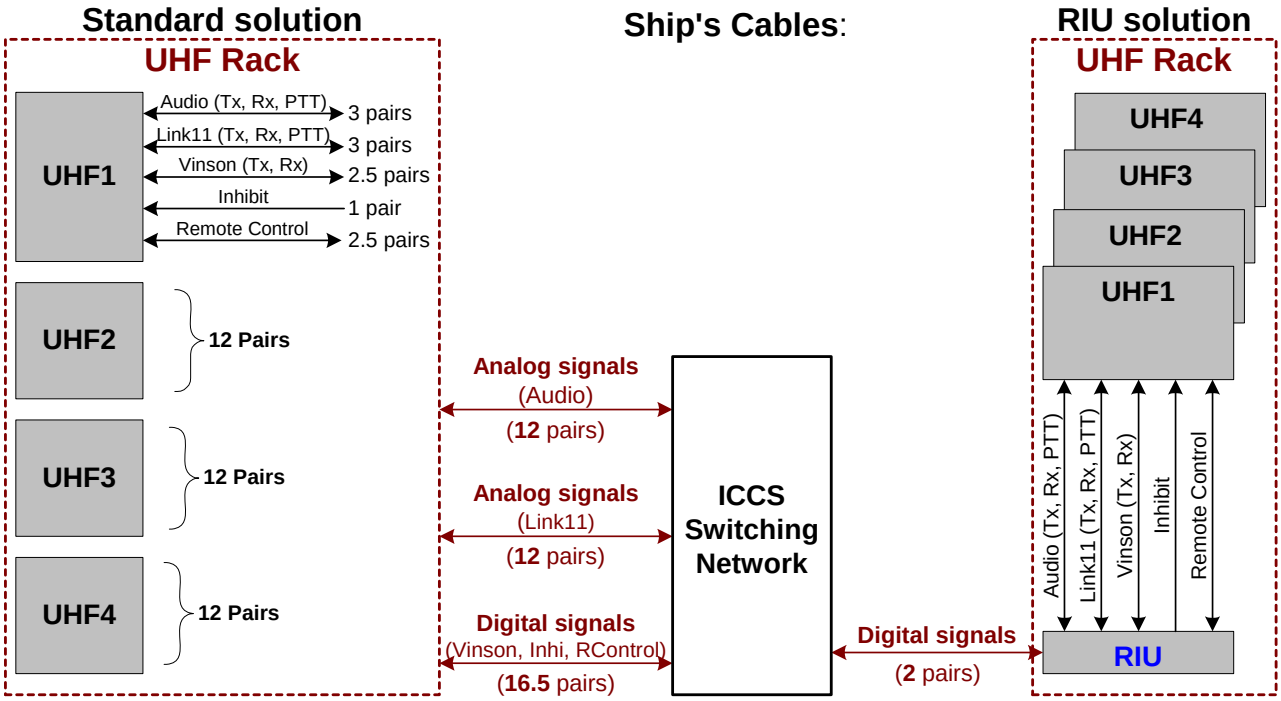


Figure 2-2 – UHF Ship's cabling

The unit consists of 1U height unit adequate for 19" rack installation. The unit has a power switch, fuse holder and status led on the front panel while the external connectors are mounted on the rear panel.

Figure 2-3 – RIU (Front and Rear views)

As outlined in the above figures, the unit was designed to cope with the following configurations:

- Up to 4 HF transceivers/receivers (audio, Link11 and remote control interfaces);
- Up to 8/4 V/UHF transceivers (audio, Link11, Vinson and remote control interfaces);
- Combination of the above configurations.

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

Each RIU board provides 8 analogue, 4-wire interface circuits suitable for radio sets, modems (audio side), narrowband secure voice equipment, red side of wideband secure voice equipment and Link 11 composite audio. In addition, the unit also provides 4 Vinson compatible (16 kbps data) interface circuits and 2 serial data interfaces RS-232/MIL-188/RS-422.

The RIU also includes equipment remote control capability providing 4 Ethernet ports 10Base-T Ethernet Interface according to IEEE 802.3 and 2 serial channels RS-422/RS-485. The control commands issued on the ICCS Communications Control Computer are routed to the ICCS switching network and then conveyed to the specific RIU. In turn, the RIU provides the serial channels or Ethernet buses that are connected to equipment remote control ports. Conversely, information coming from the remote controlled equipment is received by the RIU and from there conveyed to the ICCS Communications Control Computer.

It should be noted that the application software, specific to each equipment, runs in the RIU. 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 ICCS Communications Control software. This solution is aimed at a maximum efficiency, minimising, at the same time, software configuration and up-grade efforts.

Besides the interface circuits just described, the **RIU** provides 12 input and 14 output lines, used to output and read equipment control signals, whenever such signals are not time-critical.

Those inputs and outputs can also be configured to be sampled and routed directly to PCM buses, just like common audio channels (B-channels). This feature is required to enable CW signals switching, as well as time-critical control lines, such as PTT and specially Link11 PTT. The assignation of I/O lines to each interface circuits is part of the software configuration of the unit, which is performed during unit start-up.

The specifications of the **RIU** are the following:

LED	Status signalling
Unit identification	Four bit address
Hardware/firmware revision	stored in Flash EPROM memory
Isolation	of all external connections
E1 Interface	120Ω twisted pairs, accordingly ETSI ETS 300 011 and ETS 300 125
Audio Interfaces	8 transformer-isolated four-wire balanced Audio / Link11 Interfaces 0dBm@600 Ω, 300-3400Hz@±0.5dB
Data (Vinson)	4 optically isolated four-wire single ended 16kps, 2.2Vpp@600 Ω / 5.2 Vpp @ 20 kΩ, 10Hz to 25kHz@±3dB
Serial Data Interfaces	2, Tx/Rx, Clock, RS-232/RS-423, MIL-STD-188C, Protocol signals
Remote Control Interfaces	4 Ethernet ports, 10Base-T Ethernet Interface according to IEEE 802.3 2, Tx/Rx, RS-422 / RS-485.
Digital outputs	14 isolated
Digital Inputs	12 optically isolated
Power supply	115/230VAC, 50/60Hz
Consumption	30 VA
Operating temperature	0 - 50ºC
Weight	2.5Kg approx.
Dimensions	483 (W) x 43.5 (H) x 310 (D) mm

2.2 Data Interface Unit (DIU)

The Data Interface Unit (DIU) multiplex up to 8 synchronous / asynchronous data subscribers (TxClk, RxClk, TxData, RxData and protocol lines) into a 2 Mbps interface.

As illustrated in the next figure, the use of DIU reduces the ship's cabling significantly.

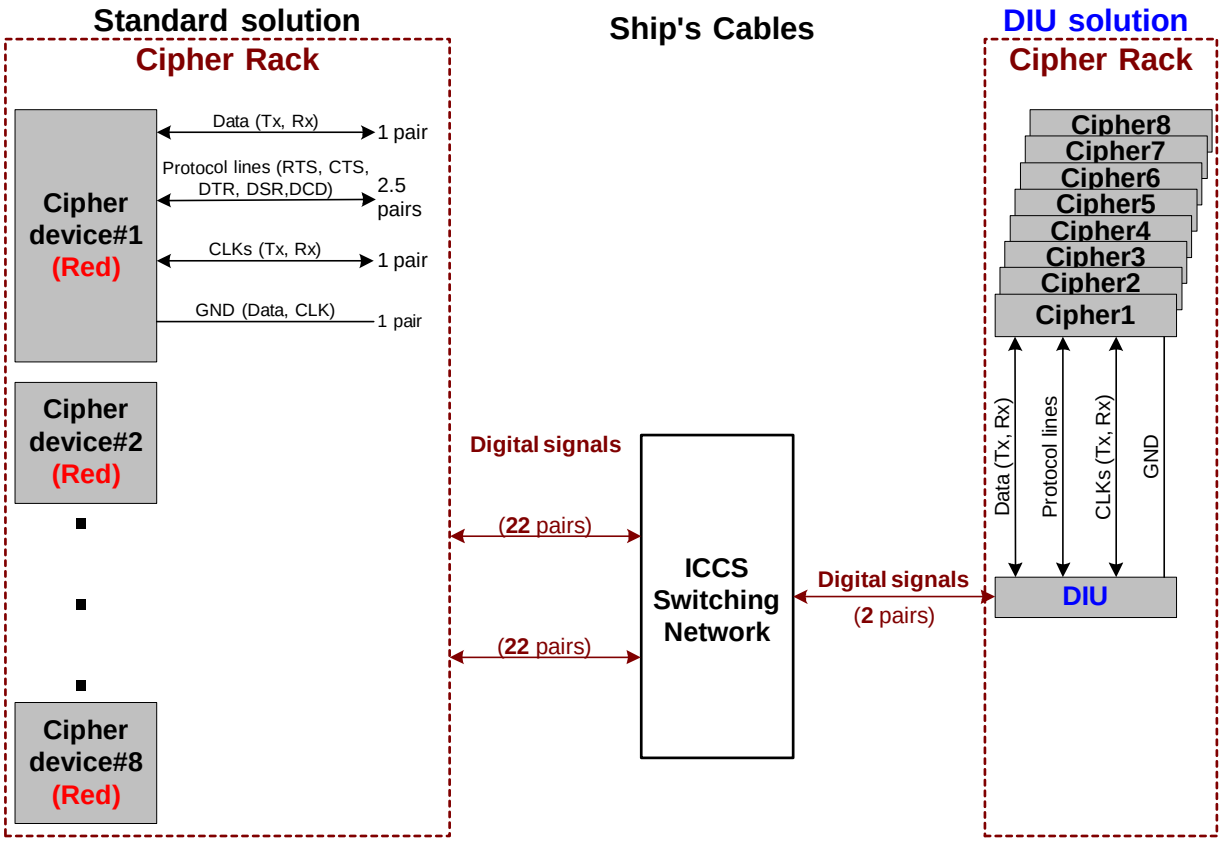


Figure 2-4 – Example of Ship's cabling reduction

The DIU consists of a 19", 1U unit with power switch, fuse holder and status led on the front panel and the external connectors on the rear panel.

Figure 2-5 – DIU (Front and Rear views)

The **DIU** provides the following types of configurable interfaces:

- RS-232/MIL-188/RS-422 asynchronous data with or without flow control
- RS-232/MIL-188/RS-422 synchronous data up to 128kbps, with or without flow control and timing.

The specifications of the **DIU** are the following:

LED	Status signalling
Unit identification	Four bit address
Hardware/firmware revision	stored in Flash EPROM memory
Isolation	all external connections
E1 Interface	120Ω twisted pairs, accordingly ETSI ETS 300 011 and ETS 300 125
Serial Data Interfaces	8, RS232/MIL-188/RS422 Tx/Rx data, Tx/Rx Clock, and Protocol lines, synchronous (up to 128 kbps) or asynchronous (up to 19200 baud)
Digital outputs	6 isolated
Digital Inputs	8 optically isolated
Power supply	115/230VAC, 50/60Hz
Consumption	30 VA
Operating temperature	0 - 50ºC
Weight	2.5Kg approx.
Dimensions	483 (W) x 43.5 (H) x 310 (D) mm

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