



ICS 4 / AN - URC 109

Marconi
Communication Systems



ICS4 / AN-URC109

- has been designed to meet modern Fleet requirements for Availability, Reliability and Maintainability. It can include v.l.f/h.f/v.h.f/u.h.f, SATCOM and Sonar to provide a very flexible and comprehensive external communications system.
- The unique Marconi broadband architecture enables all h.f transmissions to be amplified simultaneously by a common powerbank, and then radiated from wideband antennas.
- Frequency changes are very fast, and can be made in rapid succession.
- H.F transmitted power can be adjusted for each frequency and the separation between any two channels can be as low as 50kHz.
- The MIL-STD 1553 bus control option allows computer control of the system and a powerful automated confidence check programme to be run.
- The modular construction allows systems to be configured to suit any class of ship, allowing a high degree of standardization in operation, maintenance and logistic support.
- The specifications for each of the four main sub-systems which make up the ICS4/ AN-URC109 system have been chosen to give the optimum compromise between noise figure, linearity, etc. for the total system operating in a shipboard environment.

FEATURES OF THE SYSTEM INCLUDE -

- _____ Broadband architecture _____
- _____ Powerbank amplifier _____
- _____ Rapid frequency change _____
- _____ Close frequency spacing _____
- _____ Power management systems _____
- _____ Remote control _____
- _____ User friendly design _____

OPTIONS AVAILABLE INCLUDE -

- _____ MIL-STD 1553 bus control _____
- _____ Real time channel evaluation _____
- _____ Frequency hopping ECCM _____



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THE SYSTEM IN DETAIL

THE TRANSMITTING SUB-SYSTEM

This covers the m.f and h.f bands – 240kHz to 30MHz – employing a broadband architecture. Notable features include an amplifier powerbank, combining transformers and a broadband antenna system.

Baseband signals comprising voice and/or a.f tones from teletype and tactical data modems, with the carrier attenuated to the appropriate levels, are fed to the the exciters where the signals are converted to the selected radiated frequencies. H.F signals, adjusted for output power level, are automatically routed through the powerbank of broadband amplifiers to the appropriate antenna. The "wideband" transmitting circuits are provided by a number of exciter units feeding, via a combiner, a bank of wideband power amplifiers, connected in parallel, and the resulting r.f outputs are fed via a hybrid into the relevant section of the wideband antenna system. This "powerbank" technique permits the simultaneous radiation of a number of frequencies from a single broadband antenna, with the facility for rapid changes of frequencies and power levels.

Two, four or six amplifiers in parallel form a powerbank, according to the size of the package.

In applications where a powerbank/wideband amplifier system is not feasible, transmitting circuits can be provided by individual transmitters, each comprising an exciter unit, an amplifier and an antenna tuner.

EXCITERS

These are designed to give an output of 100mW p.e.p to drive an amplifier in the bands between 240kHz and 30MHz, and are suitable for single sideband

with reduced carrier SSB (pc), single sideband with suppressed carrier SSB (sc), and compatible DSB (am comp.).

The exciter unit has intermediate frequencies carefully chosen to minimize spurious emissions. The local oscillator frequencies are derived from the outputs of a built-in frequency synthesizer, which is locked in turn to a master oscillator external to the exciter, thus ensuring a high degree of accuracy and stability.

Information on nineteen preset frequencies may be stored in a memory, and a twentieth frequency can be set up using the front panel controls, selection of the channels being either from the front panel or from remote points.

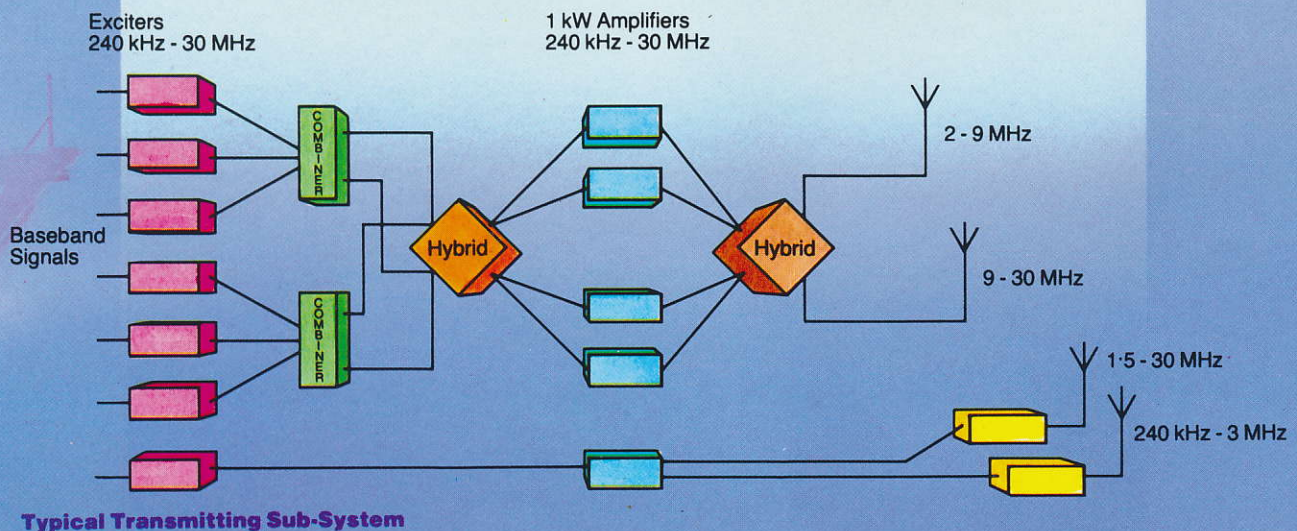
To achieve a compact, high performance design, solid-state electronics have been used throughout the exciter, with components mounted, in general, on printed circuit boards contained within plug-in replaceable sub-assemblies for ease of maintenance.

POWER AMPLIFIER

Each comprises a distributed amplifier together with a solid-state drive, associated power supplies and control circuits. It is capable of giving 1kW p.e.p over the band of 0.5MHz to 30 MHz with reduced power down to 240 kHz.

ANTENNA SYSTEM

The operation of the wideband antenna system is dependent on the superstructure of the ship and can only be accurately determined by modelling the antennas on a copper scale model. Due to structural limitations such as mast height, the wideband antenna system may be restricted in frequency coverage. In order to provide



Typical Transmitting Sub-System

communication circuits in the lower part of the h.f band and down to 240 kHz, a small number of whip antennas and an m.f wire antenna may be used.

The wideband antenna is connected via a hybrid directly to the powerbank. There are no tuned circuits, thus facilitating rapid frequency changes. Whip antennas are connected directly to tuning units which are automatically and rapidly tuned following the initiation of a change of frequency. The m.f antenna is connected to a matching unit which is tuned remotely by means of a push-button on the supervisory and control panel.

THE RECEIVING SUB-SYSTEM

This covers the v.l.f to h.f frequency range – 10 kHz to 30 MHz. The receiving sub-system comprises an active antenna, a frequency standard and m.f/h.f receivers. Signals received by the small active antenna are passed to receivers in which they are processed to be routed, via the distribution and control system, to the users. The antenna distribution can feed up to 36 receivers without the use of passive splitters, tunable multicouplers, pre-selectors, notch filters or patch panels. The distribution and control system also routes back command signals for receiver channel selection.

To enable the simultaneous control of exciters and receivers in common frequency simplex operation, each exciter unit may be paired with a receiver. This allows for common remote channel selection switching, and receiver muting, when the associated exciter is activated. Those receivers not paired with exciters are normally used for reception of broadcasts, facsimile, etc.

All systems use the same principles and vary only in the number of equipments required for a particular class of ship.

ACTIVE ANTENNA

An active antenna outfit AVK receives and amplifies signals in the range 10 kHz to 30 MHz to provide a matched output into a 50 Ohm coaxial cable which feeds a number of receivers via multicouplers. The unit is designed to give satisfactory intermodulation performance in situations where field strengths from adjacent transmitters are as high as 37V/m.

The outfit comprises a robust weatherproof deckmounted cabinet surmounted by an antenna of 1.6m length. The cabinet contains an extremely linear and low-noise valve amplifier together with power supply circuits, and provides good e.m.p protection.

FREQUENCY STANDARD

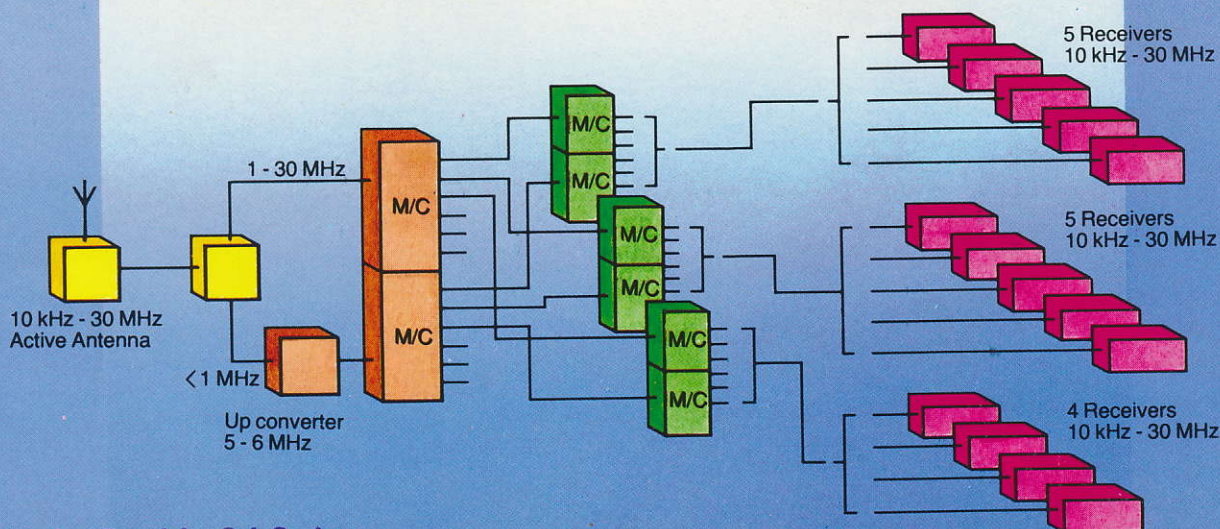
This provides a 1MHz frequency standard to the receivers and transmitter exciter units and accomodates the receiver antenna distribution system.

It consists of a frequency converter assembly, receiver antenna multicoupler unit, frequency standard multicoupler unit and two oscillator r.f power units, all fitted in a standard cabinet with an indicator control unit.

RECEIVER

The receiver covers the band 10 kHz to 30 MHz. Each receiver has two r.f signal inputs, one covering from 1 MHz to 30 MHz and the other 5.01 MHz to 5.999 MHz, the latter for upconverted l.f/m.f signals in the frequency 10 kHz to 1 MHz. It operates generally in the SSB mode in the upper sideband but provision is also made for DSB and CW operation, giving FSK and LINK 11 capability.

I.F frequencies are selected carefully to minimise spurious responses. To ensure a high degree of accuracy and stability the synthesizer is locked to the frequency standard.



Typical Receiving Sub-System

The construction, appearance and operation of the receiver is very similar to the exciter, ten replaceable sub-assemblies being mounted in a replaceable chassis, and up to five receivers being normally accommodated within a compact standard cabinet. The electronic circuitry is entirely solid-state, giving a high operational performance.

DISTRIBUTION AND CONTROL SYSTEM

The system has been designed to meet the need for fully flexible utilisation of all the external communications of modern warships. It comprises a Distribution Control console and a number of peripheral units allowing users to be connected, as required, to any of the available radio equipment.

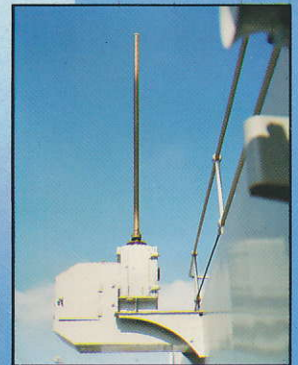
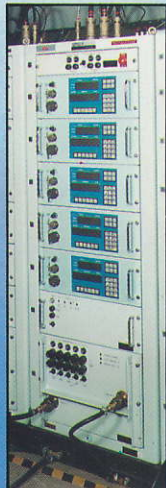
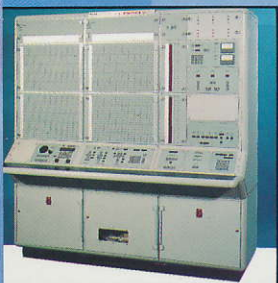
The system is able to handle a mix of secure and non-secure traffic, the secure facility being allocated to authorised users at the DCO console. System confidence checking is built-in,

together with mimic panels, which display the configuration of the system. Up to four communication plans can be pre-programmed into the DCO for instant recall.

As an alternative to the hard-wired control system, a 1553 bus controlled option is available. This allows centralised and automated system management from the ship's computers, and enables full control of frequency selection, mode selection, power level control, equipment/system status monitoring and performance checking.

THE MESSAGE PROCESSING SUB-SYSTEM

This can employ the latest technical features to provide efficient distribution and storage of all types of signal. The sub-system can be closely tailored to suit the requirements of any particular vessel or operational scenario.



T E C H N I C A L D A T A

1. TRANSMITTING SUB-SYSTEM

FREQUENCY RANGE	240kHz - 30MHz
FREQUENCY INCREMENT	100Hz
POWER OUTPUT	Up to 6kW mean, 12kW p.e.p. Dependent upon system size IP/S generally better than -36dB for operation at rated power, depending upon system size and product order.
LINEARITY	Harmonics generally better than -43dB for 700W tone in 2kW powerbank, depending upon system size and product order
LOAD VSWR	Will tolerate any load vswr when driven to nominal rated power.
NOISE AND SPURIOUS EMISSIONS	-128dB relative to p.e.p in 3kHz bandwidth at 2½% off-tune, falling to -138dB at 6% off-tune for single activated channel.
TRANSMISSION MODES	SSB (SC), carrier supression \leq 40dB. SSB (PC), carrier -16dB relative to p.e.p. Compatible AM, carrier and sideband both -6dB relative to p.e.p

2. RECEIVING SUB-SYSTEM

FREQUENCY RANGE	10kHz - 30MHz
FREQUENCY INCREMENT	10Hz
NOISE FIGURE	\geq 19dB over the range 2 -30MHz
MAXIMUM SIGNAL LEVEL	Up to 12V e.m.f into distribution system without damage.
LINEARITY	Third order intercept at distribution system input equals +38dBm for tones spaced 2½% from tune frequency.
RECIPROCAL MIXING	Degradation in noise figure \geq 2dB for 1V e.m.f signal at 2½% off-tune frequency.
RECEPTION MODES	I.F bandwidths and response times optimised for RATT, data, speech, CW and DSB modes.

Marconi

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